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Pure Water Monterey
A Groundwater Replenishment Project

DRAFT ENGINEERING REPORT

VOLUME II: APPENDICES

MRWPCA PURE WATER MONTEREY GROUNDWATER REPLENISHMENT PROJECT

January 29, 2016

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APPENDIX A

National Water Research Institute Independent Advisory Panel Reports

NATIONAL WATER RESEARCH INSTITUTE

Draft Final Report

of the October 21-22, 2013, Meeting of the

Independent Advisory Panel

for

Monterey Peninsula Groundwater Replenishment Project

Prepared for:

Monterey Regional Water Pollution Control Agency
5 Harris Court, Building D
Monterey, California 93940

January 7, 2014

DISCLAIMER

This report was prepared by an NWRI Independent Advisory Panel, which is administered by the National Water Research Institute (NWRI). Any opinions, findings, conclusions, or recommendations expressed in this report were prepared by the Panel. This report was published for informational purposes.

ABOUT NWRI

A 501c3 nonprofit organization, the National Water Research Institute (NWRI) was founded in 1991 by a group of California water agencies in partnership with the Joan Irvine Smith and Athalie R. Clarke Foundation to promote the protection, maintenance, and restoration of water supplies and to protect public health and improve the environment. NWRI's member agencies include Inland Empire Utilities Agency, Irvine Ranch Water District, Los Angeles Department of Water and Power, Orange County Sanitation District, Orange County Water District, and West Basin Municipal Water District.

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Publication Number: NWRI-2013-08

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ACRONYMS

AF	Acre foot
AI	Aggressiveness Index
AOC	Assimilable organic carbon
AOP	Advanced oxidation processes
AWTP	Advanced water treatment plant
BAF	Biologically active filtration
Cal-Am	California American Water Company
CCPP	Calcium Carbonate Precipitation Potential
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CPUC	California Public Utilities Commission
CSIP	Castroville Seawater Intrusion Project
EIR	Environmental Impact Report
GWR	Groundwater replenishment
LSI	Langlier Saturation Index
MF	Microfiltration
MPWMD	Monterey Peninsula Water Management District
MRWPCA	Monterey Regional Water Pollution Control Agency
NWRI	National Water Research Institute
RO	Reverse osmosis
TDS	Total dissolved solids
UV	Ultraviolet light
WPA	Water Purchase Agreement

1. PURPOSE AND HISTORY OF THE PANEL

In 2013, the National Water Research Institute (NWRI)[1] of Fountain Valley, California, a 501c3 nonprofit, appointed local and national water industry experts to an Independent Advisory Panel (Panel) to provide expert peer review of the proposed Monterey Peninsula Groundwater Replenishment (GWR) Project being considered by the Monterey Regional Water Pollution Control Agency (MRWPCA)[2] and its project partner, the Monterey Peninsula Water Management District (MPWMD).[3]

The GWR project is expected to create a sustainable source of water supply by using highly-treated water from a new advanced water treatment plant (AWTP) to augment local drinking water aquifers. Specifically, the project involves developing and conveying highly-treated water from the AWTP to the Seaside Basin using a series of shallow (i.e., vadose zone) and deep injection wells. Once injected into the Seaside Basin, the treated water would mix with the groundwater present in the aquifers and be stored for future use.

This additional supply would replenish the aquifers and increase the yield of the Seaside Basin for local pumpers, including the primary pumper, California American Water Company (Cal-Am). The GWR project will be designed to provide 3,500 acre-feet (AF) per year of high-quality replacement water to Cal-Am for delivery to its customers in the Monterey District service area, thereby enabling Cal-Am to reduce its diversions from the Carmel River system by the same amount.

The Panel is tasked with reviewing the proposed GWR project and providing findings and recommendations on project alternatives, alternative evaluation, and associated bench and pilot studies. Examples of issues that the Panel may address include public health and safety, advanced water treatment design issues, permitting and regulatory requirements, and public outreach and advocacy.

The Panel is made up of four experts in areas related to GWR projects, such as engineering, regulatory criteria, public health, hydrogeology, and other relevant fields. Panel members include:

- George Tchobanoglous, PH.D., P.E., NAE, University of California, Davis (Davis, CA)
- Jean-François Debroux, Ph.D., Kennedy/Jenks Consultants (San Francisco, CA)
- Martin B. Feeney, P.G., CHG, Consulting Hydrogeologist (Santa Barbara, California)
- Michael P. Wehner, MPA, REHS, Orange County Water District (Fountain Valley, California)

Background information about the NWRI Panel process can be found in Appendix A, and brief biographies of the Panel members can be found in Appendix B.

[1] http://www.nwri-usa.org/.
[2] http://www.mrwpca.org/.
[3] http://www.mpwmd.dst.ca.us/.

2. PANEL MEETING

A 2-day meeting of the Panel was held on October 21-22, 2013, at the administrative offices of MRWPCA in Monterey, California. This meeting represents the first time the Panel has met to review the proposed GWR project.

2.1 Background Material

Prior to the meeting, the following background material and reports were provided to the Panel:

a) Draft Memorandum dated May 7, 2013, from Phyllis Stanin, Principal Geologist/Vice President of Todd Engineers, to Bob Holden, Principal Engineer at MRWPCA, providing details on GWR project elements in support of the Environmental Impact Report (EIR) process.

b) Document dated May 30, 2013, and titled "NOTICE OF PREPARATION: Monterey Peninsula Groundwater Replenishment Project Environmental Impact Report."

c) Document dated August 21, 2013, that details the following from a bifurcation motion:
   - Findings Required for GWR Decision Pursuant to Settlement Agreement.
   - Procedural Schedule and Scope Pursuant to Settlement Agreement.

d) Letter dated October 10, 2013, to Mayor Jason Burnett of the City of Monterey (California) from Keith Israel, General Manager of MRWPCA, providing a list of key impediments to the timely completion of GWR.

e) Letter dated October 10, 2013, to Bob Holden, Principal Engineer at MRWPCA, from Derrik Williams, President of HydroMetrics Water Resources, Inc., that discusses the modeling completed in support of GWR project development efforts.

f) A schedule of GWR project tasks and responsible parties from June 2014 to August 2014.

2.2 Meeting Agenda

Staff from NWRI and MRWPCA collaborated on the development of the agenda for the Panel meeting, which is included in Appendix C. The agenda was based on meeting the following specific objectives:

- Develop a working understanding of the proposed GWR project.
- Identify proposed project strengths and areas where more information is needed.
- After the meeting, prepare a brief summary of project questions and obstacles for use by the GWR project team.

The majority of the meeting was devoted to presentations made by MRWPCA staff and the project team. Time was provided for the Panel to ask questions and engage in discussion following each presentation. The presentations included:

- Panel Charge
- Overview of the Project Partners (MPWMD and MRWPCA)
- Overview of Related and Planned Projects
- GWR Project
- Bench Testing
- Pilot Testing and Sampling Plan
- Product Water Conveyance
- GWR Project – Injection
- Public Outreach

Once the presentations were concluded, the Panel met in a closed session to discuss the information presented and address questions provided by MRWPCA and the project team. Before the meeting adjourned, the Panel prepared a report outline and drafted preliminary findings and recommendations, which have been expanded upon in this report.

2.3 Meeting Attendees

All Panel members attended this meeting with the exception of George Tchobanoglous. Other attendees included NWRI staff, MRWPCA staff, MPWMD staff, project team members, representatives from agency partners, and regulators. A complete list of Panel meeting attendees is included in Appendix D.

3. OBSERVATIONS AND FINDINGS

The principal observations and findings derived from the material presented and discussed during the meeting are provided below. They are organized under the following categories:

- General
- Project Goals and Outcomes
- Schedule
- GWR Source Waters
- Treatment
- Monitoring
- Pilot Study
- Conveyance
- California Environmental Quality Act (CEQA)
- Groundwater Items
- Brine
- Public Outreach

3.1 General

The Panel compliments MRWPCA and the project team for their excellent presentations, which were well-prepared and professional. The Panel also appreciated the background documents provided by MRWPCA.

3.2 Project Goals and Outcomes

- It is critical that MRWPCA understand all the criteria to allow the California Public Utilities Commission (CPUC) to approve the Water Purchase Agreement (WPA). The Panel requests that MRWPCA provide its interpretation of the criteria in the settlement agreement. The interpretation should be accompanied by a plan, including a schedule to meet each criterion. It is not appropriate for the Panel to develop this interpretation.

  The Panel can evaluate MRWPCA's plan and progress in meeting these criteria. Once all the criteria are met, the Panel can provide a letter stating that the Panel believes MRWPCA has met the criteria as interpreted by MRWPCA.

- The Panel agrees that the GWR project is consistent with integrated water management planning as described in the California Water Plan.

- The Panel concurs that a draft engineer's report should be developed and incorporated into the schedule, as well as reviewed by the Panel. Allowing the California Department of Public Health (CDPH) to review the draft report would help in their conceptual approval of the project (which is necessary to satisfy CPUC's WPA approval).

- The Panel is concerned that the project (including conveyance and injection costs) could be greater than $3,000 per AF. Preliminary estimates may be useful.

- The variability and sustainability of influent flows are of concern in light of additional conservation efforts, impacts of higher rates, inflow and infiltration, agricultural practices, and so on. Additional analysis, including seasonal flows, would be helpful in determining future flows. A breakdown between Salinas and the peninsula may be useful. Also, what is the likelihood of acquiring rights to the identified sources?

- In a time of shortage, how would water be allocated between the Castroville Seawater Intrusion Project (CSIP) and GWR obligations?

- The Panel requests information on flow consistency and justification between source water availability, treatment, conveyance, and injection (e.g., why is injection well capacity being doubled?). The Panel recognizes that some items are upsized. It is possible to upsize all the items by similar amounts or to present a plan for upsizing components and long-term usage.

3.3 Schedule

- The Panel is aware of the tight schedule that MRWPCA is trying to meet. MRWPCA should coordinate Panel meetings with the review of GWR project tasks and milestones to expedite this schedule.

- The Panel would find it useful to have a numbered list of tasks, with a paragraph describing each task and Gantt chart to better understand how elements tie together, what the milestones are, what review is needed, and so on. This format will facilitate the Panel's review of MRWPCA's efforts related to GWR project tasks.

3.4 GWR Source Waters

- Regarding the presentation on the Blanco Drain, the Panel does not see a clear use of this water resource. MRWPCA should develop a plan for how Blanco Drain, if needed, is incorporated into the GWR project. In addition, a clear use for the 1/4 Reclamation Ditch water is not apparent.

- Regarding wastewater flows, is there a projection on when the reduction in flows will flatten out? Flows may drop more with increased water rates.

3.5 Treatment

- The Panel believes that ozone-biologically active filtration (BAF)-microfiltration (MF)-reverse osmosis (RO)-ultraviolet-based advanced oxidation processes (UV/AOP) to be appropriate to treat all sources that have gone through secondary treatment.

- To maintain appropriate levels of total dissolved solids (TDS) in the irrigation water, consider sending advanced treated water to the tertiary pond to control salinity if high TDS source water is sent to the plant headworks.

- MRWPCA should evaluate the possibility of the advanced treatment plant being larger than 3,500 AF. For example, a larger plant can treat water for the growers (rather than for economic growth) and could treat periods of high flows. Additional capacity in a larger advanced treatment plant could be used to offset the reduced availability of source water during dry years and droughts.

- Is the priority for source water treatment the following: Agricultural wash, Salinas stormwater, peninsula stormwater, 1/4 Reclamation Ditch, and Blanco Drain? A priority for the source waters should be established for the project.

- Is there a plan to stabilize the high-purity water before conveyance and injection? Is there a target finished water quality related to stability (e.g., Langlier Saturation Index [LSI], Aggressiveness Index [AI], and Calcium Carbonate Precipitation Potential [CCPP])? The appropriate stability index should be matched to the planned infrastructure materials and the prevention of metals mobilization in the aquifer.

- Is there an intent to maintain a chlorine residual in the finished water pipeline? The wells may perform better, especially if significant amounts of assimilable organic carbon (AOC) are present in the finished water.

3.6 Monitoring

- What is the rationale for quarterly monitoring of the source waters? Will the wet periods or specific crop washing be captured sufficiently?

- Regarding source water monitoring, the Panel recommends that MRWPCA provide a proposed list of constituents to change from quarterly monitoring to either annual monitoring or no monitoring. In addition, a brief narrative on the rationale to remove the constituents would be helpful for the Panel's review. The Panel would review the list and develop recommendations for submission to CDPH.

- Regarding monitoring for the pilot study, the Panel recommends that MRWPCA provide the proposed monitoring scheme for the pilot study, including constituents, locations, frequency, and related information. A brief narrative providing the project team's rationale would be helpful.

3.7 Pilot Study

- The Panel looks forward to seeing the early results from the pilot study.

- Will the pilot study results be used to determine if ozone and/or BAF are needed? Is this a goal of the pilot study?

3.8 Conveyance

- Due to the treatment employed, the stability of the water will need to be addressed with regards to pipeline material and corrosion. A stabilized water will be important for groundwater injection.

3.9 California Environmental Quality Act (CEQA)

- The Panel was impressed with the thoroughness of the CEQA efforts and encourages MRWPCA to continue these efforts as the project moves forward.

3.10 Groundwater Items

- The stability of the water will need to be evaluated for both aquifer systems (the Paso Robles and Santa Margarita formations).

- The groundwater sampling list will be forthcoming for Panel review. The Panel concurs that the list should include ordnance-related compounds, including perchlorate.

- The location analysis seems well handled in balancing all the components. The hydraulic modeling investigations (particle tracking) supported the analysis.

- Some sensitivity analysis on the modeling could be conducted on the reduced thickness of the Santa Margarita formation as the formation is not uniform.

- Costs for wells need to include costs for above-ground well facilities.

- The EIR should consider noise and visual impacts of the above-ground appurtenances.

- Is the use of one monitoring well in the Paso Robles because of the known heterogeneity? It would be helpful to justify the use of only one monitoring well.

- The well exploration program should include cased-hole geophysics, such as induction and gamma logging.

- Regarding the stability of RO source water quality: How will finished water quality impact wells? How will chemical reactions with aquifer materials be evaluated? Is there a need for geochemical modeling?

3.11 Brine

- MRWPCA should develop a brine management plan that includes discharge, seawater desalination brine, GWR brine, blending of brines, diffuser redesign, and so on.

3.12 Public Outreach

- The Panel recognizes that public outreach is a critical component of the project.
- Outreach to growers will be an important consideration as the project moves forward.
- It will be important to work with project partners and to understand the roles of each of the partners.
- Continued coordination between project proponents and tours of the Orange County Water District's Groundwater Replenishment System will be useful and beneficial.
- The communication plan should be finalized in coordination with project partners.
- There is a need to develop a consistent vocabulary and message for various agency representatives as they discuss the project at public meetings.
- As the timeline moves towards the completion of the project, the need for outreach efforts will intensify.
- There is a need to develop a visitor program for pilot facilities. The ability for visitors to view the pilot facilities would be useful, as observed in Orange County and San Diego.
- The use of a website and social media tools should be maintained throughout the effort.
- The Panel recommends that progress with the outreach program be reviewed at future Panel meetings.

APPENDIX A: PANEL BACKGROUND

About NWRI

For over 20 years, NWRI – a science-based 501c3 nonprofit located in Fountain Valley, California – has sponsored projects and programs to improve water quality, protect public health and the environment, and create safe, new sources of water. NWRI specializes in working with researchers across the country, such as laboratories at universities and water agencies, and are guided by a Research Advisory Board (representing national expertise in water, wastewater, and water reuse) and a six-member Board of Directors (representing water and wastewater agencies in Southern California).

Through NWRI's research program, NWRI supports multi-disciplinary research projects with partners and collaborators that pertain to treatment and monitoring, water quality assessment, knowledge management, and exploratory research. Altogether, NWRI's research program has produced over 300 publications and conference presentations.

NWRI also promotes better science and technology through extensive outreach and educational activities, which includes facilitating workshops and conferences and publishing White Papers, guidance manuals, and other informational material.

More information on NWRI can be found online at www.nwri-usa.org.

About NWRI Panels

NWRI also specializes in facilitating Independent Advisory Panels on behalf of water and wastewater utilities, as well as local, county, and state government agencies, to provide credible, objective review of scientific studies and projects in the water industry. NWRI Panels consist of academics, industry professionals, government representatives, and independent consultants who are experts in their fields.

The NWRI Panel process provides numerous benefits, including:

- Third-party review and evaluation.
- Scientific and technical advice by leading experts.
- Assistance with challenging scientific questions and regulatory requirements.
- Validation of proposed project objectives.
- Increased credibility with stakeholders and the public.
- Support of sound public-policy decisions.

NWRI has extensive experience in developing, coordinating, facilitating, and managing expert Panels. Efforts include:

- Selecting individuals with the appropriate expertise, background, credibility, and level of commitment to serve as Panel members.
- Facilitating hands-on Panel meetings held at the project's site or location.

- Providing written report(s) prepared by the Panel that focus on findings and recommendations of various technical, scientific, and public health aspects of the project or study.

Over the past 5 years, NWRI has coordinated the efforts of over 20 Panels for water and wastewater utilities, city and state agencies, and consulting firms. Many of these Panels have dealt with projects or policies involving groundwater replenishment and potable (indirect and direct) reuse. Specifically, these Panels have provided peer review of a wide range of scientific and technical areas related water quality and monitoring, constituents of emerging concern, treatment technologies and operations, public health, hydrogeology, water reuse criteria and regulatory requirements, and outreach, among others.

Examples of recent NWRI Panels include:

- **Groundwater Recharge Scientific Study** for the LOTT Clean Water Alliance (WA)
- **Groundwater Replenishment System Program Review** for the Orange County Water District (CA)
- **Examining the Criteria for Direct Potable Reuse** for Trussell Technologies (CA) and WateReuse Research Foundation (VA)
- **Evaluating Potable Reuse** for the Santa Clara Valley Water District (CA)
- **Indirect Potable Reuse/Reservoir Augmentation Project Review** for the City of San Diego (CA)
- **BDOC as a Surrogate for Organics Removal in Groundwater Recharge** for the California Department of Health Services (CA)
- **Effluent Master Plan** for Tucson Water (AZ)
- **Groundwater Replenishment Project Review** for the Los Angeles Department of Water and Power (CA)

More information about the NWRI Independent Advisory Panel Program can be found on the NWRI website at http://nwri-usa.org/Panels.htm.

APPENDIX B: PANEL BIOGRAPHIES

GEORGE TCHOBANOGLOUS, PH.D., P.E., NAE
Professor Emeritus
University of California, Davis (Davis, CA)

For over 35 years, wastewater expert George Tchobanoglous has taught courses on water and wastewater treatment and solid waste management at the University of California, Davis, where he is Professor Emeritus in the Department of Civil and Environmental Engineering. He has authored or coauthored over 500 publications, including 22 textbooks and eight engineering reference books. Tchobanoglous has been past President of the Association of Environmental Engineering and Science Professors and currently serves as a national and international consultant to both government agencies and private concerns. Among his honors, he received the Athalie Richardson Irvine Clarke Prize from NWRI in 2003, was inducted to the National Academy of Engineers in 2004, and received an Honorary Doctor of Engineering degree from the Colorado School of Mines in 2005. In 2012, he received the first Excellence in Engineering Education Award from AAEE and AEESP. In 2013, he was selected as the AAEE and AEESP Kappe Lecturer. Tchobanoglous received a B.S. in Civil Engineering from the University of the Pacific, an M.S. in Sanitary Engineering from the University of California, Berkeley, and a Ph.D. in Environmental Engineering from Stanford University.

JEAN-FRANÇOIS DEBROUX, Ph.D.
Director, Advanced Technologies Group
Kennedy/Jenks Consultants (San Francisco, CA)

At Kennedy/Jenks Consultants, Jean Debroux serves as Director of the Advanced Technologies Group, which was formed to solve technologically challenging problems. Part of this effort includes performing pilot and field studies for regulated and emerging contaminants and evaluates the cost impacts of complying with Safe Drinking Water Act regulations. A water quality expert, Debroux has extensive experience and expertise working with water utilities and research organizations in water treatment and water reuse issues, and is an active member of the WateReuse Foundation, where he serves on the Research Advisory Committee. Debroux received a B.S. in Chemical Engineering from the University of South Florida, and both an M.S. in Environmental Engineering and Ph.D. in Civil Engineering from the University of Colorado, Boulder. In addition, he attended the Environmental Management Institute at Tufts University and has served as a Post-Doctoral Research Fellow and Lecturer at Stanford University and as a Research Fellow at Université de Poitiers, France.

MARTIN B. FEENEY, P.G., CHG
Consulting Hydrogeologist (Santa Barbara, California)

Martin Feeney has been a consulting hydrogeologist since 1997, providing hydrogeologic consulting services to water agencies, private industry, and engineering firms. Prior to this, he served as hydrogeologist at various consulting firms such as Balanced Hydrologics, Inc. and Fugro West, Inc., where he provided analysis of groundwater basins, developed groundwater flow and transport, and developed saline groundwater source for desalination plants, injection wells/artificial recharge programs, and underground storage tank site assessment and remediation. He has also been involved in numerous groundwater resources and water well projects throughout California, working for groups such as Monterey County, Salinas Valley, Santa Clara Valley Water District, Ventura County, and various others. Feeney received a B.S. in Earth Sciences from the University of California, Santa Cruz and an M.S. in Environmental Planning (Groundwater) from California State University.

MICHAEL P. WEHNER, REHS, MPA
Assistant General Manager
Orange County Water District (Fountain Valley, California)

Mike Wehner has over 40 years of experience in water quality control and water resources management. He has been with the Orange County Water District (OCWD) since 1991, currently serving as Assistant General Manager. Among his responsibilities, he directly manages the Water Quality and Technology Group, including Laboratory, Water Quality, Hydrogeology, Research and Development, and Health and Regulatory Affairs Departments. He is also involved with numerous aspects with the Groundwater Replenishment System (the nation's largest IPR project), including providing technical guidance on treatment and quality, as well as managing monitoring programs for the purification facility and receiving groundwater. He was also manager of OCWD's 8-year Santa Ana River Water Quality and Health Study, which evaluated the impact of using effluent-dominated river waters for groundwater recharge. Prior to joining OCWD, Wehner spent 20 years with the Orange County Health Care Agency, where he managed the Water Quality Control Section of Environmental Health. He is a Registered Environmental Health Specialist in California and is an internationally recognized expert in water quality, public health, and advanced water treatment processes, serving on expert panels in the United Kingdom, Australia, and Singapore, as well as for California and U.S. agencies and foundations. He received a Masters of Public Administration from California State University Long Beach and a B.S. in Biological Sciences from the University of California, Irvine.

APPENDIX C: MEETING AGENDA

NATIONAL WATER RESEARCH INSTITUTE

Independent Advisory Panel Meeting for Monterey Regional Water Pollution Control Agency on Monterey Peninsula Groundwater Replenishment Project

Preliminary Meeting Agenda
October 21-22, 2013

Location
Monterey Regional Water Pollution Control Agency
Administrative Offices
5 Harris Court, Bldg. D
Monterey, CA 93940
(831) 372-3367

On-Site Contacts:
Jeff Mosher (NWRI)
Cell: (714) 705-3722
Mike McCullough (MRWPCA)
Office: (831) 594-2597

Meeting Objectives:

- Develop a working understanding of the Proposed Groundwater Replenishment Project.
- Identify proposed project strengths and areas where more information is needed.
- After the meeting, prepare a brief summary of project questions and obstacles for use by the GWR team.

Monday, October 21, 2013		
10:00 am	**Welcome and Introductions** - CDPH (Jan Sweigert) - RWQCB (Harvey Packard) - MPWMD (Dave Stoldt) - MRWPCA (Keith Israel)	Jeff Mosher, NWRI Mike Wehner, Panel
10:30 am	Panel Charge - Goals and Objectives - Panel Outcomes	Keith Israel, MRWPCA
10:45 am	Overview of Partners: MPWMD and MRWPCA	Larry Hampson, MPWMD and Bob Holden, MRWPCA
11:00 am	Overview of Related and Planned Projects - Monterey County Water Situation (Bob Holden) - Water Solutions (Larry Hampson) o Deep Water Desal, People's Desal, and Other Desal o Monterey Peninsula Water Supply Project (Desalination, ASR, GWR)	Bob Holden and Larry Hampson

11:30 am	Groundwater Replenishment Project (GWR) - Source Water Characterization - Quantities and Locations (Bob Holden) - Qualities (Gordon Williams) o Secondary, Tertiary, Ag Wash Water, Blanco Drain, Reclamation Ditch o Sampling Plan	Bob Holden
12:30 - 1:00 pm	**WORKING LUNCH**	
1:00 pm	Bench Testing - Secondary, Ag Wash water, Blanco Drain, and Secondary + Ag Wash water	Gordon Williams, Trussell
2:00 pm	Pilot Testing and Sampling Plan - Secondary and Advanced treatment	Kevin Alexander, SPI
2:45 pm	**BREAK**	
3:00 pm	Product Water Conveyance	Alison Imamura, DDA
3:50 pm	Panel Deliberations	Mike Wehner, Panel
5:00 pm	**Adjourn**	

Tuesday, October 22, 2013

8:30 am	**Summary of Day 1**	Jeff Mosher, NWRI Mike Wehner, Panel
8:40 am	Groundwater Replenishment Project - Injection - Seaside Groundwater Basin - Injection Sites - Modeling - Monitoring Well - Injections Wells	Phyllis Stanin, Todd Engineers
9:45 am	**BREAK**	
10:00 am	Public Outreach	Keith Israel, MWRPCA
10:15 am	Questions and Discussions	
10:30 am	Panel Deliberations	Mike Wehner, Panel
12:00 noon	**Working Lunch**	
1:30 pm	Debrief with MWRPCA	All
2:00 pm	**Adjourn**	

APPENDIX D: MEETING ATTENDEES

Panel Members:

- Jean-François Debroux, Ph.D., Kennedy/Jenks Consultants (San Francisco, CA)
- Martin B. Feeney, P.G., CHG, Consulting Hydrogeologist (Santa Barbara, California)
- Michael P. Wehner, REHS, MPA, Orange County Water District (Fountain Valley, California)

National Water Research Institute:

- Jeff Mosher, Executive Director

Monterey Regional Water Pollution Control Agency:

- Garrett Haertel, P.E., Compliance Engineer
- Brad Hagemann, Assistant General Manager
- Karen Harris, Community Relations Specialist
- Robert Holden, P.E., Principal Engineer
- Keith Israel, General Manager
- Mike McCullough, Recycled Water Project Assistant

Monterey Peninsula Water Management District

- Larry Hampson, District Engineer
- Jonathan Lear, PG, CHg, Senior Hydrogeologist.
- Joe Oliver, PG, CHg, Water Resources Division Manager
- David J. Stoldt, General Manager

Project Team Members:

- Jim Brezack, Brezack and Associates Planning
- Jerry Cole, Consultant
- James Crook, Environmental Engineering Consultant (Retired CDPH)
- Denise Duffy, Denise Duffy & Associates
- Alison Imamura, Denise Duffy & Associates
- Margie Nellor, Nellor Environmental Associates (on phone)
- Phyllis Stanin, Todd Engineers
- Alex Wesner, Separation Processes Inc.
- Valerie J. Young, AICP, Environmental Planning and Water Reuse Consultant

California Department of Public Health:

- Randy Barnard (on phone)
- Brian Bernados
- Eugene Leung (on phone)
- Jan Sweigert

Regional Water Quality Control Board, Central Coast Region

- Harvey Packard

Monterey County Health Department

- Cheryl Sandoval (on phone)

NATIONAL WATER RESEARCH INSTITUTE

Draft Final Report

of the May 1-2, 2014, Meeting of the

Independent Advisory Panel

for

Pure Water Monterey Peninsula Groundwater Replenishment Project

Prepared for:

Monterey Regional Water Pollution Control Agency
5 Harris Court, Building D
Monterey, California 93940

June 23, 2014

DISCLAIMER

This report was prepared by an NWRI Independent Advisory Panel, which is administered by the National Water Research Institute (NWRI). Any opinions, findings, conclusions, or recommendations expressed in this report were prepared by the Panel. This report was published for informational purposes.

ABOUT NWRI

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Jeffrey J. Mosher, Executive Director
Gina Melin Vartanian, Editor

Publication Number: NWRI-2014-07

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ACRONYMS

AF	Acre foot
ASR	Aquifer storage and recovery
AWTP	Advanced water treatment plant
BAF	Biologically active filtration
Cal-Am	California American Water
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CSIP	Castroville Seawater Intrusion Project
EIR	Environmental Impact Report
GWR	Groundwater replenishment
L	Liter
MF	Microfiltration
MPWMD	Monterey Peninsula Water Management District
MRWPCA	Monterey Regional Water Pollution Control Agency
NDMA	N-Nitrosodimethylamine
NWRI	National Water Research Institute
RO	Reverse osmosis
TDS	Total dissolved solids
UV	Ultraviolet light
WPA	Water Purchase Agreement

1. PURPOSE AND HISTORY OF THE PANEL

In 2013, the National Water Research Institute (NWRI)[1] of Fountain Valley, California, a 501c3 nonprofit, appointed local and national water industry experts to an Independent Advisory Panel (Panel) to provide expert peer review of the proposed Pure Water Monterey Peninsula Groundwater Replenishment (GWR) Project being considered by the Monterey Regional Water Pollution Control Agency (MRWPCA)[2] and its project partner, the Monterey Peninsula Water Management District (MPWMD).[3] Henceforth, MRWPCA, MPWMD, and their consultants will be referred to as the "Project Team."

The GWR project is expected to create a sustainable source of water supply by using highly-treated water from a new advanced water treatment plant (AWTP) to augment local drinking water aquifers. Specifically, the project involves developing and conveying highly-treated water from the AWTP to the Seaside Basin, where the water will be injected into the aquifer using a series of shallow (i.e., vadose zone) and deep wells. Once injected into the Seaside Basin, the treated water would mix with the groundwater present in the aquifers and be stored for future use.

This additional supply would replenish the aquifers and increase the yield of the Seaside Basin for local pumpers, including the primary pumper, California American Water (Cal-Am). The GWR project will be designed to provide 3,500 acre-feet (AF) per year of high-quality replacement water to Cal-Am for delivery to its customers in the Monterey District service area, thereby enabling Cal-Am to reduce its diversions from the Carmel River system by the same amount.

The Panel is tasked with reviewing the proposed GWR project and providing findings and recommendations on project alternatives, alternative evaluation, and associated bench and pilot studies. Examples of issues that the Panel may address include public health and safety, advanced water treatment design issues, permitting and regulatory requirements, and public outreach and advocacy.

The Panel is made up of four experts in areas related to GWR projects, such as engineering, regulatory criteria, public health, hydrogeology, and other relevant fields. Panel members include:

- George Tchobanoglous, PH.D., P.E., NAE, University of California, Davis (Davis, CA)
- Jean-François Debroux, Ph.D., Kennedy/Jenks Consultants (San Francisco, CA)
- Martin B. Feeney, P.G., CHG, Consulting Hydrogeologist (Santa Barbara, CA)
- Michael P. Wehner, MPA, REHS, Orange County Water District (Fountain Valley, CA)

Background information about the NWRI Panel process can be found in Appendix A, and brief biographies of the Panel members can be found in Appendix B.

[1] http://www.nwri-usa.org/.
[2] http://www.mrwpca.org/.
[3] http://www.mpwmd.dst.ca.us/.

2. PANEL MEETING

A 2-day meeting of the Panel was held on May 1-2, 2014, at both the MRWPCA Regional Treatment Plant in Marina, California (May 1) and the MRWPCA administrative offices in Monterey, California (May 2). This meeting represents the second time the Panel has met to review the proposed GWR project.

2.1 Background Material

Prior to the meeting, the following background material and reports were provided to the Panel:

- Revised draft of the 29-page concept approval proposal, titled "Monterey Regional Water Pollution Control Agency Groundwater Replenishment Project: Proposal to Inject Highly-Treated Recycled Water into the Seaside Groundwater Basin" (dated April 23, 2014). The proposal was expected to be submitted to the California Department of Public Health (CDPH) by May 15, 2014.

2.2 Meeting Agenda

Staff from NWRI and the Project Team collaborated on the development of the agenda for the Panel meeting, which is included in Appendix C. The agenda was based on meeting the following specific objectives:

- Review the draft concept approval proposal to be submitted to CDPH for review.
- Develop a working understanding of the proposed GWR Project.
- Identify proposed project strengths and areas where more information is needed.
- After the meeting, prepare a brief summary of project questions and obstacles for use by the GWR team.

The majority of the meeting was devoted to presentations made by the Project Team. Time was provided for the Panel to ask questions and engage in discussion following each presentation. The presentations included:

- Water Quality, including:
    - Source Water Characterization
    - Pilot Facility Preliminary Results
    - Baseline Groundwater Basin Quality
    - Ongoing Vadose Zone Leaching Tests
- Outreach Update
- CEQA Status Report and Permits
- Water Rights Update
- Settlement Update
- Source Control Program
- Regulatory – Draft Concept Proposal
- GWR Panel Checklist: A Recap Items from October 21-21, 2013 Panel Meeting

In addition to the presentations, the Panel was given a tour of the Advanced Water Purification Demonstration Facility at the MRWPCA Regional Treatment Plant in Marina, California, and participated in a field trip to view possible water sources to be used as part of the project, including: Tembladero Slough, Blanco Drain, Reclamation Ditch, Salinas Pump Station, and the Industrial Ponds.

Once the presentations and tours were concluded, the Panel met in a closed session to discuss the information presented and address questions provided by the Project Team. Before the meeting adjourned, the Panel prepared a report outline and drafted preliminary findings and recommendations, which have been expanded upon in this report.

2.3 Meeting Attendees

All Panel members attended this meeting. Other attendees included NWRI staff, MRWPCA staff, MPWMD staff, consultants, representatives from agency partners, and regulators. A complete list of Panel meeting attendees is included in Appendix D.

3. OBSERVATIONS AND FINDINGS

The principal observations and findings derived from the material presented and discussed during the meeting are provided below. They are organized under the following categories:

- General
- Source Water
- Regional Treatment Plant
- Advanced Treatment
- Aquifer Injection
- Project Management
- Public Outreach
- Suggested Revisions to the Draft Concept Proposal

3.1 General

- The Panel compliments the Project Team for their excellent presentations, which were well-prepared and professional. The Panel also appreciated the background documents provided by the Project Team.

- The Panel concludes that the GWR project will contribute to the water supply portfolio of the Cal-Am's Monterey Peninsula service area by supplementing existing sources and providing a greater degree of independence, thus improving the reliability and sustainability of the region's water supplies.

- The Panel commends the Project Team for the significant amount of effort and progress that has been made in reaching project goals.

- The organization of the Panel meeting and field trip was both instructive and productive not only for Panel members, but for others in attendance, including regulators.

- The progress that the Project Team has made in their responsiveness to the previous Panel report is exemplary.

- The Panel concurs with the Project Team on the importance of securing water rights and associated contracts for the various source waters.

- The Panel has reviewed the draft project proposal to "Inject Highly-Treated Recycled Water into the Seaside Groundwater Basin" and believes that it represents a comprehensive description and assessment of the proposed GWR project and that it should be submitted to CDPH for early review.

3.2 Source Water

- Some probability distributions of the advanced treatment facility influent constituents

would be important in terms of the operation of the ozone and membrane systems.

- The Panel has some concern that the quantity number projected for indoor water use in the future may be higher than should be anticipated, given current trends in conservation.

3.3 Regional Treatment Plant

- Because of excess capacity in the current trickling filter treatment process, it may be possible to operate one of the filters in a nitrifying mode. Such an operation may (1) eliminate the need for ozone (and reduce N-Nitrosodimethylamine [NDMA] formation potential), (2) further enhance the effectiveness of the ozone, and/or (3) produce an effluent that is significantly easier to filter (based on actual data from the Orange County Water District in Fountain Valley, California).

3.4 Advanced Treatment

- The Panel is concerned with the measures that have been taken to manage salinity. More specifically, is the goal of going from 750 to 799 milligrams of total dissolved solids per liter (TDS/L) in the recycled water realistic given the quantity and quality of the existing and new water sources?

- In assessing the chemistry of the stabilized product water from the reverse osmosis (RO) process, it will be important to check a number of indexes for both precipitation and corrosion in conjunction with the various pipe materials to be used.

- The remedies for stabilizing the water need to be consistent with the leaching or plugging potential of the final water on soils at the recharge area.

- Is chlorine addition (form of chlorine, e.g., chloramine or free) part of the chemical stabilization process?

- The methodology to be used to assess whether to include ozone and/or biologically active filtration (BAF) in the overall treatment process needs to be defined (e.g., water quality, treatability, cost, or a combination of factors).

3.5 Aquifer Injection

- Additional information needs to be developed on water movement in the Santa Margarita aquifer (e.g., the sensitivity to thickness of the highly conductive zone).

- To increase the travel time of the recharged water in the subsurface, consideration should be given to operating the existing aquifer storage and recovery (ASR) wells as only injection wells without recovery.

- Given that the vadose wells and injection wells will be co-located, it is recommended that the injection well be drilled first so that intervening clay layers can be characterized so that the vadose well design can be optimized.

3.6 Project Management

- Effective project coordination and management will be required to move forward in the very limited timeframe available for this project.

- Consideration should be given to the employment of an overall engineering project manager to coordinate the efforts of all sub-consultants.

3.7 Public Outreach

- The Panel commends the Project Team for the effort they have undertaken (e.g., educational visuals) to make the pilot facilities accessible and an educational experience.

- Given the noise level of the room in which the pilot facility is located, it would be helpful if some outdoor facilities, such as an open area tent with educational display materials and a place to sit and converse, would help occupy the visitors not touring the inside of the pilot facility.

- Because of the effectiveness of tours of the treatment facilities on public perception, it is recommended that the pilot facilities be retained and operated beyond the current study period. The pilot-scale facilities can also be used for operator training.

- The Panel is concerned that public outreach may be moving too far ahead of the actual project in terms of developing hand outs and visual materials. It appears by the public outreach materials that the project is a foregone conclusion.

- The Panel questions the usefulness and/or effectiveness of the proposed summit with the congressional delegation. The Panel would suggest that such a meeting might be appropriate once a concept approval letter has been received from CDPH.

3.8 Suggested Revisions to the Draft Concept Proposal

As noted in Section 2.1, the concept approval proposal, "Monterey Regional Water Pollution Control Agency Groundwater Replenishment Project: Proposal to Inject Highly-Treated Recycled water into the Seaside Groundwater Basin" (dated April 23, 2014), was to be submitted to CDPH by May 15, 2014. Because of the short turnaround time, the Panel provided comments and suggested revisions to the proposal during the Panel meeting. In this section, the Panel would like to formally document comments and recommendations made at the meeting. They include:

- The Panel commends the Project Team for a well-written, high-quality proposal.

- The Panel noted that the purpose of this proposal is to receive approval from CDPH to continue to move forward with evaluating the design and implementation of the proposed project. Therefore, it does not require detailed data and information, unlike (for instance) an engineer's report. In fact, the Panel cautions against sharing data in advance of efforts being undertaken through the California Environmental Quality Act (CEQA) process (including the development of the Environmental Impact Report [EIR]).

- A consistent term should be used throughout the report to refer to the end-product (for instance, "highly treated recycled water," "product water," or "purified water").

- In Section 4.3 "Public Outreach," it is important to include the activities and results of the re-branding effort that began in early 2014, such as changing the project's name to "Pure Water Monterey."

- Within Section 5 "Proposed Project Components," the Panel recommends adding a Section 5.4 on "Aquifer Recharge Facilities." In addition, a general statement that "recharge water may enter the vadose zone" could be added to the new Section 5.4.

- Section 7 "Seaside Groundwater Basin" and Section 8 "Injection Well Facilities" could be combined into one "Groundwater" section. The information on "Injection Well Facilities" could be expanded (by no more than a page) and should include work that has been conducted to-date to verify this effort. In addition, revise the groundwater injection map to reflect recent changes to well placement.

- Update Section 9.7 "Response Retention Time" with the new model run for Well Number 1.

APPENDIX A: PANEL BACKGROUND

About NWRI

For over 20 years, NWRI – a science-based 501c3 nonprofit located in Fountain Valley, California – has sponsored projects and programs to improve water quality, protect public health and the environment, and create safe, new sources of water. NWRI specializes in working with researchers across the country, such as laboratories at universities and water agencies, and are guided by a Research Advisory Board (representing national expertise in water, wastewater, and water reuse) and a six-member Board of Directors (representing water and wastewater agencies in Southern California).

Through NWRI's research program, NWRI supports multi-disciplinary research projects with partners and collaborators that pertain to treatment and monitoring, water quality assessment, knowledge management, and exploratory research. Altogether, NWRI's research program has produced over 300 publications and conference presentations.

NWRI also promotes better science and technology through extensive outreach and educational activities, which includes facilitating workshops and conferences and publishing White Papers, guidance manuals, and other informational material.

More information on NWRI can be found online at www.nwri-usa.org.

About NWRI Panels

NWRI also specializes in facilitating Independent Advisory Panels on behalf of water and wastewater utilities, as well as local, county, and state government agencies, to provide credible, objective review of scientific studies and projects in the water industry. NWRI Panels consist of academics, industry professionals, government representatives, and independent consultants who are experts in their fields.

The NWRI Panel process provides numerous benefits, including:

- Third-party review and evaluation.
- Scientific and technical advice by leading experts.
- Assistance with challenging scientific questions and regulatory requirements.
- Validation of proposed project objectives.
- Increased credibility with stakeholders and the public.
- Support of sound public-policy decisions.

NWRI has extensive experience in developing, coordinating, facilitating, and managing expert Panels. Efforts include:

- Selecting individuals with the appropriate expertise, background, credibility, and level of commitment to serve as Panel members.
- Facilitating hands-on Panel meetings held at the project's site or location.

- Providing written report(s) prepared by the Panel that focus on findings and recommendations of various technical, scientific, and public health aspects of the project or study.

Over the past 5 years, NWRI has coordinated the efforts of over 20 Panels for water and wastewater utilities, city and state agencies, and consulting firms. Many of these Panels have dealt with projects or policies involving groundwater replenishment and potable (indirect and direct) reuse. Specifically, these Panels have provided peer review of a wide range of scientific and technical areas related water quality and monitoring, constituents of emerging concern, treatment technologies and operations, public health, hydrogeology, water reuse criteria and regulatory requirements, and outreach, among others.

Examples of recent NWRI Panels include:

- **Development of Water Recycling Criteria for Indirect Potable Reuse through Surface Water Augmentation and the Feasibility of Developing Criteria for Direct Potable Reuse** for the California Department of Public Health (CA)
- **Developing Proposed Direct Potable Reuse Operational Procedures and Guidelines for New Mexico** for the New Mexico Environment Department (NM)
- **Monterey Peninsula Groundwater Replenishment Project** for the Monterey Regional Water Pollution Control Agency (CA)
- **Groundwater Recharge Scientific Study** for the LOTT Clean Water Alliance (WA)
- **Groundwater Replenishment System Program Review** for the Orange County Water District (CA)
- **Examining the Criteria for Direct Potable Reuse** for Trussell Technologies (CA) and WateReuse Research Foundation (VA)
- **Evaluating Potable Reuse** for the Santa Clara Valley Water District (CA)
- **Indirect Potable Reuse/Reservoir Augmentation Project Review** for the City of San Diego (CA)
- **BDOC as a Surrogate for Organics Removal in Groundwater Recharge** for the California Department of Public Health (CA)
- **Effluent Master Plan** for Tucson Water (AZ)
- **Groundwater Replenishment Project Review** for the Los Angeles Department of Water and Power (CA)

More information about the NWRI Independent Advisory Panel Program can be found on the NWRI website at http://nwri-usa.org/Panels.htm.

APPENDIX B: PANEL BIOGRAPHIES

GEORGE TCHOBANOGLOUS, PH.D., P.E., NAE
Professor Emeritus
University of California, Davis (Davis, CA)

For over 35 years, wastewater expert George Tchobanoglous has taught courses on water and wastewater treatment and solid waste management at the University of California, Davis, where he is Professor Emeritus in the Department of Civil and Environmental Engineering. He has authored or coauthored over 500 publications, including 22 textbooks and eight engineering reference books. Tchobanoglous has been past President of the Association of Environmental Engineering and Science Professors and currently serves as a national and international consultant to both government agencies and private concerns. Among his honors, he received the Athalie Richardson Irvine Clarke Prize from NWRI in 2003, was inducted to the National Academy of Engineers in 2004, and received an Honorary Doctor of Engineering degree from the Colorado School of Mines in 2005. In 2012, he received the first Excellence in Engineering Education Award from AAEE and AEESP. In 2013, he was selected as the AAEE and AEESP Kappe Lecturer. Tchobanoglous received a B.S. in Civil Engineering from the University of the Pacific, an M.S. in Sanitary Engineering from the University of California, Berkeley, and a Ph.D. in Environmental Engineering from Stanford University.

JEAN-FRANÇOIS DEBROUX, Ph.D.
Director, Advanced Technologies Group
Kennedy/Jenks Consultants (San Francisco, CA)

At Kennedy/Jenks Consultants, Jean Debroux serves as Director of the Advanced Technologies Group, which was formed to solve technologically challenging problems. Part of this effort includes performing pilot and field studies for regulated and emerging contaminants and evaluates the cost impacts of complying with Safe Drinking Water Act regulations. A water quality expert, Debroux has extensive experience and expertise working with water utilities and research organizations in water treatment and water reuse issues, and is an active member of the WateReuse Foundation, where he served on the Research Advisory Committee for 7 years. Debroux received a B.S. in Chemical Engineering from the University of South Florida, and both an M.S. in Environmental Engineering and Ph.D. in Civil Engineering from the University of Colorado, Boulder. In addition, he attended the Environmental Management Institute at Tufts University and has served as a Post-Doctoral Research Fellow and Lecturer at Stanford University and as a Research Fellow at Université de Poitiers, France.

MARTIN B. FEENEY, P.G., CHG
Consulting Hydrogeologist (Santa Barbara, California)

Martin Feeney has been a consulting hydrogeologist since 1997, providing hydrogeologic consulting services to water agencies, private industry, and engineering firms. Prior to this, he served as hydrogeologist at various consulting firms such as Balanced Hydrologics, Inc. and Fugro West, Inc., where he provided analysis of groundwater basins, developed groundwater flow and transport, and developed saline groundwater source for desalination plants, injection wells/artificial recharge programs, and underground storage tank site assessment and remediation. He has also been involved in numerous groundwater resources and water well projects throughout California, working for groups such as Monterey County, Salinas Valley, Santa Clara Valley Water District, Ventura County, and various others. Feeney received a B.S. in Earth Sciences from the University of California, Santa Cruz and an M.S. in Environmental Planning (Groundwater) from California State University.

MICHAEL P. WEHNER, REHS, MPA
Assistant General Manager
Orange County Water District (Fountain Valley, California)

Mike Wehner has over 40 years of experience in water quality control and water resources management. He has been with the Orange County Water District (OCWD) since 1991, currently serving as Assistant General Manager. Among his responsibilities, he directly manages the Water Quality and Technology Group, including Laboratory, Water Quality, Hydrogeology, Research and Development, and Health and Regulatory Affairs Departments. He is also involved with numerous aspects with the Groundwater Replenishment System (the nation's largest IPR project), including providing technical guidance on treatment and quality, as well as managing monitoring programs for the purification facility and receiving groundwater. He was also manager of OCWD's 8-year Santa Ana River Water Quality and Health Study, which evaluated the impact of using effluent-dominated river waters for groundwater recharge. Prior to joining OCWD, Wehner spent 20 years with the Orange County Health Care Agency, where he managed the Water Quality Control Section of Environmental Health. He is a Registered Environmental Health Specialist in California and is an internationally recognized expert in water quality, public health, and advanced water treatment processes, serving on expert panels in the United Kingdom, Australia, and Singapore, as well as for California and U.S. agencies and foundations. He received a Masters of Public Administration from California State University Long Beach and a B.S. in Biological Sciences from the University of California, Irvine.

APPENDIX C: MEETING AGENDA

NATIONAL WATER RESEARCH INSTITUTE

Independent Advisory Panel Meeting for Monterey Regional Water Pollution Control Agency on Monterey Peninsula Groundwater Replenishment Project

Preliminary Draft Meeting Agenda

May 1-2, 2014

Location
Monterey Regional Water Pollution Control Agency
Regional Treatment Plant--THURSDAY
14811 Del Monte Blvd.
Marina, CA 93933
(831) 883-1118
Administrative Offices FRIDAY
5 Harris Court, Bldg. D
Monterey, CA 93940
(831) 372-3367

On-Site Contacts:
Jeff Mosher (NWRI)
Cell: (714) 705-3722
Mike McCullough (MRWPCA)
Cell: (831) 594-2597

Meeting Objectives:

- Develop a working understanding of the Proposed Groundwater Replenishment Project.
- Identify proposed project strengths and areas where more information is needed.
- After the meeting, prepare a brief summary of project questions and obstacles for use by the GWR team.

Thursday, May 1, 2014 – MRWPCA Regional Treatment Plant – NOTE LOCATION!

9:00 am	**Welcome and Introductions (RTP)**	Jeff Mosher, NWRI
9:10 am	All Things Water Quality - Source Water Characterization - Pilot Facility Preliminary Results - Baseline Groundwater Basin Quality - Vadose Zone Leaching Analysis	Gordon Williams, Trussell, Brad Reisinger, SPI, Phyllis Stanin, Todd Groundwater, Joe Oliver, MPWMD,
11:45 - 12:30 pm	**WORKING LUNCH - RTP**	
12:30 pm	Tour of Advanced Water Purification Demonstration Facility - Technical Hurdles – Gordon Williams - Building Eye Candy – Mark Millan	Gordon Williams, Trussell, Brad Reisinger, SPI
1:00 – 4:00 pm	FIELD TRIP	Mike McCullough,

	Tembladero Slough, Blanco Drain, Reclamation Ditch, Salinas Pump Station, Industrial Ponds, return to RTP	MRWPCA
4:00 pm	Outreach Update	Steve Thomas, Thomas Brand, Dave Stoldt, MPWMD, Karen Harris, MRWPCA,
4:20 pm	CEQA Status Report & Permits	Valerie Young
4:45 pm	Water Rights Update	Dave Stoldt & Larry Hampson, MPWMD
5:00 pm	Settlement Update	Bob Holden, MRWPCA
5:45 pm	**Adjourn**	

Friday, May 2, 2014 – MRWPCA Administration Offices – NOTE LOCATION!

8:30 am	**Summary of Day 1**	Jeff Mosher, NWRI George T., Panel
8:45 am	Source Control Program	Garrett Haertel, MRWPCA
9:00 am	Regulatory – Draft Concept Proposal	Jim Crook & Margie Nellor
9:45 am	**BREAK**	
10:00 am	GWR IAP Checklist - Recap Items from October 21-21, 2013 IAP meeting	Bob Holden, MRWPCA
10:30 am	Panel Deliberations	George T., Panel
12:00 noon	**Working Lunch**	
1:30 pm	Debrief with MRWPCA	All
2:00 pm	**Adjourn**	

APPENDIX D: MEETING ATTENDEES

Panel Members:

- CHAIR: George Tchobanoglous, PH.D., P.E., NAE, University of California, Davis (Davis, CA)
- Jean-François Debroux, Ph.D., Kennedy/Jenks Consultants (San Francisco, CA)
- Martin B. Feeney, P.G., CHG, Consulting Hydrogeologist (Santa Barbara, CA)
- Michael P. Wehner, REHS, MPA, Orange County Water District (Fountain Valley, CA)

National Water Research Institute:

- Jeff Mosher, Executive Director
- Gina Vartanian, Outreach and Communications Manager

Monterey Regional Water Pollution Control Agency:

- Garrett Haertel, P.E., Compliance Engineer
- Karen Harris, Community Relations Specialist
- Robert Holden, P.E., Principal Engineer
- Keith Israel, General Manager
- Mike McCullough, Recycled Water Project Assistant

Monterey Peninsula Water Management District

- Jonathan Lear, PG, CHg, Senior Hydrogeologist
- Joe Oliver, PG, CHg, Water Resources Division Manager

Project Team Members:

- Jim Brezack, Brezack and Associates Planning, LLC (on phone)
- Diana Buhler, Denise Duffy & Associates
- Jerry Cole, Consultant
- James Crook, Ph.D., P.E., Environmental Engineering Consultant (Retired CDPH)
- Denise Duffy, Denise Duffy & Associates
- Alison M. Imamura, AICP, Denise Duffy & Associates
- Mark Millan, Data Instincts, Inc.
- Margaret H. Nellor, P.E., Nellor Environmental Associates (on phone)
- Brad Reisinger, P.E., Separation Processes, Inc
- Bahman Sheikh, Ph.D., P.E., Water Resources and Reuse Specialist
- Phyllis Stanin, P.G., Todd Engineers
- Steve Thomas, Thomas Brand Consulting
- Gordon J. Williams, Ph.D., P.E, Trussell Technologies, Inc.
- Valerie J. Young, AICP, Environmental Planning and Water Reuse Consultant

California Department of Public Health:

- Brian Bernados, PE, Division of Drinking Water & Environmental Management

Regional Water Quality Control Board, Central Coast Region

- Peter Von Langen, Ph.D., Environmental Scientist

- Harvey Packard, Section Manager /Aquatic Habitat

Monterey County Health Department

- Cheryl Sandoval, Supervising Environmental Health Specialist, Drinking Water Protection Services

APPENDIX B

2014 MRWPCA Pure Water Project Concept Proposal and Division of Drinking Water Conditional Approval Letter

Monterey Regional Water Pollution Control Agency
Pure Water Monterey Groundwater Replenishment Project

Proposal to Inject Highly-Treated Recycled Water into the Seaside Groundwater Basin

DRAFT May 19, 2014

DRAFT

This proposal was prepared by the Pure Water Monterey Groundwater Replenishment Project (Proposed Project or GWR) team, which includes staff from the Monterey Regional Water Pollution Control Agency (MRWPCA), the Monterey Peninsula Water Management District, and their consultants.

This proposal was reviewed by members of the Proposed Project's Independent Advisory Panel convened by the National Water Research Institute.

MRWPCA thanks the California Department of Public Health for its participation and input regarding the Proposed Project. This participation and input has been invaluable to the project team for developing the Proposed Project and this proposal.

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List of Acronyms

AFY	Acre-feet per year
AOP	Advanced oxidation process
ASR	Aquifer storage and recovery
AWT	Advanced water treatment
AWTF	Advanced Water Treatment Facility
BAF	Biologically Active Filtration
CalAm	California American Water Company
CDPH	California Department of Public Health
CECs	Constituents of emerging concern
CSIP	Castroville Seawater Intrusion Project
CT	Disinfection contact time multiplied by disinfectant residual
DBPs	Disinfection byproducts
EIR	Environmental impact report
FAT	Full advanced treatment
gpm	Gallons per minute
GWR	Pure Water Monterey Groundwater Replenishment Project
IAP	Independent Advisory Panel
IPR	Indirect potable reuse
MF	Membrane filtration
mgd	Million gallons per day
mg/L	Milligrams per liter
mJ/cm^2	Millijoules per square centimeter
MRWPCA	Monterey Regional Water Pollution Control Agency
NDMA	N-nitrosodimethylamine
ng/L	Nanograms per liter
NPDES	National Pollutant Discharge Elimination System
RO	Reverse osmosis
RTP	Regional Treatment Plant
RWQCB	Central Coast Regional Water Quality Control Board
RUWAP	Regional Urban Water Augmentation Project
SIWTF	Salinas Industrial Wastewater Treatment Facility
SWRCB	State Water Resources Control Board
SVRP	Salinas Valley Reclamation Project
TDS	Total dissolved solids
TOC	Total organic carbon
UV	Ultraviolet light

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Section 1 - Introduction

The purpose of this proposal is to obtain concept approval from the California Department of Public Health (CDPH)[1] for the Proposed Pure Water Monterey Groundwater Replenishment Project (Proposed Project).

The Proposed Project is a planned indirect potable reuse (IPR) project that will involve injecting highly-treated recycled water from a new proposed advanced water treatment facility (AWTF) into the Seaside Groundwater Basin and subsequent withdrawal of the water at downgradient domestic water supply wells by the California American Water Company (CalAm[2]) for delivery to its customers in the Monterey District service area. CDPH has developed draft groundwater replenishment regulations[3] and is the key regulatory agency that currently evaluates and approves IPR projects. Therefore, a decision by the proponents of the Proposed Project to implement the project will depend, in part, on obtaining concept approval from CDPH.

The Project is being developed by the Monterey Regional Water Pollution Control Agency (MRWPCA) in partnership with the Monterey Peninsula Water Management District (Water Management District). Some background on these two agencies is provided below.

Monterey Regional Water Pollution Control Agency: MRWPCA was established in 1972. MRWPCA operates the regional wastewater treatment plant, including a water recycling facility (collectively known as the Regional Treatment Plant, or RTP), a nonpotable water distribution system known as the Castroville Seawater Intrusion Project, sewage collection pipelines, and 25 wastewater pump stations. The current MRWPCA service area is shown in dark blue in Figure 1. Additional information about the RTP is provided in subsection 5.2, MRWPCA Regional Treatment Plant.

Monterey Peninsula Water Management District: The Water Management District is a special district formed in 1978 to manage, augment, and protect water resources for the benefit of the community and the environment. The Water Management District manages the production and use of water from the Carmel River stored in Los Padres Reservoir, water production in the Carmel Valley aquifer, and groundwater pumped from municipal and private wells in Carmel Valley and the Seaside Groundwater Basin. The Water Management District regulates public fresh water supply systems within its boundaries, including systems owned by CalAm. Its authority includes regulating the creation of new water distribution systems and expansions, water connection permits, allocation of water to jurisdictions within its boundaries, water conservation ordinances and inspections, and water rationing programs.

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[1] Effective July 1, 2014, CDPH Drinking Water Program will become the new State Water Resources Control Board's Division of Drinking Water.

[2] CalAm is an investor-owned public utility that serves approximately 38,500 customers in the Monterey Peninsula area.

[3] CDPH draft groundwater replenishment regulations website: Groundwater Replenishment with Recycled Water - June 26, 2013 draft regulations (PDF). Sentate Bill 104 requires CDPH to adopt these as emergency regulations by June 30, 2014 without Office of Adminstrative Law review.

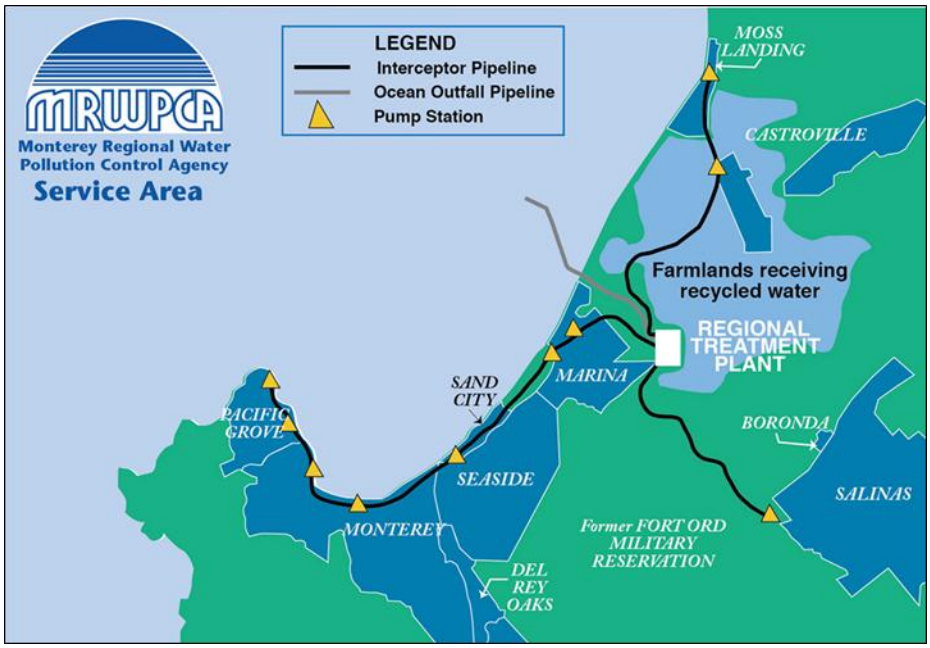

Figure 1. MRWPCA service area map

Section 2 - Need for the Proposed Project

Historical and persistent low groundwater elevations caused by pumping have led to concerns that seawater intrusion may threaten the groundwater resources in the Seaside Groundwater Basin. The Basin has experienced chronic overdraft conditions with declining water levels in both of the Basin's aquifers that are used for water supply (the deeper, confined Santa Margarita aquifer and the shallower, unconfined Paso Robles aquifer). In response to the overdraft conditions, the basin was adjudicated in 2006 and steps to mitigate declining water levels were implemented. Over the last few years, water levels have stabilized in some areas but continue to decline in areas of concentrated pumping, especially in the deeper aquifer. Record low water levels were observed in many basin wells in 2012 and water levels remain below sea level in both aquifers adjacent to the Proposed Project. Although recent evaluations have determined that seawater intrusion is not occurring at present, both aquifers are at risk for the potential of seawater intrusion in the future.

In 1995, the State Water Resources Control Board (SWRCB) issued Order No. WR 95-10, which found that CalAm was diverting more water from the Carmel River Basin than legally entitled. The SWRCB ordered CalAm to maximize use of the Seaside Groundwater Basin (to the extent feasible) instead of diverting Carmel River water. In addition, a subsequent Cease and Desist Order (SWRCB Order Number WR 2009-0060) issued in 2009 requires CalAm to secure replacement water supplies for its Monterey District service area by December 2016 and reduce its Carmel River diversions to 3,376 acre-feet per year (AFY) by the 2016-17 timeframe.

The Proposed Project would create a reliable source of water supply by recharging the Seaside Groundwater Basin with highly-treated recycled water produced from a new AWTF using a series of shallow and deep injection wells. Once injected into the Seaside Groundwater Basin, the highly-treated recycled water from the AWTF would mix with ambient groundwater and be stored for future use.

Section 3 - Proposed Project Objectives

The primary objective of the Proposed Project is to replenish the Seaside Groundwater Basin with 3,500 AFY of high-quality recycled water from the AWTF that would replace a portion of CalAm's current water supply. To accomplish this primary objective, the Proposed Project would need to meet the following objectives:

- be capable of commencing operation, or of being substantially complete, by the end of 2016 or, if after 2016, no later than necessary to meet CalAm's replacement water needs;
- be cost-effective such that the project would supply reasonably-priced water; and
- be capable of complying with applicable water quality regulations intended to protect public health and groundwater quality.

Secondary objectives of the Proposed Project include the following:

- assist in preventing seawater intrusion in the Seaside Groundwater Basin;
- assist in diversifying Monterey County's water supply portfolio; and
- provide additional water to the RTP that could be used for crop irrigation through the Salinas Valley Reclamation Project (SVRP) and Castroville Seawater Intrusion Project (CSIP) system.

Section 4 - Current Activities Supporting Proposed Project Implementation

Activities over the last two years have included:

- initiating California Environmental Quality Act review, with a planned Final Environmental Impact Report (FEIR) in December 2014;
- selection and testing of advanced water treatment processes that are capable of treating recycled water to meet the requirements specified in the CDPH draft groundwater replenishment regulations;
- identification of potential sources of water (referred to herein as "source waters") that would be added to the existing MRWPCA wastewater supply and receive treatment at the RTP and AWTF;
- sampling of the source waters over a one-year period to fully characterize the chemical quality of each source;
- preliminary design of the advanced water treatment (AWT) pilot facilities;
- conducting a pilot-scale demonstration study of the proposed AWTF treatment train scheduled to be completed in June 2014 to: (1) determine the performance of the ozone, membrane filtration, and reverse osmosis treatment processes and identify pertinent

design criteria; and (2) ensure that the highly-treated recycled water meets all applicable water quality requirements;

- modeling and other hydrogeological studies to determine the locations and depths of injection and monitoring wells, injection well capacities, residence time of recycled water underground prior to extraction, etc.;
- design and implementation of a hydrogeological field program involving characterization of the vadose zone, installation of a monitoring well, and baseline groundwater quality sampling;
- development and implementation of an outreach program to educate the public and others about the Proposed Project and assess public acceptability of the full-scale project; and
- review of the MRWPCA industrial pretreatment and source control program.

Much of this work will support the preparation of an Engineering Report for the Proposed Project that is expected to be submitted to CDPH and Central Coast Regional Water Quality Control Board (RWQCB) by December 2014.

4.1 Independent Advisory Panel

A four-member Independent Advisory Panel (IAP), administered by the National Water Research Institute, has been formed to provide an independent third-party review of the Proposed Project for MRWPCA, the Water Management District, and regulators (e.g., CDPH, CCRWQCB, SWRCB, and Monterey County Environmental Health Department). The IAP has been kept updated on the progress of the Proposed Project through two meetings, site visits, and draft technical reports. Feedback from the IAP has been instrumental in helping to determine the research and other facets needed to ensure the Proposed Project's successful design, approval, and implementation in compliance with applicable regulatory and scientific standards.

4.2 CDPH Participation

A cornerstone of MRWPCA's efforts has been keeping CDPH actively engaged throughout project development. CDPH staff, including those from local district offices and others with experience on IPR projects in other parts of the state, have attended IAP meetings and have been actively engaged in the Proposed Project since its inception via site visits, meetings, and correspondence regarding various aspects of the project.

4.3 Public Outreach

An informed public is the key to a successful IPR project. MRWPCA began reaching out to key stakeholders in 2006 when the concept for IPR via groundwater recharge was developing. At that time, a project similar to the current Proposed Project was included in the draft EIR for the Coastal Water Project that included evaluation of other potential sources of water for the Monterey area. Outreach activities for the 2006 project included information sessions and interviews with MRWPCA Board members and other community leaders, local media events, a project website, and trips to the Orange County Water District by community leaders to view its successful Groundwater Replenishment System.

The Proposed Project began to be developed in 2010 as part of CalAm's Monterey Peninsula Water Supply Project that replaced the similar Coastal Water Project that was officially initiated in 2012. The emphasis was on its ability to be fast-tracked in time to meet the SWRCB Cease and Desist Order issued in 2009 requiring CalAm to secure replacement water supplies for its Monterey District service area by December 2016.

An outreach team was assembled in 2013 that included MRWPCA, the Water Management District, the Monterey Peninsula Regional Water Authority, and several outreach consultants. In January 2014 the public outreach tasks were transferred from MRWPCA to its project partner, the Water Management District. The project was renamed "Pure Water Monterey – A Groundwater Replenishment Project" for marketing purposes. A new logo was developed and the website URL was changed to www.PureWaterMonterey.org. The new public outreach plan is primarily focused on the safety, sustainability, and reliability of the new water supply. Facebook and Twitter pages were established to support social media marketing. The outreach team also developed a speaker bureau to facilitate community group speaking engagement coordination. Consistent messaging and images are being used to support the Proposed Project on all platforms.

MRWPCA's billing insert for December 2013/January 2014 included a description of the Proposed Project Demonstration Project with a public tour invitation. Public tours of the pilot plant facilities began in February 2014. As the outreach program moves forward, it will include a mass media campaign with radio, print, and television advertisements scheduled for 2014. The speaking bureau circuit will intensify as the Proposed Project Draft EIR is made available for public review in the fall of 2014. Also, efforts are ongoing to include non-English speakers in the public participation process.

4.4 Industrial Pretreatment and Source Control Program

MRWPCA administers an approved pretreatment program under National Pollutant Discharge Elimination System (NPDES) Permit R3-2008-0008.[4] Not including outreach efforts, MRWPCA maintains a staff of three full-time employees and one part-time employee that provide permitting, inspection, sample collection, sample analysis, data analysis, review and response, enforcement, development of program requirements, and administration (including record keeping and data management). The part-time position provides support for regulation of the Salinas Industrial Wastewater Treatment Facility and member entity contract inspection services for the NPDES stormwater permit.

Currently, there are 18 permitted industrial users that discharge into the MRWPCA municipal wastewater system, only five of which are defined as Significant Industrial Users in accordance with federal pretreatment regulations. The total industrial flow represents approximately two percent of the wastewater flow currently coming into the RTP. MRWPCA has established technically-based local limits for heavy metals and other constituents that apply to all discharges

[4] The NPDES permit renewal process is currently underway.

and local limits for silver that specifically apply to photo processors, x-ray developers, and printers.

In 2013, a consulting firm conducted a Pretreatment Compliance Inspection on behalf of the RWQCB. The inspection report concluded that the program was in compliance with pretreatment requirements and included recommendations for minor changes to industrial user permit language regarding self-monitoring and submittal time frames for industrial user re-sampling that can be easily effectuated by MRWPCA.

The CDPH draft groundwater replenishment regulations contain specific requirements relating to source control. The current MRWPCA source control program would meet these requirements, recognizing that some program enhancements would be implemented to address the addition of new sources of water to the RTP[5]; the use of the AWTF product water for IPR; and review of local limits for IPR.

Section 5 - Proposed Project Components

The physical components of the Proposed Project are described in this section. A simplified flow schematic of the major components of the Proposed Project is provided in Figure 2. The major project components are described in the subsections below:

- *Source waters* – diversion of new source waters to the existing municipal wastewater collection system and conveyance of those waters as municipal wastewater to the RTP to increase availability of secondary-treated wastewater treatment at the AWTF.
- *Treatment process and facilities at RTP* – use of existing primary and secondary treatment facilities at the RTP, as well as a new AWTF, AWTF product water stabilization, AWTF recycled water pump station, and brine disposal facilities.
- *Groundwater recharge facilities* – new deep injection and vadose zone wells to inject product water from the Proposed Project into the Seaside Groundwater Basin, backflush facilities, pipelines, electricity/power distribution facilities, and an electrical/motor control building.

5.1 Source Waters

The preliminary determination of feasibility of the Proposed Project required a number of technical investigations to develop regulatory and design requirements. One of the key feasibility/planning actions was to assess the ability of the project to utilize supplemental source waters to augment available secondary-treated wastewater flows. Based on planning-level design information and alternative screening analysis, the following sources of water were recommended to be included in the Proposed Project:

- Monterey Peninsula stormwater and urban runoff that flows into Lake El Estero. This source would yield an average raw water supply of 87 AFY, based upon estimated daily runoff into the Lake and available conveyance capacity in the municipal wastewater system. A current proposal to add stormwater influent flows from an adjacent drainage

[5] MRWPCA would permit agricultural wash water, storm water runoff, and any other new sources as part of its source control program.

basin to Lake El Estero through infrastructure changes is estimated to increase this yield to 119 AFY;

- City of Salinas urban stormwater and dry weather runoff from the southwest portion of the city that is currently discharged into the Salinas River. This source is estimated to yield an average raw water supply of 206 AFY;
- Salinas agricultural wash water, 80 to 90 percent of which is water used for washing produce, is currently conveyed to the Salinas Industrial Wastewater Treatment Facility (SIWTF) for treatment (aeration) and disposal by evaporation and percolation. This source is estimated to yield an average raw water supply of between 3,288 AFY and 3,733 AFY (influent to the SIWTF); and
- Municipal wastewater from MRWPCA member agencies that is conveyed to and treated through the existing primary and secondary processes at the RTP that would otherwise be discharged to the Pacific Ocean. This source is estimated to yield an average of 4,600 AFY to 6,242 AF based on a conservatively low estimate of future unused treated wastewater.

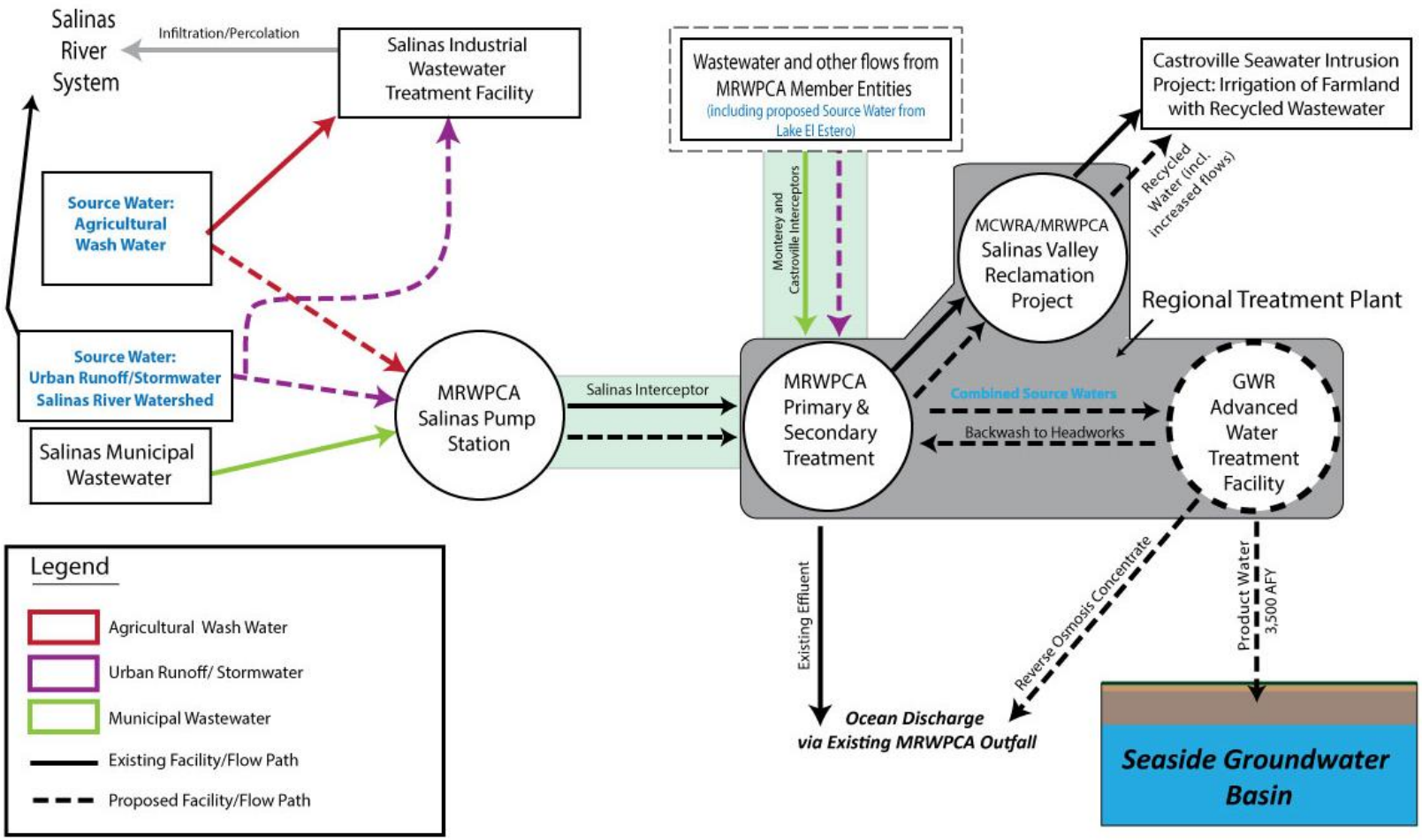

Figure 2. Proposed Project Flow Schematic

This combination of source waters was found to achieve the project objectives, and meet component evaluation criteria with the least cost and environmental effects, while providing additional benefits to MRWPCA member entities. In particular, the proposed source waters would use existing infrastructure facilities with available capacity for conveyance purposes, thus minimizing capital costs and environmental impacts.[6]

These waters would be collected through the existing MRWPCA wastewater collection system, increasing the influent flows to the RTP primary and secondary processes. Once treated by the RTP, this increase in RTP secondary effluent would be used as the influent water for the AWTF.

5.2 MRWPCA Regional Treatment Plant

The RTP receives residential, commercial, and industrial wastewater and has an average dry weather design capacity of 29.6 million gallons per day (mgd) and a peak wet weather design capacity of 75.6 mgd. It currently receives and treats approximately 17 to 18 mgd of wastewater and, therefore, has capacity to treat additional flows. The RTP primarily treats municipal wastewater, but also accepts some dry weather urban runoff and other discrete wastewater flows.

Wastewater is treated to two different standards at the RTP: (1) disinfected tertiary recycled water (as defined in the CDPH *Water Recycling Criteria*[7]) for unrestricted agricultural irrigation use; and (2) secondary treatment for discharge through the MRWPCA ocean outfall**.** The RTP secondary treatment consists of non-nitrifying trickling filters, bioflocculation, and clarification. In winter months, secondary-treated wastewater from the RTP is discharged to Monterey Bay through the MRWPCA ocean outfall, which includes a diffuser that centers about 11,260 feet offshore at a depth of approximately 100 feet. The diffuser on the ocean outfall is designed to convey ultimate wet weather flows of up to 81.2 mgd (above the current permitted capacity of 75.6 mgd).

When there is demand for nonpotable irrigation water, tertiary-treated wastewater from the RTP is recycled for irrigation of 12,000 acres of farmland in the northern Salinas Valley. The RTP is designed to produce up to 29.6 mgd of tertiary recycled water for use by the SVRP. The SVRP includes the tertiary treatment plant and an 80 acre-foot storage pond that holds tertiary treated recycled water and Salinas River water before it is distributed to farmland through the CSIP distribution system. The use of recycled wastewater for irrigation reduces regional dependence on local groundwater, which, in turn reduces groundwater pumping-related seawater intrusion into the Salinas Valley aquifers.

The tertiary plant has the capacity to generate approximately 33,200 AFY of recycled water. Actual tertiary water that is delivered via CSIP directly for agricultural irrigation has averaged 12,936 AFY (2001 through 2013). The amount of water delivery each year is dependent on crops grown and weather.

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[6] A source water alternatives analysis identified that source water from the Reclamation Ditch, Tembladero Slough, and/or Blanco Drain may be included in the future, if additional supplemental source water supplies are required and permits or agreements have been received for their use.

[7] CDPH *Water Recycling Criteria*. 2009. Title 22, California Code of Regulations, Division 4, Chapter 3. http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Lawbook/RWregulations-01-2009.pdf

5.3 Advanced Water Treatment Facilities at the RTP

The AWTF would receive secondary effluent from the RTP as source water for treatment.[8] The following is a list of the proposed AWTF structures and facilities:

- inlet source water diversion facilities to bring secondary effluent to the AWTF;
- advanced treatment process facilities, including
    - prescreening,
    - ozonation,
    - biologically active filtration (optional),
    - membrane filtration (MF) treatment,
    - booster pumping of the membrane filtration filtrate (potentially with intermediate storage),
    - cartridge filtration (optional),
    - chemical addition,
    - reverse osmosis (RO) membrane treatment,
    - advanced oxidation process (AOP) using ultraviolet light (UV) and hydrogen peroxide (H_2O_2),
    - decarbonation (potentially), and
    - product-water stabilization with calcium, alkalinity and pH adjustment;
- final product storage and distribution pumping; and
- brine mixing facilities.

Additional information on each AWT process is presented below. Figure 3 provides a simplified process flow diagram illustrating the proposed treatment facilities.

AWTF Design Flows and System Waste Streams

The proposed AWTF would have a design capacity to produce between 3.5 and 4.0 mgd of highly-treated recycled water. In producing high quality water, the proposed AWTF would also produce two waste streams: backwash from the membrane filtration process and brine from the RO process. The MF backwash would be diverted back to the RTP headworks or to the RTP trickling filters. The RO concentrate would be piped to a proposed new brine and effluent receiving, mixing, and monitoring facility from which it would flow to the MRWPCA's existing outfall alone, with secondary wastewater effluent, and in the future possibly with CalAm desalination facility brine.

Inlet Raw Water Diversion Structure and Pump Station

A new diversion structure would be installed on an existing secondary effluent pipeline at the RTP to divert and convey secondary effluent to the proposed AWTF. A new influent pump station consisting of a subgrade wetwell and pumps would accept and equalize the RTP secondary effluent flow. A new inlet diversion structure, an influent pump station, and an approximately 360-foot long, 24-inch diameter pipeline to bring secondary effluent to the AWTF would also be constructed.

[8] As described in previous sections, the Proposed Project proposes to divert additional water sources and convey those waters with municipal effluent to the RTP, including City of Salinas Urban Runoff to Salinas River, Lake El Estero Storage Management Water, Agricultural Wash Water Flows, and excess/unused RTP secondary effluent.

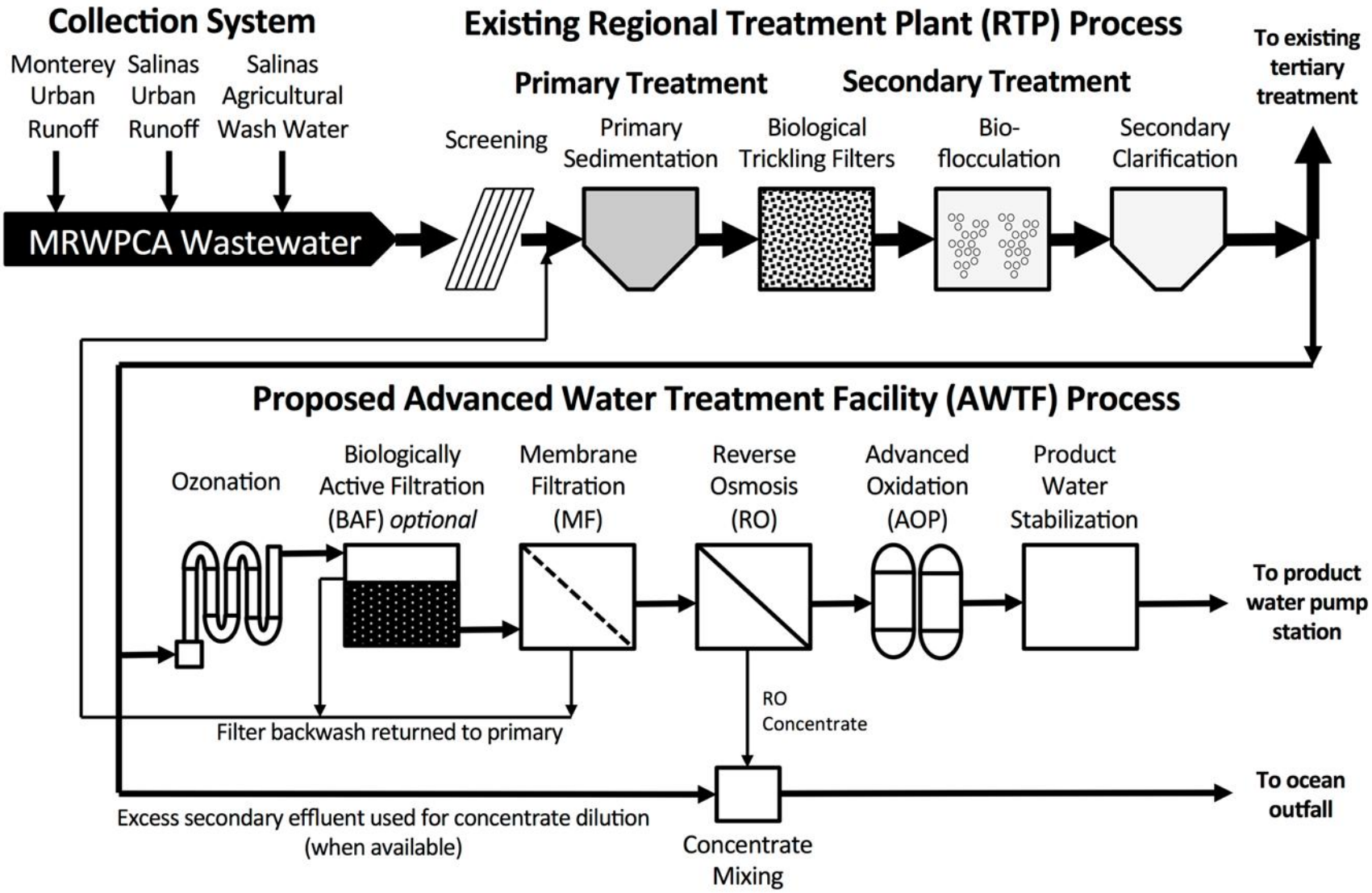

Figure 3. Flow Schematic of Proposed Treatment Process

AWTF Pretreatment
Before the MF process, the secondary effluent would be pretreated using pre-screening and up to three separate subsystems:

Chloramination. Chloramines would be used to reduce biofouling of the membrane systems. The chloramination system would include sodium hypochlorite storage, and chemical feed pumps, or connection to existing chlorine vacuum system, and an inline injection and mixing system. Sodium hypochlorite would either be injected upstream of ozonation or downstream of the biologically active filtration (BAF) system, depending on whether or not BAF is included in the final treatment process design. Sodium hypochlorite reacts with ammonia present in the source water to form chloramine, which is an effective biocide that reduces biological fouling on the MF and RO process membranes.

Ozonation. Ozone treatment is proposed to provide a chemical/pathogen destruction barrier and reduce the membrane fouling. The ozone system would be comprised of several components: liquid oxygen storage or an onsite oxygen generator, an ozone generator, a side-stream injector, ozone contactor, and ozone destruct units. There are two potential approaches for supplying oxygen for ozone generation: (1) liquid oxygen delivered to onsite cryogenic storage tanks and evaporated through vaporizers, or (2) produce oxygen at the treatment facility using a pressure-swing adsorption oxygen generation system. Ozone generators would convert oxygen gas into ozone gas. The ozone gas would be injected into a side stream of feed water flow that would then be recombined with the main supply line after ozone injection. The ozonated water would flow into one or more contactors to provide contact time for disinfection/oxidation, ozone residual decay, and off-gassing. Off-gas would be treated through a catalytic-based ozone destruct system to prevent the release of ozone to the atmosphere. Once dissolved in the process water, ozone reacts with various contaminants in the water, resulting in several treatment benefits, including (1) reduction of organic compounds that cause membrane fouling, (2) reduction of many constituents of emerging concern (CECs), and (3) inactivation of pathogenic microorganisms. If BAF is not included, sodium bisulfite may be added to the ozone effluent to eliminate any ozone residual that remains in the water after ozonation.

Biologically Active Filtration (optional). The BAF process may be used downstream of ozone treatment to reduce the concentration of residual organic matter present in the ozone effluent and to reduce the solids loading on the membrane filtration process. The BAF system would consist of gravity-feed filter basins with several feet of granular media, and an underdrain/media support system. Ancillary systems would include a backwash basin, backwash pumps, and air compressor and supply system for an air scour system, and a washwater basin to facilitate filter backwashing.

Membrane Filtration Treatment System
The MF system would remove suspended and colloidal solids, including bacteria and protozoa using a number of new discrete process units that include: hollow fiber membrane modules and valve manifolds to direct the flow of feed, filtrate, cleaning solutions, backwash supply, backwash waste, and compressed air to the corresponding module connecting piping. Proposed appurtenant facilities would include backwash supply, cleaning, and compressed air systems. Feed pumps would draw water from the feed clearwell and supply a pressurized feed to

pretreatment strainers and the membrane units. Cleaning chemicals would include acid, caustic, and sodium hypochlorite. Backwash and screening residuals would be adjusted to a neutral pH and returned to the RTP headworks, along with residuals associated with the cleaning system. The projected recovery of treated water from the membrane filter system is roughly 90 percent; this recovery accounts for waste residuals associated with both backwashing and cleaning.

Reverse Osmosis Membrane Treatment System

An RO process that employs semi-permeable membranes is proposed to remove dissolved salts and organics from the MF filtrate. The proposed RO system would consist of a single-pass two-stage system, which separates the MF filtrate feed water into a purified product stream (permeate) and a concentrated brine stream (brine). The proposed RO system would include individual process trains, housing the process membranes in pressure vessels along with connecting piping and valve manifolds for feed, permeate, concentrate, cleaning and flush supplies. The ancillary equipment for the overall RO system would include a membrane cleaning system and permeate flush system. RO membrane cleaning chemicals would likely include proprietary chemicals, acid, and caustic detergent.

Feed to the RO system would be delivered directly from the upstream MF system; or alternately stored in an intermediate equalization tank. In either case, it would be necessary to increase the feedwater pressure prior to RO using new booster pumps and high pressure feed pumps. Pretreatment chemicals would likely include an antiscalant and acid and would be injected into a low pressure line. If an equalization tank is employed, cartridge filters may be required to protect the RO process membranes from any incidental debris that may enter the tank. Brine from the RO system would be discharged to a new mixing structure with final disposal through the existing MRWPCA ocean outfall. Product water would flow to the advanced oxidation system. Separate cleaning and flush system equipment would also be included.

Advanced Oxidation Process System

The proposed new AOP system would provide a final polishing step for pathogen disinfection and would provide an additional chemical destruction barrier for the RO permeate. The proposed AOP system would consist of a chemical feed to add hydrogen peroxide and chambers containing reactors housing arrays of UV lamps along with ballasts to power the ultraviolet system. UV reacts with hydrogen peroxide to form hydroxyl radicals, which, along with the UV light, oxidizes, destroys, or inactivates chemicals of concern and pathogens. The system sizing would be driven by the requirement in the CDPH June 2013 draft groundwater replenishment regulations for AOP. Support facilities for the reactors would include chemical storage, metering pumps, and ballasts.

Post-Treatment

Product water from the AOP would be sent to the proposed new post-treatment system. Due to the high removal of minerals that is achieved through RO treatment, post-treatment stabilization of the product water is needed to prevent corrosion of pipe materials in the product water conveyance system and injection facilities. Stabilization would also be used to reduce the potential for product water to mobilize minerals and other chemicals from the soils within the Seaside Groundwater Basin upon injection. RO permeate is a soft, low alkalinity water, and the final product water quality would be adjusted to specific goals for hardness, alkalinity, and pH.

This adjustment may include decarbonation by a gas stripping tower to remove carbon dioxide (CO_2), the addition of lime (calcium oxide), and pH adjustment with sodium hydroxide and CO_2 addition. There are several potential treatment technologies that may be used to achieve post-treatment stabilization, including: (1) a calcite contactor with caustic and CO_2 addition; (2) a lime saturator (either quicklime or hydrated lime) with CO_2 addition; or (3) the addition of purchased lime slurry. Depending on the stabilization goals, partial decarbonation (removal of CO_2) may be necessary, but at a minimum, decarbonation would be needed for any slurry feed water. If CO_2 addition were utilized, the new equipment would include liquid CO_2 storage, vaporizers, vapor heater, pressure regulator, and feed system, and diffusers. Regardless of technology, a new chemical storage system for post-treatment would be required.

Brine Mixing Facility

As discussed above, the new AWTF would produce RO brine that would be disposed or discharged via the MRWPCA's ocean outfall. In addition to the RO reject water, other water that is currently discharged to the outfall includes secondary effluent from the RTP, and brine waste collected from individual water softeners and private desalination facilities and delivered by truck to the RTP. Proper disposal of these waste streams to the outfall, and eventually the ocean, requires that they be thoroughly mixed to prevent stratification in the outfall that may lead to complicated corrosion potential to the outfall pipe and to optimize the mixing with sea water in the bay.

The brine mixing facility would accomplish the required mixing, metering and sampling, using the following processes and facilities:

- Three (3) cast-in-place concrete vaults. The first vault (over the existing outfall) would divert secondary effluent to the second, mixing vault (a 60-inch nominal static mixer in a fiberglass mixing pipe with a reducer), and a third (downstream over the existing outfall) to return the blended flows to the outfall.
- Pipelines and valves, such as 54-inch outer diameter high density polyethylene and flow meters between the first and second vaults (measures secondary effluent) and between the second and third vaults (measures combined flow).
- Flow meters on each of the brine streams entering the mixing vault and a Lab and Control Building between the second flow meter and the third vault.
- A sampling port in the third vault to measure total dissolved solids, pH, dissolved oxygen temperature, and other constituents of the blended effluent as required by permit conditions.
- Two (2) sluice gates in each of the two diversion vaults (1st and 3rd).
- An air release valve on the upstream end of the static mixer.

5.4 Groundwater Recharge Facilities

The highly-treated recycled water would be conveyed approximately 10 miles from the AWTF to the Seaside Groundwater Basin via a new pipeline. Groundwater replenishment will occur in a series of four new shallow (vadose zone wells) and four deep injection wells. Recycled water would co-mingle with groundwater and be stored in the basin for subsequent recovery by CalAm through existing production wells downgradient of the injection wells. The deep injection wells would be pumped periodically for maintenance, a process referred to as backflushing. This

pumped water would be piped a short distance to a new shallow, engineered basin (backflush basin), where water would be allowed to percolate through the deep vadose zone and return to the groundwater system. Additional details regarding the recycled water conveyance facilities are provided in Section 6. Additional details on the injection well facilities are provided in Section 7.

Section 6 - Highly-Treated Recycled Water Conveyance Facilities

The Proposed Project would include construction of a pipeline to convey the highly-treated recycled water from the proposed AWTF to the Seaside Groundwater Basin for injection, along one of two potential pipeline alignments. Each pipeline alignment option would require flow control valves, isolation valves, blow down structures for maintenance, air and vacuum release valves, and other appurtenant facilities below ground within the pipeline conveyance alignment.

The proposed conveyance system is designed to convey a total of 3,500 AFY of highly-treated recycled water to the proposed new injection sites. The conveyance system design assumes an average monthly flow of 3.13 mgd for the low range of design flow and 3.59 mgd for the high range of design flow, which correlate to flows of 3.5 and 4.0 mgd, at times when the AWTF is operating. Several factors are expected to affect the actual daily flow rates through the conveyance system, including: seasonal variations; source water supply variations; down-time for maintenance of the pumping systems and AWTF mechanical equipment; and maintenance of the wells. The conveyance pipeline would be 24 inches in diameter and would comply with the CDPH pipeline separation requirements. A maximum daily flow of approximately 3.5 to 4.0 mgd was used for the design criteria for the pump stations.

Section 7 - Injection Well Facilities

The new injection well facilities would be located in the northeastern portion of the City of Seaside about 1.5 miles inland of Monterey Bay. Highly-treated recycled water would be injected into the Seaside Groundwater Basin and would be operated to increase basin yield and to complement other pumping and injection in the basin. Current conditions and operations in the Seaside Groundwater Basin are described below.

Seaside Groundwater Basin

The Seaside Groundwater Basin underlies an approximately 19-square-mile area at the northwest corner of the Salinas Valley, adjacent to Monterey Bay. Two primary aquifers provide water supply from the basin, the shallow unconfined Paso Robles Aquifer and the deeper underlying Santa Margarita Aquifer. Groundwater is currently extracted from approximately 37 wells by 20 well owners in the Seaside Groundwater Basin. CalAm owns 12 wells and pumps approximately 80 percent of the water produced in the basin. In addition, CalAm and the Water Management District operate a Seaside Groundwater Basin Aquifer Storage and Recovery (ASR) system that stores excess Carmel River water supplies during the wet season in the groundwater basin and recovers the banked water during the following dry season for consumptive use. The estimated average yield of the existing ASR facilities is 1,920 AFY, but varies yearly based on rainfall due

to the requirement to maintain adequate Carmel River instream flows. ASR wells inject into and pump from the Santa Margarita Aquifer.

The Proposed Project is designed to provide part of the replacement water needed for CalAm to comply with the SWRCB Cease and Desist Order and the Seaside Groundwater Basin Adjudication. The Proposed Project would not produce all of the needed replacement water; the primary goal of the project is to produce 3,500 AFY to be used by CalAm in order to reduce its Carmel River diversions by that same amount.

The Proposed Project would replenish both the Paso Robles and Santa Margarita aquifers upgradient of the ASR wells and other production wells. Figure 4 presents a schematic diagram illustrating the conceptual operation of the Proposed Project in the basin.

Injection Wells

The proposed injection well facilities would be located east of General Jim Moore Boulevard, south of Eucalyptus Road in the City of Seaside, and include a total of eight wells (four deep injection wells into the Santa Margarita aquifer and four vadose zone wells to supply water to the Paso Robles aquifer), monitoring wells, and backflush facilities. The proposed site plan for the groundwater recharge components is shown on Figure 5. Wells within the same target aquifer are proposed to be spaced approximately 1,000 feet apart to minimize well interference. Separate turnouts with isolation valves would be provided to each individual well site from the conveyance pipeline. Four deep injection wells and four vadose zone wells are proposed so that the water could readily be allocated among the two well types and aquifers. With water levels below sea level in both the Paso Robles aquifer (the uppermost aquifer that is unconfined) and Santa Margarita aquifer (the deeper confined aquifer), it has been determined by the Watermaster that recharge into both aquifers would be beneficial for protection against seawater intrusion and for water supply. However, most of the basin production is within the Santa Margarita aquifer where water levels are below sea level throughout the northern coastal subarea and more than 40 to 60 feet below sea level downgradient and adjacent to the injection well facilities site.

Groundwater modeling was performed to identify the optimal allocation of recharge to the two aquifers to minimize both water outflow from the basin and changes in storage in the basin. Based on the modeling performed for the Proposed Project, the Santa Margarita aquifer is targeted to initially receive 90 percent of the highly-treated recycled water from the Proposed Project and the Paso Robles aquifer is targeted to receive 10 percent of the highly-treated recycled water through injection using vadose zone wells. This project configuration would provide maximum flexibility for well operation and for managing short-term production benefits with the benefits of long-term storage.

Collectively, the four shallow and four deep injection wells represent a maximum capacity of approximately 6,000 gallons per minute (gpm). This capacity is well above the Proposed Project design flows of 3,500 AFY (with an anticipated maximum daily flow rate of 2,493 gpm with no downtime), and thus would allow for backup of pumping capacity if one or more wells are not functioning, well maintenance, and for other operational benefits. In addition, recycled water from the Proposed Project could readily be re-allocated among the two well types and aquifers as

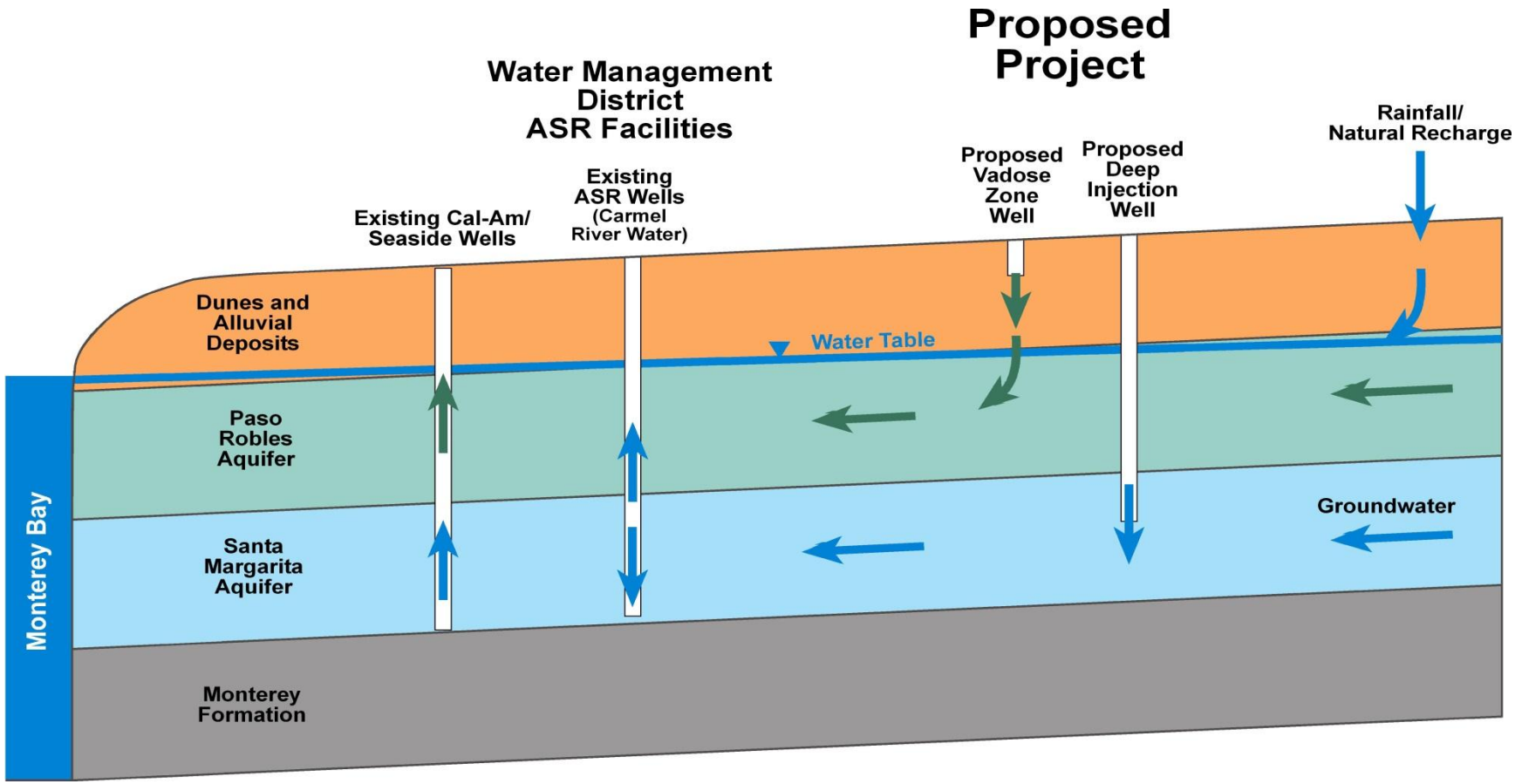

Figure 4. Conceptual Injection Schematic

Figure 5. Proposed Site Plan for Groundwater Recharge Components

basin conditions change in the future and to ensure compliance with CDPH retention time requirements. Wells may be installed in a phased approach (from east to west) as actual well capacity and required peak flow rates are more clearly defined. If there are future changes in the daily flow rates, sufficient number and total capacities of wells would be available to accommodate peak flows.

Backflush Facilities

Based on the experience of the Water Management District in the operation of its nearby ASR wells, backflushing of each injection well would occur about weekly and would require discharge of the backflush water to a percolation pond, or backflush basin, with a capacity of about 300,000 gallons. The backflush basin would be located in the middle of the injection well facilities site. Alternate sites have also been identified as shown on Figure 5. Separate pipelines would convey the back-flushed water from each well to the percolation pond.

Monitoring Wells

Monitoring wells would be used to monitor project performance and compliance with CDPH regulations. Because the Proposed Project would recharge two separate aquifers (Paso Robles and Santa Margarita aquifers), well clusters capable of monitoring both aquifers would be installed at four locations. Existing wells could be used for upgradient monitoring. The monitoring wells would also be used to satisfy regulatory requirements for monitoring of subsurface travel time, tracer testing, and other requirements for a groundwater replenishment project. Based on the June 2013 draft CDPH regulations, a minimum of two monitoring wells (each with two clusters to monitor both aquifers) would be required between the Proposed Project and the nearest downgradient production well. For this project, two wells (with two well clusters at each location) are included between the Proposed Project and the ASR wells to the northwest. In addition, two wells (also with two well clusters at each location) are included between the Proposed Project and the City of Seaside production well to the southwest. This results in a total of eight monitoring points (four in each aquifer) at the four locations shown on Figure 5. One set of monitoring wells would be located within close proximity to the project injection wells to support tracer testing as required by CDPH regulations. The second set of monitoring wells would be located more centrally between the project wells and the nearest downgradient water supply wells.

Extraction/Distribution System

CalAm would use existing Seaside Groundwater Basin wells, in addition to existing treatment facilities and existing pipelines in its Monterey District Service area, to recover, treat and deliver potable water from the groundwater basin to its customers. The water that CalAm extracts would include some of the Proposed Project highly-treated recycled water along with other groundwater from the basin. To meet the full replacement objective of the Proposed Project (3,500 AFY), additional distribution system pipelines would be required in the CalAm system.

Section 8 - Provisions for Public Health Protection

8.1 Source Water Monitoring Program

As previously stated, the source water for the AWTF would be secondary effluent from the

MRWPCA RTP. To ensure an adequate supply of secondary effluent for the AWTF, additional raw waters supplies (i.e., the source waters described in subsection 5.1, Source Waters) would be added to the MRWPCA collection system. The source waters would be diverted into the existing MRWPCA collection system, diluted and mixed with the existing municipal wastewater supplies, and treated through the RTP primary and secondary treatment processes prior to treatment at the AWTF. The unused secondary effluent would only be sent to the AWTF during periods when the secondary-treated wastewater quantities exceed the nonpotable recycled water demand of the CSIP area or other areas. Extensive water quality monitoring and bench scale testing have been conducted on these source waters to characterize the water quality and assess the required treatment.

A rigorous characterization of the source waters was undertaken for each type of water for the following constituents:

- General water quality parameters
- CDPH Maximum Contaminant Levels (MCLs)
    - Inorganic chemicals
    - Organic chemicals
    - Disinfection by-products (DBPs)
    - Radionuclides
    - Microbiological parameters
- CDPH Notification Levels (NLs)
- CDPH Drinking Water Archived Advisory Levels
- EPA Unregulated Contaminant Monitoring Rule (UCMR) Lists 1, 2 and 3
- EPA Clean Water Act Priority Pollutants
- Pesticides of local interest
- CECs

8.2 Source Water Treatability

***Unused wastewater*:** Secondary effluent in excess of the nonpotable recycled water demands will be used as part of this project. This water is currently discharged to the Monterey Bay through MRWPCA's ocean outfall. The treatment process design for the AWTF will be driven by the water quality of this existing secondary effluent. The primary water quality parameters that drive the treatment requirements for the secondary effluent are (1) pathogens, (2) total organic carbon, (3) nitrogen species (ammonia, nitrate, and nitrite) (4) mineral quality (e.g., dissolved solids including chloride, calcium, phosphate, silica), and (5) select unregulated contaminants. The concentrations of these parameters are all typical of a non-nitrified trickling filter effluent prior to disinfection.

***Salinas agricultural wash water*:** Agricultural wash water and wastewater from other agricultural processing operations throughout the City of Salinas would be diverted into the MRWPCA wastewater collection system at the MRWPCA Salinas Pump Station site. These waters are currently treated at the SIWTF. From an organic loading perspective, this source water can be characterized as a low to moderate strength wastewater, priority pollutants were not detected and organic and CEC levels and pathogen concentrations lower than that of the raw

municipal wastewater currently treated by MRWPCA at the RTP. This water contains elevated concentrations of phosphate and total dissolved solids (TDS), as compared with the existing RTP wastewater. These elevated phosphate concentrations (e.g., 9 mg-P/L compared with the existing 3 mg-P/L) will require additional controls to prevent calcium phosphate fouling on the RO membranes. Additional iron-based coagulant may be added in the collection system at the Salinas Area Pump Station or at the RTP headworks to enhance the phosphate removal through primary and secondary treatment. Further, bench-scale testing has indicated that this wash water (when mixed with the existing wastewater and treated through the RTP primary and secondary treatment) may have a measurable increase on the rate of fouling of the membrane filter; however, the degree of this impact is being evaluated through pilot testing in April and May 2014.

***Monterey and Salinas stormwater and urban runoff*:** Urban runoff and stormwater from the cities of Monterey and Salinas would be diverted to provide this source water. Sampling of these sources is ongoing; however, initial results indicate that elevated concentrations of TDS would be the primary water quality consideration for the identification of treatment requirements for the Monterey stormwater. However, this increase in TDS is minor from a treatability perspective, and it is not expected that the use of this water would require any changes to the process train. Once this water is mixed with the existing wastewater at the RTP, the resulting increase in TDS is expected to have a negligible impact on the final product water quality.

Agricultural drainage water: An additional type of source water that may be included in the project is agricultural drainage water from the Blanco Drain, Reclamation Ditch, and/or Tembladero slough. The Tembladero slough and Reclamation ditch also include urban and non-urban runoff. Extensive source water monitoring of the Blanco Drain water has been conducted, including monitoring of pesticides; only low levels of a few pesticides were detected. Of the pesticides that were detected, most concentrations were orders of magnitude below the any applicable regulatory or advisory levels for drinking water (i.e., CDPH MCLs or Notification Levels/Archived Advisory Levels). Only dieldrin and 1,3-dichloropropene were detected at concentrations approaching applicable drinking water regulatory/advisory levels in the raw water. It is expected that both of these pesticides would be reduced to concentrations below detection limits through dilution with the wastewater alone (i.e., prior to advanced treatment). Further, the ozone, RO, and AOP processes would also be expected to provide a significant barrier for these contaminants. Other contaminants that would drive the treatment of drainage water are the elevated levels of dissolved solids and nitrate, both of which will be reduced to acceptable levels through the RO treatment. It is expected that no additional treatment would be needed for this water, beyond what is already proposed for treating the secondary effluent.

***AWTF treatment process selection*:** A treatment train consisting of membrane treatment and AOP plus ozone pretreatment is planned for this project, and would meet all regulatory requirements. The ozone pretreatment is included to provide an additional barrier to pathogens and organic contaminants (*e.g.*, pesticides and CECs) and to reduce the fouling on the MF system. Following ozonation, the MF system is used to remove suspended and colloidal solids, as well as protozoa, bacteria, and prepare the water for RO. The RO system provides an excellent barrier to pathogens, salinity, and chemical contaminants, including CECs, dissolved

metals, salts, and nutrients. Finally, a UV/H_2O_2 AOPAOP will be used as a final polishing step to destroy any chemical contaminants that were able to pass through the RO.

8.3 Pathogenic Microorganism Control

To protect public health, IPR projects must inactivate or remove pathogenic microorganisms from the wastewater prior to distribution. CDPH requires minimum pathogenic reductions of 12, 10, and 10 logs for viruses, *Giardia*, and *Cryptosporidium*, respectively using at least three treatment barriers.

CDPH grants log reduction credits for unit processes that have been demonstrated to remove pathogens under expected operating conditions. The proposed pathogen reduction credits for the unit processes in the AWTF and underground retention time are shown in Table 1. The log reduction credits listed in the table are typical of what other advanced water treatment facilities in California operating under similar conditions have achieved. The CDPH draft groundwater replenishment regulations allow log reductions credits for virus for underground retention time of 1-log/month up to logs (e.g., 6 month retention time). The combination of the new AWTF and predicted underground retention time is expected to achieve log reduction credits of 18, 15, and 12 for viruses, *Giardia*, and *Cryptosporidium*, respectively, which exceeds the log reduction requirements in the draft CDPH groundwater replenishment regulations. The extra credits, not including additional credits that may be granted for secondary treatment, will provide redundancy to pathogen microorganism removal.

Table 1. Proposed Pathogen Reduction Credits for AWT Processes

Process	Conditions	Log Reduction Credits		
		Virus	*Giardia*	*Crypto*
Ozone[1]	O_3 CT of 1 mg/L-min @15 ^oC	4	3	0
MF	Daily pressure decay test	0	4	4
RO	Online TOC or conductivity monitoring	2	2	2
UV/H_2O_2	1,000 mJ/cm^2	6	6	6
Aquifer	6-month underground retention time[2]	6	0	0
Requirement		**12**	**10**	**10**
Total Credit		**18**	**15**	**12**

[1]Ozone concentration/contact time (CT) may be included if additional credit for redundancy is needed.
[2]Actual underground retention time expected to exceed 6 months.

8.4 Control of Nitrogen Compounds

The MRWPCA secondary effluent is a non-nitrified effluent, with a total nitrogen concentration of approximately 45 mg-N/L, mostly as ammonia. The primary AWTF nitrogen removal mechanism will be rejection through the RO membranes, where removal of nitrogen species typically exceeds 95 percent, with permeate concentrations of approximately 2 mg/L.

8.5 Regulated and Unregulated Contaminant Control

Regulated Contaminants
In addition to meeting pathogenic microorganism requirements, the AWTF recycled water must comply with all drinking water standards, specifically the CDPH primary and secondary Maximum Contaminant Levels (MCLs). Most MCLs were not detected in the source waters, and have not been monitored in the final AWTF water at this stage of the project. The RO pilot product water quality monitoring is focused on demonstrating the overall reduction of contaminants present in the source water. Water from the AWT pilot plant has consistently complied with all of the CDPH drinking water standards, with most concentrations being below detection limits.

Unregulated Contaminants
Unregulated contaminants of interest were also examined during the AWT piloting program, including relevant contaminants with CDPH Notification Levels, CDPH Archived Advisory Levels, pesticides of local interest, and CECs. The only unregulated contaminant of interest detected in the RO permeate was N-nitrosodimethylamine (NDMA), where concentrations have ranged from 20 to 32 ng/L. The UV/AOP process (not included at the pilot facility) will be designed to provide at least a 1-log reduction of NDMA, reducing the NDMA concentration in the final AWTF product water to 2 to 3 ng/L. These concentrations are well below the CDPH Notification Level of 10 ng/L.

Total Organic Carbon Control
Total Organic Carbon (TOC) can be used as a surrogate for unregulated and unknown organic chemicals contaminants. The project goal will be to maintain product water TOC concentrations below 0.5 mg/L, and thus far this goal has been consistently met during the pilot testing after RO.

8.6 Reliability and Redundancy

The full-scale AWTF and recharge of the highly-treated recycled water would provide reliability and redundancy through the use of multiple treatment barriers for each type of contaminant. Not counting the RTP, the AWTF would achieve chemical contaminant removal redundancy by employing at least two treatment technologies for most contaminant types (see Table 2) and at least three technologies for pathogens (see Tables 1 and 2).

The full-scale AWTF will achieve resiliency through its ability to respond to failures (the detection of failures is discussed in the subsection 8.8, Monitoring and Response Plan). If a

treatment failure in the RTP that may disrupt the AWTF is detected, the AWTF would be able to cease production. AWTF process failures of the RO system using online monitoring or the AOP system would also lead to plant shutdown. Given that the aquifers have large storage capacities and numerous extraction wells throughout the basin, the AWTF can cease production for an extended period of time, if needed. If a failure in the AWTF is detected, the AWTF would have the ability to divert the product water back to the RTP headworks, to the Reclamation pond (if the water meets tertiary treatment standards), or to the ocean outfall. If a failure is detected after the product water is injected into the aquifer, there will still be at least 12 months to allow for an appropriate response.

Table 2. MRWPCA GWR Multiple Treatment Barriers

Process	Chemical Constituents					Pathogenic Microorganisms		
	Nitrogen	TOC	DPBs	Inorganics	CECs	Bacteria	Viruses	Protozoa
Primary/ Secondary	✓	✓		✓	✓	✓	✓	✓
Ozone			✓		✓	✓	✓	✓
MF		✓		✓		✓		✓
RO	✓	✓	✓	✓	✓	✓	✓	✓
UV/H_2O_2			✓		✓	✓	✓	✓
Aquifer						✓	✓	✓

8.7 Response Retention Time

The CDPH proposed groundwater replenishment regulations require a project sponsor to propose a response retention time (RRT) to allow adequate response time to identify treatment failures and implement corrective actions. The minimum time allowed by the draft groundwater replenishment regulations is 2 months, but must be justified by the project sponsor. MRWPCA will develop a RRT taking into consideration the following safety features that are part of the Proposed Project: (1) continuous online monitoring of RO treatment with real-time results reviewed by the AWTF operators; (2) multiple levels of critical control points for RTP and AWTF operations, alarms, and unit process redundancy; and (3) the ability to shut down the AWTF at a moment's notice. As part of the RRT development, MWRPCA will also consider the time necessary to provide an alternative water supply should CDPH determine that the Proposed Project has impacted a drinking water well so that it can no longer be used as a drinking water supply. The RRT would be validated by a tracer study approved by CDPH.

8.8 Monitoring and Response Plan

Monitoring of the AWTF influent and product water quality and other process data will be conducted to ensure that the AWTF is functioning properly, and that the product water meets treatment objectives. The product water will be monitored in accordance with the CDPH draft groundwater replenishment regulations.

The effectiveness of treatment processes can be verified through online process monitoring (integrity monitoring) of critical control points in the treatment process. This online monitoring is underway at the Proposed Project pilot plant and will be undertaken at the full-scale AWTF. Each process has specific indicators that can be used to verify its performance:

- Ozone: dissolved ozone residual
- MF: effluent turbidity removal and daily pressure decay testing
- RO: conductivity removal and/or effluent TOC
- UV/AOP: UV intensity, power draw, and chemical level alarms

These processes would be measured online, and alarms would be used to adjust or shut down the process, divert the flow, or alert the operations staff immediately, as appropriate. Monitoring data obtained from the pilot plant or in the start-up phase of the full-scale AWTF would be used to establish a baseline of acceptable operational conditions. The instrumentation will be maintained and verified periodically to ensure that the online data are reputable. Further preventive maintenance would be performed on the equipment on a regular basis to avoid acute or creeping failures (e.g., O-ring replacement). The monitoring data would be analyzed/calibrated on a regular basis and modified as needed to ensure a resilient and reliable treatment process.

Section 9 - Regulatory Approval of Proposed Project Concept

The purpose of this proposal is to seek CDPH approval of the Proposed Project concept. While the development of the Proposed Project to date is summarized in this report, further information is necessary to document that all regulatory requirements specified in the CDPH draft groundwater replenishment regulations can be met. As the Proposed Project moves forward, and facilities are constructed, additional information will be forthcoming and will include the following:

- a full description of the Proposed Project and all components (final design);
- source control program (e.g. how our program meets CDPH requirements especially for the new sources and a review of our local limits to address CDPH draft requirements);
- water quality monitoring plan;
- contingency plan (e.g., an alternative source of potable water or a CDPH-approved treatment mechanism) to assure that product water not meeting drinking water standards is not distributed to the public (or others);
- response plan to identify and respond to a failure to meet product water quality requirements such that inadequately-treated water does not enter the drinking water distribution system (i.e., assure compliance with the RRT)
- operations plan that identifies the operations, maintenance, analytical methods, and monitoring needed to comply with the CDPH draft groundwater replenishment regulations; and
- engineering report.

State of California—Health and Human Services Agency
California Department of Public Health

RON CHAPMAN, MD, MPH
Director & State Health Officer

EDMUND G. BROWN JR.
Governor

June 5, 2014

Robert Holden, Principal Engineer
Monterey Regional Water Pollution Control Agency
5 Harris Court, Building D
Monterey, CA 93940

Dear Mr. Holden:

Pure Water Monterey Groundwater Replenishment Project Concept
Monterey Regional Water Pollution Control Agency- Recycled Water System No. 2790002

The California Department of Public Health (CDPH) has reviewed the DRAFT May 19, 2014 *Monterey Regional Water Pollution Control Agency, Pure Water Monterey Groundwater Replenishment Project, Proposal to Inject Highly-Treated Recycled Water into the Seaside Groundwater Basin*. The purpose of this letter is to respond to the Monterey Regional Water Pollution Control Agency (MRWPCA)'s request for CDPH review and approval of the project concept. CDPH has developed draft groundwater replenishment regulations. MRWPCA has committed to meet the requirements specified in the CDPH draft groundwater replenishment regulations.

The MRWPCA proposed project for groundwater injection will involve injecting highly-treated recycled water from a proposed new advanced water treatment facility (AWTF) into the Seaside Groundwater Basin. The AWTF would receive secondary effluent from the MRWPCA Regional Treatment Plant (RTP) as source water for treatment. The following is a list of the proposed AWTF processes:

- ozonation,
- biologically active filtration (optional),
- membrane filtration (MF) treatment,
- reverse osmosis (RO) membrane treatment, and
- advanced oxidation process using ultraviolet light and hydrogen peroxide (H_2O_2).

The proposed pathogen reduction credits for the unit processes and underground retention time are shown in Table 1, *Proposed Pathogen Reduction Credits for AWT Processes* in the Draft Proposal. These pathogen reduction credits must be substantiated in the engineering report and operations plan. Please note that RO via online TOC or conductivity monitoring can only demonstrate 1.0 to 1.5 log removal rather than 2 log removal. Still, the log reduction credits for viruses, Giardia, and Cryptosporidium should far exceed the log reduction requirements in the draft CDPH groundwater replenishment regulations. The extra log removal credits will provide an additional safeguard to ensure adequate pathogen reduction.

To obtain CDPH approval for an actual project, MRWPCA must provide an adequate basis for CDPH to make a finding that the project meets the requirements in the Health & Safety Code (H&S Code). CDPH has authority to condition a permit (H&S Code Section 116540) "as it deems necessary to assure a reliable and adequate supply of water at all times that is pure, wholesome, potable, and does not endanger the health of consumers". Nothing in this letter is intended to waive CDPH's authority.

Based on CDPH's review of MRWPCA's draft concept proposal, CDPH has concluded that the project, as conceived, when properly designed, constructed, and operated, should meet the requirements in the draft CDPH groundwater replenishment regulations. Therefore, CDPH conditionally approves the *Pure Water Monterey Groundwater Replenishment Project, Proposal to Inject Highly-Treated Recycled Water into the Seaside Groundwater Basin* Draft Concept. At a minimum, the conditions and future submittal requirements are described below.

Future Submittals

In order for CDPH to make the finding that the project poses no significant threat to public health and recommend issuance of a permit, MRWPCA will need to provide the additional information outlined below, including, but not limited to: engineering report, the final design, contingency plan, operations plan, response plan, water quality monitoring plan, and monitoring well locations.

Engineering Report, Final Design and Contingency Plan

Once project details are finalized, the project's Engineering Report must be submitted to CDPH for review and approval. Please refer to the current draft recharge regulations for guidance on content. Final design must be reviewed and approved before start of construction. The Engineering Report must contain an AWTF contingency plan which will assure that no untreated or inadequately-treated wastewater will be delivered to the use area.

Operations Plan

An Operations Plan must be developed to optimize individual treatment unit processes. Real-time monitoring with online instruments must be implemented to track, verify, and optimize performance of critical treatment processes in order to protect public health. The current demonstration project should provide data that would assist in accomplishing this. Full-scale commissioning and startup testing should finalize the treatment optimization process and be incorporated in the final Operations Plan.

Response Plan

Prior to operation, MRWPCA must submit a response plan for review and approval that will be implemented if needed to respond to a failure to meet product water quality requirements. The response plan should describe the steps to provide either:

1. an alternative source of drinking water supply to all users of a drinking water well, or
2. an approved treatment mechanism provided to all owners of a drinking water well

Water Quality Monitoring and Operational Reliability

Prior to discharge to Seaside Groundwater Basin, MRWPCA must develop and submit for approval a comprehensive Water Quality Monitoring Plan to determine compliance with all drinking water maximum contaminant levels (MCLs) and other pertinent standards. In addition, the Monitoring Plan shall include a sampling and analytical strategy for chemicals for which CDPH has established notification levels. To ensure proper performance of unit operations, full-scale commissioning and startup testing is required. This will confirm appropriate surrogate parameters and performance

indicator compounds that are tailored to monitor the contaminant removal efficiency of individual unit processes.

Seaside Groundwater Basin and Monitoring Well Requirements
The number and proper location of monitoring wells must be justified. Based on information provided to date, an additional set of monitoring wells may be needed to evaluate water quality along the path of flow from the GWR Well Site #3 to the ASR Wells 1 and 2. CDPH understands that MRWPCA intends to perform a tracer study to determine travel time to the nearest drinking water wells and confirm the theoretical estimates from the modeling.

Technical and Managerial Capacity, with Focus on Treatment Plant Operators
Adequate technical and managerial capacity must be demonstrated by the MRWPCA for the project. The MRWPCA must hire, train, and retain a sufficient number of qualified operators. A response/contingency plan including communication and notification procedures must be developed to address serious water quality problems arising from treatment plant failures that could compromise the use of Seaside Groundwater Basin as a source of drinking water.

CDPH staff will continue to be available to your staff for technical discussions and to answer questions on CDPH's requirements for the project.

If you have any questions, please feel free to contact Jan Sweigert at (831) 655-6934 or myself at (510) 620-3474.

Sincerely,

Stefan Cajina, P.E., Chief
North Coastal Region
Drinking Water Program

cc: Peter vonLangen
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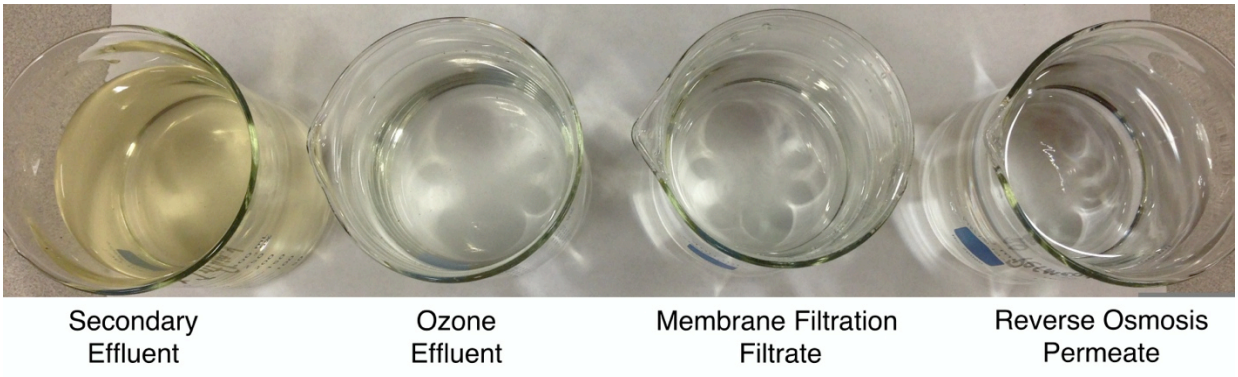
APPENDIX C

Pure Water Monterey Groundwater Replenishment Project: Advanced Water Treatment Facility Piloting Report

Pure Water Monterey Groundwater Replenishment Project: Advanced Water Treatment Facility Piloting



Draft Report - January 2016

Prepared for:

Partners for Pure Water Solutions

MRWPCA

Monterey Peninsula Water Management District

Prepared by:

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Sarah Triolo

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Alex Wesner, P.E.

Pure Water Monterey Groundwater Replenishment Project: Advanced Water Treatment Facility Piloting

DRAFT REPORT

Pure Water Monterey
A Groundwater Replenishment Project

January 2016

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Acronyms

AAL	Archived Advisory Level
AOC	Assimilable Organic Carbon
AWTF	Advanced Water Treatment Facility
BAF	Biologically active filtration
BDOC	Biodegradable dissolved organic carbon
BOD	Biochemical oxygen demand
BPA	Bisphenol A
CEB	Chemically enhanced backwash
CEC	Contaminants of emerging concern
CEPT	Chemically enhanced primary treatment
CGWRRR	California Groundwater Replenishment Reuse Regulations
CIP	Clean in place
CO_2	Carbon dioxide
COD	Chemical oxygen demand
CT	Residual concentration times contact time
DBP	Disinfection by-product
DCP	1,3 dichloropropene
DCPA	Tetrachloroterephthalate
DDW	State Water Resources Control Board Division of Drinking Water
DO	Dissolved oxygen
DO_3	Dissolved ozone
DOC	Dissolved organic carbon
EEM	Excitation-emission matrices
EPA	Environmental Protection Agency
EPA PP	EPA Clean Water Act Priority Pollutants
GFD	Gallons per square foot per day
gpm	Gallons per minute
GWR	Groundwater Replenishment
HAA	Haloacetic acid
HRT	Hydraulic residence time
IPR	Indirect Potable Reuse
kDal	Kilodalton
LC-MS-MS	Liquid chromatography tandem mass spectrometry
LSI	Langelier saturation index
MCL	Maximum Contaminant Level
MF	Membrane filtration
MFI	Modified fouling index
mg-min/L	Milligram-minute per liter
mg-N/L	Milligrams as nitrogen per liter
mg-P/L	Milligrams as phosphorus per liter

mg/L	Milligrams per liter
mL	Milliliter
MPN	Most probable number
MPWMD	Monterey Peninsula Water Management District
MRWPCA	Monterey Regional Water Pollution Control Agency
mV	Millivolts
NaOCl	Sodium hypochlorite
NaOH	Sodium hydroxide
NDMA	N-Nitrosodimethylamine
NDPA	N-Nitrosodi-n-Propylamine
ng/L	Nanograms per liter
NL	Notification Level
nm	Nanometer
NTU	Nephelometric turbidity unit
O_3	Ozone
OCWD	Orange County Water District
ORP	Oxidation reduction potential
pCi/L	Picocuries per liter
PLC	Programmable logic controller
pMCL	Primary Maximum Contaminant Level
PNEC	Predicted no-effect concentration
POC	Particulate organic carbon
PoLI	Pesticides of local interest
ppm	Part per million
PSA	Pressure swing absorption
psi	Pounds per square inch
psi/min	Pounds per square inch per minute
PVC	Polyvinyl chloride
RO	Reverse osmosis
RTP	Regional Treatment Plant
SBS	Sodium bisulfite
SDI	Silt density index
SEC	Size-exclusion chromatography
SIWTF	Salinas Industrial Wastewater Treatment Facility
slpm	Standard liters per minute
SM	Standard Method for the Examination of Water and Wastewater
sMCL	Secondary Maximum Contaminant Level
SVRP	Salinas Valley Reclamation Plant
TDS	Total dissolved solids
THM	Trihalomethane
TI	Threshold Inhibitor
TKN	Total Kjeldahl Nitrogen
TMP	Transmembrane pressure

TOC	Total organic carbon
TOrC	Trace organic compound
TSS	Total suspended solids
UCMR	Unregulated Contaminant Monitoring Rule
UF	Ultrafiltration
UV	Ultraviolet
UV/AOP	UV light with hydrogen peroxide advanced oxidation process
UVT	Ultraviolet light transmittance
VFD	Variable frequency drive
VSS	Volatile suspended solids
µg/L	Microgram per liter
µS/cm	Microsiemens per centimeter

Executive Summary

The Monterey Regional Water Pollution Control Agency (MRWPCA) and the Monterey Peninsula Water Management District (MPWMD) are in the process of developing the Pure Water Monterey Groundwater Replenishment (GWR) Project. The GWR project involves treating secondary effluent from the Regional Treatment Plant (RTP) with an Advanced Water Treatment Facility (AWTF), injection into a groundwater aquifer, and subsequent withdraw to augment the potable water supply of the Monterey Peninsula. Additional source waters will be brought into the RTP to provide water for the AWTF. The AWTF will include the following major treatment processes:

- Preozonation (*i.e.,* ozonation),
- Upflow biologically active filtration (BAF; optional),
- Ultrafiltration (UF), otherwise known as membrane filtration (MF),
- Reverse osmosis (RO),
- Ultraviolet light with hydrogen peroxide advanced oxidation process (UV/AOP), and
- Product water stabilization.

Preozonation, MF, and RO were pilot tested during a nine-month long pilot testing program. The BAF process was not piloted, because it is an optional process, and the design of UV/AOP and product water stabilization systems do not require pilot testing. Pilot testing was conducted from mid-October, 2013 to mid-July, 2014, with extensive pilot water quality sampling from December 2013 to June 2014. Pilot testing follows the work of bench-scale testing, when a preliminary treatment train was developed and the treatability of various source waters was assessed (Trussell Technologies, 2014c); pilot testing occurred simultaneously with an extensive source water sampling campaign (Trussell Technologies, 2014d); and pilot testing informed the Basis of Design Report for the AWTF (Trussell Technologies and SPI, 2014b).

Secondary effluent from the RTP (non-nitrified trickling filter and solids contact effluent) was pumped into the former chlorine storage building, which was used as the pilot building. At times, additional source waters were shunted to the RTP collection system, and the resulting RTP secondary effluent was influenced by these source waters. The source waters tested during piloting consisted of City of Monterey stormwater from Lake El Estero and agricultural wash water that would otherwise go to the Salinas Industrial Wastewater Treatment Facility (SIWTF). Once within the pilot building, the secondary effluent was treated with sodium hypochlorite, ozone, MF, and RO. The ozone, MF, and RO pilot were procured from pilot equipment vendors. Two MF systems were procured to test two different MF configurations: inside-out and outside-in filtration. The RO permeate flow was 18 gallons per minute (gpm), with all product and waste flows drained to the holding pond next to the building and ultimately returned to the RTP headworks.

The objectives of the pilot testing were the following:

- Determine the preozonation ozone dose,
- Select MF technology (inside-out vs. outside-in),
- Determine sustainable MF flux,
- Determine sustainable RO recovery,
- Examine the impact of agricultural wash water shunting on RO fouling,
- Assess the product water quality, and
- Assess the water quality after each individual unit process.

These objectives were met by conducting a number of long- and short-term experiments, where operational conditions were changed and water quality and performance data were monitored. Operational conditions that were tested include the following:

- Lake El Estero and agricultural wash water shunt
- Chloramine residuals between 0 and 7 milligrams per liter (mg/L)
- Pre-ozone- and post-ozone-chloramination
- Ozone doses between 0 and 25 mg/L
- Ozone dose control methods utilizing oxidation reduction potential (ORP), dissolved ozone residual, and ultraviolet light transmittance (UVT)
- MF fluxes between 25 and 40 gallons per square foot per day (GFD)
- Inside-out MF and outside-in MF
- RO recovery of 81%
- RO feed pH setpoints of 6.0 to ambient (about 7.2)
- Phosphate precipitation in the RTP through ferric chloride addition

Pilot water quality sampling included sampling of the following parameters, before and after each unit process:

- General water quality parameters (*e.g.,* alkalinity, total organic carbon (TOC))
- Inorganics (*e.g.,* phosphate, ammonia)
- Disinfection by-products ([DBPs], *e.g.,* N-Nitrosodimethylamine [NDMA])
- Pathogens and pathogen indicators (*e.g.,* total coliforms, *Cryptosporidium*)
- Synthetic organic contaminants (*e.g.,* 1,4-dioxane, pesticides)

The following conclusions and recommendation are made based on the piloting results:

Preozonation conclusions and recommendations:

1. **Need for Preozonation:** Preozonation improved MF run times by a factor in the range of 4 to 8 by reducing membrane fouling. The reduction in fouling allows for a higher MF design flux, which would reduce the size and cost of the MF system. To realize these benefits, preozonation is recommended.
2. **Ozone Control:** Two ozone dose control methods were successfully demonstrated: (1) constant ozone dose with ORP control, and (2) ozone residual ozone dose

control. A third control method, UVT control, may provide the best ozone dose control of the three methods; however, further testing would be required, as the UVT equipment tested during piloting fouled too rapidly for use in a control system. Further testing of the UVT control method is recommended at either the pilot-scale demonstration facility or the full-scale facility to determine the benefits of the UVT control method.

3. **Ozone Dose:** An average transferred ozone dose of 9.5 mg/L (10 mg/L applied ozone dose at a transfer efficiency of 95%) provided sufficient preozonation. To provide this level of preozonation, an AWTF average transferred design dose of 9.5 mg/L is recommended. The AWTF maximum and minimum design transferred dose should account for the maximum and minimum design water quality.
4. **Secondary Performance and Ozone:** High TOC and nitrite concentrations in the RTP effluent contributed to the preozonation dose. RTP trickling filter operational changes may be able to reduce the nitrite concentration in the secondary effluent, which could reduce operational costs. If the nitrite concentration were reduced, it may be possible to reduce the design ozone dose and/or operational ozone dose.
5. **Ozone Disinfection:** Preliminary testing showed that disinfection credit might be possible at transferred ozone doses in the range of 15 to 19 mg/L. These doses led to ozone CTs (residual concentration times contact time) in the range of 1 to 2 mg-min/L.
6. **NDMA Formation:** Both pre-chloramination and post-chloramination yielded similar levels of NDMA formation. NDMA formation was about an order of magnitude lower than at West Basin Municipal Water District's Edward C. Little Facility, and it is expected that the NDMA concentration in the final product will be well below the 10 ng/L Notification Level.
7. **Bromate Formation:** Acceptable levels of bromate formation were observed through the ozonation process (maximum 9 micrograms per liter [µg/L], compared to the Maximum Containment Level (MCL) of 10 µg/L). The bromate formed during ozonation was consistently removed by the downstream RO process to levels below the detection limit (*i.e.,* less than 1 µg/L for all samples).
8. **Biologically Active Filtration:** A biological process (*e.g.,* upflow BAF) downstream of preozonation would improve the product water quality, and possibly improve AWTF operation by reducing the concentration of organics in ozone-BAF effluent, including TOC, NDMA, and contaminants of emerging concern (CECs, also known as chemical of emerging concern and constituents of emerging concern).
9. **High Ozone Doses:** High ozone doses (*e.g.,* an average of 20 mg/L, applied) increased the concentration of TOC and formaldehyde in the RO permeate for the waters tested. These high ozone doses are not recommended on a regular basis for the AWTF, unless a downstream biological process is included downstream of ozone.
10. **Impact on RO Validation Testing:** Preozonation interfered with measurements analogous to those required by the Division of Drinking Water (DDW) during RO membrane integrity testing in the first 20 weeks of operation. Due to this interference, the first 20 weeks of AWTF operation will likely have to be conducted without preozonation. Alternatively, it may be possible to develop an alterative RO membrane integrity test with DDW.

Membrane conclusions and recommendations (MF and RO):

1. **Technology Selection:** The outside-in MF technology dramatically outperformed the inside-out MF technology during piloting. An outside-in MF membrane technology is recommended for the AWTF.
2. **Chloramine Residual:** A chloramine residual (*e.g.,* 2 to 5 mg/L at the RO feed) was important for controlling organic fouling on the MF system. A chloramine residual of 2 to 5 mg/L at the RO feed is recommended at the AWTF.
3. **Design Flux:** The outside-in MF membrane filtered for more than 30 days at a flux of 30 GFD, with a constant applied ozone dose of 10 mg/L during the agricultural wash water shunt. An MF design flux of 30 GFD is recommended for the AWTF.
4. **MF Fouling and Secondary Performance:** The MF membranes experienced spikes in transmembrane pressure (TMP) associated with short-term episodes of degraded secondary effluent water quality (these spikes in TMP corresponded with higher coagulant needs at the Salinas Valley Reclamation Plant [SVRP]); however, they were able to recover without operational intervention.
5. **MF Filtrate Water Quality:** The MF provided suitable RO pretreatment, with 99.8% of the MF effluent turbidity measurements less than 0.05 Nephelometric Turbidity Units (NTU), and all silt density index (SDI) measurements less than 3.
6. **RO Membrane Fouling:** At a recovery of 81%, the RO membrane required only one cleaning over a test period of approximately seven months, including extended periods with elevated phosphate concentrations and a high RO feed pH setpoint (*e.g.,* 6.8). Based on this piloting work, a preliminary AWTF design RO recovery of 81% is recommended; however, further modeling is also recommended to ascertain the effect on the RO recovery of the source waters that were not tested during piloting (*e.g.,* the Blanco Drain).
7. **Need for Phosphate Control**: Elevated phosphate concentrations in the agricultural wash water may foul the RO membrane if the phosphate is not removed through the RTP, or if the formation of phosphate minerals is not controlled at the RO process (*e.g.,* through acid addition). Phosphate removal in the RTP can be enhanced via the addition of ferric chloride through the chemically enhanced primary treatment (CEPT) facilities, although an application more specific to the AWTF feed water or the agricultural wash water is recommended for the AWTF if this method of phosphate control is pursued (*e.g.,* adding ferric directly to the agricultural wash water).
8. **pH Control:** RO specific flux dropped dramatically when pH adjustment was stopped, and adjustments to pH control affected the RO specific flux (likely due to the formation of calcium phosphate minerals). pH adjustment facilities will be necessary for the AWTF (*e.g.,* sulfuric acid).
9. **RO Cleaning:** An acid clean, without the use of detergents, was sufficient to restore RO permeability after scaling developed. Other cleans may be needed during full-scale operation if RO performance is reduced by foulants not observed during piloting (*e.g.,* biological, silica).
10. **Effect of Agricultural Wash Water:** The agricultural wash water shunt did not discernibly increase the fouling of the MF or RO membranes under the conditions tested.

UV/AOP conclusions and recommendations:

1. **Design UVT water quality:** During pilot testing, the RO permeate UVT was measured at 95% or greater for almost all samples (one sample was measured at 94%, but this is likely due to a high residual chloramine concentration in the RO permeate). Accordingly, a design RO permeate UVT of 95% was assumed for preliminary full-scale UV/AOP design.
2. **1,4-dioxane removal:** 1,4-dioxane concentrations were below the detection limit in all RO permeate samples, and it was only detected in 4 of 11 secondary effluent samples (maximum concentration of 1.2 µg/L in the secondary effluent, whereas the notification level [NL] and the detection limit are both 1 µg/L). The UV/AOP system will be designed to achieve at least 0.5-log removal of 1,4-dioxane (*i.e.,* 68.4% removal), and thus the concentration of 1,4-dixoxane in the product water is expected to be consistently below the NL. The full-scale AWTF UV/AOP system will be challenge tested (by spiking 1,4-dioxane) during start-up to demonstrate at least 0.5-log removal of 1,4-dioxane.

Water quality conclusions and recommendations:

1. **Product Water Quality:** Pilot water quality sampling results indicate that the AWTF product water is expected to meet all applicable regulations in the California Water Recycling Criteria, including the groundwater replenishment regulations for subsurface application, MCLs, NLs, and Archived Advisory Levels (AALs). The RO permeate met all requirements, except for NDMA; the UV/AOP system will be designed to meet the 1,4-dioxane removal criteria and to reduce NDMA by at least 90%, which is expected to reduce the NDMA to an acceptable concentration.
2. **CEC Reduction:** Ozone and RO removed all but a few CECs to levels below their detection limits. Of the CECs that were not removed to below their detection limits, all were measured at concentrations well below any limits linked to health concerns and most will be well removed through the UV/AOP system.
3. **DBP Formation:** DBPs (*e.g.,* NDMA and bromate) were formed through ozonation and chloramination, but at levels that would be adequately addressed by the combination of RO and AOP. DBPs are not expected to be an issue for the final product water.
4. **Additional RO Modeling:** RO modeling that takes into account (a) the blending of all source waters in the RTP collection system, (b) removal of select constituents through the RTP, and (c) removal of selected constituents through upstream AWTF processes is recommended to assess the fouling potential of the source waters.
5. **Need for Ozone:** Ozone provides benefits to the water quality, including providing a barrier to many synthetic organic compounds.
6. **Need for RO membrane:** RO treatment is needed for removal of several constituents, and is the backbone of the AWTF treatment train.
7. **Need for UV/AOP**: AOP is needed to address NDMA and provide an additional barrier against CECs (such as 1,4-dioxane) and pathogens.

8. **Source Water Variability:** Based on the source water monitoring program, it is expected that the proposed treatment train will be sufficient to meet all product water quality requirements for all of the proposed source waters.

Other design considerations:

1. **Biologically Active Filtration**: While BAF design criteria may be estimated, pilot testing is recommended prior to full-scale implementation to determine site-specific design criteria. Additionally, pilot testing would also be recommended to determine the effect of a BAF system on the performance of the downstream MF system, if the BAF were to be included in the AWTF.
2. **UV/AOP impact on organics:** Some UV/AOP systems downstream of RO in water reuse applications increase the concentration of specific organic constituents (*e.g.,* formaldehyde). UV/AOP pilot-scale testing should be considered to quantify the impact of UV/AOP on organics for this water.
3. **UV/AOP pathogen and chemical removal:** Chemical (*e.g.,* 1,4-dioxane, NDMA) and pathogen removal varies between water reuse projects. The full-scale AWTF design can account for this variation by selecting conservative design criteria. Alternatively, additional testing (*e.g.*, collimated bench-scale testing) offers a potential for a more aggressive full-scale design (*i.e.,* a less conservative design).
4. **Additional Source Waters in the RTP collection system:** The addition of new source waters to the RTP collection system may impact the RTP and the AWTF design in ways that were not discussed in the Source Water and Pilot Water Quality Report (*e.g.*, nitrite formation, RO recovery)(Trussell Technologies, 2014d). RTP and AWTF modeling and demonstration-scale testing is recommended to reduce uncertainty during AWTF design and start-up.
5. **Additional Source Waters directly to the AWTF**: If any of the new source waters were brought directly to the AWTF, then additional testing would be required to determine if there were additional pre-treatment needs.
6. **Long-term MF testing:** Several flux conditions were tested during the piloting; if additional piloting were conducted, it would be beneficial to conduct long-term testing of the 30 GFD design flux to better characterize seasonal water quality impacts.

1 Background

1.1 Project background

The Monterey Regional Water Pollution Control Agency (MRWPCA) and the Peninsula Water Management District (MPWMD) are implementing a Groundwater Replenishment (GWR) Project to augment the Monterey Bay peninsula water supply through the design and construction of an Advanced Water Treatment Facility (AWTF). This AWTF will treat secondary effluent from the RTP, and will include the following processes:

- Ozonation,
- Upflow Biologically Active Filtration (BAF; optional),
- Membrane filtration (MF),
- Reserve osmosis (RO),
- Ultraviolet advanced oxidation process (UV/AOP), and
- Product water stabilization.

The RTP wastewater supply will be augmented to provide flow for the AWTF. To achieve this augmentation, additional water supplies will be brought into the collection system. These additional water sources may include agricultural wash water, urban runoff, and potentially irrigation runoff water. A schematic of the AWTF processes, the existing RTP processes, and the additional source waters is shown in Figure 1.1.

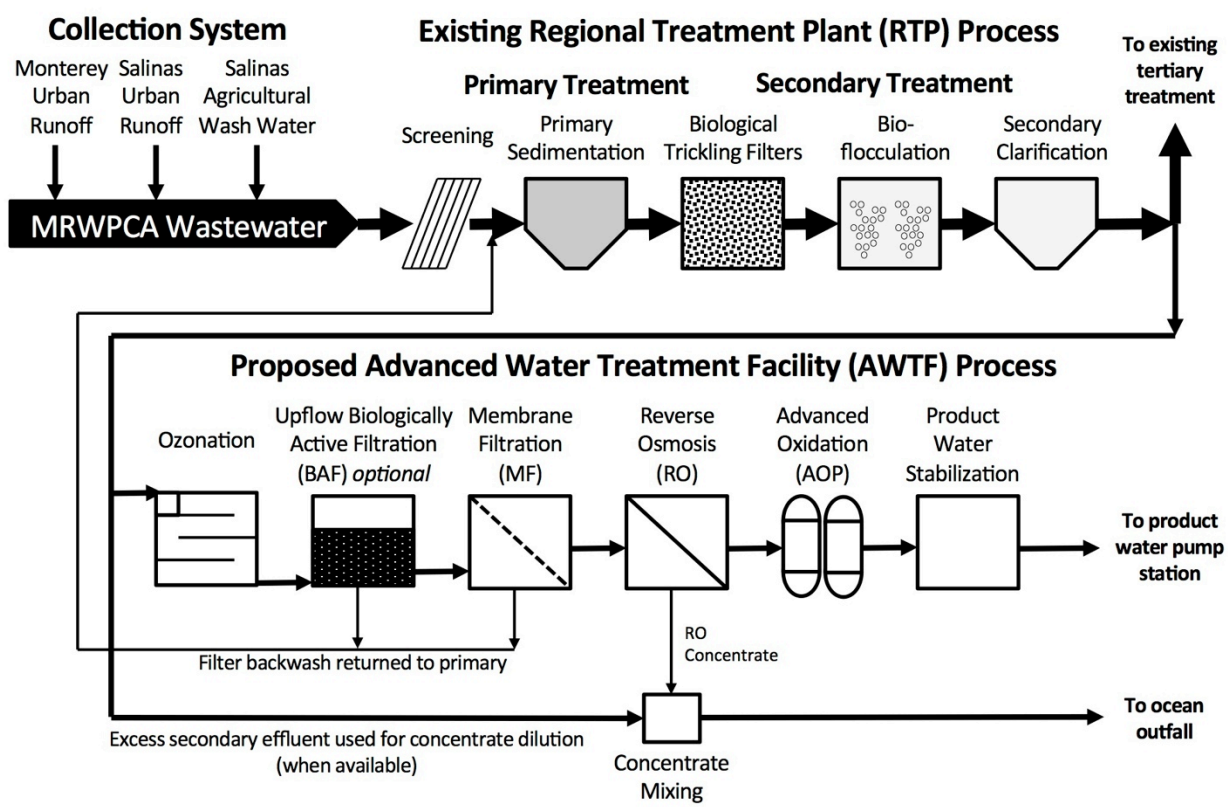


Figure 1.1 – Schematic of AWTF treatment processes

Pilot testing was conducted to develop design criteria for select unit processes (ozone, MF, and RO) and to collect water quality samples. The pilot testing began in October 2013 and was completed in July 2014. Both the design criteria results and the water quality results are discussed in this report. Bench-scale testing and source water quality sampling was also conducted to select the AWTF processes. A summary of the bench-scale testing and source water qualities is provided below.

1.2 Source water descriptions

Each of the additional water sources to the GWR Project has unique water quality signatures. These signatures are discussed in this section, as well as the identification of treatment requirements at the RTP, AWTF and any pre-treatment for these waters.

Unused wastewater

Secondary effluent in excess of the non-potable recycled water demands will be used as part of this project. This water is currently discharged to the Monterey Bay through the MRWPCA ocean outfall. The treatment process design for the AWTF was driven by the water quality of this existing secondary effluent. The primary water quality parameters that drive the treatment requirements for the secondary effluent are: (1) pathogens, (2) total organic carbon (TOC), (3) nitrogen species (ammonia, nitrate, and nitrite) (4) mineral quality (*e.g.,* dissolved solids including chloride, calcium, phosphate, silica), and (5) select unregulated contaminants. The concentrations of these parameters are all typical of a non-nitrified trickling filter effluent prior to disinfection.

Agricultural wash water

Agricultural wash water and wastewater from other agricultural processing operations throughout the City of Salinas will be diverted into the MRWPCA wastewater collection system at the MRWPCA Salinas Pump Station site. These waters are currently treated at the Salinas Industrial Wastewater Treatment Facility (SIWTF). From an organic loading perspective, this source water can be characterized as a low to moderate strength wastewater, with organic levels and pathogen concentrations lower than that of the raw municipal wastewater currently treated by MRWPCA at the RTP. This water contains elevated concentrations of phosphate and total dissolved solids (TDS), as compared with the existing RTP wastewater. These elevated phosphate concentrations (*e.g.*, 9 milligrams as phosphorus per liter [mg-P/L] compared with the existing 3 mg-P/L) will require additional controls to prevent calcium phosphate fouling on the RO membranes. Additional iron-based coagulant may be added in the collection system at the Salinas Area Pump Station or at the RTP headworks to enhance the phosphate removal through primary and secondary treatment. Further, bench-scale testing has indicated that this wash water (when mixed with the existing wastewater and treated through the RTP primary and secondary treatment) may have a measurable increase on the rate of fouling of the membrane filter; however, the degree of this impact was evaluated through pilot testing.

Monterey and Salinas stormwater and urban runoff
Urban runoff and stormwater from the cities of Monterey and Salinas will be diverted to provide this source water. Sampling of these sources indicates that elevated concentrations of TDS are the primary water quality consideration for the Monterey stormwater. However, the increase in TDS is minor from a treatability perspective, and it is not expected that the use of this water would require any changes to the process train. Once this water is mixed with the existing wastewater at the RTP, the resulting increase in TDS is expected to have a negligible impact on the final product water quality.

Agricultural drainage water
An additional type of source water that may be included in the project is agricultural drainage water from the Blanco Drain, Reclamation Ditch, and/or Tembladero slough (presently, the Blanco Drain and the Reclamation Ditch are included in the project, whereas the Tembladero Slough may be pursued at a later date). The Tembladero slough and Reclamation Ditch also include urban and non-urban runoff. Extensive source water monitoring of the Blanco Drain water has been conducted, including monitoring of pesticides; only low levels of a few pesticides were detected. Of the pesticides that were detected, most concentrations were orders of magnitude below applicable regulatory or advisory levels for drinking water (*i.e.,* State Water Resources Control Board Division of Drinking Water (DDW)[1] Maximum Contaminant Levels (MCLs) or Notification Levels (NLs)/Archived Advisory Levels (AALs)). Only two were at concentrations near applicable drinking water regulatory/advisory levels in the raw water: dieldrin and 1,3 dichloropropene (DCP). It is expected that both of these pesticides would be reduced to concentrations below detection through dilution with the wastewater alone. Further, the ozone, RO, and AOP processes would also be expected to provide a significant barrier for these contaminants. Other contaminants that would drive the treatment of drainage water are the elevated levels of dissolved solids and nitrate, both of which will be reduced to acceptable levels through the RO treatment. It is expected that no additional treatment would be needed for this water, beyond what is already proposed for treating the secondary effluent.

1.3 Bench-scale testing

Bench-scale pretreatment testing was conducted on the alternative GWR Project source waters to determine an appropriate pretreatment train and the treatability of the source waters. Testing was conducted on the RTP secondary effluent without blending, blended with the Blanco Drain, and blended with the agricultural wash water, and included pretreatment trains comprised of combinations of preozonation, coagulation and/or sedimentation. For these conditions the following parameters were measured:

- General water quality parameters
- Trace organic compounds (TOrCs)
- Excitation-emission matrices (EEMs)

[1] On July 1, 2014, California's Drinking Water Program was moved from the California Department of Public Health (CDPH) to the State Water Resources Control Board (SWRCB), and as a result of the change they are now titled the Division of Drinking Water.

- Size-exclusion chromatography (SEC)
- Ultrafiltration (UF) fractionation
- Modified fouling index (MFI)
- Bacteriophage inactivation (bacteriophage MS2)
- Disinfection by-product formation (NDMA and bromate)

The pretreatment alternatives were evaluated by their impact on membrane fouling potential (EEM, SEC, UF fractionation, MFI), TOrC removal, virus inactivation, and disinfection by-product (DBP) formation.

The results from this testing were used to develop the AWTF process described below, which included preozonation as a method for reducing membrane fouling. This testing also indicated that the unused RTP secondary effluent would be the primary driver for the treatment process, with a secondary consideration coming from the high phosphate concentrations in the agricultural wash water.

1.4 AWTF process

DDW regulates GWR projects. The MRWPCA GWR Project falls under Subsurface Application DDW regulations for Indirect Potable Reuse (IPR). These regulations require advanced water treatment facilities to include RO and AOP, in addition to setting pathogen inactivation and chemical removal requirements. Membrane filtration is included to pretreat the RO feed water, and to remove pathogenic protozoa (*e.g., Cryptosporidium* and *Giardia*). Ozone is included to pretreat the MF feed water (*i.e.,* preozonation), and provide pathogen inactivation and destruction of Contaminants of Emerging Concern (CECs). The AOP process will be UV/AOP, which provides pathogen inactivation and CEC removal. Finally, product water stabilization treatment is necessary to increase the calcium concentration, alkalinity, and pH of the product water prior to conveyance, injection and distribution.

Product water stabilization and UV/AOP systems can be designed without pilot data and, thus, they were not included in the pilot program; however preozonation, MF, and RO system design criteria require piloting.

Low-pressure membrane (*e.g.,* MF systems) design fluxes must be empirically determined through pilot testing. These design fluxes are impacted by preozonation, and thus preozonation must be included in pilot testing. Lastly, some of the RO fouling mechanisms are not well understood, and piloting of the RO system is useful for demonstrating sustainable recoveries. Given these design constraints, pilot testing was conducted at the RTP on the ozone, MF, and RO processes.

1.5 Pilot objectives

The objectives of the pilot testing were the following:

- Determine the preozonation ozone dose,
- Select MF technology (inside-out vs. outside-in),

- Determine sustainable MF flux,
- Determine sustainable RO recovery,
- Examine the impact of agricultural wash water shunting on RO fouling,
- Assess the product water quality, and
- Assess the water quality after each individual unit process.

2 Pilot Facilities and Testing

The pilot facilities, processes, procedures, and schedules are discussed in the following sections.

2.1 Description of pilot facilities

The following treatment processes were included in the pilot testing to meet the pilot objectives:

- Screening
- Chloramination
- Preozonation
- Ultrafiltration
- Reverse osmosis

Screening was included to stop clogging of the ozone pump. Chloramination is required to minimize fouling of MF and RO systems. Each system is described in more detail in the following sections.

All pilot facilities were located in the building at the RTP that used to house the chlorine cylinders (a simplified process and instrumentation diagram (P&ID) is shown in Figure 2.1, layout shown in Figure 2.2, and a photo shown in Figure 2.3). The ozone equipment was procured from the ozone equipment supplier APTWater (now called Ultura), which included an ozone generation and contacting skid (HiPOx), an oxygen generation skid, and a chiller skid. Harn R/O Systems provided the membrane equipment on skids. These skids included an inside-out MF skid (Pentair module, an outside-in MF skid (Toray module), an RO skid (2:1 array, single pass; CSM membranes), an RO cleaning skid, and MF feed and filtrate tanks. Ancillary equipment was procured separately. Upflow BAF equipment (not used) was available onsite from the Filter Loading Evaluation for Water Reuse study. These facilities, and the source water, are discussed in more detail below.

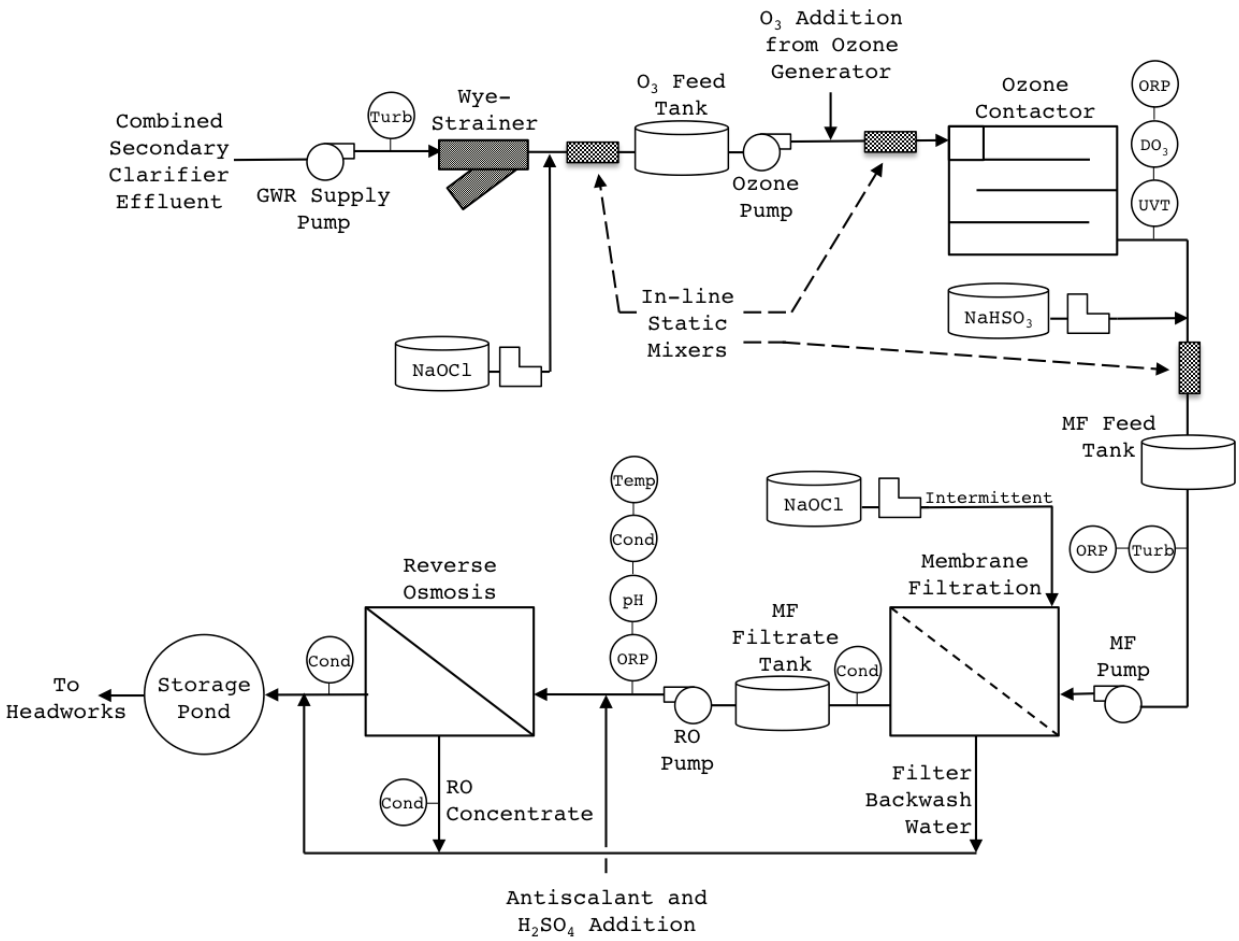


Figure 2.1 - Simple Pilot P&ID

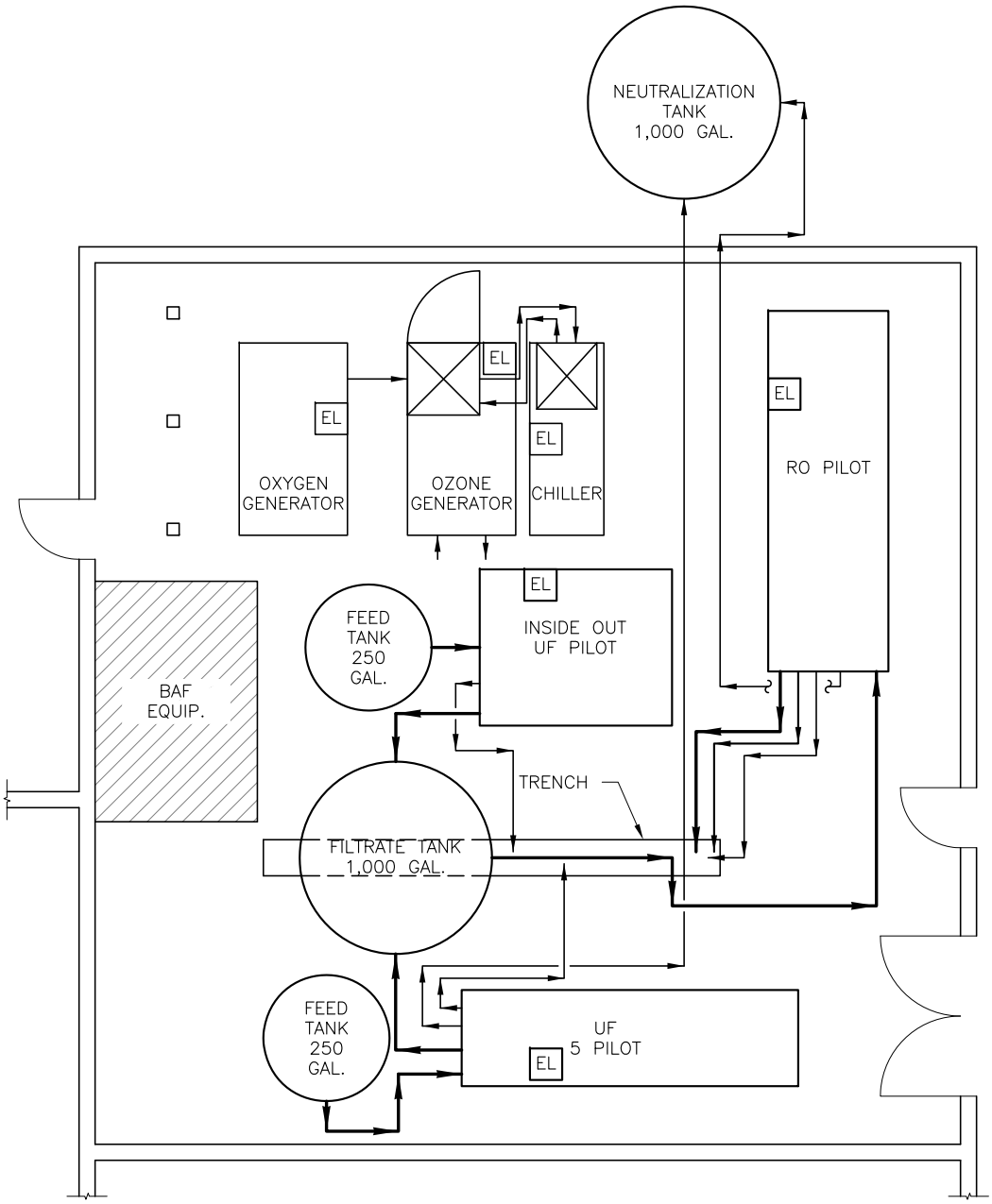


Figure 2.2 – MRWPCA GWR pilot layout

Figure 2.3 – Photo of pilot facilities. Outside-in MF front left; BAF equipment back left (not used); inside-out MF center; ozone back left; and RO right.

2.1.1 Source water

The pilot equipment received clarified secondary effluent from the RTP (non-nitrifying tricking filters, a solids contactor - also known as bioflocculation - and secondary clarifiers). A submerged pump, encased in a coarse screen[2] and located in the combined secondary clarifier effluent channel (GWR supply pump), pumped the secondary effluent through the pilot screens and into the ozone feed tank. The GWR supply pump pressurized the line leading to the ozone feed tank, where an automatic valve periodically opened and closed (about every 30 seconds) to keep the water level in the feed tank within a specified range. The GWR supply line flowed at about 60 gallons per minute (gpm) when the valve was open. After the secondary effluent entered the pilot building, it was pretreated with screening and sodium hypochlorite (discussed below).

Additional source waters were brought into the RTP collection system (also known as shunting) on two occasions during piloting (the timeline of these shunts are discussed later in the report). The first shunt consisted of Lake El Estero stormwater and it lasted for 56 hours. The second shunt was comprised of agricultural wash water and it was continued through the end of the pilot program.

2.1.2 Screening

Screening was included in the pilot process to remove snails from pilot influent. Early in the pilot program, occasional slugs of snails would enter the ozone pump and clog the closed impeller, reducing pilot flow. A Hayward wye-strainer with 1/16" perforated polyvinyl chloride (PVC) screens was used. This screen removes objects via physical straining (also known as size exclusion).

[2] Pump encasement cleaned on May 6 to restore flow (from 24-35 gpm starting April 28 to 60 gpm)

2.1.3 Chloramination

Chloramination was included in the pilot process to reduce MF and RO fouling and to inhibit snail growth in the ozone feed tank. Chloramination effectively inhibits biological growth at low concentration, which can extend MF run times and decrease the frequency of RO cleanings. Sodium hypochlorite (12.5% neat) was dosed via a Pulsafeeder diaphragm pump upstream of the ozone system to achieve a chloramine residual of 2 to 5 mg/L at the RO feed[3]. Non-nitrified secondary effluents contain high concentrations of ammonia (approximately 30 mg/L as N at the RTP), and hypochlorous acid and hypochlorite ions from the sodium hypochlorite solution react with the ammonia to form chloramines.

The sodium hypochlorite solution was kept at one part neat sodium hypochlorite to one part tap water (1:1) to increase the pump frequency, which minimizes large pockets of sodium hypochlorite solution and thus breakpointing, while also maintaining sufficient storage. Immediately downstream of injection, in-line static mixers were used to rapidly mix the sodium hypochlorite solution with the secondary effluent to minimize the breakpoint reaction.

2.1.4 Preozonation

Ozone pretreatment provides a number of benefits to a potable reuse treatment system, which warranted its inclusion in the AWTF and pilot treatment processes. These benefits are as follows: (1) low-pressure membrane pretreatment, (2) CEC destruction, and (3) the potential for pathogen disinfection credit. These benefits are discussed in more detail below. Following this discussion, a description of the ozone equipment follows.

Low-pressure membrane pretreatment
Ozonation prior to low-pressure membrane filtration (*i.e.,* preozonation) can increase low-pressure membrane (*e.g.,* ultrafiltration [UF] membrane) run times and/or the flux for some waters. Non-nitrified secondary effluent (*e.g.,* RTP effluent) is only moderately oxidized and contains high concentrations of large organic molecules (*i.e.,* > 10 kilodaltons [kDa]), which rapidly foul MF membranes. Ozonation of these large organic molecules reduces their size (*e.g.,* < 1 kDa) via oxidation, and allows them to pass through the MF system with minimal fouling (the organic molecules are then well-rejected by the downstream RO system). With the fouling potential of the water reduced by preozonation, the MF system run times are increased and/or the MF system can be designed for higher fluxes. Long run times allow for less chemical usage and a greater recovery, while designing the MF system for a larger flux reduces the number of membrane modules required.

CEC destruction
Preozonation can reduce the concentration of CECs that are discharged to the environment through the RO concentrate. CECs, and other high molecular weight organics,

[3] Field measurements made with Hach DR 890 using 25-mL total chlorine DPD packets

are typically well rejected by RO systems and thus concentrated in the RO concentrate. Ozone (O_3) can minimize the concentrating of CECs in the RO concentrate by reducing the concentration of some CECs in the RO feed. Ozone transforms CECs in the same way that it transforms MF-membrane-fouling organic molecules. CEC removal can be related to the ozone-to-TOC ratio (O_3:TOC), where larger ratios typically correlate more CEC removal (see Table 2.1 for a qualitative description of this relationship).

Table 2.1 – Relationship between O_3:TOC and typical CEC removal

O_3:TOC	Qualitative description of typical CEC removal
0.5	Easily removed CECs are destroyed
1	Many CECs are destroyed
1.5	All but recalcitrant CECs are destroyed

Pathogen disinfection credit

Preozonation can provide disinfection credit for viruses and bacteria (*e.g.,* 4 and 3 logs reduction credit, respectively, for an ozone CT of 1 milligram-minute per liter [mg-min/L]). In the same way that ozone transforms CECs and MF-fouling organic matter, ozone can destroy pathogenic viruses, bacteria, and protozoa. To claim disinfection credit, DDW requires an ozone residual be maintained at all times, such that a sufficient CT is demonstrated. If the water quality is highly variable, then the ozone system must be designed for the worst-case water quality in order to ensure disinfection at all times.

The ozone system was included in the process for both MF pretreatment and CEC removal. MRWPCA currently does not need disinfection credit from ozone (the DDW regulations require that the recycled water used as recharge water for a groundwater replenishment reuse project receives treatment that achieves at least 12-log enteric virus reduction, 10-log *Giardia* cyst reduction, and 10-log *Cryptosporidium* oocyst reduction, which are achieved through the MF, RO, and UV/AOP processes), so only preliminary testing was conducted with respect to disinfection design considerations.

Ozone generation and contacting skid

Ozone generation, injection, and contacting occurred at the ozone generation and contacting skid. Ozone was generated from high purity oxygen inside the ozone generator. High purity oxygen was received from the oxygen generation skid at approximately 15 standard liters per minute (slpm). After generation, the ozone/oxygen gas stream was injected into the screened secondary effluent. The ozone concentration in this gas stream was typically 8 to 12% ozone by weight, as measured by a Teledyne Instruments: Advanced Pollution Instrumentation gas-phase ozone analyzer. Injection was achieved with an injection quill, driven by a differential in the gas pressure compared to the liquid pressure. Mixing was achieved downstream of injection with four two-foot 1.5-inch diameter in-line static mixers (3 to 4 seconds; flow 25 to 45 gpm).

After injection and mixing, contact time was provided in the 6-inch serpentine pipeline contactor shown in Figure 2.4 (2 to 3 minute hydraulic residence time [HRT]). At the end of contacting, an air vent valve separated gas from the fluid stream. The gas stream passed

through a thermally catalyzed ozone destruct to remove ozone in the off-gas. After the off-gas was removed, the ozonated secondary effluent passed through a number of sensors before quenching and final discharge to the MF feed tanks. An oxidation-reduction potential (ORP) sensor[4], dissolved ozone (DO_3) sensor[5], and an ultraviolet light transmittance (UVT, at 254 nm) sensor[6] were located at the end of the contactor, downstream of the air-vent valve. These sensors were used to control the ozone dose (described in subsequent sections).

A sodium bisulfite (SBS) solution was injected downstream of the instruments, as needed, to quench residual ozone (*i.e.,* to eliminate the ozone residual through reduction reactions). The downstream membranes are sensitive to ozone, and the ozone system was occasionally operated to produce an ozone residual at the contactor effluent. When operated this way, the ozone residual was quenched with SBS. A dilution of approximately one part SBS (neat strength of 25%) to thirty-two parts non-chlorinated tap water was made (1:33). This dilution ensured a rapid pump speed, which would not allow pockets of dissolved ozone to carry downstream without quenching. After quenching was accomplished on an as needed basis, the ozonated effluent flowed to the MF feed tanks.

[4] George Fischer Signet +GF+, 277X series
[5] Emerson Process Management, Rosemount Analytical, 499A OZ
[6] AccUView online UV Transmission Analyzer, HF Scientific.

Figure 2.4 - Ozone generation skid (center), chiller skid (right), and oxygen generation skid (back left), during installation

Oxygen generation and chiller skids

Oxygen was generated on-site at the oxygen generation skid (see Figure 2.5). Generation equipment consisted of a screw press air compressor, an air drier, a coalescing filter, a pressure swing absorption (PSA) oxygen purifier, an oil-water separator, and receivers. Pressure swing absorption systems take advantage of pressure dependent nitrogen adsorption capabilities of zeolite media by operating in cycles. In the high-pressure cycle, nitrogen is removed from the chilled airflow by adsorption to the media. When the media is saturated with nitrogen, the flow shifts to a parallel PSA cell, while the saturated cell is depressurized. At the low pressures that come with depressurization, nitrogen desorbs from the media and is released to the atmosphere. The cells are rotated to achieve a constant production of high purity oxygen (approximately 94% oxygen by weight[7]).

Ozone generation produces excess heat, which must be cooled. Cooling was accomplished through a closed-loop chiller system, with a water-glycol mixture as the working fluid.

[7] Ultura lab testing prior to deployment of the PSA system

Figure 2.5 - Oxygen generation skid, during installation

2.1.5 Membrane filtration

UF is a class of low-pressure membrane filtration (MF) systems that utilizes a pressure differential to drive liquids across a semipermeable membrane. MF is dead end filtration and is generally considered to consist of pores sized between 0.1 and 0.01 microns. The filtration mechanism is size exclusion.

For the MRWPCA GWR Pilot, the MF serves as pretreatment to the RO by removing solid particles larger than 0.01 to 0.04 micron. These include viruses, bacteria, and suspended solids. Two different hollow fiber MF systems were evaluated during the MRWPCA GWR Pilot. The first was a Pentair X-flow which has an inside to outside flow configuration, meaning the feed water is introduced to the *Lumen* or inside of the fiber and the product water or *Filtrate* flows across to the outside of the fiber. The other system tested was a Toray HFU-2020N that has an outside to inside flow configuration in which the feed water enters the fiber from the outside and the product water flows from the lumen side.

Pentair X-Flow System

The Pentair X-Flow unit was provided by Harn RO systems and is shown is Figure 2.6 below. The unit was equipped with 1 Pentair *X-Flow* UF module, feed and back wash pumps both with variable frequency drives (VFDs), 700-micron Y-Strainer, and an on-

board programmable logic controller (PLC) that captured and recorded data every 2 minutes from on-board instruments.

Figure 2.6 - Pentair X-Flow Pilot Unit

The Pentair MF unit was started up on November 11, 2014 and testing officially concluded February 11, 2014. Several flux rates, ranging from 6 to 20 GFD, were attempted to identify the optimum operating point in terms of maximizing production and minimizing the cleaning frequency. At start-up, the Pentair unit was configured to automatically back wash every 25 minutes and to undergo daily Chemically Enhanced Backwash (CEB) cycles with a 200 mg/L sodium hypochlorite (NaOCl) solution followed by a Sulfuric Acid solution targeting pH 2 to 3. Throughout the pilot, a chloramine residual was maintained through the pilot system with the target of 2 to 5 mg/L at the RO feed.

Toray System

The Toray MF Pilot unit was provided by Harn RO systems and is shown in Figure 2.7 below. The unit was equipped with 2 Toray *HFU-2020N* UF modules, feed and back wash pumps both with VFDs, 100-micron Arkal self-backwashing pre-strainer, and an on-board PLC that captured and recorded data every 2 minutes from on-board instruments.

Figure 2.7 - Toray Pilot Unit

The Toray MF unit operated for just under 8 months, from November 18, 2013 through July 7, 2014. Several flux rates, ranging from 25 to 40 GFD, were attempted to identify the optimum operating point in terms of maximizing production and minimizing the cleaning frequency. While in operation, the Toray unit underwent daily CEB cycles with a 300-mg/L NaOCl solution. Throughout the pilot, a chloramine residual was maintained through the pilot system with the target of 2 to 5 mg/L at the RO feed.

2.1.6 Reverse Osmosis

RO is a class of medium- to high-pressure membrane filtration that utilizes a pressure differential to drive liquids across a semipermeable membrane. RO utilizes a pressure differential to overcome the osmotic pressure of the liquid. The precise mechanism of salt removal is not completely understood; however, there are primarily four theories. These include the *Sieve*, *The Wetted Surface*, the *Preferential Sorption-capillary,* and the *Solution-Diffusion Model* Mechanisms. It is the *Solution-Diffusion Model* that is most accepted.

The solution-diffusion model of transport assumes a non-porous, homogeneous membrane surface layer. Each component in a pressurized solution dissolves in the membrane and diffuses through the membrane. The flow of water and salt through the membrane is uncoupled (*i.e.,* they are independent of each other), and the water transports at a more rapid rate than the salt.

For the MRWPCA GWR Pilot, the RO serves to remove dissolved ions, bacteria, viruses, and CECs. The typical range of molecular weight cut off is less than 100 Daltons for RO membranes.

The Toray RO Pilot unit was provided by Harn RO systems and is shown below. The RO pilot unit was a two-stage configuration with 2 vessels in the first stage and one in the

second. Each vessel contained seven *CSM RE4040-FE* 4-inch RO elements. The pilot unit was equipped with a booster pump, 10-micron cartridge filter, high pressure feed pump, and an interstate booster pump. Both the high-pressure feed and interstate booster pumps were controlled by VFDs. Recovery was manually controlled. Data was recorded automatically every 10 minutes via the on-board PLC.

Figure 2.8 - RO Pilot Unit

The chemical feed system consisted of Threshold Inhibitor (TI) and acid addition. The dose rate for both chemicals was manually controlled. The TI used was Avista Technologies *Vitec 4000* and was dosed at 5 mg/L through the entire pilot. 92% Sulfuric Acid was used for pH control.

2.2 Piloting procedures

Schedules and procedures necessary to meet the pilot objects are discussed in this section.

2.2.1 Test plan

A pilot test schedule was developed to meet the pilot objectives (see Table 2.2). The major components of this test plan were as follows:

- Inside-out versus outside-in MF filtration testing
- MF flux and preozonation dose testing
- RO recovery testing
- Shunt testing (Lake El Estero and agricultural wash water)
- Water quality sampling (process, product, and DBPs)

The details of the above experiments, and their results, are discussed in detail later in the report.

Table 2.2 – Pilot test schedule

Description	Month									
	10-13	11	12	1	2	3	4	5	6	7-14
Mobilization and start-up										
MF technology (inside-out vs. outside-in) selection										
Sustainable MF flux testing										
Preozonation ozone dose testing										
Sustainable RO recovery testing										
Lake El Estero Shunt testing										
Agricultural wash water shunt testing										
Individual treatment process water quality sampling										
Product water quality sampling										
Disinfection by-product water quality sampling										
Demobilization										

2.2.2 Bench-scale stabilization

Bench-scale stabilization of the RO permeate was conducted to prepare a sample for leach testing. TODD engineers extracted soil samples from the Seaside aquifer (where GWR injection will occur) during preliminary drilling. A sample of stabilized RO permeate was used to measure the leaching potential of the soil. Product water stabilization reduces aquifer leaching and mineral mobilization (*e.g.,* arsenic), among other things. At the time of this experiment, product water stabilization goals for the MRWPCA RO permeate had not yet been developed, and thus the product water stabilization goals of Orange County Water District (OCWD) were used (shown in Table 2.3).

Table 2.3 - GWR Bench-Scale Post-treatment Stabilization Goals

Parameter	Unit	Target Value
Langelier Saturation Index (LSI)	--	-0.1
Calcium	mg/L as $CaCO_3$	32
Alkalinity	mg/L as $CaCO_3$	40
pH	--	8.5

These goals were targeted with the following steps:

1. Strip carbon dioxide (CO_2) from the RO permeate with air stripping
2. Add calcium with calcium chloride dehydrate
3. Increase alkalinity with sodium hydroxide (NaOH)
4. Adjust the pH, as needed, with CO_2 injection

The above procedure was followed using pilot RO permeate and shipped to TODD engineers for leaching analysis.

2.2.3 Toxicity testing

The toxicity of the RO concentrate was analyzed and compared against the requirements of the California Ocean Plan. The sample was collected on April 19 and shipped to Pacific EcoRisk for analysis. Pacific EcoRisk tested the water for acute and chronic toxicity. The test species for acute toxicity was Inland silverside (*Menidia beryllina)*, and Giant Kelp (*Macrocystis pyrifera)* was used as the chronic toxicity test species. These test species are the same species used by the RTP for their regular compliance with the Ocean Plan. The results of this testing are reported in the Pacific EcoRisk toxicity report and attached Trussell Tech cover letter and the Source Water and Product Water Quality (Trussell Technologies, 2014d).

2.3 Water quality sampling scope

Two water quality sampling campaigns were conducted during the pilot test period: a source water sampling campaign and the pilot sampling campaign. The pilot sampling campaign was conducted to characterize the performance of specific processes and to evaluate the water quality of the RO permeate (*i.e.,* the AWTF process product water without UV/AOP and product water stabilization). The source water sampling campaign was conducted to evaluate the treatability of various sources in consideration for AWTF flow augmentation. The results from both of these sampling campaigns are useful when reporting the pilot results; however, this report focuses on the pilot water sampling results. A description of the source water campaign, including results, motivation, and methods, is described elsewhere (Trussell Technologies, 2014d). Select results from the source water sampling are reported in this Pilot Report when required for clarity or completeness. An overview of the source water campaign is presented below.

2.3.1 Source water quality sampling

A one-year monitoring program was started in July 2013 for five of the potential source waters. Regular monthly and quarterly sampling was carried out for the RTP secondary effluent, agricultural wash water, and Blanco Drain drainage water. Limited sampling of stormwater from Lake El Estero was performed due to seasonal availability, and there was one sampling event for the Tembladero Slough drainage water.

A full characterization of these source waters, as defined by DDW's Policy Memo 97-005, was performed on these waters (RTP effluent, agricultural wash waster, and Blanco Drain on a quarterly basis; Lake El Estero and Tembladero slough one time each), with an expanded monitoring list for pesticides given the high levels of agricultural activity in the area. An all-inclusive approach was taken to the source characterization, where the full list of parameters was monitored in all sources. The types of constituents included in the GWR source water monitoring campaign are the following:

- General water quality parameters
- DDW MCLs
    - Inorganic chemicals
    - Organic chemicals

  - DBPs
  - Radionuclides
  - Microbiological parameters
- DDW NLs
- DDW Drinking Water AALs
- Environmental Protection Agency (EPA) Unregulated Contaminant Monitoring Rule (UCMR) Lists 1, 2 and 3
- EPA Clean Water Act Priority Pollutants (EPA PP)
- Pesticides of Local Interest (PoLI)
- CECs

See the Source Water and Product Water report for detail and results (Trussell Technologies, 2014d).

2.3.2 Pilot water quality sampling

Water quality sampling was conducted on a weekly basis during piloting. Source water sampling for the GWR project (including RTP effluent) was conducted on a monthly basis. The scope and full results of the source water sampling is discussed in the Source Water and Product Water Report (Trussell Technologies, 2014d), whereas the scope of the pilot water quality sampling is discussed in this report. Select results from the source water sampling campaign are also reported in this report when necessary. The sample locations at the pilot for the pilot water quality sampling campaign were the following:

- Pilot influent (secondary effluent)
- Ozone effluent (after quenching, when quenching was needed)
- MF effluent
- RO permeate
- RO concentrate
- MF backwash

These sample locations are highlighted in the process flow diagram shown in Figure 2.9.

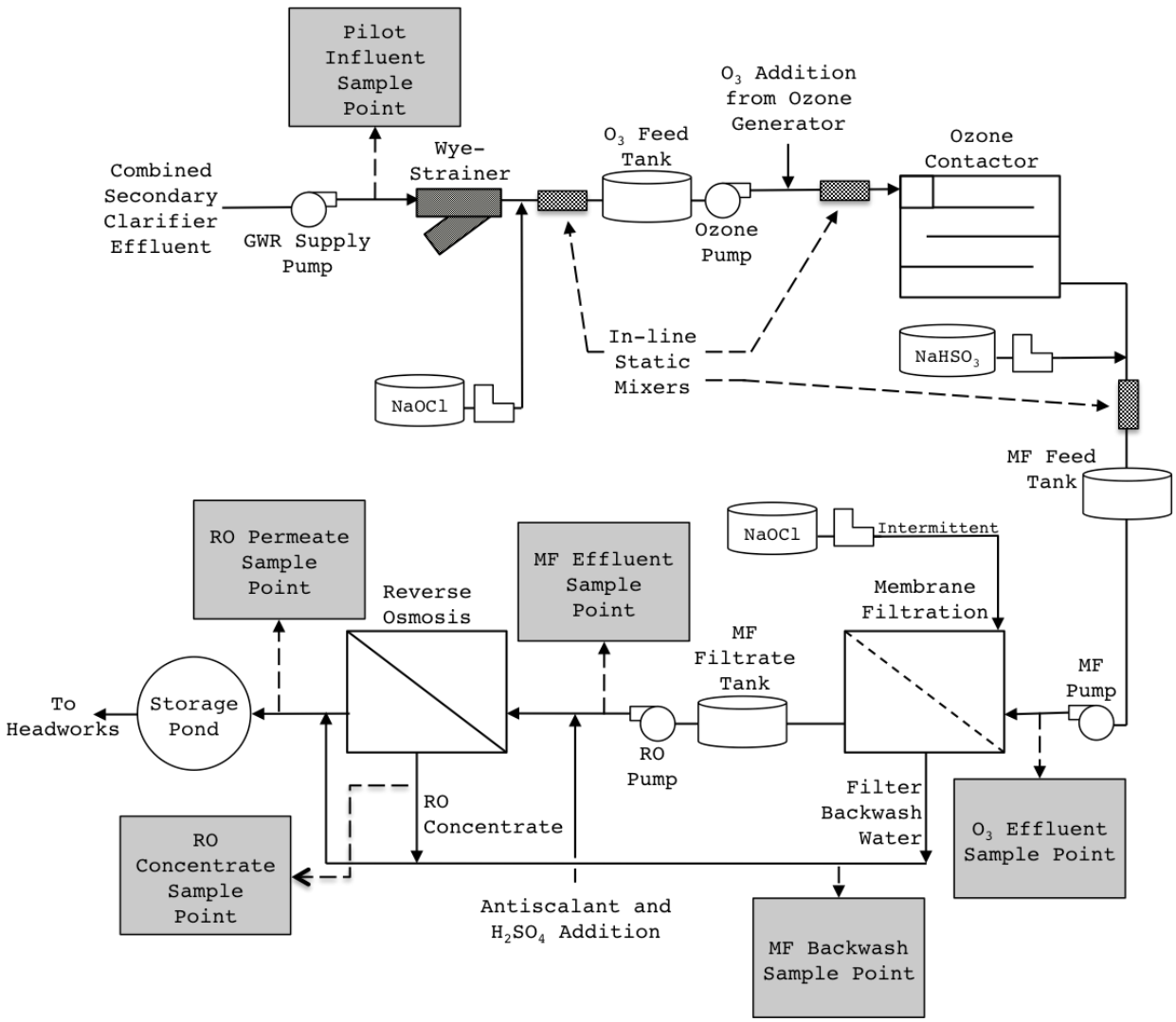


Figure 2.9 – Weekly water quality sampling locations

At locations listed above, samples were collected for the following water quality parameters:

- General water quality parameters (*e.g.,* alkalinity, TOC)
- Inorganics (*e.g.,* phosphate, ammonia)
- DBPS (*e.g.,* NDMA)
- Pathogens and pathogen indicators (*e.g.,* total coliforms, *Cryptosporidium*)
- Synthetic organic contaminants (*e.g.,* 1,4-dioxane, pesticides)

A detailed list of the water quality analysis performed for each sample location is shown in Table 2.5. Monterey Bay Analytical Services and Eurofins Eaton Analytical primarily performed the analysis, with sub-contactor labs as needed. A schedule of the sample events is shown in Table 2.4. Samples collected monthly were analyzed for the widest variety of parameters, while samples collected weekly were only analyzed for routine

parameters. One sampling of the RO permeate was conducted for all MCLs, NLs, and AALs on April 8, 2014[8].

Table 2.4 - Regular Water Quality Sampling Events

Sample Date	Sample type
12/10/2013	Monthly
12/17/2013	Semi-monthly
12/23/2013	Weekly
12/30/2013	Weekly
1/7/2014	Weekly
1/14/2014	Monthly
1/21/2014	Weekly
1/28/2014	Semi-monthly
2/4/2014	Weekly
2/11/2014	Monthly
2/18/2014	Weekly
2/26/2014	Semi-monthly
3/4/2014	Weekly
3/11/2014	Monthly
3/18/2014	Weekly
3/25/2014	No sampling

Sample Date	Sample type
4/2/2014	Semi-monthly
4/8/2014	Monthly
4/15/2014	Weekly
4/22/2014	Semi-monthly
4/30/2014	Weekly
5/6/2014	Weekly
5/13/2014	Monthly
5/21/2014	Weekly
5/27/2014	Semi-monthly
6/3/2014	Weekly
6/10/2014	Weekly[a]
6/17/2014	Weekly[a]
6/24/2014	Monthly[a]

[a] Reduced sampling; see appendix

[8] Uranium (MCL), vanadium (NL), chlorate (NL), and N-Methyl dithiocarbamate (Metam sodium) (AAL) were omitted by the lab.

Table 2.5 – Constituents analyzed during regular water quality sampling events[a]

Parameter	RTP Raw	Pilot Inf	Ozone Eff.	MF Filtrate	RO Permeate	MF Backwash	RO Conc.
General Water Quality Parameters							
Alkalinity		2/M		2/M	2/M		2/M
Conductivity		2/M		2/M	2/M		2/M
Hardness - Total		2/M		2/M	2/M		2/M
pH		2/M		2/M	2/M		2/M
Temperature		2/M			2/M		
Total Dissolved Solids (TDS)		2/M		2/M	2/M		2/M
Total Suspended Solids (TSS)		2/M	2/M	2/M		2/M	
Turbidity		W	W	W	W	W	W
Dissolved Oxygen (DO)		W	W				
Oxidation/Reduction Potential (ORP)			2/M	2/M	2/M		
Biochemical Oxygen Demand (BOD)		2/M	2/M	2/M	2/M	2/M	2/M
Chemical Oxygen Demand (COD)		2/M	2/M	2/M	2/M	2/M	2/M
Biodegradable dissolved organic carbon (BDOC)		M	M		M		M
Dissolved organic carbon (DOC)		M	M				
Total Organic Carbon (TOC)		W	W	W	W		2/M
UV-254 Absorbance		W	W	W	W		2/M
Inorganics							
Ammonia		W	2/M	2/M	W		M
Nitrate		W	2/M	2/M	W		M
Nitrite		W	W	2/M	W		M
Total Kjeldahl Nitrogen (TKN)		W	2/M	2/M	W		M
Aluminum				2/M	2/M		M
Arsenic		2/M		2/M	2/M		M
Barium				2/M	2/M		M
Boron				2/M	2/M		M
Bromide		2/M	2/M	2/M	2/M		M
Calcium				2/M	2/M		M
Chloride				2/M	2/M		M
Cyanide		2/M		2/M	2/M		M
Fluoride				2/M	2/M		M
Iron		2/M		2/M	2/M		M
Magnesium				2/M	2/M		M
Manganese		2/M		2/M	2/M		M
Mercury				2/M	2/M		M
Molybdenum				2/M	2/M		M
Nickel				2/M	2/M		M
Phosphate (orthophosphate)		2/M		2/M	2/M		M
Potassium				2/M	2/M		M
Selenium				2/M	2/M		M
Silica				2/M	2/M		M
Sodium				2/M	2/M		M
Strontium				2/M	2/M		M
Sulfate				2/M	2/M		M
Sulfide				2/M	2/M		M
DBPs							
Total THMs and HAAs		2/M			2/M		M
Bromate		2/M	2/M		2/M		M
Nitrosamines		2/M	2/M	2/M	2/M		M
Microbiological Parameters							
Total coliform and *E. Coli*		W	W	W	W		
Cryptosporidium and *Giardia*	M	M	M	M			
Synthetic Organic Contaminants							
CECs (See Table 8)		M	M		M		M
1,4-Dioxane		M	M		M		M
Select pesticides (EPA 505 and 525.2)		M	M		M		M

[a] Weekly (W), twice per month (2/M), and monthly (M)

2.4 Timeline of piloting activities

Pilot equipment was onsite at the RTP from October 2013 to July 2014. During this time various changes were made to the piloting program. One change was the shunting of additional source water to the RTP headworks. Two shunts were conducted during piloting. Lake El Estero stormwater was shunted for 56 hours in February, and the agricultural wash water was shunted from April through the end of piloting. A summary of these shunt periods is shown in Figure 2.10.

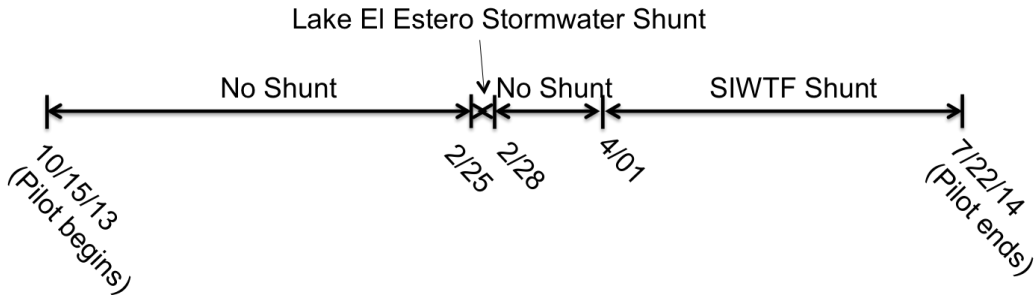
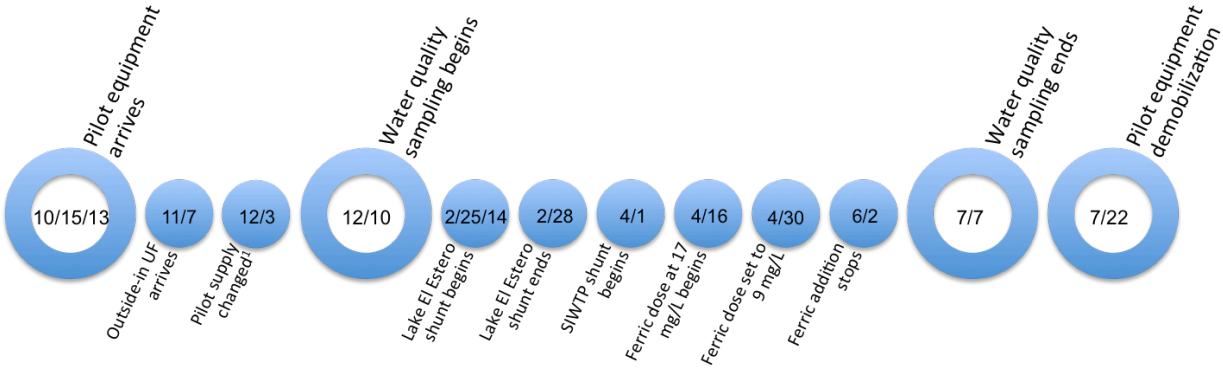


Figure 2.10 – Schedule of shunt testing during piloting

In addition to shunt water testing, another impact on the pilot feed water was the addition of ferric chloride to the RTP primary effluent. As phosphate concentrations in the RTP secondary effluent increased due to the agricultural wash water shunt, the RTP chemically enhanced primary treatment (CEPT) facilities were to add ferric to the primary effluent on an experimental basis. Over time, these doses were reduced to determine the impact of elevated concentration of phosphate on RO scaling. The ferric dose schedule, and other notable piloting events, are summarized in Figure 2.11.



[1] Supply changed from Class C sump basin to a submerged pump in combined secondary clarifier effluent channel due to concerns over the representativeness of the Class C sump station water

Figure 2.11 – Timeline of select piloting events

3 Operational results and discussion

Operational results are reported and discussed in this section. The section is divided into the major unit processes: ozone, MF, and RO. Results from the water quality sampling are reported and discussed in the following section.

3.1 Ozone

The ozone testing was conducted simultaneously with the MF flux and RO recovery testing. Ozone tests include determining an adequate ozone dose control method, testing the effect of moderate and high ozone doses on membrane fouling, and preliminary ozone CT testing. These tests and results are discussed in this section.

3.1.1 Dose control testing

The concentration of organics that cause membrane fouling and the ozone demand vary temporally in the secondary effluent. Ideally, the ozone dose is adjusted based on fluctuations in this concentration and demand. Alternatively, if the variability is low enough, a constant ozone dose may prove suitable, as the degree of under- and over-dosing may be minimal.

Three ozone dose control systems were explored during pilot testing: UVT at 254 nanometers (nm) control, ORP control, and dissolved ozone residual control. Of the three options, UVT control most accurately adjusts the ozone dose for some waters; however, UVT control at this pilot was unsuccessful due to instrumentation limitations with this feed water. Instead of UVT control, the pilot was successfully operated with both ORP and dissolved ozone residual control. These three control methods are discussed below.

UVT control

UVT is the most directly representative online metric available for the concentration of large organic molecules that foul low-pressure membranes (UF membranes), and thus controlling the ozone dose with UVT is ideal. In this control method, the ozone dose is adjusted to maintain a UVT effluent setpoint or a delta UVT setpoint (*i.e.,* the difference between the influent UVT and the effluent UVT). The UVT setpoint is empirically determined by observing the relationship between membrane fouling and various UVT setpoints.

At the pilot, the ozone effluent and delta UVT was measured during both moderate ozone dose testing (constantly applied ozone dose of 10 mg/L) and high ozone dose testing (variable ozone dose tied to ozone demand, with an average applied ozone dose of 20 mg/L) with weekly grab samples[9]. Both the moderate ozone and the high ozone doses successfully minimized membrane fouling, and thus these ozone effluent and delta UVT measurements represent preliminary UVT setpoints. The high ozone doses did not discernably decrease membrane fouling compared to the moderate ozone doses, thus the high ozone doses were likely achieving an upper limit on the oxidation of membrane

[9] Thermo Scientific AQUAMATE

foulants. The average delta UVT during this maximum ozone testing, which likely represents a maximum delta UVT for this water, was 10% (9 to 11% for 10 samples; 1 sample at 15%). The average delta UVT for the moderate ozone doses was similar, albeit lower, at 8%, and contained higher variability (4 to 11% for 10 samples; 1 sample at 15%). The variability in the delta UVT during moderate ozone testing is likely due to regular underdosing. Regular overdosing must have also occurred (assuming variability in the ozone demand and concentration of membrane fouling organics), but the delta UVT ceiling (approximately 10 to 11%) curtailed data on the magnitude of this occurrence.[10] To minimize membrane fouling, the recommended delta UVT is 10%. This delta UVT was not consistently achieved with a constantly applied moderate ozone doses (*e.g.,* 10 mg/L), indicating that, on average, this dose is slightly lower than optimal. The high ozone doses (*e.g.,* 20 mg/L) achieved this delta UVT limit all the time, indicating that this dose is optimal or that it exceeds the optimal dose (possibly significantly exceeding the optimal dose).

Effluent UVT can also be used as a setpoint, however the ozonated effluent UVT exhibited more variability than the delta UVT. The variability seems to be due to varying concentrations of compounds in the secondary effluent that absorb UV at 254 nm, but which are not oxidized by ozone (and which may not foul membranes). The effluent and delta UVT for various ozone doses are summarized in Table 3.1.

Table 3.1 - Ozonated delta and effluent UVT[a]

Applied ozone dose	Average delta UVT at 254 nm (%, range)	Average effluent UVT at 254 nm (%, range)
Moderate (10 - 12 mg/L)	11 (9 – 15)	65 (59 – 70)
High (15 - 22 mg/L)	9 (4 – 15)	64 (62 – 68)

[a] Based on 13 and 11 high and moderate dose samples, respectively; control (*i.e.,* no ozone addition) showed a difference of -0.3 to 1% increase in UVT).

The UVT measurements reported above indicate that UVT control is suitable for this water if UVT can be measured continuously in the ozone effluent. Suitable online UVT analyzers may be available, but the sensor tested during piloting was unable to measure UVT continuously. The analyzer UVT decreased rapidly between cleans (*e.g.,* 10% over 12 to 24 hours), due to the deposition of a foulant on the flow-through cell surface. The foulant had a yellow-orange color and could be removed with either an acid solution or physical wiping. The analyzer had an ultrasonic cleaning feature, but this did not inhibit fouling. It is recommended that future piloting efforts test alterative UVT analyzers with built-in wipers that may remove the foulant (*e.g.,* Hach Company offers a UVT analyzer with a built-in wiper blade). Although the foulant was not analyzed, it appeared to be iron and manganese precipitate, which may have formed through the oxidization of reduced iron and manganese [Fe(II) and Mn(II)] in the pilot feed water.

[10] Some variability is also due to variances in the chloramine residual concentration, which varied between 2 and 7 mg/L as Cl_2 at the ozone effluent during piloting.

Another consideration with UVT control is that the UVT sample point must be located downstream of the dissolved ozone residual dissipation or after the dissolved ozone residual has been quenched. Dissolved ozone absorbs UV at 254 nm, and may interfere with organic measurement.

Constant ozone dose with ORP control

Two other ozone dose control methods were tested due to challenges with UVT control. One successful control method was to set a constant ozone dose low enough such that the ozone residual decayed after a given contact time or sample location. The presence or absence of an ozone residual at the given contact time or sample location was measured with an ORP sensor. ORP sensors register the presence or absence of oxidants, such as ozone, and they are sensitive enough to distinguish been chloramines and dissolved ozone, even at very low ozone concentrations (0.1 mg/L dissolved ozone compared to 5 mg/L as Cl_2 chloramines). If a dissolved ozone concentration is detected at the ORP sensor, then the ozone dose is turned down until the ozone concentration is no longer detected. If the ORP sensor is located at the end of the ozone contactor, then this method of control limits the concentrations of dissolved ozone leaving the ozone system to rarely detectable concentrations.

The primary limitation to this control scheme is its inability to adjust the ozone dose when the loading of membrane-fouling organics fluctuates. Thus, the ozone dose is higher or lower than needed most of the time. This control scheme was successfully operated at the pilot scale to achieve the design MF flux of 30 GFD (with a constant applied ozone dose of 10 mg/L). The ORP electrode required cleaning (*e.g.,* rinsing with a dilute acid solution) on a weekly to twice a week basis to avoid biofilm and inorganic precipitate build-up. Example ORP measurements for this water are summarized in Table 3.2. The pilot was typically operated with an ORP upper limit setpoint of 480 millivolts (mV).

Table 3.2 – Example ORP values for various ozone residuals

Ozone residual (mg/L)	Chloramine residual (mg/L as Cl_2)	ORP (mV)
No ozone dosed	~5	110
0 (ozone dissipated)	No chlorine dosed	215
0 (ozone dissipated)	~5	375 – 450
0.1	~5	500
0.2 – 0.5	~5	700 - 900

A variation of this method was also tested where the constant ozone dose was paired with a dissolved ozone sensor and a quenching system instead of an ORP sensor. In this set-up, the dissolved ozone sensor detects the residual ozone concentration, and an appropriate chemical quenching dose is applied to quench the residual. Quenching the ozone residual (instead of avoiding it, as is practiced in the ORP sensor configuration) allows for a higher operating ozone dose compared to the ORP sensor configuration. The downside is that

dissolved ozone sensors are less robust compared to ORP sensors. ORP electrodes require less frequent cleaning and they are less sensitive to damage.

Dissolved ozone residual control

The final ozone control system that was tested was the dissolved ozone setpoint method. In this method, the ozone dose is varied to reach an ozone setpoint at some location downstream. A dissolved ozone sensor measures the dissolved ozone, and this sensor must be located at some point where dissolved ozone is present at appropriate ozone doses. The dissolved ozone setpoint at a given sample location must be empirically determined by correlating the ozone setpoint with membrane run time. Ozone demand (ozone dose minus ozone residual) is not a direct measurement of the concentration of organics that foul membranes, but it is a function of those organics, as they contribute to ozone demand (among other compounds, such as nitrite). As the concentration of organics increase, the ozone demand increases, and the ozone dose increases correspondingly. Similarly, if the ozone demand increases for another reason (*e.g.,* due to increase in the nitrite concentration), the ozone demand will increase, and the ozone dose will increase. Although the concentration of organics is not increasing in this later case, more ozone is needed, because more will be consumed through reactions with the increased concentration of nitrite. Thus, a dissolved ozone residual control system varies the ozone dose as the ozone demand and the concentration of membrane-fouling organics fluctuates, similarly to UVT control.

This control system was employed during the high ozone dose testing. For these tests, the dissolved ozone sensor was located at the effluent of the ozone contactor (3-minute HRT), and the setpoint was maintained at 0.1 mg/L. This setpoint and location required an average applied ozone dose of 20 mg/L, with a range of 14 to 25 mg/L. The ozone demand varied diurnally, typically with two peaks per day: one at noon, and another at midnight (see Figure 3.1 for the applied ozone dose during an example week of testing). This ozone control method successfully reduced membrane fouling during pilot testing, and adjusted the ozone dose according to changes in ozone demand.

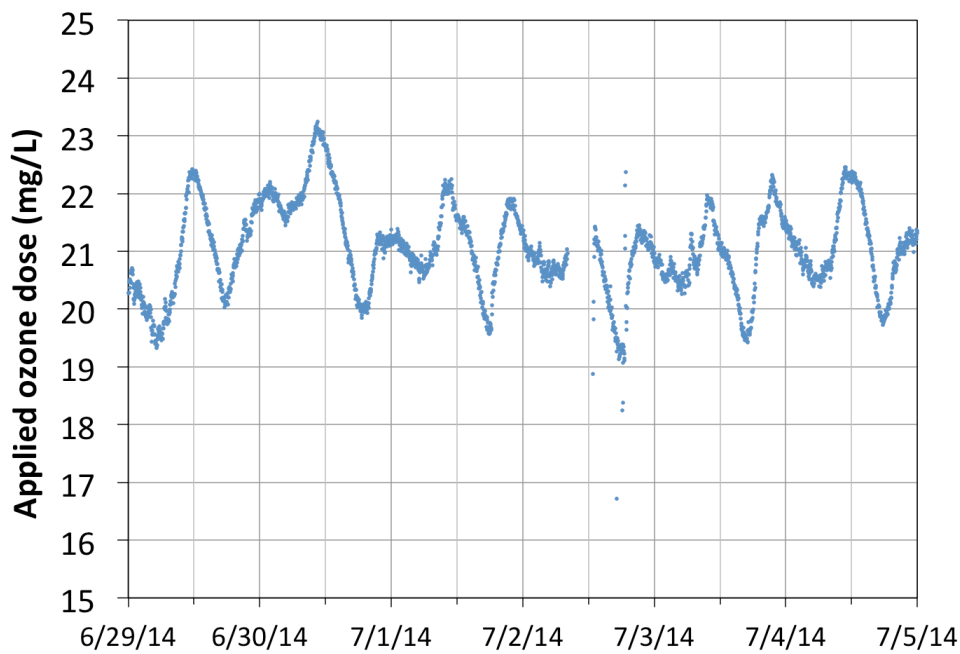


Figure 3.1 – Example of variability in applied ozone dose required to meet the 0.1 mg/L setpoint (ozone turned off in the afternoon of 7/2 for an experiment)

Dissolved ozone decays exponentially. To minimize this decay, sample tubing or piping that feeds a dissolved ozone sensor must have a minimal residence time. Once ozone reaches the sensor, it crosses a hydrophobic membrane and is reduced at the gold cathode. The gold cathode did not tarnish during piloting, but the membrane required frequent attention (daily examination), and at least weekly replacement. The membrane is very sensitive, and is easily torn by abrasion (*e.g.,* dabbing with a Kimwipe®). Air entrapment behind the membrane occurred occasionally, which diminished response time, and foulant accumulated on the surface. This foulant resembled the UVT flow-through cell foulant in appearance, and it was also susceptible dilute acid solutions. Over time, irreversible foulants accumulated on the membrane, and the membrane required replacement. These irreversible foulants had the same appearance as the foulants that were easily removed with dilute acid solutions, but they were amenable to acid treatment.

3.1.2 Ozone dose testing

Various ozone doses were tested to determine a design ozone dose for preozonation. This dose is a function of the water quality, including nitrite, TOC, and other constituents that contribute to ozone demand. During testing, the effect of ozone on foam formation was observed, as excessive foam formation may impact design. These tests and observations are discussed in this section.

Applied ozone dose

Ozone dose testing included extended testing at moderate and high ozone doses, as well as testing without ozone addition. These tests were performed to determine an appropriate

preozonation design dose and to determine the impact of preozonation versus no ozone. Moderate ozone dose testing consisted of a constant applied ozone dose of 10 mg/L, whereas high ozone dose testing utilized the ozone residual control with a setpoint of 0.1 mg/L after a 3-minute HRT. This high ozone dose setpoint resulted in an average applied ozone dose of approximately 20 mg/L (ranging from 14 to 25 mg/L). Membrane flux was tested without ozone by turning off both the ozone and oxygen addition, but allowing the secondary effluent to travel through the ozone contactor (where it was dosed with sodium hypochlorite upstream of the contactor). A summary of the tests conducted is presented later in this section.

The impact of preozonation compared to the absence of ozonation was measured by comparing MF run times with and without ozone, while keeping the MF flux constant. This comparison shows that preozonation doses between 10 and 14 mg/L increase the MF run time by a factor of 4 to 8 (see Table 3.3). The factor of four increase represents a lower bound, as the chlorine pump used during daily MF CEBs was inadvertently turned off half way through the run (run #2). The factor of seven increase represents an upper bound, as the ozone doses were relatively high during this run (14 mg/L in run #1 compared to 10 mg/L in run #2). The longer run time observed during MF run #1, compared to run #2, may be due to the higher ozone dose (14 versus 10 mg/L, with the high dose possibly achieving a maximum UVT increase more consistently than the lower dose), the cessation of chlorinated CEBs half way through run #2, or to other seasonal variations in water quality.

Table 3.3 – Effect of preozonation on MF run time

MF Run Number	MF flux (GFD)	Run time (days)[a]	Applied ozone dose (mg/L; range)
1	25	36	14 (12 - 17)
2	25	17	10 (9 - 11)
3	25	5	0

[a] The no-ozone test began with eight days run time with ozone. These eight days were subtracted from the run times of each trial shown in this table.

The effect on transmembrane pressure (TMP) increase of preozonation versus non-ozonation is shown in Figure 3.2. Preozonation seems to oxidize organic material that is not easily removed during daily CEBs. During the tests without ozone, the pressure required to maintain the flux setpoint was not significantly reduced with the CEB (*i.e.,* the TMP recovery due to the CEB was minimal).

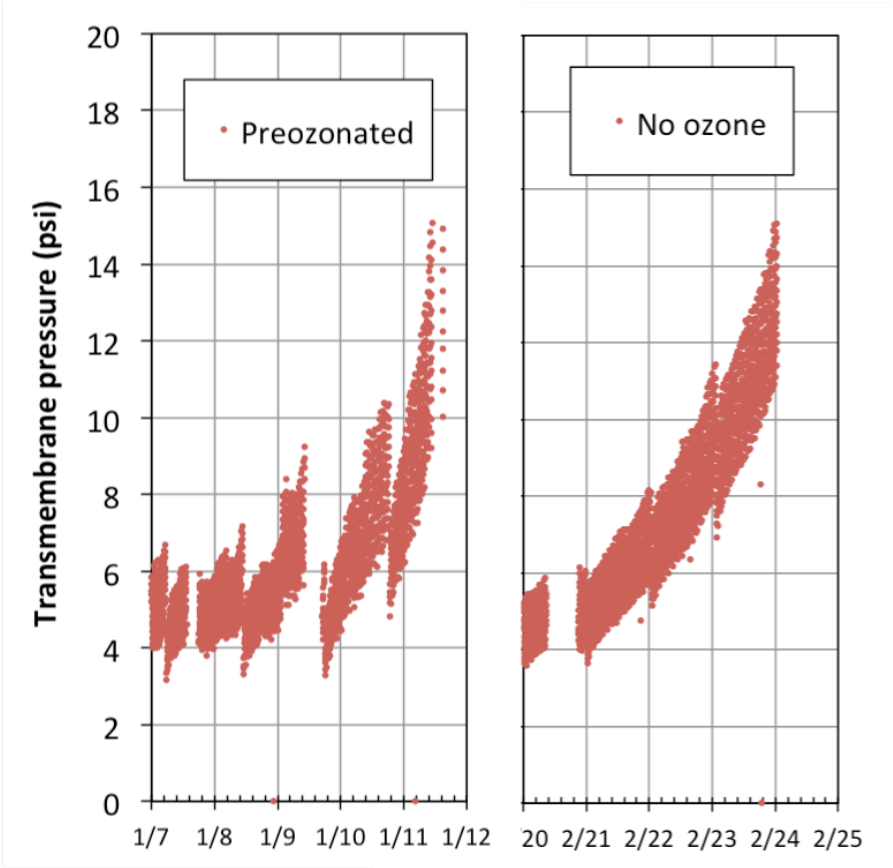


Figure 3.2 – Effect of ozonation on CEB TMP recovery (psi is pounds per square inch)

Moderate and high ozone testing was conducted to determine a recommended design ozone dose. Various combinations of ozone dose and MF flux were tested, with the goal of achieving the highest flux with a run time of approximately thirty days (summary of runs shown in Table 3.4). This goal was achieved with a moderate ozone dose (10 mg/L) and an MF flux of 30 GFD (run time 32 days at 30 GFD, with 3.5 days at a combination of 25 and 28 GFD). Subsequent testing explored higher MF fluxes, combined with higher ozone doses. This testing included a run at an MF flux of 35 GFD and a high ozone dose (20 mg/L average, 17 to 23 mg/L range) that achieved a run time of only 15 days (with an additional six days proceeding at 30 GFD) and a run at 32 GFD at high ozone doses (20 mg/L average, 17 to 22 mg/L range[11]) that lasted 22 days. During these experiments, run times greater than thirty days could not be achieved with fluxes of 32 GFD or greater. Given that the high ozone doses did not substantially increase the MF run time, designing for the high ozone dose to minimize MF fouling is not recommended.

[11] Including about four hours of no ozone, to conduct a brief experiment

Table 3.4 – Summary of MF run conditions and results

MF Run Number	Date	MF flux (GFD)	Applied ozone dose (mg/L; range)	Run time (days)
1	11/15/13 – 01/12/14	25	14 (12 - 17)	44
2[b]	01/14 – 02/10	25	10 (9 - 11)	25
3[c]	02/10 – 02/25	25	10 (9 – 10), 0[a]	8, 5
4[d]	02/25 – 03/13	25	10 (10 - 11)	15
5	03/17 – 03/28	40	18 (17 - 18)	7
6	03/28 – 04/01	40	16 (15 - 17)	2
7	04/01 – 04/02	40	13 (13 – 13)	1
8	04/07 – 05/20	25, 28, 30[a]	10 (10 – 10)	1, 2, 32
9	05/20 – 06/12	30, 35	21 (17 - 23)	6, 15
10	06/12/14 – 07/07/14	32	19 (17 - 22)	22

[a] Run time corresponds to each condition shown, *e.g.,* during run 3, the system was run 8 days with a dose of 10 mg/L, and 5 days for a dose of 0 mg/L.
[b] No chlorine in CEB half way through the run
[c] No chlorine in CEB while ozone was applied
[d] Run terminated before terminal TMP reached

Water quality

Water quality greatly impacts the required ozone dose for membrane fouling minimization (transfer efficiency, mixing, and contact time also impact the required applied ozone dose). Specifically, higher ozone doses are needed for waters that contain higher concentrations of membrane fouling organics (*e.g.,* non-nitrified secondary effluents like MRWPCA), and for effluents with higher ozone demands. Ozone demand is a measurement of the reduction in dissolved ozone after time, after its application (analogous to chlorine demand and BOD), and represents concentrations of constituents that react with ozone. Some of these constituents are membrane-fouling organics, while others are not foulants. An example of a constituent that reacts rapidly with ozone, but that is not a membrane foulant is nitrite. Nitrite will react with ozone, making less ozone available for membrane-fouling organic oxidation. Another parameter that relates to ozone demand is TOC. TOC is a bulk measurement of all of the organic carbon in the water, including membrane-fouling organics, as well as non-fouling organics that react with ozone. The MRWPCA secondary effluent has high concentrations of both nitrite and TOC, which contribute to the high ozone dose required for membrane pretreatment.

Nitrite in the secondary effluent (pilot influent) was measured at the pilot through four different sampling campaigns, which are described below (see Figure 3.3 for data):

1. Grab samples collected and measured on site during piloting ("field grab")[12]
2. Grab samples collected during the pilot water quality sampling campaign ("pilot grab")[13]
3. 24-hour composite samples collected during source water quality sampling campaign ("source water 24-hr composite")[14]
4. 24-hour composite samples regularly collected by the RTP[15]. These data are displayed in the plot in two sets: (a) data collected while the pilot was in operation ("pilot"), and (b) all composites from 2008 to 2014 ("historical").

These data show unusually high concentrations of nitrite in the secondary effluent, which are indicative of partial nitrification in the secondary process. Ammonia measurements throughout the RTP treatment train indicate that this partial nitrification is typically occurring in the trickling filters (Trussell Technologies, 2014a). When ozone is applied to this water, the nitrite will consume 3.4 mg/L of ozone per mg/L of nitrite as N. For example, the average, weekly RTP effluent 24-hour composite nitrite concentration measured during piloting was about 0.73 mg/L as N, which would consume about 2.5 mg/L of ozone, while the largest weekly RTP effluent 24-hour composite nitrite concentration of 2.9 mg/L as N would consume 9.9 mg/L of ozone. The ozone that is consumed by nitrite is then unavailable for membrane-fouling organic oxidization. Therefore, the ozone dose needs to account for the nitrite concentration, ideally by maintaining a UVT setpoint or an ozone residual.

The design and operating ozone dose for the AWTF ozone system could be reduced if less nitrite was produced in the RTP. Nitrite production can occur in biological systems that partially nitrify. As mentioned previously, partial nitrification presently occurs in the RTP trickling filters. It may be possible to change the operation of the trickling filters to avoid this partial nitrification (*e.g.,* adjusting the recycle rate), and the production of nitrite. The average, weekly RTP effluent 24-hour composite nitrite concentration observed during piloting was 0.73 mg/L as N. If this concentration were 0.1 mg/L as N, instead of 0.73 mg/L as N, then the associated decrease in ozone demand would be 2.2 mg/L. This might allow for a decrease in the average transferred ozone dose from 9.5 mg/L to 7.3 mg/L, assuming that the nitrite would have reacted with ozone prior to the ozone reacting with the membrane fouling organics. Similarly, reducing the maximum expected nitrite concentration may be able to reduce the ozone design dose, and thus the size of the ozone system, by up to 30% (the cost of the ozone system does not scale linearly). The cost savings is potentially significant (*e.g.,* up to 1 million dollars of total project costs), and thus reducing nitrite formation in the secondary system is recommended.

[12] Hach DR 890, NitriVer® 3 powder pillows, diluted 10:1 using Class A glassware with lab DI water, 11/7/13 to 7/2/14; 33 samples.
[13] Analyzed by Monterey Bay Analytical Services, SM 4500-NH_3 B&C or F/G, 12/10/13 to 6/24/14; 26 samples.
[14] Analyzed by Monterey Bay Analytical Services, SM 4500-NH_3 B&C or F/G, 9/9/13 to 6/10/14; 11 samples.
[15] 11/7/08 to 7/7/14, weekly, at a minimum, from May 2010 onward, as needed before; 245 samples.

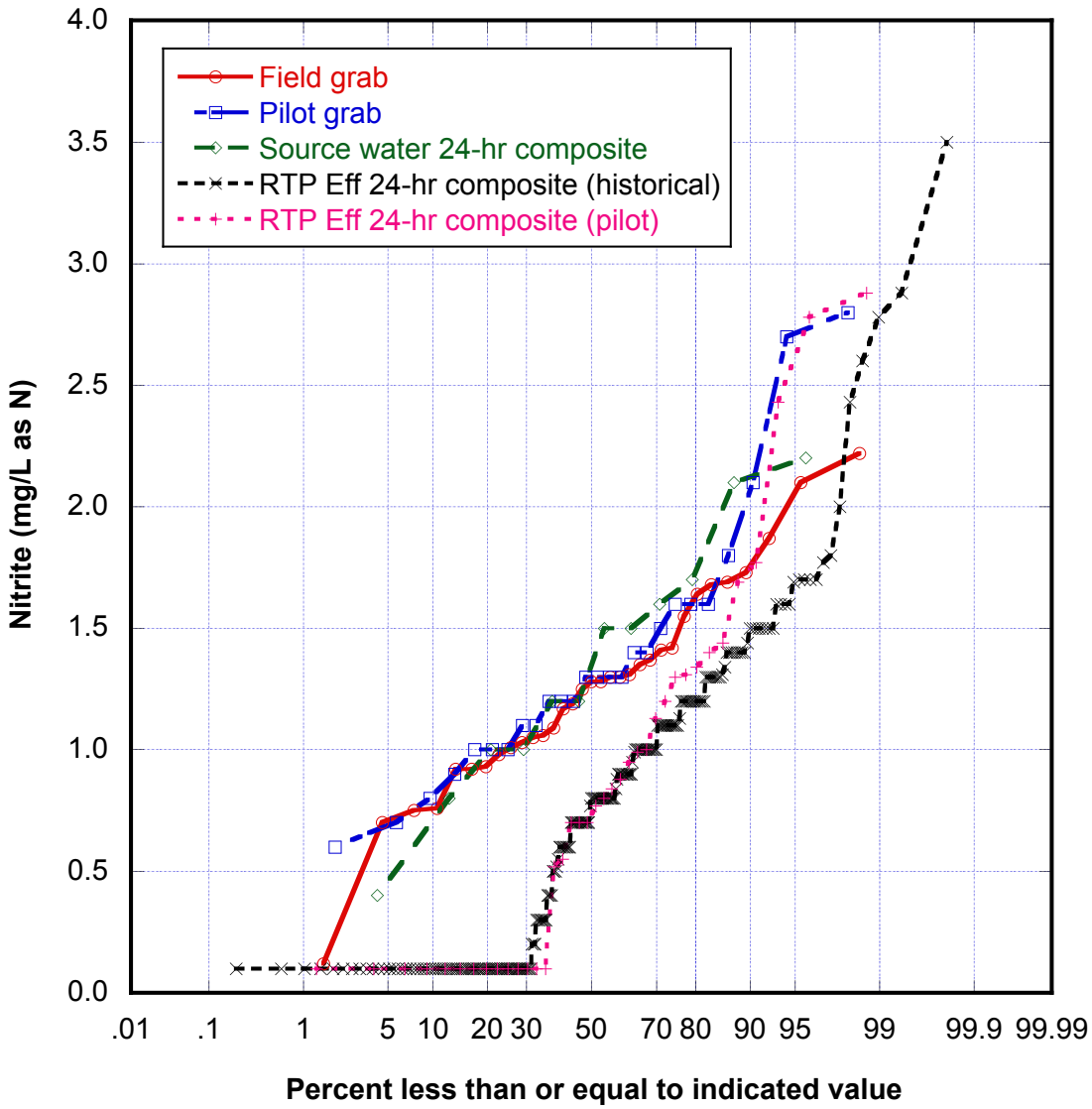


Figure 3.3 – Probability plot of nitrite measured during piloting and earlier

TOC was also measured through pilot and source water sampling campaigns, and estimated from RTP dissolved organic carbon (DOC) and total suspended solids (TSS) data (see Figure 3.4)[16]. Particulate organic carbon (POC) in the RTP samples was estimated from DOC and TSS data by assuming that 75% of the TSS were volatile suspended solids (VSS) and that 53% of the VSS were carbon[17]. The difference in TOC values between the RTP samples and pilot and source water samples is partially due to the method of estimation (16 to 32%, based on validating the method with pilot and source water data, respectively).

[16] 23 pilot grab samples, 12 source water composite samples, 828 RTP samples from January 2, 2011 to May 15, 2014

[17] Assuming a generic cell chemical formula of $C_5H_7O_2N$

The rest of the difference is possibly due to differences in the TOC measurement method (Standard Method [SM] 5310B and SM5310C for the RTP and the source water composite samples, respectively), where SM5310B generally includes compounds that are chemically refractory and not measured by SM5310C and more efficiently oxidizes high concentrations of suspended organic carbon. Error may have also been introduced in the dilution step required for the SM5310C sample. Differences in TSS measurements may have been due to sedimentation in the sample carboys prior to pouring samples for TSS analysis. The difference between pilot grab samples and RTP composite samples may be due to diurnal variations in water quality. Given the difference between the two datasets, the higher, more conservative, TOC values are recommended for design purposes. Regardless of dataset, these TOC values are fairly typical for a non-nitrified trickling filter secondary effluent, and are high compared to nitrified secondary effluents. The high TOC concentrations increase the ozone demand of the water, and thus the doses necessary for membrane pretreatment.

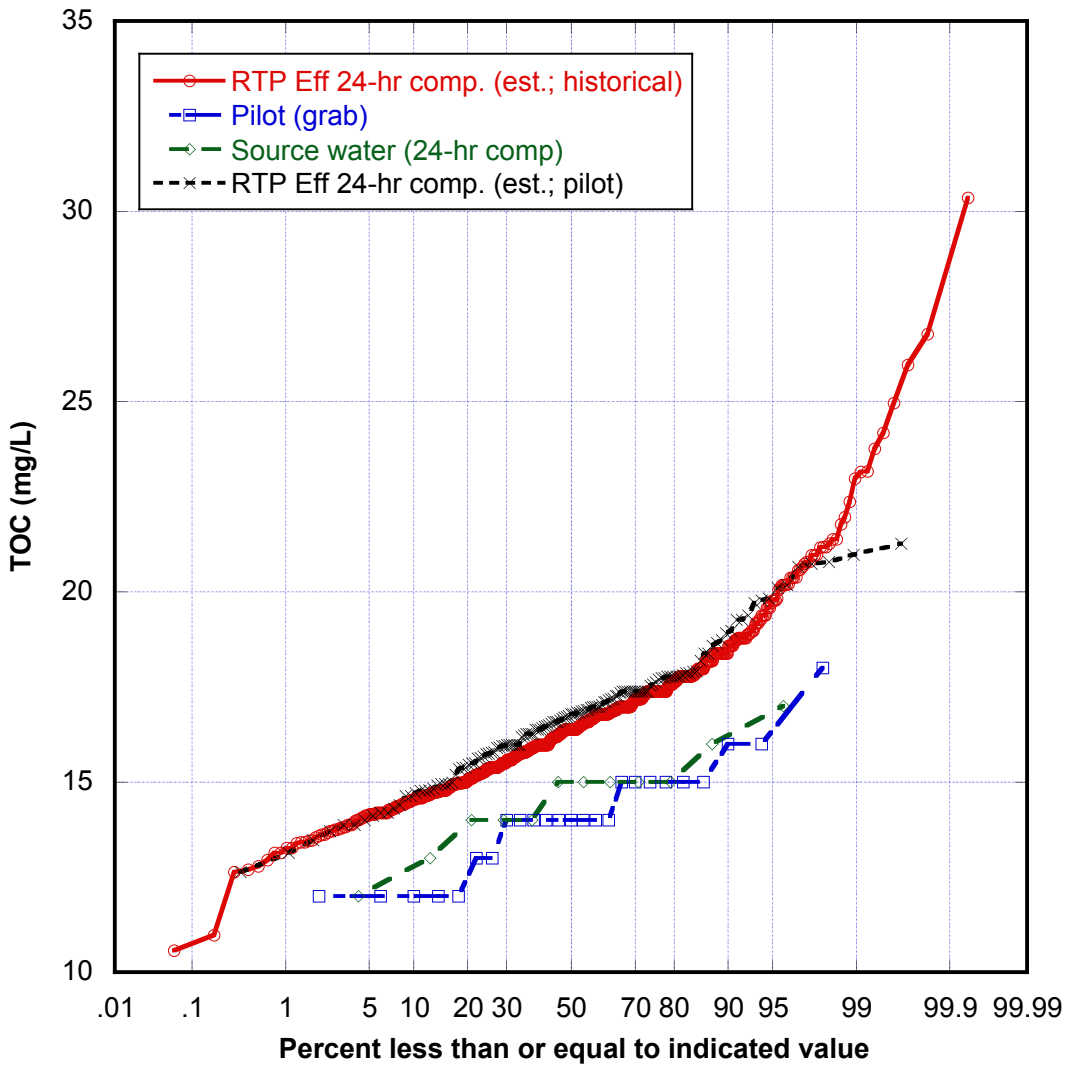


Figure 3.4 – Probability plot of TOC measured during piloting, and estimated TOC from RTP effluent sampling

Instantaneous ozone demand was measured during brief experiments with grab samples and continuously with online instrumentation (see Table 3.5). An ORP and dissolved ozone residual sensor were used to measure the ozone residual at the end of the ozone contactor (contact time of 3 minutes at a flow of 28 gpm). ORP readings were used to detect the presence or absence of ozone (indicating a concentration of zero, in the absence of ozone). Thirty-second ozone demand was calculated from 30-second ozone residual grab samples[18]. When a residual was detected, these 30-second residual concentrations were used to estimate the instantaneous ozone demand. These ozone demand values are typical for non-nitrified secondary effluents, high compared to typical ozone applications, and result in the preozonation doses that are higher than typical ozone applications.

Table 3.5 – Estimated and measured ozone demand

Transferred ozone dose (mg/L)	Number of measurements	Estimated instantaneous ozone demand (mg/L)[a]	30-second ozone demand (mg/L)[b]	~3-minute ozone demand (mg/L)
9	1	--	10	10
15 - 19	5	12 - 16	13 - 17	15 - 19
12 – 22	20,437	--	--	12 - 22
8 – 14	ca. 70,000	--	--	8 – 14

[a] Assuming first-order decay following instantaneous reactions (Rakness, 2008), which requires measurement of an ozone residual downstream of instantaneous reactions (*e.g.,* 30 seconds).
[b] Based on ozone residual measurements at 30 seconds

As mentioned previously, the applied ozone dose was varied to meet an ozone setpoint during the high ozone dose testing. A week of data from this phase of testing is shown again in Figure 3.5 with the addition of ozone influent online turbidity. The applied ozone dose correlates to the 3-minute ozone demand, when multiplied by transfer efficiency (88% during this period of testing). Within a week, the ozone demand varies by about 4 mg/L at these doses, with diurnal variations between 2 and 3 mg/L. These data also show that turbidity correlates somewhat with ozone demand, with turbidity spikes observed during most ozone demand spikes (although of differing magnitudes).

[18] Hach AccuVac Ampules, low (0 to 0.25 mg/L) or high (0 to 1.50 mg/L), as needed; indigo method with DR 890.

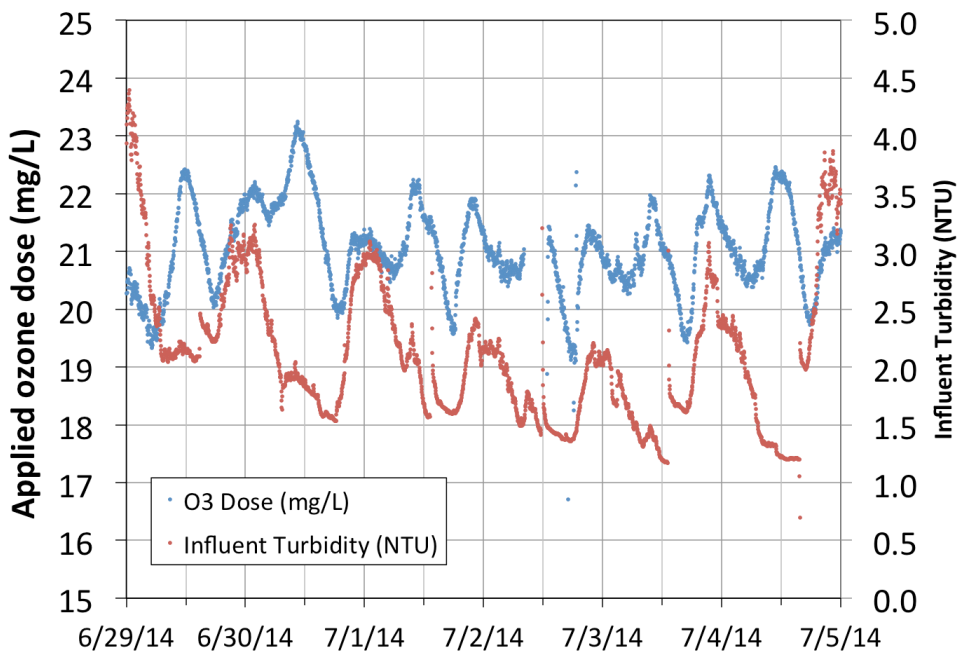


Figure 3.5 – Applied ozone dose to meet effluent setpoint of 0.1 mg/L and ozone influent turbidity

Turbidity was measured upstream of the ozone system with an online analyzer[19]. The average turbidity observed during piloting was 2.4 NTU (range of 0.9 to 6.2 NTU, at the 1st and 99th percentile, respectively). A probability plot of this data is shown in Figure 3.6, and a trend is shown in Figure 3.7. The high turbidity values observed in the probability plot may be due to slugs of high turbidity water that sheared from the sample tubing walls and passed through the analyzer, or from periodic cleanings. The overwhelming majority of the readings are between 0.9 and 6.2 NTU. The trend shows seasonal variation in the mean turbidity, and seasonal variation in the diurnal variation (*i.e.,* changes in the thickness of the band).

[19] Hach 1720E Low Range Turbidimeter

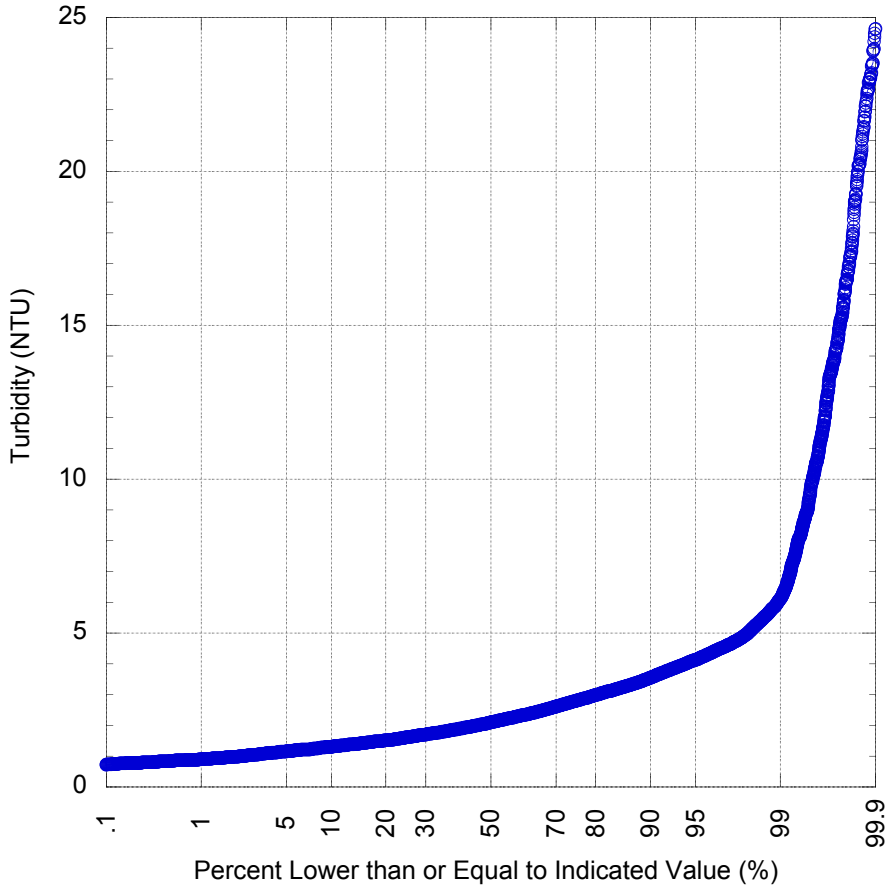


Figure 3.6 – Pilot influent (secondary effluent) turbidity probability plot

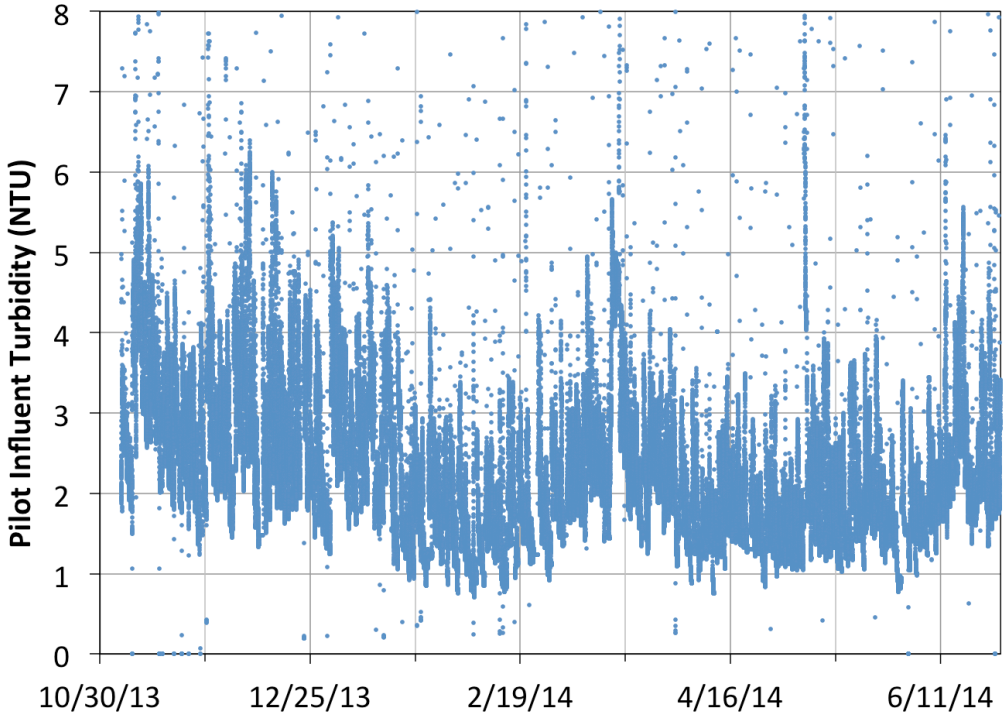


Figure 3.7 - Pilot influent (secondary effluent) turbidity trend plot

Foam

Foam creation was minimal through the ozone process during piloting. Qualitative observations could not distinguish between the volume of foam created with the application of ozone and the volume created without the application of ozone or high-purity oxygen. Thus, it appeared that foam was created from constituents in the secondary effluent, perhaps as the flow may have been aerated during the 5-foot drop, which was exposed to the atmosphere. Throughout the majority of pilot testing, the ozonated effluent flowed to MF feed tanks, which contained overflow pipes (2 to 3 inches) at different elevations. The lower elevation overflow pipe continuously drained ozonated effluent, and thus minimal foam accumulated in the MF feed tank with the lower elevation overflow pipe. The MF feed tank with the higher elevation overflow pipe accumulated 2 to 6 inches of foam. When this latter feed tank was modified to ensure that foam wasting did not even occur on an infrequent basis (*e.g.,* during daily CEBs), the foam depth did not change. Presumably, the foam breakdown rate limited the foam depth.

3.1.3 Transfer efficiency

Ozone transfer efficiency is the fraction of applied gaseous ozone that dissolves into the liquid phase (*e.g.,* 100% transfer efficiency equates to all of the applied ozone dissolving into the liquid). In practice, this is estimated with measurement of the ozone concentration in the off-gas and the applied gas, assuming no gas-phase ozone decay. Increasing ozone transfer efficiency decreases the ozone that is wasted (*i.e.,* sent to the ozone destruct). Transfer efficiency is used to calculate the transferred ozone dose from the applied ozone dose (the transferred ozone dose is the product of the applied ozone dose and the transfer efficiency). Given that transfer efficiencies will vary between ozone installations, or between pilot-scale and full-scale, the transferred ozone dose is useful for comparing systems, or translating pilot results to full-scale design. Transfer efficiency was measured at the pilot on a weekly basis. The results from these measurements are shown in Table 3.6 for both the moderate ozone dose testing, and the high ozone dose testing.

During piloting, transfer efficiency primarily correlated with ozone system flow. Mixing at the pilot was achieved through static mixers, which are a function of flow, and transfer efficiency is dependent on mixing. Thus low system flows resulted in lower transfer efficiencies. Due to pump capacity limitations, the ozone flow was increased or decreased at the pilot to achieve moderate and high doses, respectively. Thus, the transfer efficiency also correlates fairly well to ozone dose. Minor flow or head loss adjustments during the moderate dose testing lead to a wider range in transfer efficiencies (*i.e.,* 92 to 98%, with one measurement at 87% associated with low flow conditions as the GWR supply pump capacity dropped off due to clogging).

Table 3.6 – Pilot ozone transfer efficiency

Ozone test phase (applied dose)	Average transfer efficiency (%, range)
Moderate (10 mg/L)	95 (87 – 98)
High (20 mg/L, average)	88 (86 – 90)
Other (12 – 16 mg/L)	92 (91 – 93)

3.1.4 Disinfection CT preliminary testing

A potential use of preozonation is to achieve disinfection credit. This disinfection credit requires the maintenance of an ozone CT (*e.g.,* 1 mg-min/L) through the measurement of the ozone residual in the ozone contactor. The ozone residual must be measured in at least one location; however, measuring the ozone residual in multiple locations increases the resolution of the ozone decay curve, which may increase the reportable ozone CT. Methods for calculating the ozone CT include the following: (1) assuming that the ozone residual is constant between measurements, or (2) constructing an ozone decay curve, assuming first-order decay kinetics (Rakness, 2008). The latter method more accurately represents ozone decay, and yields higher CT values.

Preliminary measurements of the ozone CT were taken at the pilot for both the moderate ozone dose (10 mg/L, applied) and the high ozone dose (20 mg/L, average applied). At the high dose, CTs of 1 to 2 mg-min/L could be achieved with transferred ozone doses of approximately 15 to 19 mg/L (five sampling events; Table 3.7 for summary)[20]. At the moderate dose, no ozone residual was detected at the first sample point (one sampling event, triplicates). These preliminary data show that the high ozone doses (*e.g.,* transferred ozone dose of 18 mg/L) can achieve disinfection CTs (CT greater or equal to 1 mg-min/L). Further testing would be required to determine the transferred ozone dose necessary to sustain a disinfection CT on a continuous basis. A full-scale ozone disinfection design must be conservative enough to account for a wide range of water qualities that affect ozone demand.

Table 3.7 – Ozone CT measurements for various applied ozone doses

Applied ozone dose(s) (mg/L)[a]	Ozone CT (mg-min/L)[b]
21	1.9
20	1.4
18	0.8
17	1.2
19	1.4

[a] Transfer efficiency approximately 88%
[b] Calculated based on Rakness, 2008

[20] The ozone residual was measured at four locations in the ozone contactor (approximate sample times of 0.5, 1.0, 1.5, and 2.5 minutes, assuming a 80% baffling efficiency).

3.1.5 Sodium Hypochlorite Dose Location experiment

The effect of the sodium hypochlorite dose location on NDMA formation was tested on 6/27/14. NDMA may form from chloramination and/or ozonation of secondary effluent. At the AWTF, both oxidants will be added to the secondary effluent for membrane pretreatment. The order that these oxidants are introduced into the secondary effluent may impact the total NDMA formation across both of these processes. For example, ozone NDMA precursors may not be the same as chloramine precursors, and one oxidant may oxidize the precursors of the other.

Two test conditions were examined (in triplicates) at the pilot to understand the effect of the sodium hypochlorite dose locations on NDMA formation: chlorine upstream of ozone (pre-chloramination) and chlorine downstream of ozone (post-chloramination). Two controls were also tested: only chlorine and only ozone. The results of these tests are shown in Table 3.8. The results show that pre-chloramination and post-chloramination produced essentially the same concentration of NDMA, at concentrations that are in agreement with other measurements of NDMA at the pilot. Both pre- and post-chloramination produced slightly less NDMA than the added effects of NDMA formation from the addition of only one of the oxidants (formation of 41 nanograms per liter [ng/L], range of 37 to 47 ng/L). Based on these results, either pre- or post-chloramination is expected to yield acceptable NDMA formation levels at the AWTF.

Table 3.8 - NDMA pre- and post-chloramination formation

Parameter	Average NDMA (ng/L)[a] (Range)		
Test condition	**Influent**	**Effluent**	**Formation**
Pre-chloramination[c]	11	49 (45 - 52)	38 (34 - 41)
Post-chloramination[c]	7.6	46 (44 - 48)	38 (36 - 40)
Only chloramination	6.7	17 (15 - 22)	11 (8 - 15)
Only ozonation	9.3	40 (36 - 44)	31 (27 - 35)

[a] Two hours contact time
[b] Ozone dose of 10 mg/L applied (approximately 90% transfer efficiency)
[c] Chlorine residual of 6.2 - 6.3 mg/L as Cl_2
[d] Samples collected at about 1 hour intervals between test conditions

3.1.6 TOC transformation experiment

The transformation of TOC through ozonation was measured at the pilot during an experiment conducted on July 2nd, 2014. Ozone typically increases assimilable organic carbon (AOC) in secondary effluents by transforming organic molecules that microorganisms cannot use as energy into smaller organic molecules that are more readily available to microorganisms. AOC is a measurement of the concentration of organic

material in a sample that can be assimilated by microorganisms (AOC is truly only a measurement of the assimilability of the organic carbon to the species of microorganisms used in the AOC test). Ozone cannot increase the TOC of water (*i.e.,* it does not add carbon to the water), and it typically does not lower TOC (*i.e.,* it typically does not mineralize carbon). However, by transforming the chemical properties or size of the organic molecules, ozonation may impact the removal of TOC through downstream processes (*e.g.,* RO).

The pilot TOC transformation experiment was conducted at an applied ozone dose of 21 mg/L (transfer efficiency approximately 88%). Under this condition, TOC, ultraviolet light absorbance (UVA), AOC, and aldehyde samples were collected at the MF effluent and RO permeate. A control condition was also tested, where ozone (and oxygen) were not applied to the chloraminated secondary effluent. The results from the analysis of these samples are summarized in Table 3.9.

Table 3.9 – TOC transformation through the ozonation process

Sample Location[a]	**MF Effluent**		**RO Permeate**		**Unit**
Condition	**No Ozone**	**With Ozone**	**No Ozone**	**With Ozone**	
Bulk parameters:					
Total Organic Carbon[b]	7.5	8.6	ND (< 0.2)[c]	0.39	mg/L
Dissolved UV Abs. at 254 nm	0.189	0.107	ND (< 0.009)	0.011	cm^{-1}
Assimilable Organic Carbon	1400	2900	<10	50	µg/L
Aldehydes:					
Formaldehyde	20	130	9.2	71	µg/L
Acetaldehyde	9.4	55	2.7	17	µg/L
Benzaldehyde	2.6	3.9	1.2	1.3	µg/L
Crotonaldehyde	1.1	ND (< 1)	ND (< 1)	ND (< 1)	µg/L
Glyoxal	12	130	ND (< 10)	ND (< 10)	µg/L
Methyl glyoxal	ND (< 10)	27	ND (< 10)	ND (< 10)	µg/L
Butanal	ND (< 1)	5.7	ND (< 1)	ND (< 1)	µg/L
Decanal	ND (< 1)	ND (< 1)	ND (< 1)	ND (< 1)	µg/L
Heptanal	ND (< 1)	10	ND (< 1)	ND (< 1)	µg/L
Hexanal	ND (< 1)	13	1	1.2	µg/L
Nonanal	2.2	7.6	ND (< 1)	ND (< 1)	µg/L
Octanal	ND (< 1)	ND (< 1)	ND (< 1)	ND (< 1)	µg/L
Pentanal	ND (< 1)	ND (< 1)	ND (< 1)	ND (< 1)	µg/L
Propanal	3.1	15	ND (< 1)	5.1	µg/L

[a] ND (not detected, or below the detection limit; detection limit shown in parenthesis)
[b] Measured in triplicates in the RO permeate; average shown
[c] Measured as 0.21 mg/L by Trussell Technologies lab (0.20 - 0.23), hold time 35 days

The ozone dose tested during this experiment represents a high ozone dose. This high ozone dose was not used as the basis of design for the preliminary AWTF design (rather the 10 mg/L dose was used). Thus, these data should exaggerate what is expected at the AWTF, with the lower ozone doses (lower ozone doses will transform the organics to a lesser degree). With this high ozone dose, the RO permeate TOC concentration approximately doubled compared to without ozone (it increased by 70%, assuming the non-ozone test condition RO permeate TOC was at the detection limit and that RO TOC rejection is independent of influent TOC concentration).

The increase in RO permeate TOC is only partially explained by the increase in RO permeate AOC (21 to 26%, assuming the no-ozone test condition RO permeate TOC was at the detection limit), which means that the rest of the RO permeate TOC increase is due to organic molecules that were transformed such that they can pass through RO (*e.g.,* smaller), but not to the degree that they were assimilated during the AOC test (*i.e.,* 74 to 79% of the increase in TOC is recalcitrant). An increase in RO permeate AOC may foster biological growth in the downstream conveyance system, if sufficient chloramine concentrations are not present for inhibition. Given that the increase in AOC is small, a chloramine residual will be present in the conveyance system, and these data come from an experiment with ozone doses higher than the design AWTF dose, the AWTF is expected to meet all product water quality goals. The effect of the AWTF design ozone dose (*i.e.,* 10 mg/L applied pilot dose) on RO permeate TOC concentrations is further discussed in the product water quality section of this report.

Notable results from the aldehyde analysis are the formation of formaldehyde and acetaldehyde. As is discussed in the Source Water and Product Water Quality Report, the formaldehyde NL is 100 micrograms per liter (µg/L). Acetaldehyde does not have an NL, or any other regulatory level, but a Predicted No-effect Concentration (PNEC) has been developed, which is 23 µg/L (Anderson, 2010). The concentrations measured in the RO permeate during this experiment were somewhat close to these levels, but below them. This experiment was conducted at a high ozone dose (21 mg/L) and at a fairly high O_3:TOC ratio (approximately 1.4 with approximate nitrite effects taken into account). The AWTF will be designed for lower ozone doses (10 mg/L) and lower O_3:TOC ratios (*e.g.,* 0.5), which will result in lower formaldehyde and acetaldehyde production (26 and 5.1 µg/L of formaldehyde and acetaldehyde, respectively, measured during one sample event of the RO permeate with a secondary effluent TOC of 14 mg/L and transferred ozone dose of approximately 9.1 mg/L). Formaldehyde may increase slightly through the UV/AOP process; however, this increase is expected to be minor, such that AWTF product water formaldehyde concentration is not expected to exceed the NL. If further pilot testing is conducted, testing the effect of the UV/AOP process on the concentration of RO permeate organics should be considered to verify that the effect of UV/AOP on organic formation is minor.

3.2 Ultrafiltration

3.2.1 Pentair module testing (inside-out)

Several operational parameters were monitored and used to evaluate the Pentair MF system performance. These include *TMP*, *Flux,* and *Permeability*. *TMP* is the pressure differential between the feed and filtrate side of the membrane and is measured in pounds per square inch (psi). *Flux* is the volumetric flow rate across the membrane measured in gallons per square feet per day, GFD. *Permeability* is the flux divided by the TMP and is a measure of the ability of the membrane barrier to allow passage or diffusion of a substance. Data *Normalization* is a mathematical technique that allows the user to compare operation at a specific set of conditions to a reference set of conditions. This allows the user to determine whether changes in membrane performance are caused by fouling, damage to the membrane, or are just due to different operating conditions such as temperature.

Flux and transmembrane pressure testing

From start-up the Pentair X-Flow module had difficulties in this application. The membrane TMP along with the operating flux are plotted in Figure 3.8. Initially, the flux rate was set to 25 GFD; however, at this flux the membrane would rapidly approach the critical TMP within 2 to 3 days. The reason for the rapid TMP increase was originally thought to be caused by the relatively large 700-micron mesh size of the pre-strainer.

From December 16th, 2013 through January 18th, 2014 the flux rate was dramatically reduced to between 12 and 17 GFD. This was done primarily to keep the unit operational while the pre-strainer could be replaced with one similar to the Toray unit. On January 18th, a 100-micron pre-strainer was installed on the Pentair unit. On January 20th, the flux rate was increased from 17 to 20 GFD. Within a matter of hours, the TMP reached the critical value.

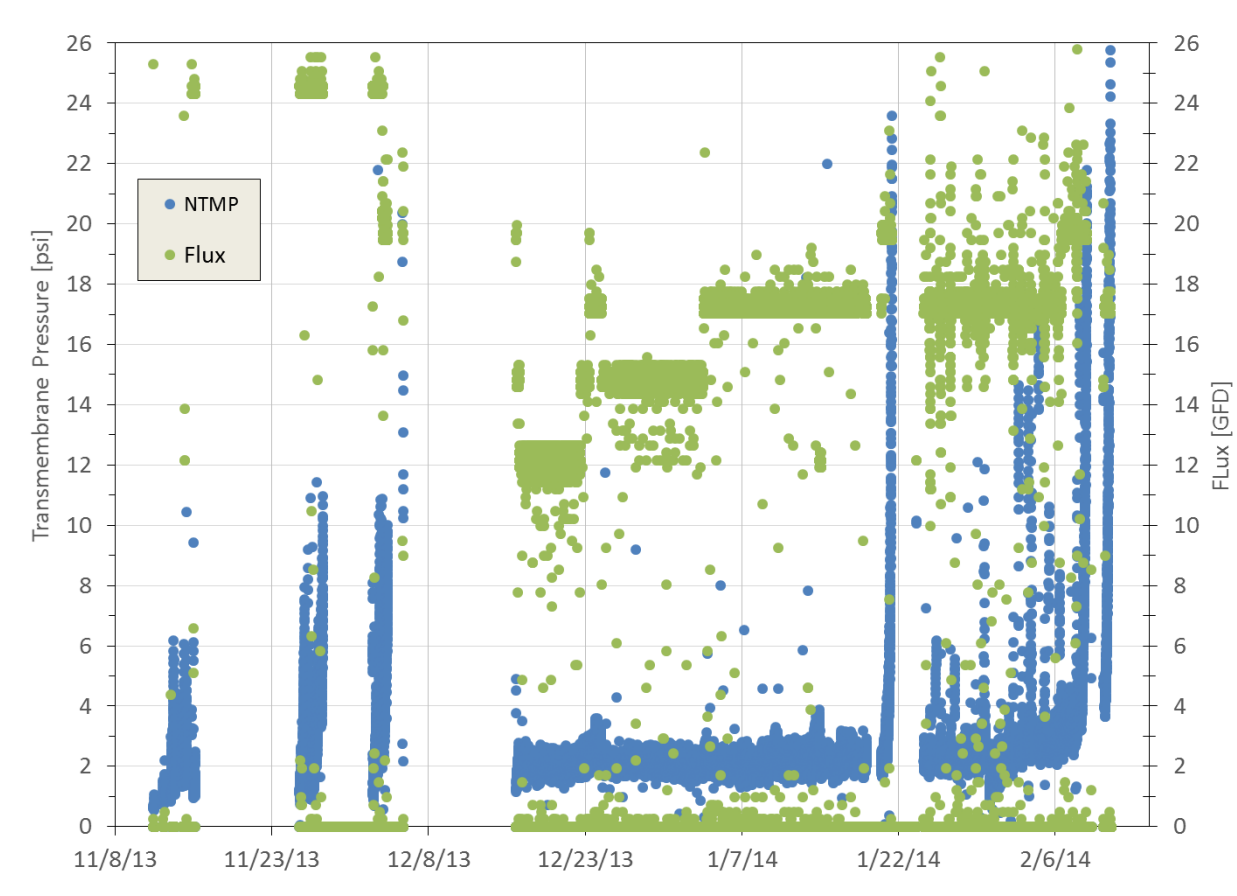


Figure 3.8 - Pentair TMP and Flux

A field technician from Harn RO systems performed a routine clean in place (CIP) on the Pentair unit on Jan 29th. The unit was returned to service at 17 GFD on January 30th, 2014. Following the CIP, the TMP was stable. One week after the CIP on Feb 6th, the flux rate was increased to 20 GFD. The TMP reached the critical value within three days. Because the Pentair unit was unable to maintain flux above 17 GFD, it was decided the inside out configuration was not suitable for this application.

3.2.2 Toray module Testing (outside-in)

Feed Water Quality

During piloting, the feed water quality remained relatively stable. Temperature, turbidity, and pH are plotted in Figure 3.9. The turbidity trend shows spikes in excess of 10 NTU. Fouling of the analyzer cuvette caused these spikes. The actual feed turbidity was never observed to be above 10 NTU.

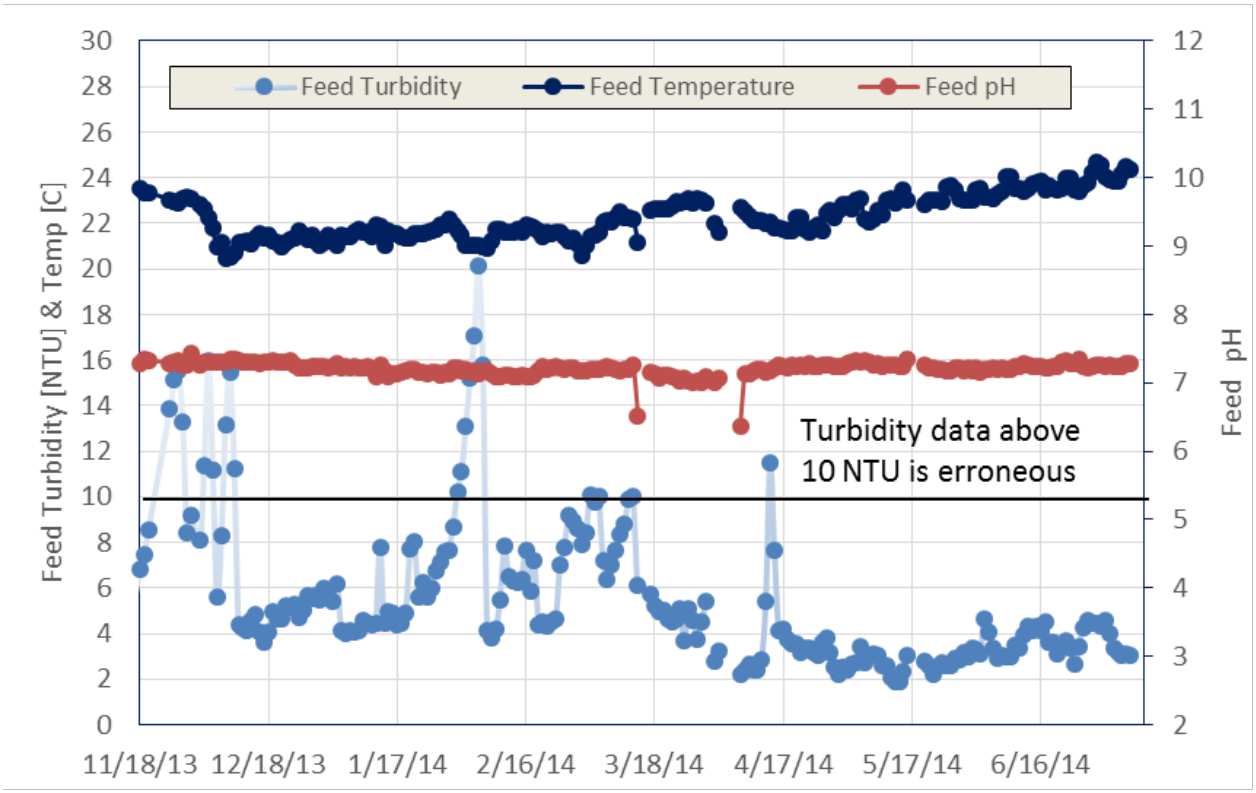


Figure 3.9 - Toray Feed Parameters

Flux and transmembrane pressure testing

Between the initial startup and shutdown, nine CIP cycles were performed on the Toray MF unit. The following section summarizes operating conditions and durations of each trial. For each trial, the total continuous run time is presented. The continuous run time neglected time off line resulting from periodic shutdowns of upstream equipment, such as repairs within the MRWPCA RTP and ozone system repairs.

TMP, flux, and permeability were operational parameters that were monitored and used to evaluate the Toray MF system performance (see Figure 3.10 for TMP and flux data).

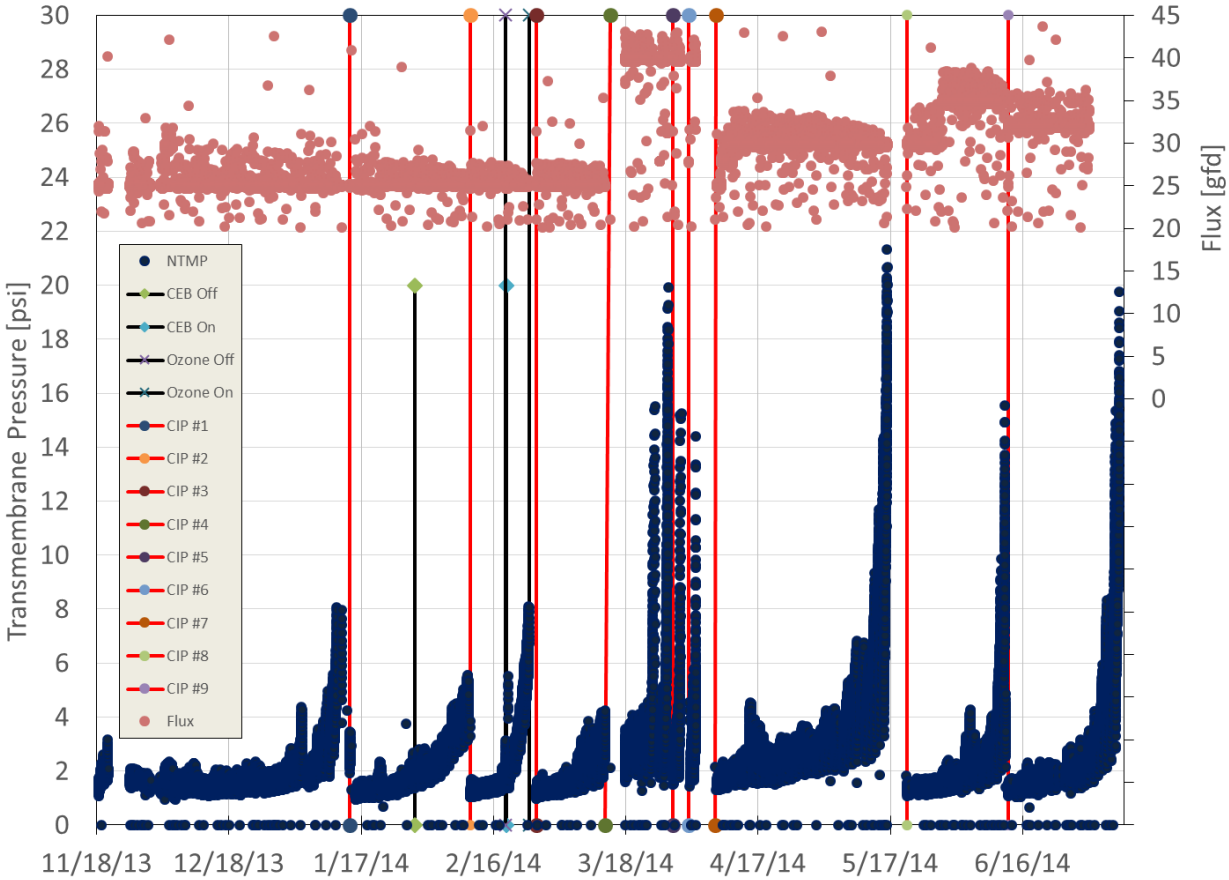


Figure 3.10 - Toray Transmembrane Pressure (Flux axis shown with truncated scale for ease of viewing the data)

Trial 1: 11/15/2013 – 01/12/2014

The first CIP was performed after 44 days (6.3 weeks) of continuous operation at a flux of 25 GFD and was done as a matter of routine maintenance. The TMP data shows a small spike that occurred on January 3rd, 2014. After an investigation of operations, it was determined that the chlorine feed used for chloramination went dry over a long holiday weekend. This is noted to exemplify the importance of controlling organic foulants. Once the chlorine system was returned to service, the MF system self-corrected.

Trial 2: 1/14/2014 – 2/10/2014

The second run yielded a shorter run time: 25 days (3.6 weeks) of continuous operation at 25 GFD. However, this run was likely abbreviated due to an inadvertent chemical feed pump shut down. The chemical pump that supplies NaOCl during the daily CEB was unintentionally disabled on Jan 29th. This was not discovered and corrected until Feb 18th. In addition to the lack of cleaning chemicals, the 2nd CIP was performed a few days early to ensure the system was fully operation for the monthly water quality sample scheduled for the second week of February (*i.e.,* the run could have lasted longer if the unit was allowed to reach the TMP shutdown setpoint of 21 psi).

Trial 3: 2/10/2014 – 2/25/2014
A planned ozone shut down was scheduled during this run. Once stable, MF operation was established at 25 GFD following the 2nd CIP, and the ozone system was taken off line to evaluate the corresponding effect to the membrane systems. Coincidentally, the same day the ozone was turned off, it was discovered that the chlorine pump was off and the regularly scheduled CEBs were resumed with the commencement of the no-ozone test. On February 18th the ozone system was turned off. The resulting TMP increase was very rapid, going from an average of 3 psi to the critical value within seven days. During trial 3, the Toray unit operated continuously for a total of 12.7 days (1.8 weeks) before reaching the critical TMP.

Trial 4: 2/25/2014 – 3/13/2014
Following the ozone shut down trial, the Toray unit was cleaned and returned to service at 25 GFD with the ozone system returned to service. After 15 days (2.1 weeks) of continuous operation, the unit was cleaned to prepare for the next trial, operating at an increased flux rate of 40 GFD. This CIP was performed as matter of preparation for the next phase of testing (*i.e.,* the CIP was not performed due to the module reaching the TMP shutdown setpoint).

Trial 5: 3/17/2014 – 3/28/2014
During the fifth trial, the MF flux rate was increased from 25 GFD to 40 GFD, and the ozone dose was increased from 10 mg/L to 18 mg/L. The TMP increase during the first 6 days was steady and moderate, from an average of 4.5 psi to 5.57. Then on the seventh day operating at 40 GFD, the TMP went from 5.75 to 29 psi in a matter of hours. The unit was returned to service by forcing several back-to-back backwash cycles followed by a CEB. These backwashes were undertaken to determine if the fouling event was due to a one-time surge in poor water quality. The unit was returned to service; however, it shut down on high TMP within two days. This trial yielded a substantial shorter run time of 8.2 days (1.2 weeks) of continuous operation.

Trial 6: 3/28/2014 – 4/1/2014
Initially it was not clear if the rapid fouling of the previous trial had resulted from the increased flux rate, inorganic fouling resulting from the increased Ozone dose, or simply an ineffective clean prior to the trial. The Toray unit was cleaned and returned to service under the same conditions, except that the ozone dose was decreased from 18 to 16 mg/L to reduce the likelihood of inorganic precipitation. This time the unit fouled in two days. The total continuous run time for this trial was 1.6 days.

Trial 7: 4/1/2014 – 4/2/2014
Following the 6th trial, the Toray unit was cleaned once again, and the ozone dose was lowered to 13 mg/L to further reduce the likelihood of inorganic precipitation. However within two days the critical TMP was reached. During Trial 7, the Toray unit operated continuously for 1.2 days at 40 GFD.

Trial 8: 4/7/2014 – 5/20/2014
Once it was established that 40 GFD was too aggressive, the flux rate was reduced. Following the 7th CIP, the unit was operated at 25 GFD for a day to verify the membrane module had not sustained irreversible fouling. The flux rate was then increased to 28 GFD for two more days. On the third day, April 11, the flux rate was increased to 30 GFD. The Ozone dose was 10 mg/L. During this trial, the Toray unit operated continuously for an additional 31.9 days (4.6 weeks) at 30 GFD. The total continuous run time for this trial was 35.4 days (5.1 weeks). On April 15th, the TMP rapidly jumped from 3 to 6 psi. Based on previous trials, it appeared the TMP was about to run away to the critical value. However, by the next day the TMP began to drop. Each consecutive day the TMP continued to drop until April 19th, when the TMP fell in line with a normal rate of increase. For the remainder of the trial, the rate of TMP increase was normal. This spike is explained in the following section.

Trial 9: 5/20/2014 - 6/12/2014
The 9th trial began by continuing to operate the Toray unit at 30 GFD for a week and changing the ozone dose to an average of 20 mg/L. During this time, the TMP showed no appreciable increase, less than 1 psi. In an effort to identify the upper limit to the sustainable operating flux, on May 28th the flux rate was increased to 35 GFD. On June 3rd, the TMP again took another unexpected jump. Once again, on the 4th the TMP dropped back in line with the normal rate of increase. The Toray unit operated continuously for 20.9 days (2.9 weeks), 15 days at 35 GFD.

Trial 10: 6/12/2014 - 7/7/2014
During the entire 10th trial, the Toray unit was operated at 32 GFD, while the ozone dose was maintained at an average of 20 mg/L. The Toray unit operated continuously for 22.2 days (3.2 weeks).

In addition to the TMP and Flux data, Figure 3.10 (introduced above) also shows Toray membrane testing milestones such as the CIPs, the chemical pump inactivation, and the ozone deactivation trial (indicated by vertical lines on the plot). An evaluation of the operating data over the course of the pilot operation period indicates the optimum operating flux rate is 30 GFD.

All the CIPs, except CIP number five, were performed in two steps, first with a 3,000 parts per million (ppm) NaOCl solution followed by a 3% Citric Acid solution. Each solution was recirculated for one hour, and then left to soak for three more hours. During the soak, the module was aerated for 30 seconds every 30 minutes. CIP number five had the acid portion performed first, followed by the NaOCl portion. With the exception of the chemical order, the chemical concentrations and sequences were identical to the other CIPs.

Over the course of the pilot, two unexpected TMP spikes were observed: one on April 15th 2014 and the other on June 4th 2014. Further investigation of the RTP revealed a decline in secondary effluent quality, which led to filtration difficulties at the Salinas Valley Reclamation Plant (SVRP; *i.e.,* SVRP required a significant increase in the coagulant dose to

meet their effluent turbidity requirements)[21]. A plot of the TMP, along with the coagulant dose, is shown in Figure 3.11. The two TMP spikes are highlighted in red. A decline in MF performance is likely during times when the RTP secondary effluent water quality is low. However, the pilot unit recovered from these events without additional cleanings or operational effort.

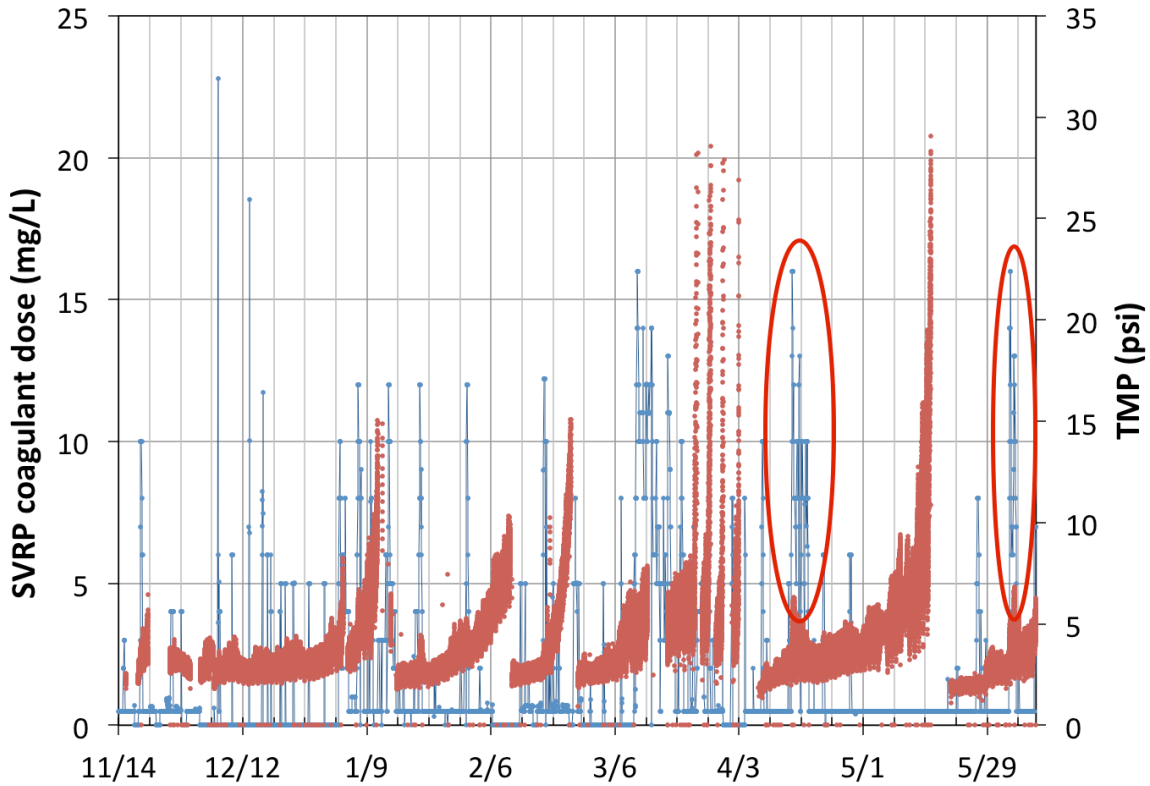


Figure 3.11 - Toray TMP and SVRP Coagulant Dose

Figure 3.12 below contains the plot of the normalized membrane permeability.

[21] Coagulant is a polymer blend (JC-1676), and is added to the secondary effluent whenever the SVRP coagulant addition (also JC-1676) exceeds 10 mg/L (operator initiated). This coagulant may have also impacted filterability at the pilot (by increasing or decreasing the MF TMP).

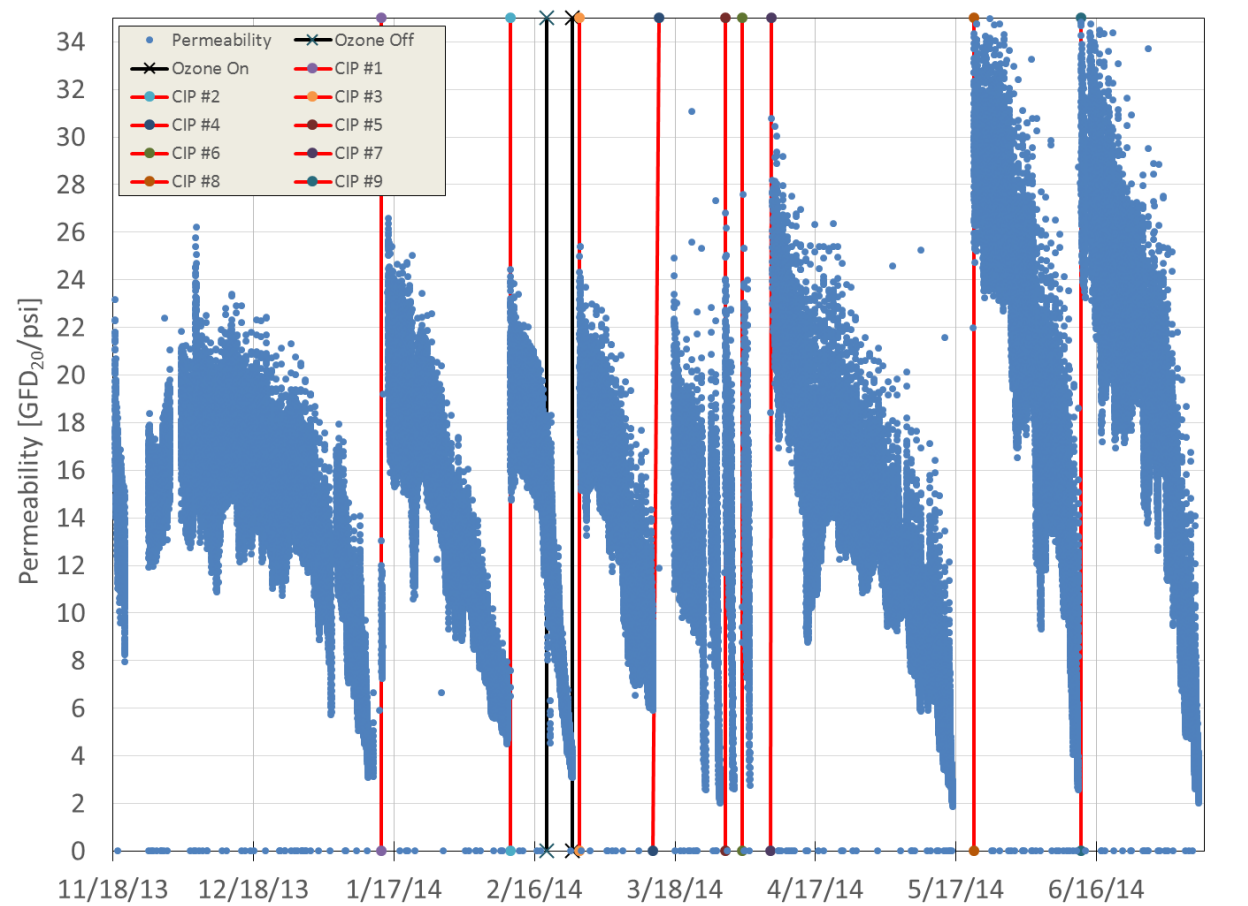


Figure 3.12 - Toray Normalized Permeability

A plot of the filtrate turbidity data is shown in Figure 3.13. 99.8% of the 134,600 data points collected were less than 0.05 NTU. Furthermore, all of the silt density index (SDI) results were less than 3.0. The PLC could not record daily membrane integrity test results; however, they never exceeded 0.1 pounds per square inch per minute (psi/min; *i.e.,* the alarm set point). In general, values below 0.5 psi/min indicate an integral membrane. Above 0.5 psi/min, membrane pinning may be required.

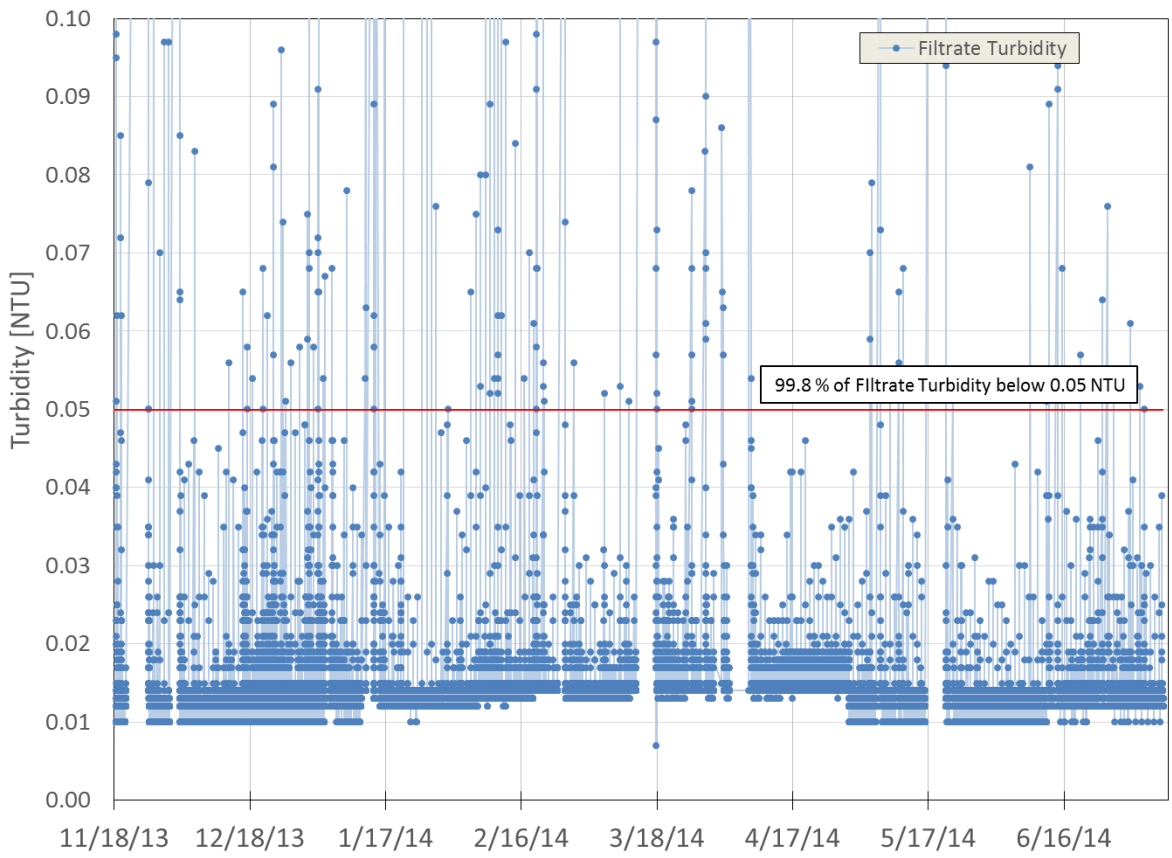


Figure 3.13 - Toray Filtrate Turbidity (the red line indicates the 99.8 percentile value)

3.3 Reverse osmosis

3.3.1 Performance testing

The feed parameters are plotted in Figure 3.14. The feed conductivity experienced two significant spikes, one in December of 2013 and the second in late February 2014. The cause of the first spike is unknown; however, the second spike resulted from the temporary introduction of Lake El Estero water between February 20th and March 1st for testing purposes. During the period of time between May 12 and June 3, 2014, the conductivity analyzer probe had malfunctioned; hence, there were no data collected through the PLC. During this time, the feed conductivity was measured manually and an average value of 1690 microsiemens per centimeter (µS/cm) was used for data normalization.

The feed temperature dropped suddenly from 22 °C to 20 °C in December 2013, then began to climb steadily to 24 °C by the conclusion of the pilot in June 2014. Overall, the water temperature was stable and did not cause any operational challenges.
At the onset of the pilot, the target pH was 6.8 with calcium phosphate being the primary constituent of concern. In late February, the feed pH began to increase unexpectedly.

Originally, the cause of the pH rise was unknown. In an effort to maintain the target 6.8 value, the acid dose was slowly increased. On April 21, 2014, it was discovered that the pH probe had been drifting high. The acid dose was adjusted and the actual pH was monitored manually with field measurements. The online data showed the pH between April 21 and June 13, 2014 to be around 8.0. The actual value was 6.8 through May 21, at which time the target pH was lowered to 6.0, shown with the red dashed line. The pH target was lowered on May 21st to target calcium phosphate because the RTP began receiving agricultural wash water, which contains elevated phosphorus levels.

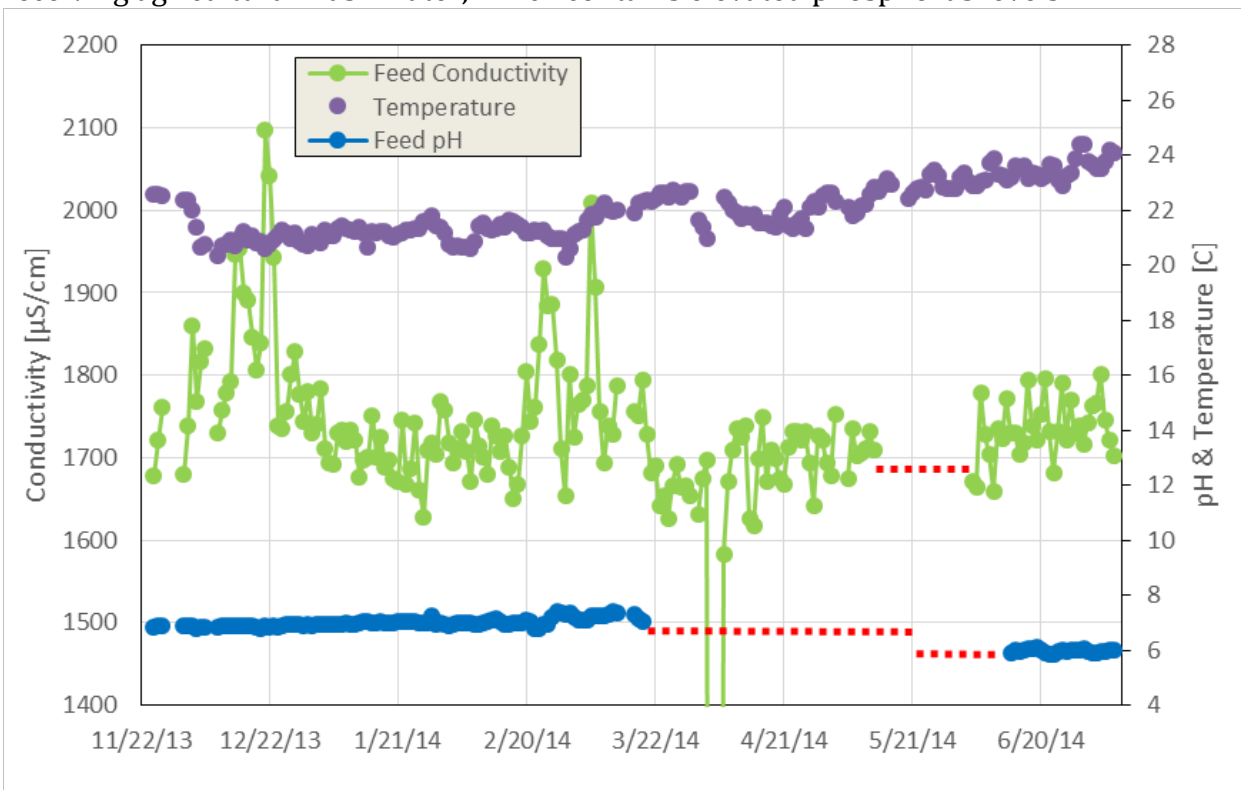


Figure 3.14 - RO Feed Parameters

The RO system performance was very stable from startup on November 25th, 2014, though shut down on July 7, 2014, after just over 7 months of operation. During the course of the pilot, the RO unit required only one CIP, which occurred on April 28th, 2014. Throughout the pilot testing, a chloramine residual was maintained through the pilot system with the target of 2 to 5 mg/L at the RO feed.

Several operational parameters were monitored and used to evaluate the RO system performance. These include: *Specific Flux, Normalized Differential Pressure, Feed Pressure, Normalized Rejection,* and *Normalized Permeate Conductivity.* The Specific Flux is the ratio of the Flux to the Net Driving Pressure, where the net driving pressure is the available feed pressure less the sum of the osmotic, train differential, and permeate back pressures. The differential pressure is a measure of the pressure drop from the feed to the concentrate and can be measured either across the entire train or across the individual train stages. Rejection is a measure of the total dissolved ions removed from the feed water.

The overall train normalized specific flux along with the ratio of individual specific flux for both stages are shown in Figure 3.15. The normalized specific flux is the specific flux normalized for temperature. The specific flux ratio is an indicator of any differential fouling or scaling between the two stages.

In mid-January, the specific flux began to decrease slightly, and continued to decrease while the ozone system was off line. However, immediately following the restart of the ozone, the RO specific flux began to recover slightly. While the lack of ozone likely played a role in the specific flux decrease, the exact cause is unknown. The specific flux decrease also coincides with the feed conductivity increase that occurred when the pilot received Lake El Estero water, which also likely had an effect on the RO performance.

On March 14, 2014, the overall specific flux dropped sharply. An evaluation of the second stage differential pressure (*i.e.,* the pressure drop between the feed and concentrate) also shows a sharp decrease during this time. Additionally, the permeate flow from the tail vessel also began to drop off during this time. All of these operational factors indicate scale formation in the tail end of the RO unit. The RO unit was taken off line on April 28 for the only CIP. The unit was cleaned with a 3.0% Citric Acid solution. The solution was heated to 100 °F. The solution was recirculated through the second stage for 30 minutes, and allowed to soak for 60 minutes. While the second stage was soaking, the CIP solution was recirculated through the first stage and allowed to soak for 60 minutes. The entire procedure was performed twice for a total of three hours of acid contact time per stage.

Following the clean, the specific flux data appeared to recover beyond that of the startup value. The days following the CIP continued to show increasing specific flux. An evaluation of the on-board instruments revealed the flow rates being recorded by the PLC were different than those reported on the respective flow meter displays. After trouble shooting the symptoms, it was determined that an analog input card in the PCL had failed. This card was replaced on May 15, 2014. Following the analog card replacement, the specific flux trend returned to the expected post-CIP value.

On May 28th, the sulfuric acid supply ran dry for approximately 20 hours (this is evident by the sudden drop in specific flux and the spike in the specific flux ratio). Immediately after it was discovered, the supply was refilled and the feed pH was dropped to 5.0 for approximately one hour. During this hour, the flow from the tail vessel was monitored and it slowly showed signs of recovery. It was decided to return the RO unit to service, monitor performance, and clean if necessary. Following this incident, the RO unit performance returned and maintained stable operation for the duration of the pilot.

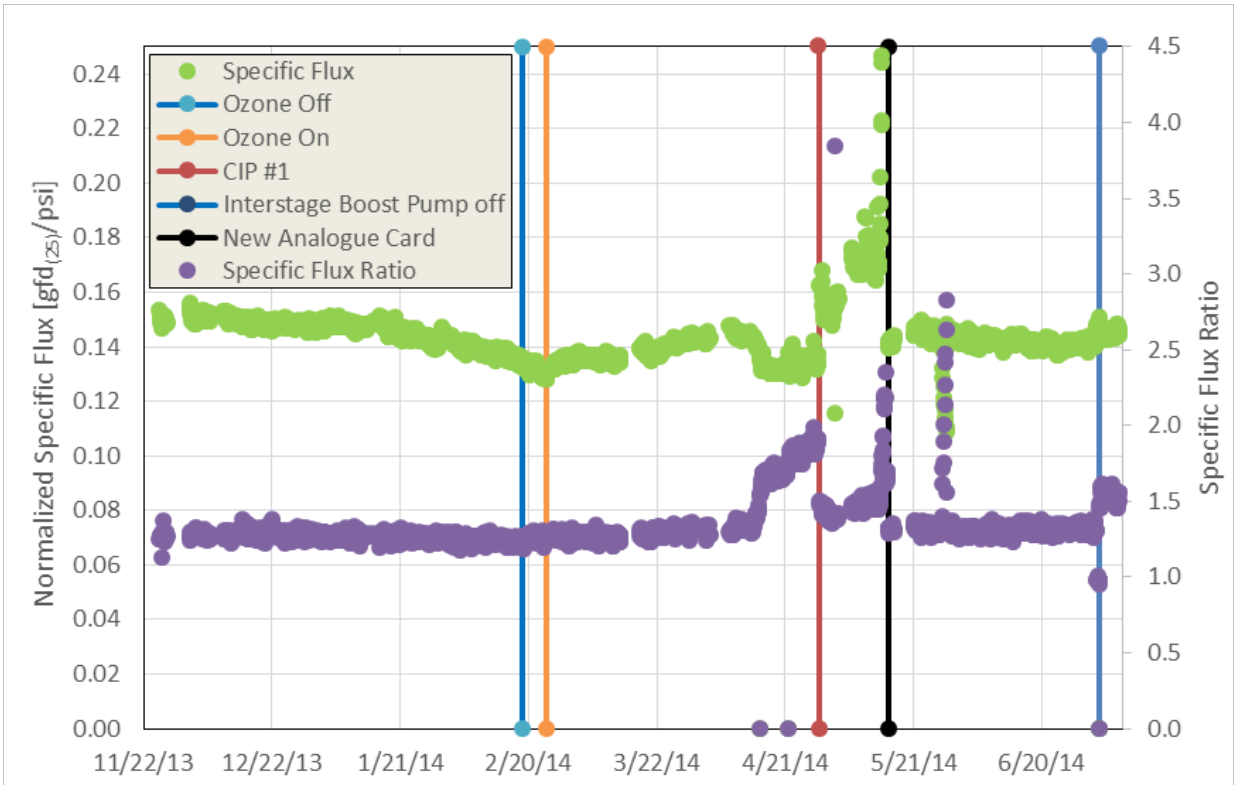


Figure 3.15 - RO Specific Flux and Specific Flux Ratio

The overall train normalized differential pressure plot is shown in Figure 3.16. The differential pressure remained very stable over the duration of the pilot. There was a slight decrease prior to the CIP, caused by a drop in the second stage differential pressure. In mid-June, 2014, there was a slight jump from about 27 to 29 psi.

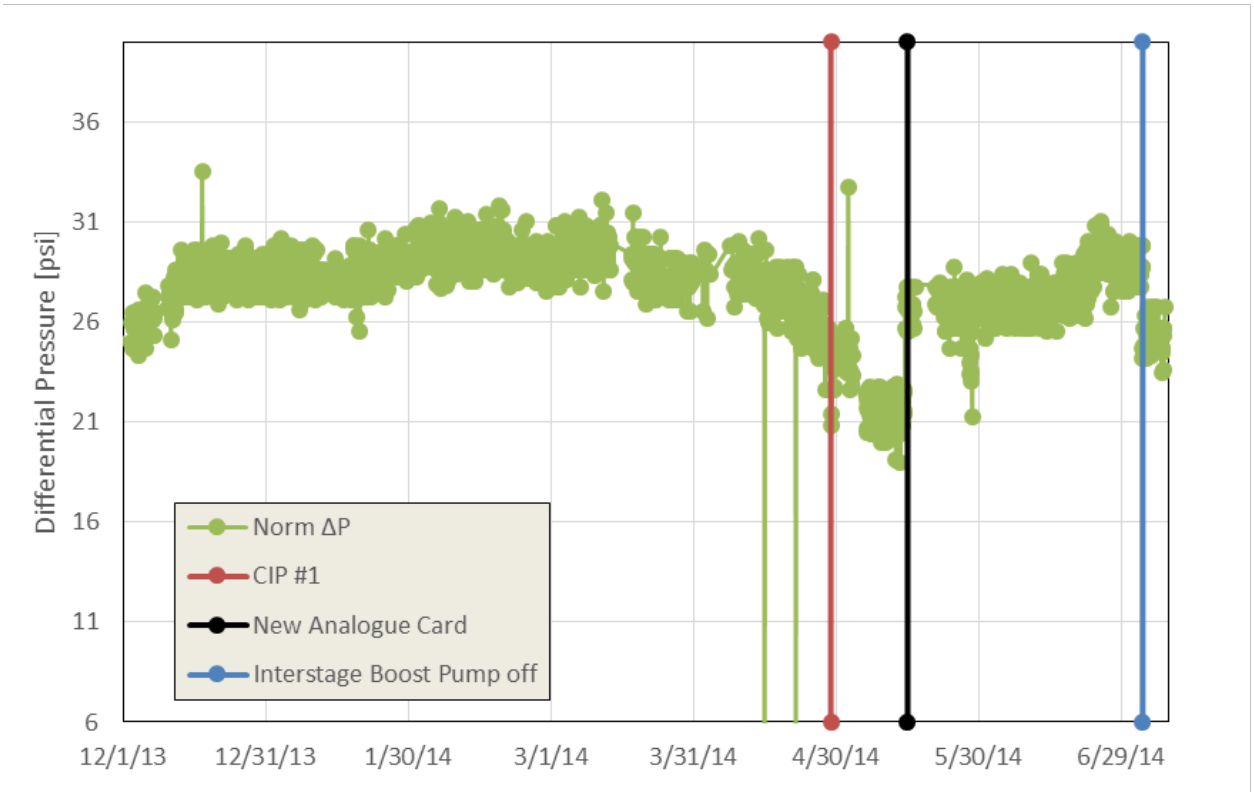


Figure 3.16 - Normalized Differential Pressure

The individual stage normalized differential pressures are shown in Figure 3.17. The second stage decrease prior to the clean is very evident here, while Stage 1 remained very stable.

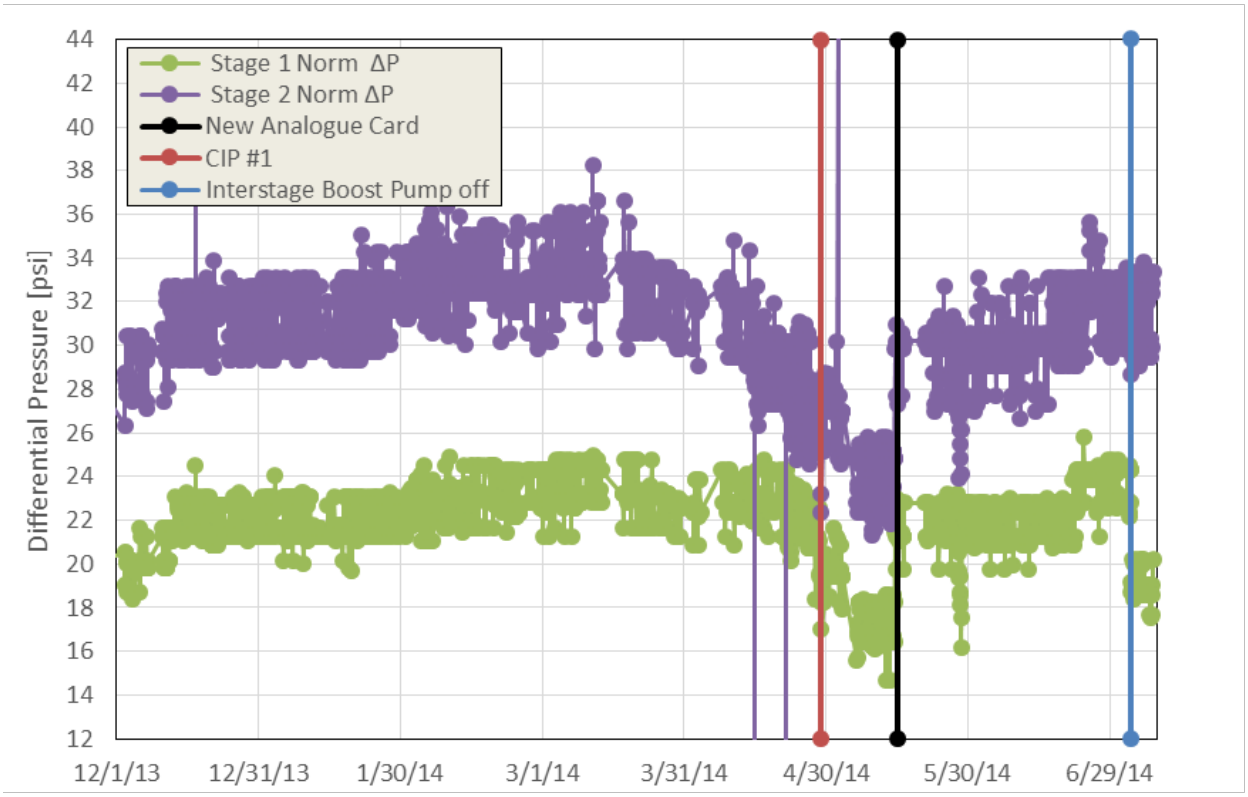


Figure 3.17 - Stage Normalized Differential Pressures

The actual feed pressures for both stages are shown in Figure 3.18. The red dashed lines were added to highlight post clean performance. The jump in the second stage feed pressure prior to the clean is another indicator of tail end element scaling. Following the clean and the analog card replacement, both stage feed pressures returned to normal levels relative to start-up values.

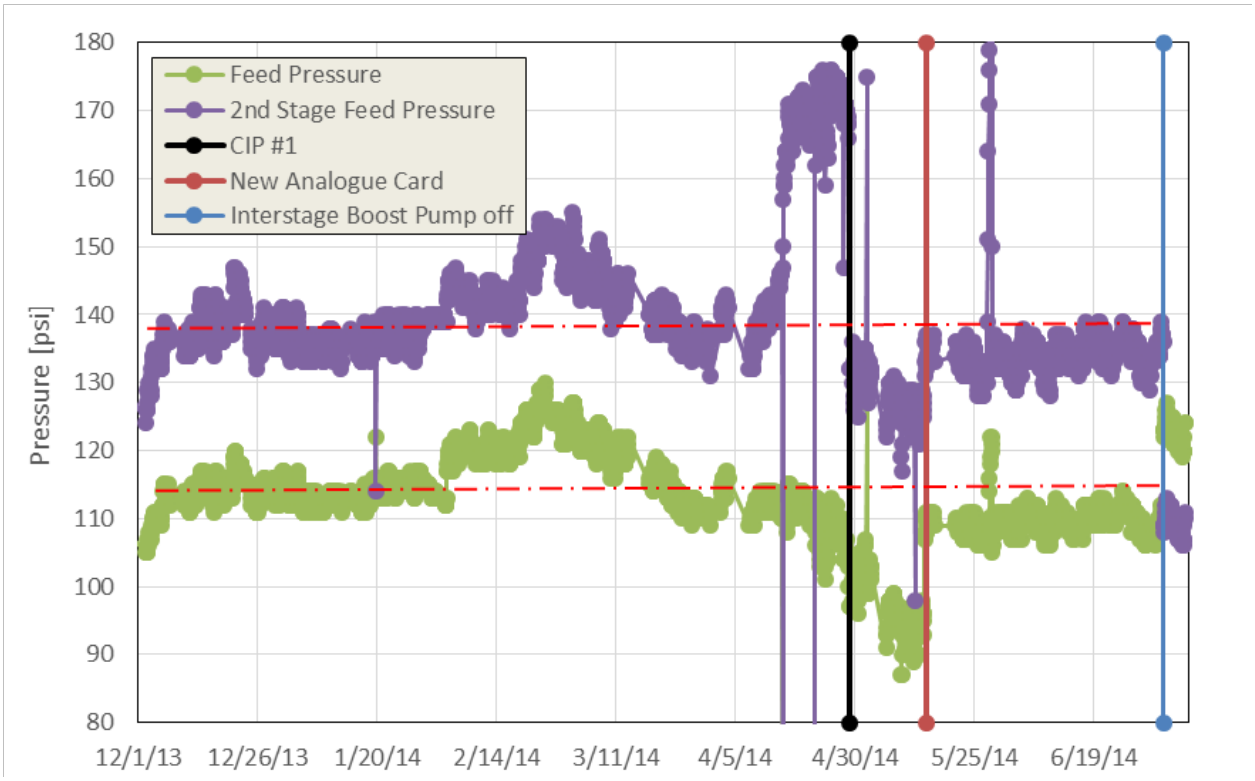


Figure 3.18 - Actual Stage Feed Pressure

The normalized salt rejection trend is shown in Figure 3.19. Overall, the data are very stable, exceeding 98.5%. The small spike shown prior to the analog card replacement is erroneous.

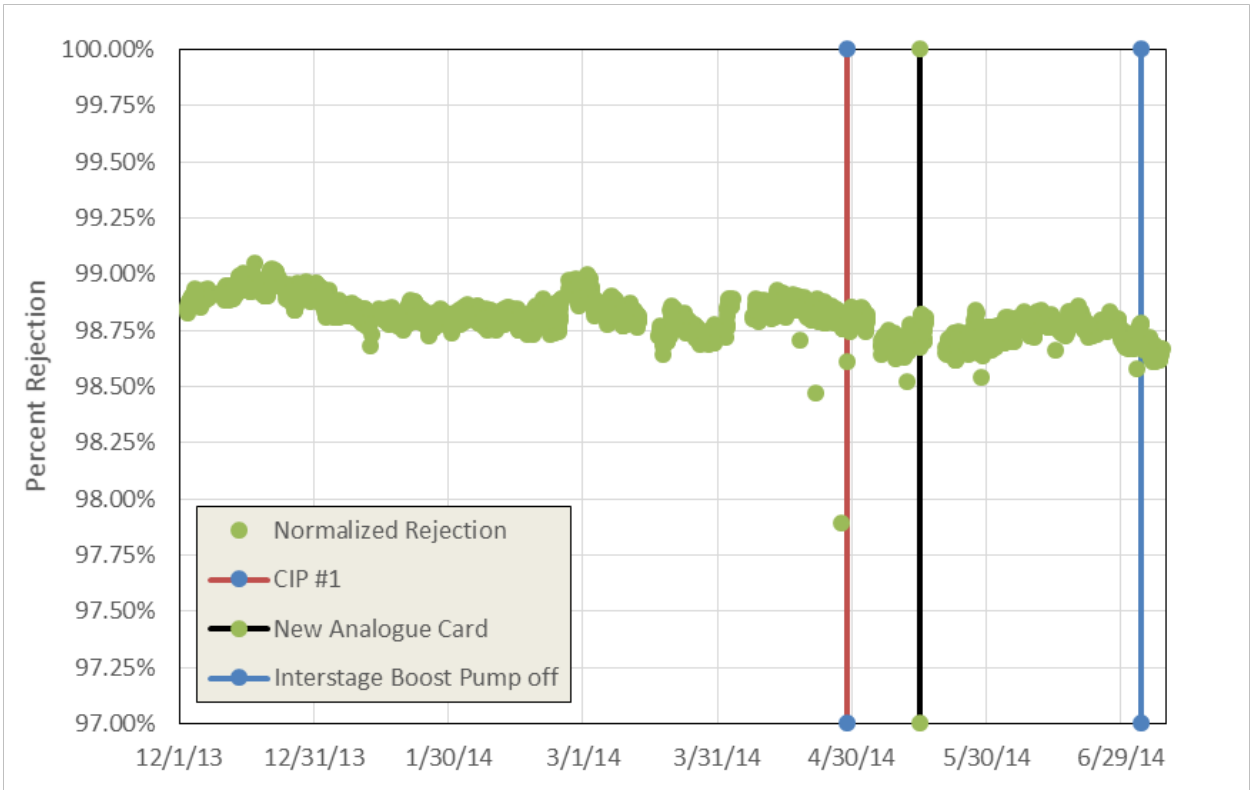


Figure 3.19 - Normalized Rejection

The normalized permeate conductivity trend is shown in Figure 3.20. While this data shows some fluctuation, the overall trend is very stable.

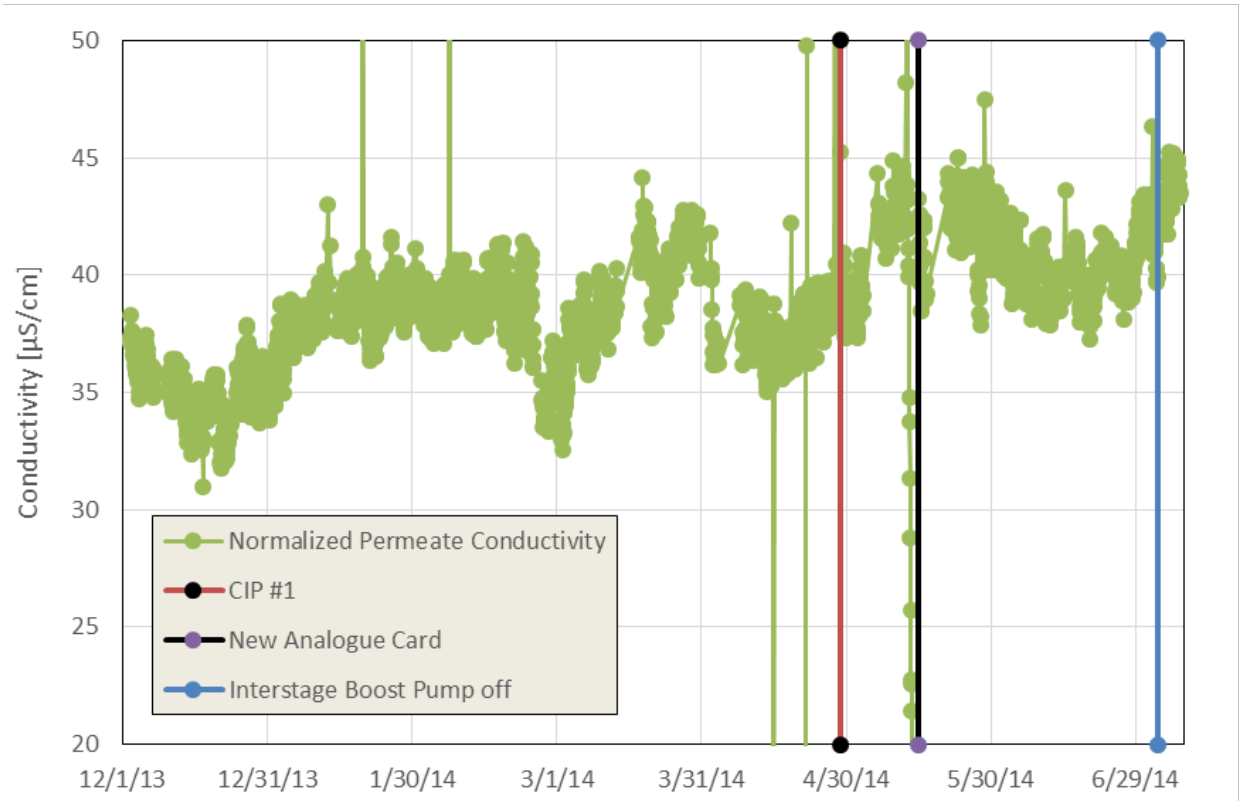


Figure 3.20 - Normalized Permeate Conductivity

3.3.2 Inorganic foulants

Phosphate minerals

Phosphate (mostly in the form of dihydrogen and hydrogen phosphate; also known as orthophosphate) is an ion of particular interest with respect to RO scaling, given the high concentrations of phosphate in the agricultural wash water. Hydrogen phosphate forms a sparingly soluble mineral with calcium when these constituents are at high enough concentrations. Phosphate is a salt of phosphoric acid, and the concentration of hydrogen phosphate is dependent upon pH (acid dissociation constants pK_2 and pK_3, 7.2 and 12.3, respectively). Given this dependence on pH, acid is one method of calcium phosphate control. The concentrations of these ions increase when they are retained on the RO concentrate side of the RO membrane. With an RO recovery of 81%, these ions are concentrated by a factor of 5.3 (assuming 100% rejection across the OR membrane). With the high feed concentrations associated with the agricultural wash water shunt (a high of 9 mg/L as P with the shunt compared to 4 mg/L as P without the shunt), the concentrating effect of the RO may cause scaling and fouling of the membrane, if adequate control measures are not employed (*e.g.,* pH adjustment). Phosphate concentrations measured in the secondary effluent of the RTP during piloting are shown in Figure 3.21. The samples were composited over a period of 24-hours (flow weighted), and passed through a 0.2-micron-pore-diameter filter prior to analysis.[22]

[22] RTP Lab with ion chromatography; 0.2 micron filtration required due to capillary tubing size restrictions

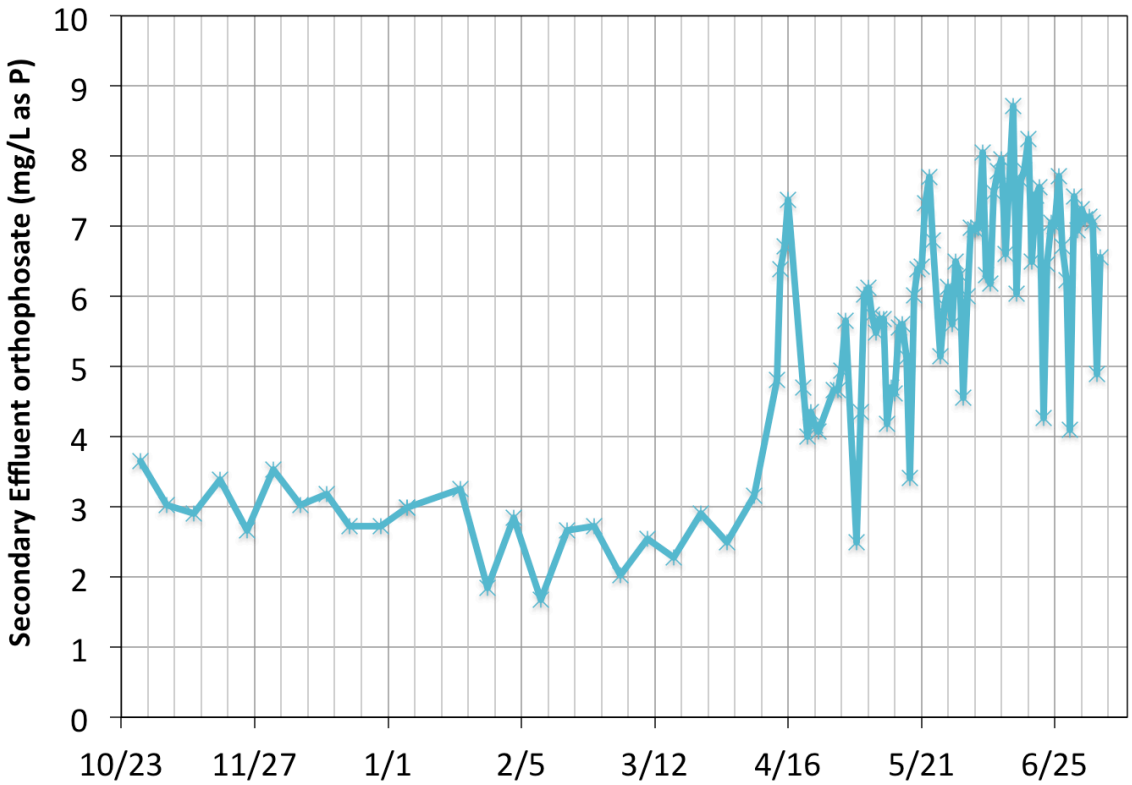


Figure 3.21 – Phosphate concentration in the secondary effluent during piloting
(includes effect of CEPT control)

Although the elevated concentrations of phosphate in the secondary effluent during April and May were a concern, pH control seemed to stave off phosphate-related fouling. The RO feed pH was manually controlled at approximately 6.8 until May 21st, when the manual RO feed pH setpoint was set to 6.0 (manual control was necessary while a faulty pH sensor on the RO skid was replaced, and the feed pH was verified approximately weekly during this time period). While there may have been diurnal variations in the MF effluent pH (which would correspond to variations in the RO feed pH, given the manual control), the RO system did not discernably foul with these setpoints, under the high phosphate loads. On the other hand, the RO fouled rapidly when pH control was ceased (the RO recovered from this event after pH control was reinstated), and small perturbations to the RO feed pH appeared to impact the RO specific flux (an indicator that is typically used to monitor RO fouling). The one fouling event that required RO cleaning occurred prior to the higher phosphate concentrations associated with the agricultural wash water shunt (March 15, whereas the agricultural wash water shunt began on April 1). Another factor that may have contributed to the RO performance with these high phosphate loads is that the MF system may have filtered out sub-colloidal phosphate precipitates. The nominal pore size of the MF system was 0.01 microns, and any sub-colloids larger than this size would be well removed through the MF system. Although filtration through the MF system is possible, pH control likely played a key role in controlling phosphate-related mineral scaling, and thus pH control is recommended for the AWTF.

Phosphate removal at the RTP may occur through biological uptake and wasting, or through precipitation and sludge removal. Phosphorus typically makes up 1.5 to 2% of the dry weight of microbial cells. As cells increase in number through the secondary process, they remove dissolved phosphate from the wastewater. When these cells are settled out in the secondary clarifiers, the phosphorus is removed from the treated wastewater. Another method of phosphorus removal is chemical precipitation with metal salts (*e.g.,* ferric). With appropriate doses, ferric chloride can form sparingly soluble minerals with phosphate that settle out from the wastewater. A stoichiometric relationship between ferric dose and phosphate precipitation typically exists for high residual (effluent) phosphate concentrations (*i.e.,* when effluent dissolved phosphate concentrations are not low). As lower effluent phosphate concentrations are targeted, metal hydroxides form and the removal mechanism transitions from precipitation to adsorption to these metal hydroxides. This transition significantly increases the required ferric dose (Sedlak, 1991). A potential negative effect of a ferric chloride based phosphate control is the possibility of dissolved iron carryover into the RO feed. Iron is one of the many ions that contribute to RO scaling, and this carryover could possibly impact RO performance.

During the time period of elevated phosphate concentration in the RO feed (April through July), ferric chloride was experimentally used to control phosphate concentrations in the secondary effluent (see timing and magnitude of doses in Figure 3.22).[23] The starting ferric chloride dose of 18 mg/L had a statistically significant impact average on the phosphate concentration compared to the residual phosphate concentrations of the lower dose and no dose, after adjusting for variations in the RTP influent concentration (95% confidence). This high dose seems to have achieved residual phosphate concentrations that were similar to the secondary effluent concentrations prior to the agricultural wash water shunt. The lower dose of 9 mg/L did not yield a residual phosphate concentration that was statistically significant from the high dose or no ferric addition secondary effluent concentration.

[23] Ferric chloride (41% strength ferric chloride) dosed through the RTP chemically enhanced primary treatment (CEPT) facilities

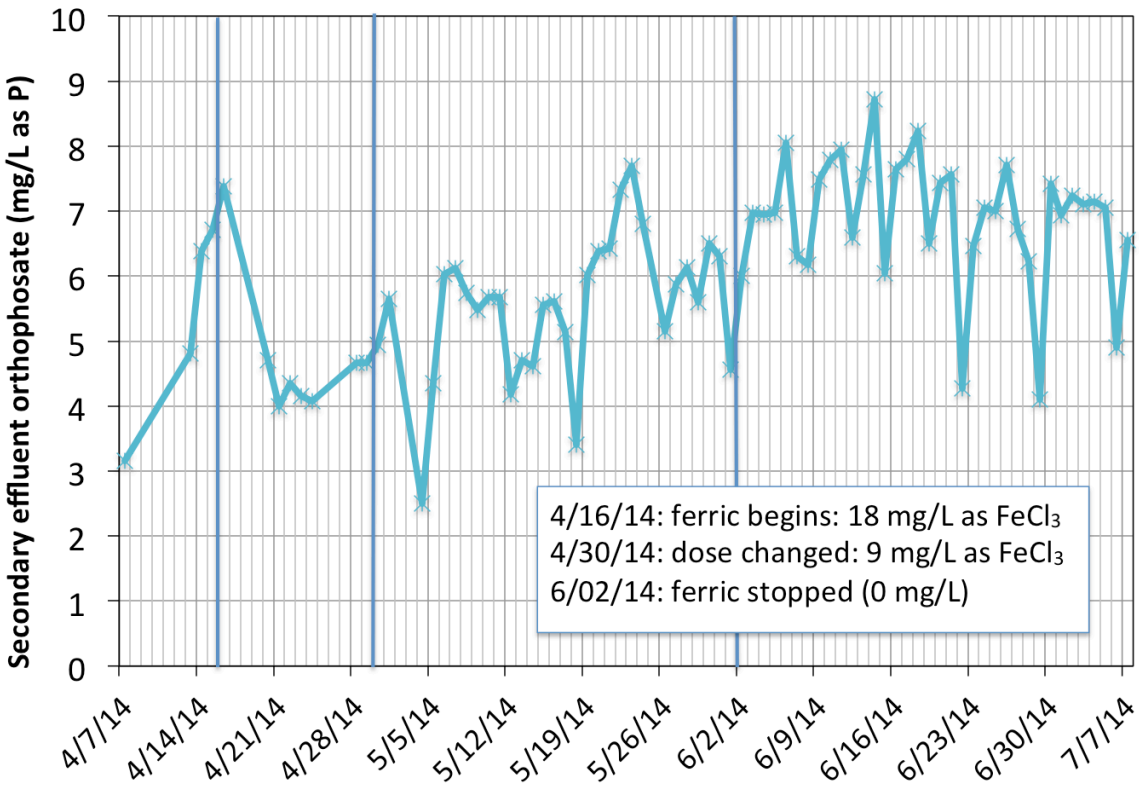


Figure 3.22 – Phosphate measurements during agricultural wash water shunt and ferric chloride doses

An approximate qualitative representation of the change in phosphorus concentration is shown in Figure 3.23. These data come from 24-hour composite samples at five locations in the RTP: RTP influent, primary influent (after recycle streams are included), primary effluent, trickling filter effluent, and secondary effluent. Although the difference in phosphate concentrations across neighboring sample locations was directly used to calculate the increase or decrease in phosphate as if all samples were collected over the same time period and with the same weighting scheme, the collection times and collection weighting schemes actually varied between sample locations.[24] Further, these data indicate an overall increase in phosphate concentrations through the RTP (*i.e.,* an increase in RTP influent compared to the secondary effluent; although not statistically significant at the 95% confidence interval). This increase may be due to suspended phosphate dissolving into the dissolved form (to pass through a 0.2-micron filter) through the RTP. With these caveats in mind, it may be possible to make broad observations from the data. First, these data seem to indicate a recirculation of phosphate through the recycling flow, presumably from the screw press pressate (three grab samples indicate 63 to 111 mg/L as P in late May). They also seem to show removal through biological clarification. Finally, the data appear to indicate that phosphate removal through primary sedimentation may have

[24] RTP influent and secondary effluent were flow-weighted and collected from midnight to midnight; primary effluent and trickling filter were time-weighted, from approximately 7 am to 7 am; primary influent was time weighted up until 4/30/14, and flow-weighted after said date, from approximately 7 am to 7 am, regardless.

been negligible, although this observation may be skewed by absence of total phosphate data (including dissolved and suspended).

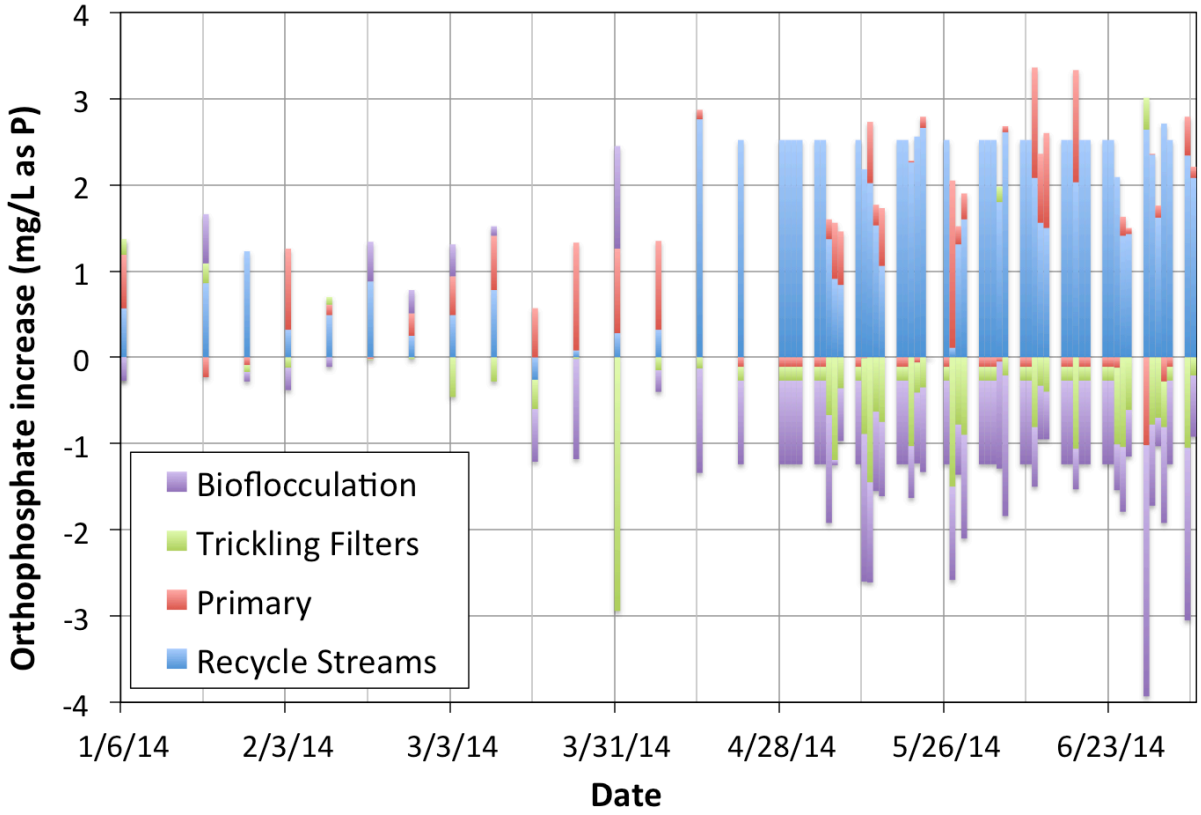


Figure 3.23 - Change in orthophosphate concentration through RTP (the mean of these changes across treatment processes are not statistically significant at the 95% confidence interval; all samples are 24-hour composites, but collection time periods and weighting schemes vary between sample locations)

Full-scale design, and later operation, of the AWTF should consider the costs and benefits of chemical precipitation (*e.g.,* ferric chloride), pH control (*e.g.,* sulfuric acid control at the RO feed), or other methods (*e.g.,* biological phosphorus removal) for controlling phosphate in the RO feed.

Other mineral foulants

In addition to calcium phosphate minerals, there are a number of other sparingly soluble minerals that may contribute to RO scaling (*e.g.,* aluminum silicates). The ions that constitute these sparingly soluble minerals were measured during piloting (see results of these measurements in Table 3.10; the probability plots of three ions with particularly high concentrations in this feed water are shown in Figure 3.24 and Figure 3.25). In some cases (*e.g.,* calcium phosphate minerals), the solubility of these minerals can be increased (*i.e.,* decrease the rate of mineral formation, or eliminate mineral formation) by decreasing the RO feed pH (*e.g.,* through acid addition). Lowering the pH, however, may have the opposite effect on some other minerals, where their solubility may decrease (*i.e.,* the rate of mineral formation may increase). Some RO scaling minerals are also amendable to anti-

scalants (also known as anti-foulants or threshold inhibitors); however, anti-scalants are not available at this time for all minerals that may foul RO membranes in water reuse applications.

Table 3.10 – Inorganic parameters of concern with respect to RO fouling, measured in the RO feed water

Constituent (mg/L)	Median	Range[a]
Alkalinity	306	250-342
Aluminum	0.078	0.021-0.75
Calcium	58	51-65
Chloride	230	203-266
Fluoride	0.6	0.5-0.8
Phosphate	3.1	0.3-14
Magnesium	22	10-26
Manganese	0.052	0.043-0.078
Nitrate	19.9	*<1*-47
Silica	39	38-40
Sodium	152	149-173
Potassium	20	19-21
Iron	0.378	0.157-0.931
Barium	0.011	0.003-0.029
Sulfate	90	84-94
Strontium	0.378	0.360-0.396
TDS	808	757-897

[a] 13 samples, except for nitrate (12 samples), with approximately 6 samples during the agricultural wash water shunt

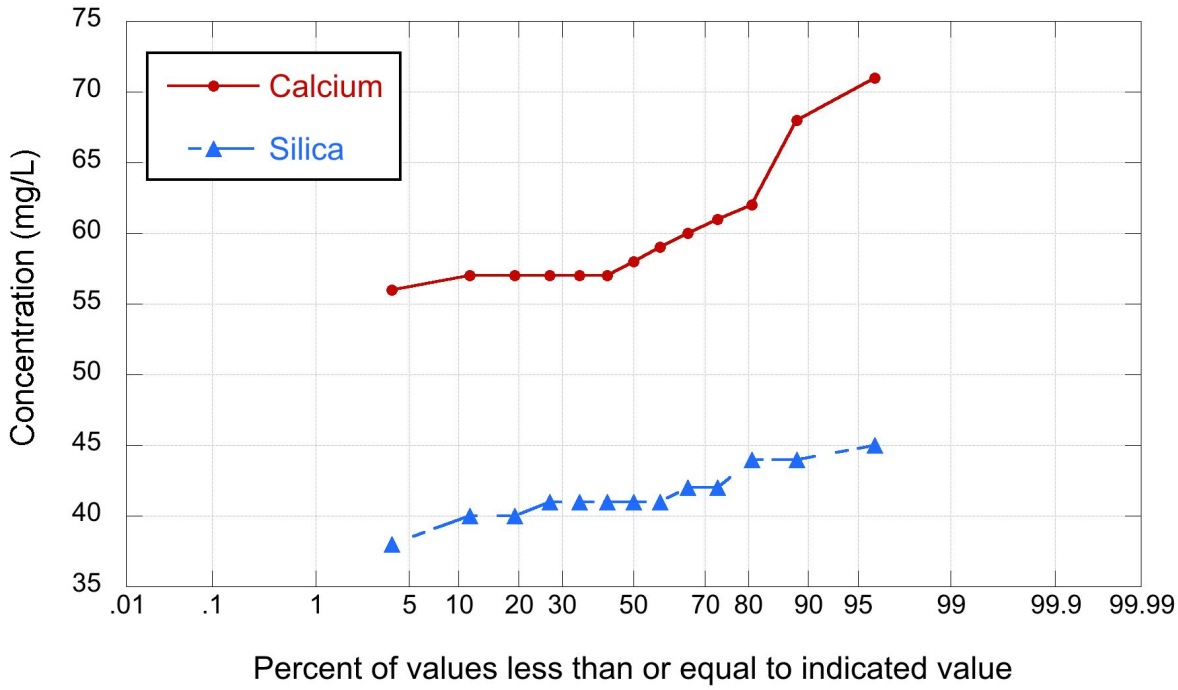


Figure 3.24 – Probability plot of calcium and silica concentrations in RO feed water

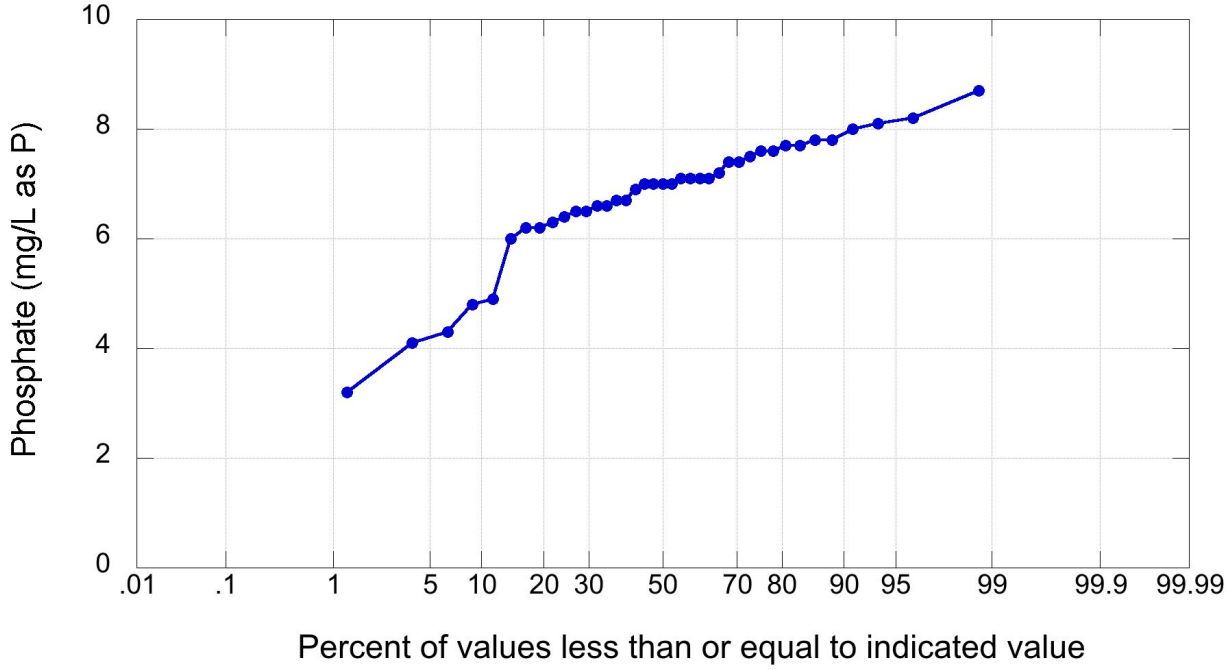


Figure 3.25 – Probability plot of phosphate concentrations in the RTP effluent after April 1, 2014, the date on which the agricultural wash water was routed into the RTP, and only when ferric chloride was not added at the RTP (*i.e.,* excluding dates 4/16 through 6/2)

Inorganic parameters of concern (*i.e.,* the ions that may form sparingly soluble minerals in RO membranes) were also measured during the source water sampling campaign (Trussell Technologies, 2014d). The results from this sampling effort are summarized in Table 3.11. Some of these ions are present in the source waters at concentrations that are of concern with respect to RO fouling (*e.g.,* iron, aluminum). However, these source waters will be blended and treated prior to entering the RO. They will blend together with municipal and industrial wastewater in the RTP collection system; they will undergo primary and secondary treatment through the RTP (where sedimentation of solid-bound ions, and biological update may occur); and they will receive chloramination, preozonation and MF treatment (where oxidative precipitation and removal may occur). Direct water quality samples are not available to characterize these effects, as select source water shunting occurred during the pilot program. If the final RO feed water quality can be estimated (after the effects of blending, RTP removal, and upstream AWTF removal), then RO modeling can be conducted to determine the impact of these constituents on RO fouling and RO recovery. An estimate of final RO feed water quality, and the associated RO modeling, is outside the scope of this pilot report; however, both of those tasks are recommended to ascertain the impact of the source water quality on the RO design and operation. The concentrations of some salts in the source waters may limit the RO recovery if they are not well removed by upstream processes, or sufficiently reduced through blending.

Table 3.11 – Observed median concentrations and ranges of inorganic parameters of concern for RO scaling. All concentrations in mg/L.

Parameter	RTP Effluent	Ag Wash Water	Blanco Drain	El Estero	Tembladero Slough
Alkalinity	316 (277-344)	168 (157-260)	356 (327-373)	185 (157-212)	363
Aluminum	0.048 (0.021-0.256)	0.237 (0.14-0.598)	0.77 (0.26-2.04)	0.296 (0.189-0.402)	1.54
Calcium	58 (54-62)	81 (76-100)	154 (128-169)	100 (77-122)	166
Chloride	217 (183-235)	237 (154-292)	274 (241-307)	423 (332-514)	394
Fluoride	0.56 (0.4-0.8)	0.3 (*<0.1*-31.9)	0.7 (0.66-0.9)	0.3	0.7
Phosphate (as P)	3.0 (2.2-13)	27.5 (10.5-47.2)	*<0.1* (*<0.1*-0.2)	*<0.1*	*<0.1*
Magnesium	22 (20-24)	34 (28-39)	146 (140-177)	42 (32-52)	159
Manganese	0.045 (0.034-0.051)	0.049 (0.039-0.051)	0.243 (0.06-0.449)	0.281 (0.219-0.342)	0.108
Nitrate	21.5 (*<1*-42)	22.5 (*<1.1*-28)	292 (70.3-352)	*<1*	255
Silica	40 (39-44)	44 (41-48)	30.5 (26-63)	*<0.5*	30
Sodium	161 (144-173)	177 (133-200)	241 (196-266)	235 (174-296)	333
Potassium	21 (19-22)	36 (32-42)	2.3 (1-2.7)	7.8 (6.2-9.3)	4.9
Iron	0.339 (0.175-0.537)	0.434 (0.3-0.875)	1.563 (0.639-3.891)	0.355 (0.202-0.508)	2.962
Barium	0.0115 (0.011-0.026)	0.096 (0.082-0.109)	0.068 (0.054-0.079)	0.086 (0.065-0.107)	0.119
Sulfate	88 (83-151)	170 (153-172)	523 (498-530)	157 (127-186)	412
Strontium	0.37 (0.29-0.74)	0.58 (0.51-1.30)	1.25 (0.99-2.20)	0.5	1.8
TDS	793 (771-803)	1282 (797-1591)	2003 (1822-2066)	1226 (946-1506)	1968

3.4 UV Hydrogen Peroxide Advanced Oxidation Process

Although this process was not piloted, results from the pilot water sampling campaign and the source water quality sampling campaign (see Trussell Technologies, 2014d for detailed report on the source water quality) inform the UV/AOP design. Design considerations are discussed in this section, after a brief introduction to the UV/AOP process in the AWTF.

At the AWTF, the UV/AOP will provide a final polishing step for pathogen disinfection and an additional chemical destruction barrier for the RO permeate. Hydrogen peroxide will be added to a reactor, which houses arrays of ultraviolet lamps. Ultraviolet light from these lamps react with hydrogen peroxide to form hydroxyl radicals, which, along with the ultraviolet light, oxidizes, destroys, or inactivates chemicals of concern and pathogens. The system sizing will be driven by the requirement in DDW's Groundwater Replenishment Regulations criteria for advanced oxidation (*i.e.,* NDMA and 1,4-dioxane removal requirements).

Although the RO is capable of removing the majority of organic and inorganic compounds, some particularly recalcitrant, low molecular weight compounds (especially neutrally charged compounds) are found in RO permeate (*e.g.,* NDMA and 1,4-dioxane). AOP systems are designed in this context to achieve required levels of NDMA and 1,4-dioxane removal, as removal of these compounds is indicatives removal of a wide variety of CECs. NDMA removal requirements are designed to achieve an effluent concentration less than the NL of 10 ng/L. The 1,4-dioxane removal requirements are stipulated by DDW in the Groundwater Replenishment regulations (0.5-log removal).

Secondary effluent NDMA concentrations are typically below the NL; however, NDMA is formed through ozonation and chloramination processes (see Figure 3.26). The ozone oxidant is short-lived, and thus NDMA formation from ozone is rapid. Chloramines are persistent, and NDMA formation may continue with residual chloramine if NDMA precursors are present (thus the NDMA concentration increases through the MF process). The RO process achieves measurable NDMA removal, but this removal is not sufficient to reach the NL. Given that NDMA can increase through the application of oxidants, the concentration of NDMA precursors in the source water is important in evaluating the RO feed NDMA concentration. The concentration of NDMA precursors of the RTP effluent combined with the agricultural wash water was empirically tested during piloting, by measuring NDMA after applying sodium hypochlorite and ozone (see Figure 3.26 and Figure 3.27), where the impact of the agricultural wash water shunt on the RO permeate concentration appears to be minimal. NDMA formation in the Blanco Drain water was minimal during bench scale testing after the application of ozone (Trussell Technologies, 2014b). Given that NDMA formation from other source waters is expected to be minimal, the maximum NDMA concentration observed during piloting was used as the basis of UV/AOP design (32 ng/L). Based on this maximum measurement, the UV/AOP system will be designed to achieve a 1.5-log reduction in NDMA, which will produce an effluent concentration of 1 ng/L, an order of magnitude below the NL.

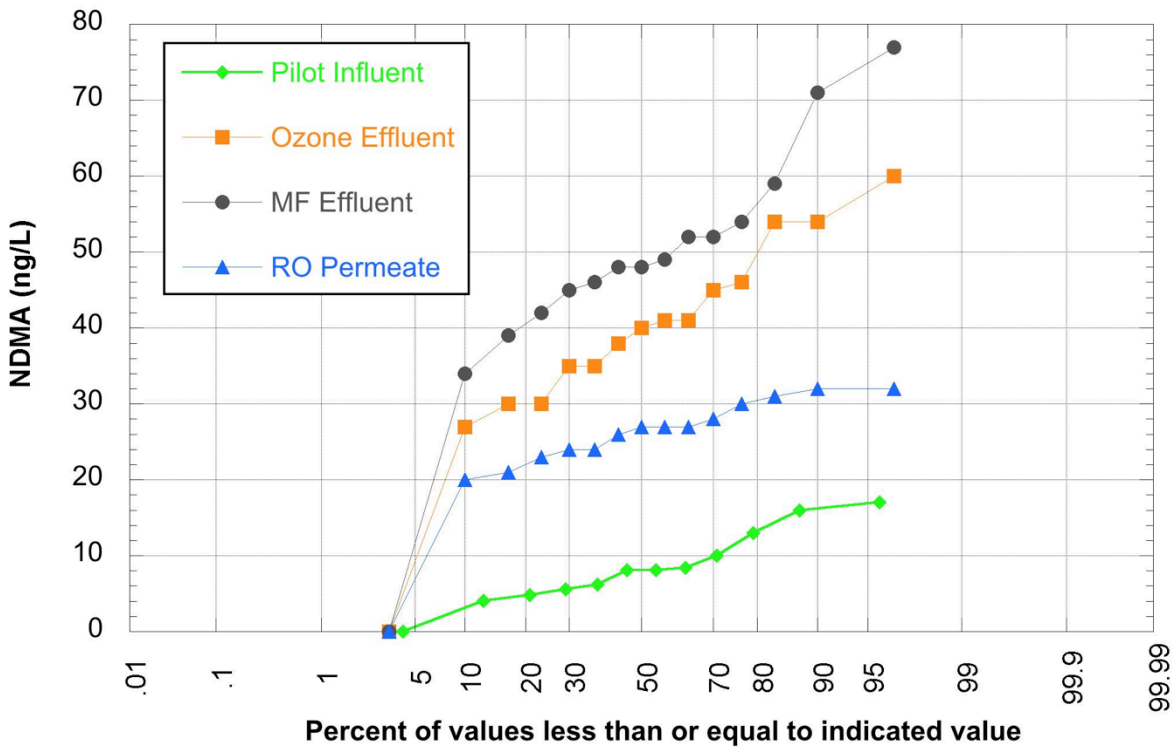


Figure 3.26 – Probability plot of NDMA concentrations through the pilot

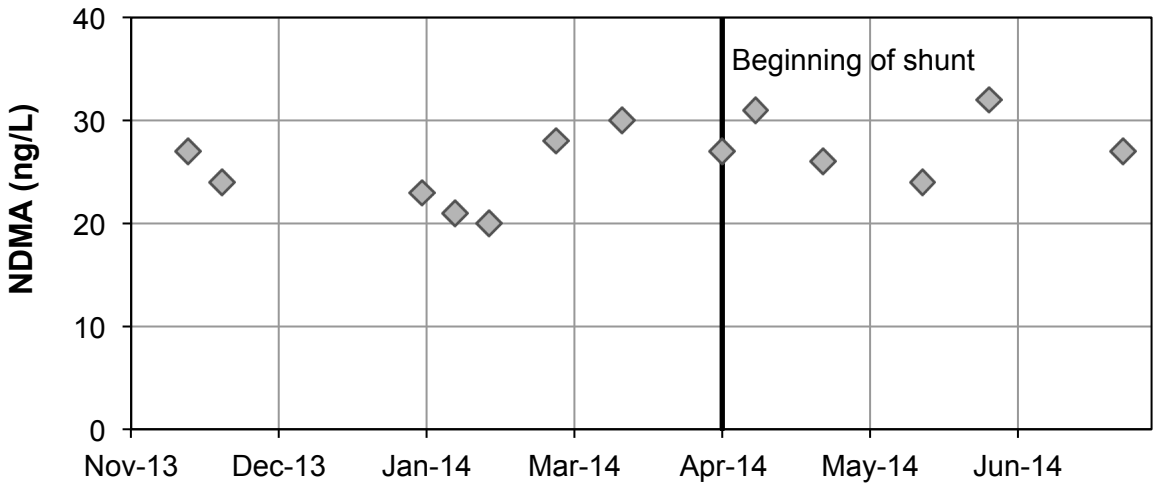


Figure 3.27 – NDMA concentrations in the pilot reverse osmosis permeate

1,4-dioxane has been detected in the RTP effluent at levels very close to the California NL of 0.001 mg/L, and it has not been detected in the other source waters (Table 3.12). As mentioned previously, the AOP will be designed to achieve 0.5-log removal of 1,4-dioxane, which will be demonstrated during start-up of the full-scale AWTF. This level of removal will bring the effluent concentration below the NL. Blending of the additional source waters is expected to reduce the UV/AOP 1,4-dioxane concentration even further, such that there is no measureable level in the UV/AOP feed.

Table 3.12 – 1,4-dioxane concentrations measured in potential source waters

	RTP Effluent	Ag Wash	Blanco Drain	El Estero	Tembladero Slough
1,4-dioxane (mg/L)	*<0.001 (<0.001-**0.0012**)*	*<0.001*	*<0.001*	*<0.001*	*<0.001*

UVT is another key parameter for the design of the AOP system. AOP systems rely on the formation of hydroxyl radicals, which are strong oxidants that react rapidly with organics. In a UV hydrogen peroxide AOP system, the formation of hydroxyl radicals is dependent on how much UV light reaches and reacts with the hydrogen peroxide. UVT is a measurement of how much UV light will be transmitted in a water matrix (*i.e.,* it is an indicator of how much UV light will reach hydrogen peroxide); thus UVT relates to hydroxyl radical production. A UVT of 95% or greater was initially specified for the AOP. UVT values greater than this design value were observed during the initial testing; however, the UVT dropped shortly after the start of the agricultural wash water shunt test at the start of April 2014 (Figure 3.28).

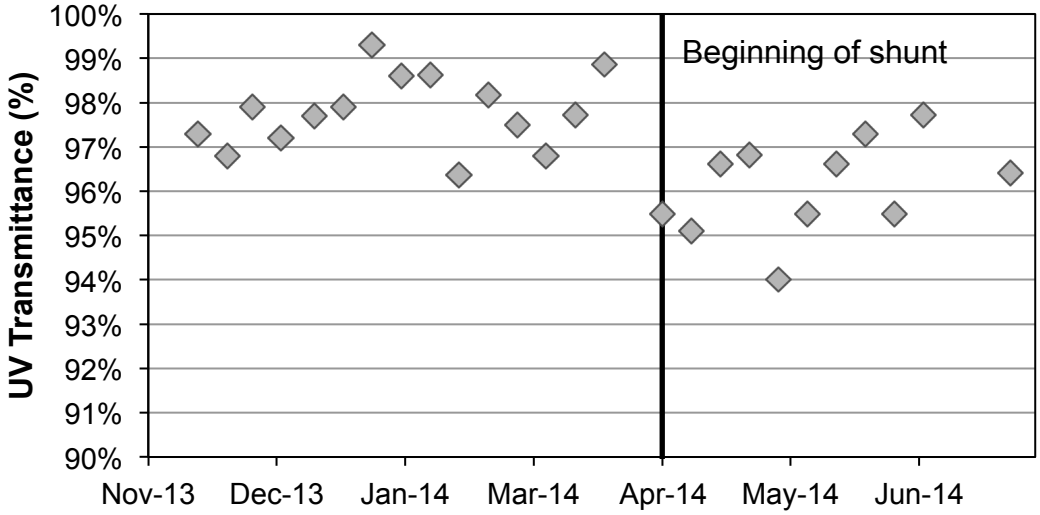


Figure 3.28 – UVT of the RO permeate over the duration of the pilot testing

Several process changes were occurring at the pilot facility from April through June 2014 (when the UVT dropped), including: the addition of ferric chloride as part of the CEPT, an increase in the chloramine residual used to prevent bio-fouling across the membrane processes, and an increase in the ozone dose associated with experimentation with higher MF flux rates. For the lowest UVT value observed in RO permeate (April 2014; 94%), the chloramine residual was approximately 7 mg/L, exceeding the target range of 2 to 5 mg/L. Chloramines reduce UVT (through the absorbance of UV light), and thus it is believed that this low UVT value is not realistic of future operating conditions (the AWTF will have better control over the chloramine residual, compared to the pilot facilities; see probability plot in Figure 3.29). Correspondingly, the UV/AOP system design was not based on a UVT of 94%; instead, the AOP process design UVT remains at 95%.

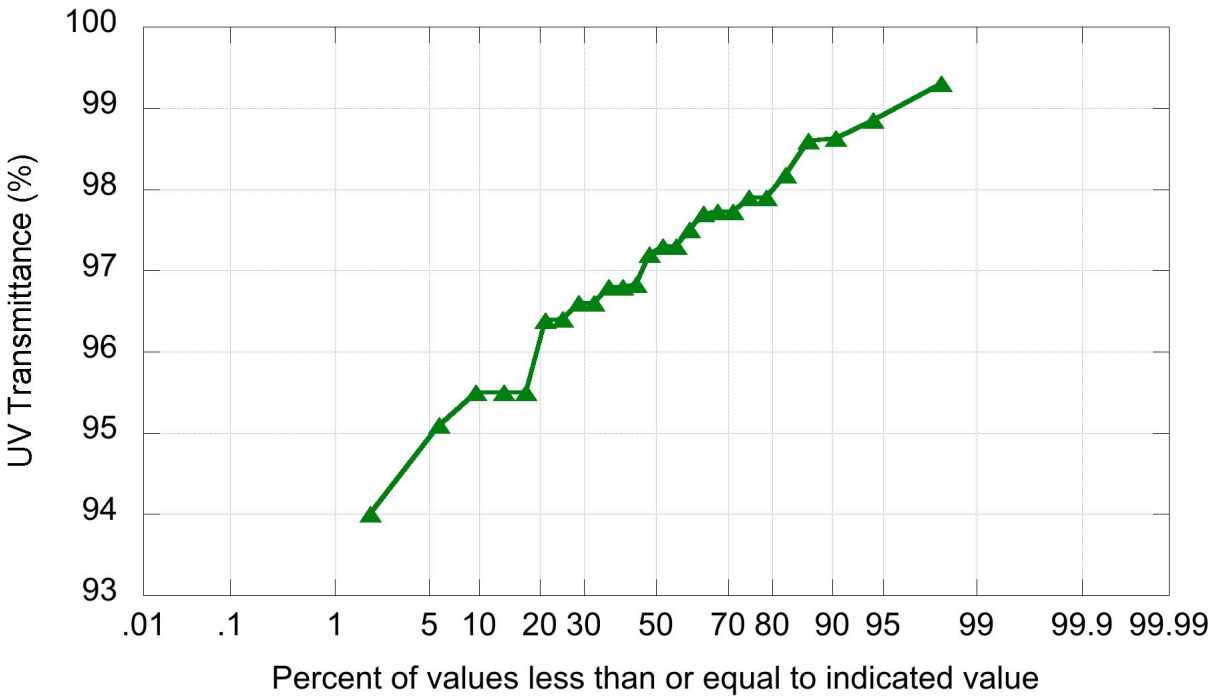


Figure 3.29 – Probability plot of UVT of the RO permeate

4 Product Water Quality

The results of the pilot testing, pilot water quality monitoring, and the source water monitoring (Trussell Technologies, 2014d) can be used to estimate the expected product water quality from the AWTF. The product water must be in compliance with all relevant regulations, and must also meet safe levels for other unregulated constituents such as pesticides and CECs. Where possible, worst-case product water qualities have been predicted based on piloting and source water monitoring; demonstrating that the AWTF can treat the worst-case water quality to levels below specified limits ensures consistent compliance and protection of public health.

4.1 Regulated Constituents

4.1.1 Total Nitrogen

The effluent limitation for total nitrogen is 10 mg N/L (DDW Groundwater Replenishment regulations), and the pilot plant consistently met this limit (Figure 4.1). After the addition of the agricultural wash water to the RTP in April 2014, the average pilot influent (RTP secondary effluent) total nitrogen decreased from 43.7 mg N/L to 34.8 mg N/L. This was expected because the wash water has a lower total nitrogen concentration compared to the RTP effluent.

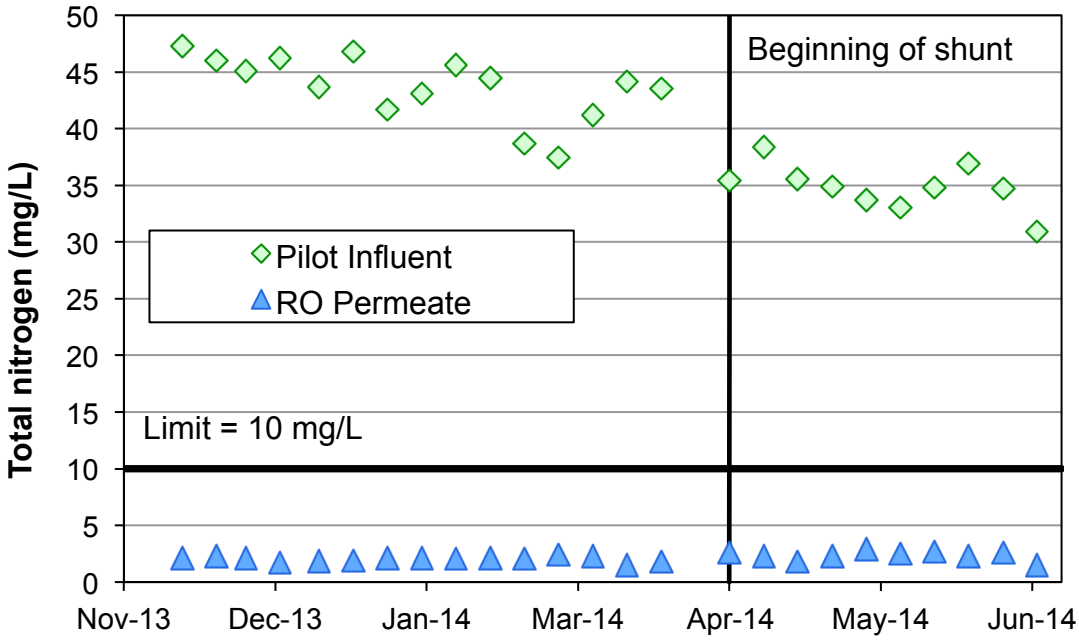


Figure 4.1 – Removal of total nitrogen through the pilot

The Blanco Drain has significantly elevated levels of nitrate – the median concentration observed during sampling was 68 mg/L as N, compared to the 5.4 mg/L as N seen in the RTP effluent during source water sampling. These high nitrate concentrations contribute to the high total nitrogen concentration observed in the Blanco Drain (70 mg/L as N), compared to the RTP effluent (44 mg/L as N, where the RTP effluent total nitrogen is mostly comprised of its high ammonia levels). The impact of the Blanco Drain on the RTP

effluent total nitrogen concentration can be reasonably predicted because nitrogen removal is not expected in the RTP. Using the projected monthly flows, total nitrogen concentrations throughout the year were predicted. The results of the analysis are summarized in Table 4.1, including the highest monthly total nitrogen based on the median observed values and the maximum observed values. Despite the high nitrate levels in the Blanco Drain, the maximum predicted total nitrogen under median conditions is only about 5% higher than what has already been observed in the RTP effluent. The maximum predicted value, based on the maximum observed values, is only 8.5% higher than the observed maximum in the RTP effluent (without Blanco Drain blending).

Table 4.1 – Observed and predicted total nitrogen concentrations calculated using both median and maximum values. Observed concentrations are from RTP effluent; blended concentrations include RTP effluent, wash water, Blanco Drain, El Estero, and Tembladero Slough.

Parameter	RTP Effluent (mg N/L)	Blended Source Waters (mg N/L)
Median	44.4	46.5
Maximum	50.5	54.8

The average total nitrogen removal through the pilot was 94.3%. Assuming this removal, a blended source water total nitrogen concentration of 46.5 mg N/L would be reduced to 2.7 mg N/L and total nitrogen of 54.8 mg N/L would be reduced to 3.1 mg N/L. Both of these concentrations are still well below the limit of 10 mg N/L. Therefore, despite high nitrate levels (and corresponding high total nitrogen levels) in the Blanco Drain, the AWTF should have no problem meeting the 10 mg/L total nitrogen effluent limit.

4.1.2 Total Organic Carbon

TOC can be used as a surrogate for unregulated and unknown organic chemical contaminants. The project goal is to maintain RO permeate TOC concentrations below 0.5 mg/L (per the DDW Groundwater Replenishment regulations)[25]. Although the TOC in the wash water was measured at high concentrations compared the RTP effluent (Trussell Tech, 2014d), the wash water was measured prior to it receiving biological treatment. Primary and secondary treatment at the RTP is expected to significantly decrease the wash water TOC concentration. In fact, a significant decrease in the RTP effluent TOC was observed during the time period of the agricultural wash water shunt, compared with values observed before the shunt: 14.8 ± 0.7 mg/L and 13.0 ± 0.7 mg/L (mean ± 95% confidence interval), for before and after the shunt testing, respectively (see Figure 4.2). It is expected that the addition of low-TOC waters (*e.g.*, Blanco Drain, Tembladero Slough, Lake El Estero) would only further decrease the TOC.

[25] For groundwater recharge by subsurface application, DDW requires that the applied recycled water TOC (24-hour composite sample, minimum once a week) not exceed 0.5 mg/L based on a 20-week running average of all TOC results and an average of the last four TOC results. Grab samples may be used in lieu of a 24-hour composite sample if it is demonstrated that a grab sample is representative of the water quality throughout a 24-hour period.

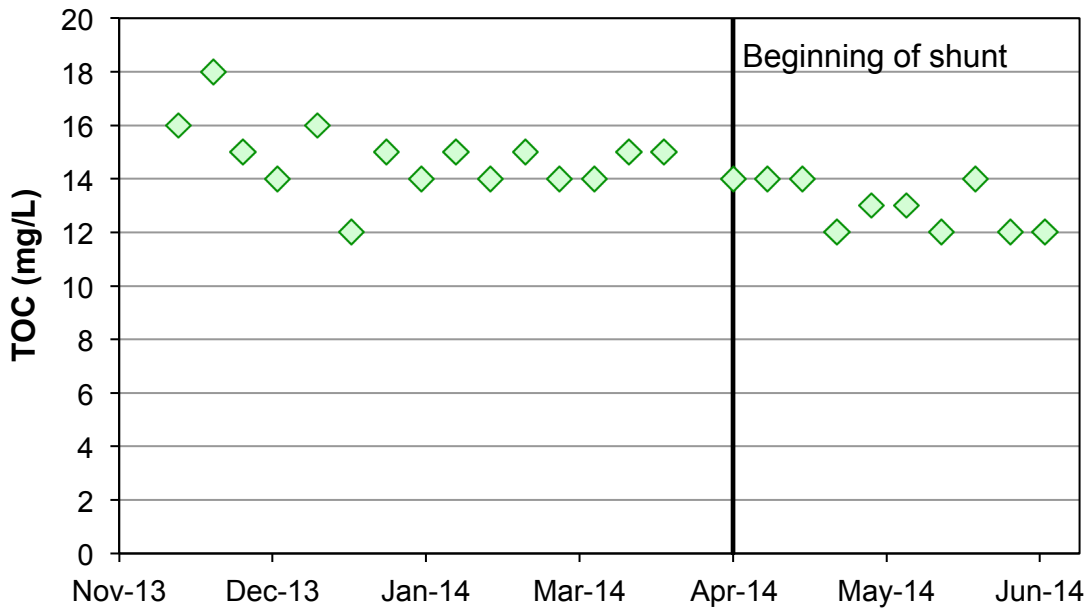


Figure 4.2 – TOC concentrations entering the pilot

The TOC concentrations in the RO permeate are impacted by the ozone dose. Sampling of the RO permeate at a time when ozone was not running indicates that ozone can significantly increase the TOC concentration in the RO permeate (RO permeate TOC concentrations of 0.39 mg/L and < 0.20 mg/L with and without ozone, respectively [ozone applied dose 21 mg/L]). In May 2014, the ozone dose in the pilot was increased to test the impact on the run-time of the MF unit; as illustrated in Figure 4.3, this increase caused the TOC in the RO permeate to increase, going above 0.5 mg/L three times. The design ozone dose chosen for the full-scale AWTF is the lower dose; this, coupled with the expected reduction in TOC from blending with other low-TOC source waters, indicates that an average RO permeate level of 0.5 mg/L TOC or less is consistently achievable.

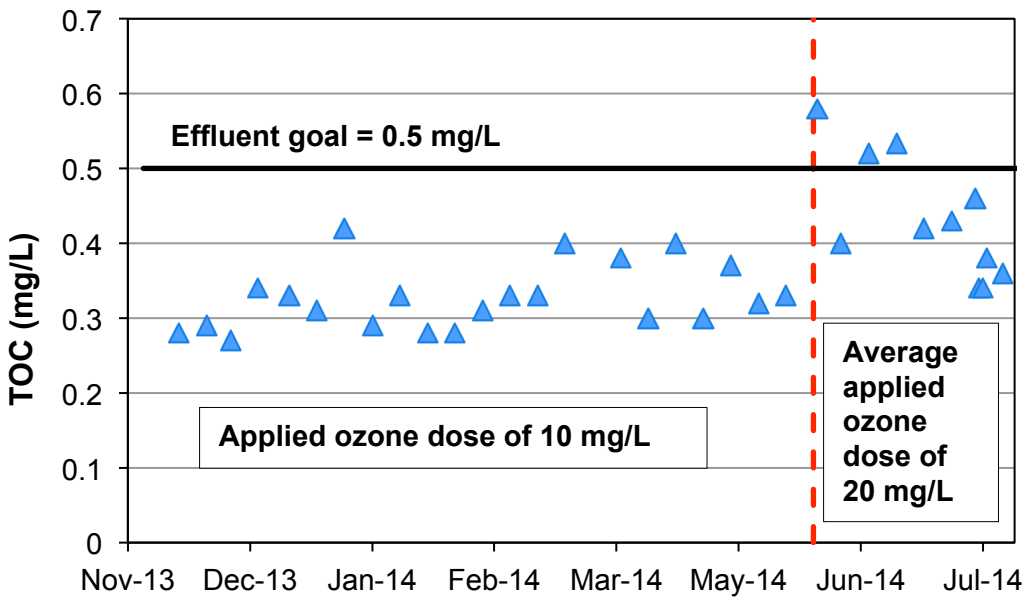


Figure 4.3 – TOC concentrations in the pilot RO permeate. Increase in ozone dose started on 5/20/14 and continued through the end of piloting

In addition to the ongoing product water TOC limit of 0.5 mg/L, DDW also maintains a stricter, temporary RO permeate TOC limit of 0.25 mg/L (95% of samples) for the first 20 weeks. While the ongoing limit is meant to continuously guarantee the quality of the product water, the temporary limit is one of two methods that DDW employs to ensure high quality RO membranes are procured for GWR projects (the other tool is sodium chloride rejection requirements). DDW has observed a relationship between the RO permeate TOC concentration during the first 20 weeks of RO operation and the quality of the RO membrane; however, this relationship was observed prior to the advent of preozonation. As discussed earlier, preozonation can increase the RO permeate TOC concentration from less than 0.25 mg/L (*e.g.,* 0.2 mg/L) to greater than 0.25 mg/L (*e.g.,* 0.4 mg/L), even in high quality RO membranes (*i.e.,* membranes that can meet the 0.25 mg/L TOC limit for 20 weeks without preozonation and that can meet the sodium chloride rejection requirements). Given this interference, RO membrane quality verification (the first 20 weeks of AWTF operation) will likely have to be conducted without preozonation. Alternatively, it may be possible to develop an alternative approach to RO membrane quality verification with DDW.

4.1.3 Pathogens

Pathogen removal to levels below detection (*i.e.,* below current detection limits) was observed through the pilot. The addition of other source waters is not expected to impact pathogen removal, since the other source waters have lower concentrations of pathogens, compared to the RTP. Additionally, the UV/AOP, which has not been piloted, will be designed for 6-logs of removal credit (*i.e.,* 99.9999% removal credit) for viruses, *Giardia* and *Cryptosporidium*. A summary of pathogen and pathogen indicator concentrations is shown in Table 4.2. A summary of expected log removal credits is shown in Table 4.3.

Measurement of *Giardia* and *Cryptosporidium* can present a particular challenge in the matrices samples at the RTP and the pilot plant. At this point in time, no standard method has been developed for the measurement of these species in wastewater and recycled water, which contain constituents that interfere with common methods of measurement. The best widely accepted method available at this time is EPA method 1623a, which was used for analysis of the treated wastewater. One of the separation steps in 1623a is a filtration step, and this step is infeasible for the high solids concentration of raw wastewaters (*e.g.,* RTP Influent). Draft EPA method 1693 omits this filtration step, and this method was employed for the raw wastewater samples. Despite these limitations, some general conclusions can be drawn from the data, such as those mentioned above.

Table 4.2 – Summary of pathogen removal observed through the pilot

Constituent/ sample location	RTP Influent[d]	Pilot Influent (secondary effluent)	Ozone Effluent	MF Effluent	RO Permeate
Cryptosporidium (oocysts/L)	< 2 1 – 8	< 0.35 (*<0.09*-0.9)	*2.65*[a] *(0.3-23.3)*	*<0.09*	--
Recovery[c]	23%	30%	*92%*	*26%*	--
Giardia (cysts/L)	8847 1634 – 13626	< 0.15 (*<0.09*-1.1)	*<0.2*[a] *(<0.09-4.4)*	*<0.09*	--
Recovery[c]	[e]	*<0.092%*	*76%*	*50%*	--
Total coliform[b] (MPN/100 mL)	-- --	2.8×10^5 (2.4×10^3 – 1.6×10^6)	6.3×10^2 (5.5×10^1 – 3.1×10^3)	*<1*	*<1*
E. coli[b] (MPN/100 mL)	-- --	6.0×10^4 (4.9×10^2 – 3.3×10^5)	2.7×10^1 (*<1* – 5.5×10^2)	*<1*	*<1*

[a] There were consistently higher *Cryptosporidium* concentrations in the ozone effluent than the pilot influent (secondary effluent). This effect appears to be an artifact of the analysis; whereas the ozonation of the water likely increased the method recovery for *Cryptosporidium* and *Giardia*.
[b] Values are geometric means; MPN (most probable number)
[c] Recovery measured on one of the six samples
[d] Draft EPA method 1693, which omits the filtration step of EPA method 1623a (1623a used on other samples)
[e] ColorSeed not used, thus native *Giardia* interfered with matrix spike (recovery was 658%)

Table 4.3 – Anticipated pathogen log removal credit

Process	Log reduction credits		
	Enteric virus	*Giardia* cysts	*Cryptosporidium* oocysts
RTP (primary and secondary treatment)[a]	0	0	0
Ozone[a]	0	0	0
MF[b]	0	4	4
RO	1.5	1.5	1.5
AOP (UV/H_2O_2)	6	6	6
Final disinfection (free chlorine)[a]	0	0	0
Aquifer residence time[c]	5.4	0	0
Regulatory requirement	12	10	10
Total pathogen removal credit	12.9	11.5	11.5

[a] Not pursuing pathogen credit at this time
[b] Not pursuing virus removal credit at this time
[c] Based on modeling; actual residence time expected to exceed 6 months (actual residence time to be determined through tracer testing)

4.1.4 Maximum Contaminant Levels

One product water quality goal is to meet all of the DDW MCLs for drinking water. Results from the pilot testing indicate that the RO should produce a permeate that is in compliance with these MCLs; a summary of all compounds with an MCL that were detected at least once in the RO permeate is presented in Table 4.4. In this table sMCL and pMCL represent Secondary and Primary Maximum Contaminant Levels.

There are several constituents that have been measured above or close to their MCL in the source waters that were not included in the piloting testing for extended periods (*i.e.,* Blanco Drain, Lake El Estero, Tembladero Slough). However, because the best available treatment technologies are being used, and because high levels of removal in the pilot testing have been achieved, none of these constituents are expected to impact the ability of the AWTF to meet all MCLs.

Table 4.4 – Constituents with MCLs detected in RO permeate

Constituent	Unit	MCL	Median (Range)[a]
Consumer Acceptance[b]			
Chloride	mg/L	250 (sMCL)	3 (<1 - 6)
Conductivity	µS/cm	900 (sMCL)	38 (32 - 46)
Sulfate	mg/L	250 (sMCL)	<1 (<1 – 1)
TDS	mg/L	500 (sMCL)	<10 (<10 – 26)
Turbidity	NTU	5 (sMCL)	<0.05 (<0.05 – 0.1)
Inorganics			
Aluminum	mg/L	0.2 (pMCL)	<0.01 (<0.01 – 0.045)
Arsenic	mg/L	0.01 (pMCL)	<0.001 (<0.001 – 0.002)
Chromium	mg/L	0.05 (pMCL)	0.005
Cyanide	mg/L	0.15 (pMCL)	<0.005 (<0.005 – 0.007)
Fluoride	mg/L	2 (pMCL)	<0.1 (<0.1 – 0.2)
Nitrate	mg/L as N	10 (pMCL)	<0.2 (<0.2 – 0.7)
Nitrite	mg/L as N	1 (pMCL)	<0.1 (<0.1 – 0.4)
Nitrate + Nitrite	mg/L as N	10 (pMCL)	0.55 (0.1 - 1.6)
Selenium	mg/L	0.1 (pMCL)	<0.002 (<0.002 – 0.01)
Synthetic Organic Compounds			
Total trihalomethanes	µg/L	80 (pMCL)	1.85 (0.68 – 5)
Radionuclides			
Radium-226	pCi/L	5 (pMCL)	0.298 ± 0.327

[a] 13 samples analyzed except for chromium and radium-226 (1 sample), total trihalomethanes (12 samples), turbidity (25 samples), and nitrate and nitrite (26 samples).
[b] Odor threshold was measured at 5 units (above the sMCL of 3) on one sample without dechlorination. The high odor threshold is almost surely due to the residual chloramines, and not due to other odorous compounds present in the water.

Bromate is a regulated ozone DBP that was closely monitored during the pilot testing (MCL 10 µg/L). Bromate formation during ozonation is shown in Figure 4.4, where the highest concentration observed (9 µg/L) was still below the 10 µg/L MCL. RO is one of the best available technologies for bromate reduction, and for all samples collected during the

piloting, the RO reduced the product water bromate concentration to below detection (*i.e.,* less than 1 µg/L).

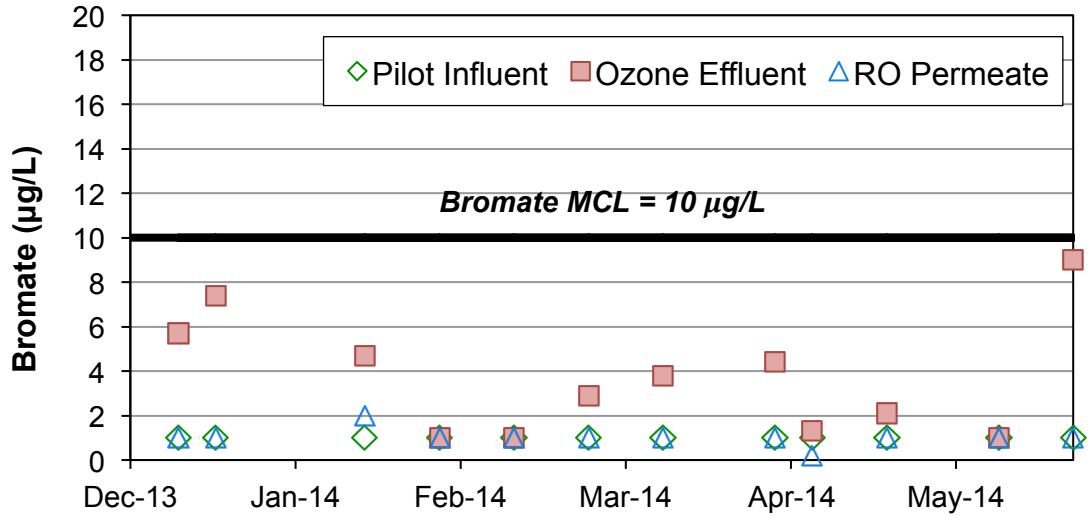


Figure 4.4 – Bromate formation through ozonation and removal through RO treatment

4.2 Unregulated Constituents

4.2.1 Notification Levels and Archived Notification Levels

The only constituent measured in the RO permeate above its DDW NL or DDW AAL was NDMA (see Table 4.5). However, the UV/AOP process is specifically design to achieve 1.5-log removal (*i.e.,* 96.8% removal) of NDMA. This level of removal will reduce the NDMA concentration to a range of approximately 0.63 to 1.0 ng/L (from the measured range of 20 to 32 ng/L present in the RO permeate), which is well below the NL. The detection limit for 1,4-dioxane makes it difficult to ascertain where the concentration in the RO permeate is in comparison to the NL (since the NL is equal to the detection limit). In addition to 1.5 log NDMA removal, the UV/AOP system will also be designed to achieve a minimum of 0.5 log removal of 1,4-dioxane to insure that the product water 1,4-dioxane concentration will be significantly below the NL (1,4-dioxane log removal will be demonstrated during start-up of the full-scale AWTF).

Table 4.5 – Constituents with NLs or AALs detected in RO permeate

Constituent	Unit	Limit	Median (Range)	Number of samples analyzed
Boron	mg/L	1 (NL)	0.18 (0.16 – 0.23)	13
Formaldehyde[a]	mg/L	0.1 (NL)	0.049 (0.026 – 0.071)	2
NDMA	ng/L	10 (NL)	27 (20 – 32)	14
N-Nitrosodi-n-Propylamine (NDPA)	ng/L	10 (NL)	<2 (<2 – 2.9)	14
Chloropicrin	µg/L	50 (AAL)	3.5	1
2,3,5,6-Tetrachloroterephthalate (DCPA)	mg/L	3.5 (AAL)	0.0001	1

[a] The high formaldehyde concentration was measured with a transferred ozone dose of approximately 18 mg/L, which is higher than the AWTF design transferred ozone dose

4.2.2 CEC Panel

The panel list of CECs measured by the Eurofins Eaton Analytical Liquid Chromatography Tandem Mass Spectrometry (LC-MS-MS) method (92 constituents) was measured monthly in the pilot influent, ozone effluent, and RO permeate. Ozonation consistently reduced the concentrations of many of the CECs to levels below detection (*e.g.*, bisphenol A (BPA) and several of the pharmaceuticals); on average, there were approximately 40 CECs detected in the pilot influent and 26 detected in the ozone effluent. With a few exceptions described below, the RO removed the remaining CECs to below detection. In addition, the AWTF will include UV/AOP, which would be used as an additional barrier to destroy chemicals and pathogens (UV/AOP was not piloted, and therefore no grab samples were collected on UV/AOP effluent). The CEC removals observed across the GWR pilot system are shown in Figure 4.5.

In three of the seven monthly sampling events, there were a few CECs detected in RO permeate (not including previously discussed NDMA). These compounds included erythromycin, caffeine, iohexal, albuterol, carbadox, fluoxetine, and quinolone. In all cases, these compounds were detected in only one sample, and it is likely that several of the detections were actually false positives due to contamination. Specifically, erythromycin and carbadox (both antibiotics) were not detected in either the pilot influent or the ozone effluent, and thus the RO permeate detection from these compounds was excluded from the analysis. For quinoline (a chemical found in cigarettes) and fluoxetine (an antidepressant), the RO permeate values exceeded the ozone effluent value, and it is strongly suspected that this is a false positive as well. The remaining compounds detected in the RO permeate, *i.e.,* caffeine (a simulant), iohexal (a contrast agent), and albuterol (an asthma medication), were detected at concentrations near the detection limit and it is unclear whether or not they are actual values. For all of these compounds, it is important to keep in mind that (1) the concentrations detected were many orders of magnitude

below any demonstrated health related levels, and (2) these compounds have all been shown to be effectively removed by UV/AOP (*i.e.,* exceeding 90% for these compounds). In other words, it is expected that all of these compounds will be below current detection limits in the UV/AOP effluent.

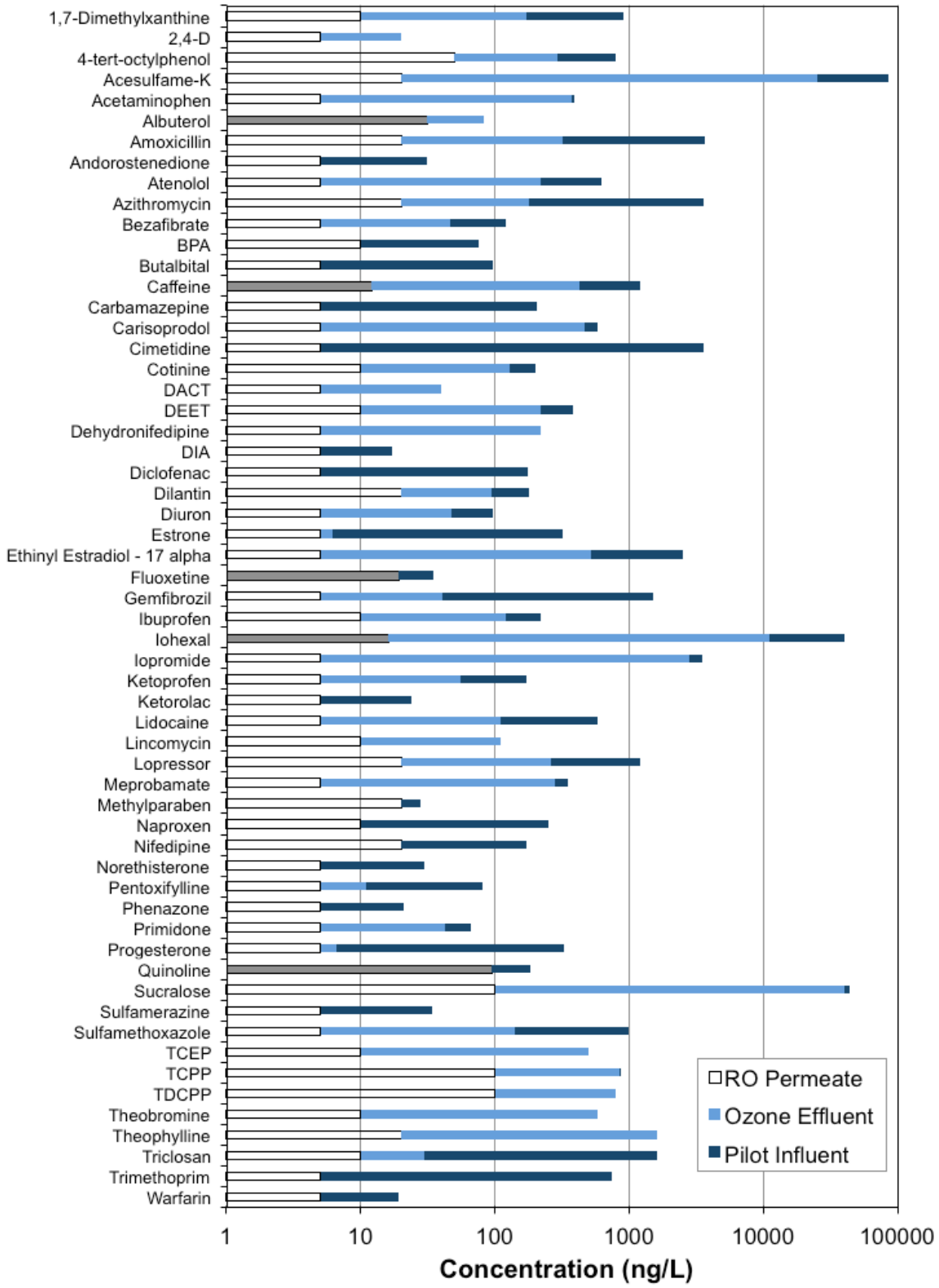


Figure 4.5 – CEC removal demonstrated during GWR pilot testing, through ozonation and reverse osmosis. Unfilled sections indicate results were below detection limit. All values shown are maximum detected values.

4.2.3 Dissolved solids

The concentration of dissolved solids on the feed and permeate side of the RO membrane were measured to determine their removal during the RO process. Select results from this effort are summarized in Table 4.6. The concentration of these dissolved solids in the RO permeate were typically below the detection limit, and thus the removal is often reported as greater than the indicated value. These data show robust removal of dissolved solids through the RO process, including a dramatic reduction in TDS.

Table 4.6 - Removal of select dissolved solids

Constituent	Average Removal[a]
TDS	>98.6%
Chloride	>98.8%
Sulfate[b]	>98.9%
Phosphate	>96.7%
Nitrate	>94.4%
Calcium	>99.1%
Magnesium	>97.8%
Sodium	97.2%
Potassium	>96.3%

[a] Removals calculated from 13 samples events with the exception of nitrate (12 sampling events)
b Sulfate was measured prior to sulfuric acid addition – removals including sulfate from sulfuric acid would be approximately >99.2 to >99.6%

4.2.4 Suspended solids

Aggregate solid parameters (*i.e.,* TSS and turbidity) and an organic parameter that includes solids bound organics (*i.e.,* TOC) were measured to determine removal through the MF system. Solids removal (*e.g.,* TSS and turbidity removal) in groundwater recharge projects is important for RO pretreatment and to avoid plugging of the aquifer. The median TSS and turbidity measured upstream and downstream of the MF system during piloting are shown in Figure 4.6. These data show that the MF system is a robust system for particle removal, and that it can provide an RO feed water low in turbidity. This solids removal correlated with a statistically significant reduction in the median TOC concentration across the MF process from 14 to 11 mg/L (95% confidence).

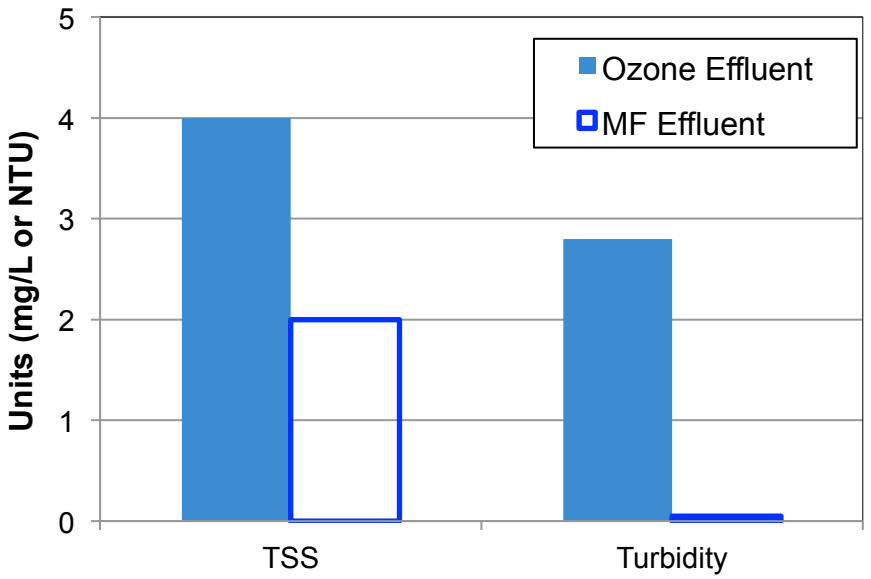


Figure 4.6 - Removal of solids through the MF process (median value shown; median MF effluent turbidity is less than the detection limit [0.05 NTU])

5 Conclusions and Recommendations

5.1 Design Conclusions

The following conclusions and recommendation are made based on the piloting results:

5.1.1 Preozonation conclusions and recommendations:

1. **Need for Preozonation:** Preozonation improved MF run times by a factor in the range of 4 to 8 by reducing membrane fouling. The reduction in fouling allows for a higher MF design flux, which would reduce the size and cost of the MF system. To realize these benefits, preozonation is recommended.
2. **Ozone Control:** Two ozone dose control methods were successfully demonstrated: (1) constant ozone dose with ORP control, and (2) ozone residual ozone dose control. A third control method, UVT control, may provide the best ozone dose control of the three methods; however, further testing would be required, as the UVT equipment tested during piloting fouled too rapidly for use in a control system. Further testing of the UVT control method is recommended at either the pilot-scale demonstration facility or the full-scale facility to determine the benefits of the UVT control method.
3. **Ozone Dose:** An average transferred ozone dose of 9.5 mg/L (10 mg/L applied ozone dose at a transfer efficiency of 95%) provided sufficient preozonation. To provide this level of preozonation, an AWTF average transferred design dose of 9.5 mg/L is recommended. The AWTF maximum and minimum design transferred dose should account for the maximum and minimum design water quality.
4. **Secondary Performance and Ozone:** High TOC and nitrite concentrations in the RTP effluent contributed to the preozonation dose. RTP trickling filter operational changes may be able to reduce the nitrite concentration in the secondary effluent, which could reduce operational costs. If the nitrite concentration were reduced, it may be possible to reduce the design ozone dose and/or operational ozone dose.
5. **Ozone Disinfection:** Preliminary testing showed that disinfection credit might be possible at transferred ozone doses in the range of 15 to 19 mg/L. These doses led to ozone CTs (residual concentration times contact time) in the range of 1 to 2 mg-min/L.
6. **NDMA Formation:** Both pre-chloramination and post-chloramination yielded similar levels of NDMA formation. NDMA formation was about an order of magnitude lower than at West Basin Municipal Water District's Edward C. Little Facility, and it is expected that the NDMA concentration in the final product will be well below the 10 ng/L Notification Level.
7. **Bromate Formation:** Acceptable levels of bromate formation were observed through the ozonation process (maximum 9 micrograms per liter [µg/L], compared to the Maximum Containment Level (MCL) of 10 µg/L). The bromate formed during ozonation was consistently removed by the downstream RO process to levels below the detection limit (*i.e.,* less than 1 µg/L for all samples).
8. **Biologically Active Filtration:** A biological process (*e.g.,* upflow BAF) downstream of preozonation would improve the product water quality, and possibly improve

AWTF operation by reducing the concentration of organics in ozone-BAF effluent, including TOC, NDMA, and contaminants of emerging concern (CECs, also known as chemical of emerging concern and constituents of emerging concern).

9. **High Ozone Doses:** High ozone doses (*e.g.,* an average of 20 mg/L, applied) increased the concentration of TOC and formaldehyde in the RO permeate for the waters tested. These high ozone doses are not recommended on a regular basis for the AWTF, unless a downstream biological process is included downstream of ozone.
10. **Impact on RO Validation Testing:** Preozonation interfered with measurements analogous to those required by the Division of Drinking Water (DDW) during RO membrane integrity testing in the first 20 weeks of operation. Due to this interference, the first 20 weeks of AWTF operation will likely have to be conducted without preozonation. Alternatively, it may be possible to develop an alterative RO membrane integrity test with DDW.

5.1.2 Membrane conclusions and recommendations (MF and RO):

1. **Technology Selection:** The outside-in MF technology dramatically outperformed the inside-out MF technology during piloting. An outside-in MF membrane technology is recommended for the AWTF.
2. **Chloramine Residual:** A chloramine residual (*e.g.,* 2 to 5 mg/L at the RO feed) was important for controlling organic fouling on the MF system. A chloramine residual of 2 to 5 mg/L at the RO feed is recommended at the AWTF.
3. **Design Flux:** The outside-in MF membrane filtered for more than 30 days at a flux of 30 GFD, with a constant applied ozone dose of 10 mg/L during the agricultural wash water shunt. An MF design flux of 30 GFD is recommended for the AWTF.
4. **MF Fouling and Secondary Performance:** The MF membranes experienced spikes in transmembrane pressure (TMP) associated with short-term episodes of degraded secondary effluent water quality (these spikes in TMP corresponded with higher coagulant needs at the Salinas Valley Reclamation Plant [SVRP]); however, they were able to recover without operational intervention.
5. **MF Filtrate Water Quality:** The MF provided suitable RO pretreatment, with 99.8% of the MF effluent turbidity measurements less than 0.05 Nephelometric Turbidity Units (NTU), and all silt density index (SDI) measurements less than 3.
6. **RO Membrane Fouling:** At a recovery of 81%, the RO membrane required only one cleaning over a test period of approximately seven months, including extended periods with elevated phosphate concentrations and a high RO feed pH setpoint (*e.g.,* 6.8). Based on this piloting work, a preliminary AWTF design RO recovery of 81% is recommended; however, further modeling is also recommended to ascertain the effect on the RO recovery of the source waters that were not tested during piloting (*e.g.,* the Blanco Drain).
7. **Need for Phosphate Control**: Elevated phosphate concentrations in the agricultural wash water may foul the RO membrane if the phosphate is not removed through the RTP, or if the formation of phosphate minerals is not controlled at the RO process (*e.g.,* through acid addition). Phosphate removal in the RTP can be enhanced via the addition of ferric chloride through the chemically

enhanced primary treatment (CEPT) facilities, although an application more specific to the AWTF feed water or the agricultural wash water is recommended for the AWTF if this method of phosphate control is pursued (*e.g.,* adding ferric directly to the agricultural wash water).

8. **pH Control:** RO specific flux dropped dramatically when pH adjustment was stopped, and adjustments to pH control affected the RO specific flux (likely due to the formation of calcium phosphate minerals). pH adjustment facilities will be necessary for the AWTF (*e.g.,* sulfuric acid).
9. **RO Cleaning:** An acid clean, without the use of detergents, was sufficient to restore RO permeability after scaling developed. Other cleans may be needed during full-scale operation if RO performance is reduced by foulants not observed during piloting (*e.g.,* biological, silica).
10. **Effect of Agricultural Wash Water:** The agricultural wash water shunt did not discernibly increase the fouling of the MF or RO membranes under the conditions tested.

5.1.3 UV/AOP conclusions and recommendations:

1. **Design UVT water quality:** During pilot testing, the RO permeate UVT was measured at 95% or greater for almost all samples (one sample was measured at 94%, but this is likely due to a high residual chloramine concentration in the RO permeate). Accordingly, a design RO permeate UVT of 95% was assumed for preliminary full-scale UV/AOP design.
3. **1,4-dioxane removal:** 1,4-dioxane concentrations were below the detection limit in all RO permeate samples, and it was only detected in 4 of 11 secondary effluent samples (maximum concentration of 1.2 µg/L in the secondary effluent, whereas the notification level [NL] and the detection limit are both 1 µg/L). The UV/AOP system will be designed to achieve at least 0.5-log removal of 1,4-dioxane (*i.e.,* 68.4% removal), and thus the concentration of 1,4-dixoxane in the product water is expected to be consistently below the NL. The full-scale AWTF UV/AOP system will be challenge tested (by spiking 1,4-dioxane) during start-up to demonstrate at least 0.5-log removal of 1,4-dioxane.

5.1.4 Water quality conclusions and recommendations:

1. **Product Water Quality:** Pilot water quality sampling results indicate that the AWTF product water is expected to meet all applicable regulations in the California Water Recycling Criteria, including the groundwater replenishment regulations for subsurface application, MCLs, NLs, and Archived Advisory Levels (AALs). The RO permeate met all requirements, except for NDMA; the UV/AOP system will be designed to meet the 1,4-dioxane removal criteria and to reduce NDMA by at least 90%, which is expected to reduce the NDMA to an acceptable concentration.
2. **CEC Reduction:** Ozone and RO removed all but a few CECs to levels below their detection limits. Of the CECs that were not removed to below their detection limits, all were measured at concentrations well below any limits linked to health concerns and most will be well removed through the UV/AOP system.

3. **DBP Formation:** DBPs (*e.g.,* NDMA and bromate) were formed through ozonation and chloramination, but at levels that would be adequately addressed by the combination of RO and AOP. DBPs are not expected to be an issue for the final product water.
4. **Additional RO Modeling:** RO modeling that takes into account (a) the blending of all source waters in the RTP collection system, (b) removal of select constituents through the RTP, and (c) removal of selected constituents through upstream AWTF processes is recommended to assess the fouling potential of the source waters.
5. **Need for Ozone:** Ozone provides benefits to the water quality, including providing a barrier to many synthetic organic compounds.
6. **Need for RO membrane:** RO treatment is needed for removal of several constituents, and is the backbone of the AWTF treatment train.
7. **Need for UV/AOP**: AOP is needed to address NDMA and provide an additional barrier against CECs (such as 1,4-dioxane) and pathogens.
8. **Source Water Variability:** Based on the source water monitoring program, it is expected that the proposed treatment train will be sufficient to meet all product water quality requirements for all of the proposed source waters.

5.1.5 Other design considerations:

7. **Biologically Active Filtration**: While BAF design criteria may be estimated, pilot testing is recommended prior to full-scale implementation to determine site-specific design criteria. Additionally, pilot testing would also be recommended to determine the effect of a BAF system on the performance of the downstream MF system, if the BAF were to be included in the AWTF.
8. **UV/AOP impact on organics:** Some UV/AOP systems downstream of RO in water reuse applications increase the concentration of specific organic constituents (*e.g.,* formaldehyde). UV/AOP pilot-scale testing should be considered to quantify the impact of UV/AOP on organics for this water.
9. **UV/AOP pathogen and chemical removal:** Chemical (*e.g.,* 1,4-dioxane, NDMA) and pathogen removal varies between water reuse projects. The full-scale AWTF design can account for this variation by selecting conservative design criteria. Alternatively, additional testing (*e.g.*, collimated bench-scale testing) offers a potential for a more aggressive full-scale design (*i.e.,* a less conservative design).
10. **Additional Source Waters in the RTP collection system:** The addition of new source waters to the RTP collection system may impact the RTP and the AWTF design in ways that were not discussed in the Source Water and Pilot Water Quality Report (*e.g.*, nitrite formation, RO recovery)(Trussell Technologies, 2014d). RTP and AWTF modeling and demonstration-scale testing is recommended to reduce uncertainty during AWTF design and start-up.
11. **Additional Source Waters directly to the AWTF**: If any of the new source waters were brought directly to the AWTF, then additional testing would be required to determine if there were additional pre-treatment needs.
12. **Long-term MF testing:** Several flux conditions were tested during the piloting; if additional piloting were conducted, it would be beneficial to conduct long-term

testing of the 30 GFD design flux to better characterize seasonal water quality impacts.

6 Reference

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7 Appendix

The following attachments are included in the appendix:

- June Pilot Water Quality Constituent sample frequency table
- Pilot Water Quality Sampling Campaign Summary sheets

Constituents analyzed during reduced sampling events (6/10 through 6/24): M is monthly and W is weekly

Parameter	RTP Raw	Pilot Inf	Ozone Eff.	MF Filtrate	RO Permeate	MF Backwash	RO Conc.
General Water Quality Parameters							
Alkalinity		M		M	M		
Conductivity		M		M	M		
Hardness - Total							
pH							
Temperature							
Total Dissolved Solids (TDS)				M	M		
Total Suspended Solids (TSS)							
Turbidity							
Dissolved Oxygen (DO)							
Oxidation/Reduction Potential (ORP)							
Biochemical Oxygen Demand (BOD)							
Chemical Oxygen Demand (COD)							
Biodegradable dissolved organic carbon (BDOC)							
Dissolved organic carbon (DOC)							
Total Organic Carbon (TOC)				W	W		
UV-254 Absorbance				W	W		
Inorganics							
Ammonia		W			W		
Nitrate		W			W		
Nitrite		W			W		
Total Kjeldahl Nitrogen (TKN)		W			W		
Aluminum				M	M		
Arsenic				M	M		
Barium				M	M		
Boron				M	M		
Bromide				M	M		
Calcium				M	M		
Chloride				M	M		
Cyanide				M	M		
Fluoride				M	M		
Iron				M	M		
Magnesium				M	M		
Manganese				M	M		
Mercury				M	M		
Molybdenum				M	M		
Nickel				M	M		
Phosphate (orthophosphate)				M	M		
Potassium				M	M		
Selenium				M	M		
Silica				M	M		
Sodium				M	M		
Strontium				M	M		
Sulfate				M	M		
Sulfide				M	M		
DBPs							
Total THMs and HAAs							
Bromate							
Nitrosamines		M	M	M	M		
Microbiological Parameters							
Total coliform and *E. Coli*					W		
Cryptosporidium and *Giardia*							
Synthetic Organic Contaminants		M	M		M		
CECs (See Table 8)							
1,4-Dioxane							
Select pesticides (EPA 505 and 525.2)							

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
General Water Quality Parameters														
Alkalinity	--	SM 2330B	mg/L as $CaCO_3$	--	306 (260-342)	13 / 13			298 (257-344)	13 / 13	10 (8-26)	13 / 13	875 (402-1289)	12 / 12
Ammonia	--	SM 4500NH3F,G	mg/L as N	--	32.1 (25.5-45.1)	26 / 26	29.9 (22.5-41.1)	12 / 12	29.5 (22.4-41.5)	12 / 12	1.4 (0.9-2.1)	26 / 26	125 (122-177)	6 / 6
Biochemical Oxygen Demand, 5-day @ 20ºC (BOD)	--	SM 5210B	mg/L	-	91 (52-119)	12 / 12	32 (7-116)	12 / 12	11 (<2-104)	11 / 12	<2 (<2-4)	3 / 12	22 (11-226)	7 / 7
Bromide	--	EPA 300.0	mg/L	--	0.2 (0.1-0.3)	12 / 12	0.2 (0.1-0.2)	12 / 12	0.2 (0.1-0.2)	13 / 13	<0.1	0 / 13	0.6 (0.5-1.2)	6 / 6
Calcium	--	EPA 200.7	mg/L	--	58 (51-65)	9 / 9			58 (56-71)	13 / 13	<0.5 (<0.5-1)	1 / 13	254 (234-291)	11 / 11
Chemical Oxygen Demand (COD)	--	EPA 410.4/Hach 8000	mg/L	--	95 (36-174)	12 / 12	79 (22-134)	12 / 12	73 (1-111)	12 / 12	3.5 (<2-6)	1 / 12	259 (<10-462)	11 / 12
Chloride	sMCL	EPA 300.0	mg/L	250	230 (203-266)	3 / 3			234 (134-266)	13 / 13	3 (<1-6)	12 / 13	1007 (962-1030)	6 / 6
Color	sMCL	SM 2120B	units	15							<3	0 / 1		
Conductivity (Specific Conductance)	sMCL	SM 2510B	µS/cm	900	1608 (1490-1717)	13 / 13			1630 (1543-1763)	13 / 13	38 (32-46)	13 / 13	6250 (5580-7200)	12 / 12
Copper	sMCL, EPA PP	EPA 200.8	mg/L	1.3/1.0							<0.004	0 / 1		
Dissolved organic carbon (DOC)	--	SM 5310C	mg/L	--	13 (11-14)	6 / 6	14 (13-16)	6 / 6					<3	0 / 1
Biodegradable Disssolved Organic Carbon	--	Allgeier, 1996	mg/L	--	<3	0 / 6	<6 (<6-6.4)	1 / 6			0.46 (<0.3-1)	5 / 6	<15	0 / 6
Dissolved oxygen (DO)	--	Field/SM4500-O	mg/L	--	4.89 (3.82-6.2)	20 / 20	>20 (15.7-38)	17 / 23						
Foaming Agents (MBAS)	sMCL	SM 5540C	mg/L	0.5							<0.05	0 / 1		
Iron	sMCL	EPA 200.7	mg/L	0.3	0.378 (0.157-0.931)	12 / 12			0.055 (0.042-0.082)	13 / 13	<0.01	0 / 13	0.25 (0.183-0.3)	6 / 6
Magnesium	--	EPA 200.7	mg/L	--	22 (10-26)	11 / 11			22 (20-28)	13 / 13	<0.5	0 / 13	100 (89-125)	11 / 11
Manganese	sMCL, NL	EPA 200.8	mg/L	0.5/0.5	0.052 (0.043-0.078)	12 / 12			0.04 (0.032-0.052)	13 / 13	<0.01 (<0.01-0.01)	1 / 13	0.163 (0.15-0.206)	6 / 6
Nitrate	pMCL	EPA 300.0	mg/L as NO_3	45	19.9 (<1-47.0)	25 / 26	25.9 (5.8-55)	12 / 12	26.7 (5.3-57.0)	12 / 12	<1 (<1-3.1)	17 / 26	118 (39-238)	6 / 6
Nitrite	pMCL	EPA 300.0	mg-N/L	1	1.3 (0.6-2.8)	26 / 26	<0.1 (<0.1-0.3)	9 / 25	<0.1 (<0.1-0.2)	3 / 12	<0.1 (<0.1-0.4)	20 / 26	<0.1	0 / 6
Nitrate+Nitrite	--	EPA 300.0	mg-N/L	--	5.6 (0.8-12.1)	26 / 26	7 (1.5-12.4)	11 / 11	7.4 (1.4-13.7)	12 / 12	0.6 (0.1-1.6)	23 / 23	46.5 (8.9-60.7)	5 / 5
Odor-Threshold	sMCL	SM 2150B	units	3							5	1 / 1		
Oxidation Reduction Potential (ORP)	--	Field	mV	--	270	1 / 1	343 (162-394)	13 / 13	321 (256-448)	13 / 13	586 (402-645)	12 / 12		
pH (field)		Field	pH		7.24 (7.16-7.38)	7 / 7	7	1 / 1	7.31 (7.28-7.43)	9 / 9	5.22 (5.04-6.05)	9 / 9	6.92 (6.6-7.58)	8 / 8
pH (laboratory)	--	SM 2330B/SM4500H+B	pH	--	7.51 (7.42-7.8)	3 / 3	6.88	1 / 1	7.5 (6.9-7.7)	12 / 12	5.6 (5.3-6.87)	11 / 11	7.2 (6.8-7.6)	9 / 9
Phosphate	--	EPA 300.0	mg/L as P	--	3.05 (0.3-14.0)	12 / 12			3.1 (1.63-14.00)	13 / 13	<0.1 (<0.1-0.1)	1 / 13	13.2 (11.4-22.2)	6 / 6
Potassium	--	EPA 200.7	mg/L	--	20 (19-21)	3 / 3			22 (19-24)	13 / 13	0.6 (<0.5-3.2)	12 / 13	98 (82-112)	6 / 6
Silica	--	EPA 200.7	mg/L	--	39 (38-40)	3 / 3			41 (38-45)	13 / 13	<0.5 (<0.5-1)	4 / 13	175 (167-191)	6 / 6
Silver	sMCL, EPA PP	EPA 200.8	mg/L	0.1							<0.01	0 / 1		
Sodium	--	EPA 200.7	mg/L	--	152 (149-173)	3 / 3			178 (129-199)	13 / 13	5 (4-6)	13 / 13	744 (532-880)	6 / 6
Sulfate	sMCL	EPA 300.0	mg/L	250	90 (84-94)	3 / 3			92 (88-103)	13 / 13	<1 (<1-1)	1 / 13	918 (619-1098)	6 / 6

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
Sulfide	--	SM4500SD	mg/L	--					*<0.05 (<0.05-0.063)*	1 / 13	*<0.05*	0 / 13	*<0.05*	0 / 6
Temperature	--	Field/SM 2550B	°C	--	21.6 (9.9-23.5)	15 / 15	19.9 (18.6-21.4)	3 / 3	20.6 (19.4-22.5)	3 / 3	22.2 (19.9-24.2)	15 / 15	21.6 (20.6-22.5)	2 / 2
Total Dissolved Solids (TDS)	sMCL	EPA 160.1/SM 2540C	mg/L	500	808 (757-897)	12 / 12			828 (794-931)	13 / 13	*<10 (<10-26)*	4 / 13	3797 (3230-4766)	12 / 12
Total Hardness	--	SM 2340B	mg/L as $CaCO_3$	--	235 (169-269)	12 / 12			239 (232-293)	12 / 12	*<10 (<10-2)*	1 / 4	1070 (951-1241)	12 / 12
Total Kjeldahl Nitrogen (TKN)	--	EPA 351.2/SM 4500B,C	mg/L	--	33.4 (26.6-42.2)	26 / 26	32 (25.5-42.8)	12 / 12	30.9 (20.1-42.1)	12 / 12	1.7 (1.1-2.8)	26 / 26	133 (121-177)	6 / 6
Total Nitrogen	--	calculation	mg/L	--	40.9 (30.9-47.3)	26 / 26	40.8 (33.1-47.5)	11 / 11	37.9 (29.5-46.7)	12 / 12	2.1 (1.5-2.9)	25 / 25	171.7 (141-196.9)	6 / 6
Total Organic Carbon (TOC)	--	SM 5310C	mg/L	--	14 (12-18)	25 / 25	14 (12-16)	25 / 25	11 (10-13)	28 / 28	0.34 (0.27-0.58)	33 / 33	52 (46-55)	11 / 11
Total Phosphorus as P	--	SM 4500-PE/EPA 365.1	mg/L	--							*<0.02*	0 / 1		
Dissolved Phosphorus	--	SM 4500-PE/EPA 365.1	mg/L	--							*<0.02*	0 / 1		
Total Suspended Solids (TSS)	--	SM 2540D	mg/L	--	5.5 (*<2*-9)	11 / 12	4 (2-10)	12 / 12	*<2*	0 / 12	*<2*	0 / 1		
Turbidity	sMCL	EPA 180.1	NTU	5	2.9 (1.6-5.7)	25 / 25	2.8 (1.2-4.7)	25 / 25	*<0.05 (<0.05-0.1)*	20 / 25	*<0.05 (<0.05-0.1)*	2 / 25	0.2 (0.1-6.2)	25 / 25
UV-254 Absorbance	--	SM 5910	cm^{-1}	--	0.204 (0.172-0.226)	25 / 25	0.14 (0.11-0.196)	25 / 25	0.131 (0.105-0.177)	26 / 26	0.012 (0.003-0.027)	26 / 26	0.541 (0.232-0.715)	12 / 12
UV Transmittance	--	calculation	%	--	63% (59%-67%)	25 / 25	72% (64%-78%)	25 / 25	74% (67%-79%)	26 / 26	97% (94%-99%)	26 / 26	29% (19%-59%)	12 / 12
Zinc	sMCL, EPA PP	EPA 200.8	mg/L	5							*<0.01*	0 / 1		
Microbiological Quality														
Cryptosporidium	--	EPA 1623	oocysts/L	TT	0.35 (*<0.09*-0.9)	4 / 6	2.7 (0.3-23.3)	6 / 6	*<0.09*	0 / 6				
Giardia	--	EPA 1623	cysts/L	-	0.15 (*<0.09*-1.1)	3 / 6	0.2 (*<0.09*-4.4)	4 / 6	*<0.09*	0 / 6				
Total coliform[1]	pMCL	SM 9223B	MPN/100 mL	TT	$2.8x10^5$ ($2.4x10^3$-$1.6x10^6$)	21 / 22	$6.3x10^2$ ($5.5x10^1$-$3.1x10^3$)	22 / 25	*<1*	0 / 25	*<1*	0 / 26		
E. coli[1]	pMCL	SM 9223B	MPN/100 mL	TT	$6.0x10^4$ ($4.9x10^2$-$3.3x10^5$)	22 / 22	$2.7x10^1$ (*<1*-$5.5x10^2$)	20 / 25	*<1*	0 / 25	*<1*	0 / 26		
DDW Drinking Water Maximum Contaminant Levels (MCLs) - primary MCLs (pMCLs) and secondary MCLs (sMCLs)														
MCLs - Inorganics														
Aluminum	pMCL, sMCL, EPA CCL	EPA 200.8	mg/L	1/0.2	0.078 (0.021-0.75)	3 / 3			*<0.01 (<0.01-0.105)*	6 / 13	*<0.01 (<0.01-0.045)*	2 / 13	0.047 (0.011-0.556)	6 / 6
Antimony	pMCL, EPA PP	EPA 200.8	mg/L	0.006							*<0.001*	0 / 1		
Arsenic	pMCL, EPA PP	EPA 200.8	mg/L	0.01	0.003 (0.002-0.045)	12 / 12			0.003 (0.002-0.003)	13 / 13	*<0.001 (<0.001-0.002)*	7 / 13	0.009 (0.008-0.012)	6 / 6
Asbestos	pMCL, EPA PP	EPA 100.2	MFL	7							*<0.2*	0 / 1		
Barium	pMCL	EPA 200.8	mg/L	1	0.011 (0.003-0.029)	3 / 3			*<0.01 (<0.01-0.04)*	1 / 13	*<0.01*	0 / 13	0.033 (0.017-0.039)	6 / 6
Beryllium	pMCL, EPA PP	EPA 200.8	mg/L	0.004							*<0.001*	0 / 1		
Cadmium	pMCL, EPA PP	EPA 200.8	mg/L	0.005							*<0.0005*	0 / 1		
Chromium	pMCL, EPA PP, UCMR 3	EPA 200.8	mg/L	0.05							0.005	1 / 1		
Cyanide	pMCL, EPA PP	SM 4500CN-F	mg/L	0.15	0.022 (*<0.005*-0.054)	10 / 12			0.014 (*<0.005*-0.095)	11 / 13	*<0.005 (<0.005-0.007)*	2 / 13	0.056 (0.006-0.143)	6 / 6
Fluoride	pMCL	SM 4500F-C/EPA 300.0	mg/L	2	0.6 (0.5-0.8)	3 / 3			0.8 (0.6-1.1)	13 / 13	*<0.1 (<0.1-0.2)*	1 / 13	3.5 (3.1-3.8)	6 / 6
Mercury	pMCL, EPA PP	EPA 245.1	mg/L	0.002	*<0.0002*	0 / 1			*<0.0002*	0 / 13	*<0.0002*	0 / 13	0.00034 (*<0.0002*-0.00051)	5 / 6

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
Nickel	pMCL, EPA PP	EPA 200.8	mg/L	0.1	*<0.01*	**0 / 3**			*<0.01*	**0 / 13**	*<0.01*	**0 / 13**	**0.0205 (0.016-0.023)**	**6 / 6**
Perchlorate	pMCL, UCMR 1	EPA 314	mg/L	0.006							*<0.002*	**0 / 1**		
Selenium	pMCL, EPA PP	EPA 200.8	mg/L	0.1	**0.003 (0.002-0.003)**	**3 / 3**			**0.004 (0.003-0.006)**	**13 / 13**	*<0.002 (<0.002-**0.01**)*	**7 / 13**	**0.013 (0.01-0.017)**	**6 / 6**
Thallium	pMCL, EPA PP	EPA 200.8	mg/L	0.002							*<0.001*	**0 / 1**		
MCLs - Volatile Organic Chemicals (VOCs)														
1,1-Dichloroethane	pMCL, EPA PP, UCMR 3	EPA 524.2	mg/L	0.005							*<0.0005*	**0 / 1**		
1,1-Dichloroethylene	pMCL, EPA PP	EPA 524.2	mg/L	0.006							*<0.0005*	**0 / 1**		
1,1,1-Trichloroethane	pMCL, EPA PP	EPA 524.2	mg/L	0.2							*<0.0005*	**0 / 1**		
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	pMCL	EPA 524.2	mg/L	1.2							*<0.0005*	**0 / 1**		
1,1,2-Trichloroethane	pMCL, EPA PP	EPA 524.2	mg/L	0.005							*<0.0005*	**0 / 1**		
1,1,2,2-Tetrachloroethane	pMCL, EPA PP	EPA 524.2	mg/L	0.001							*<0.0005*	**0 / 1**		
1,2-Dichlorobenzene	pMCL, EPA PP	EPA 524.2	mg/L	0.6							*<0.0005*	**0 / 1**		
1,2-Dichloroethane	pMCL, EPA PP	EPA 524.2	mg/L	0.005							*<0.0005*	**0 / 1**		
1,2-Dichloropropane	pMCL, EPA PP	EPA 524.2	mg/L	0.005							*<0.0005*	**0 / 1**		
1,2,4-Trichlorobenzene	pMCL, EPA PP	EPA 524.2	mg/L	0.005							*<0.0005*	**0 / 1**		
1,3-Dichloropropene	pMCL, PoLI, EPA PP	EPA 524.2	mg/L	0.0005							*<0.0005*	**0 / 1**		
1,4-Dichlorobenzene	pMCL, EPA PP	EPA 524.2	mg/L	0.005							*<0.0005*	**0 / 1**		
Benzene	pMCL, EPA PP	EPA 524.2	mg/L	0.001							*<0.0005*	**0 / 1**		
Carbon Tetrachloride	pMCL, EPA PP	EPA 524.2	mg/L	0.0005							*<0.0005*	**0 / 1**		
cis-1,2-Dichloroethylene	pMCL	EPA 524.2	mg/L	0.006							*<0.0005*	**0 / 1**		
Dichloromethane	pMCL, EPA PP	EPA 524.2	mg/L	0.005							*<0.0005*	**0 / 1**		
Ethylbenzene	pMCL, EPA PP	EPA 524.2	mg/L	0.3							*<0.0005*	**0 / 1**		
Methyl-tert-butyl ether (MTBE)	pMCL, sMCL, UCMR 1	EPA 524.2	mg/L	0.013/0.005							*<0.0005*	**0 / 1**		
Monochlorobenzene	pMCL	EPA 524.2	mg/L	0.07							*<0.0005*	**0 / 1**		
Styrene	pMCL	EPA 524.2	mg/L	0.1							*<0.0005*	**0 / 1**		
Tetrachloroethylene	pMCL, EPA PP	EPA 524.2	mg/L	0.005							*<0.0005*	**0 / 1**		
Toluene	pMCL, EPA PP	EPA 524.2	mg/L	0.15							*<0.0005*	**0 / 1**		
trans-1,2-Dichloroethylene	pMCL	EPA 524.2	mg/L	0.01							*<0.0005*	**0 / 1**		
Trichloroethylene	pMCL, EPA PP	EPA 524.2	mg/L	0.005							*<0.0005*	**0 / 1**		
Trichlorofluoromethane	pMCL	EPA 524.2	mg/L	0.15							*<0.0005*	**0 / 1**		
Vinyl Chloride	pMCL, EPA PP	EPA 524.2	mg/L	0.0005							*<0.0003*	**0 / 1**		
Xylenes	pMCL	EPA 524.2	mg/L	1.75							*<0.0005*	**0 / 1**		
MCLs - Non-Volatile Synthetic Organic Chemicals (SOCs)														
2,4-D	pMCL	EPA 515.4	mg/L	0.07							*<0.0001*	**0 / 1**		
Alachlor	pMCL, UCMR 2	EPA 505	mg/L	0.002	*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**			*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**
Atrazine	pMCL	EPA 525.2	mg/L	0.001	*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**			*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**
Bentazon	pMCL	EPA 515.4	mg/L	0.018							*<0.0005*	**0 / 1**		
Benzo(a)pyrene	pMCL, EPA PP	EPA 525.2	mg/L	0.0002	*<0.005*	**0 / 6**	*<0.00002*	**0 / 6**			*<0.00002*	**0 / 6**	*<0.00002*	**0 / 6**
Carbofuran	pMCL	EPA 531.2	mg/L	0.018							*<0.0005*	**0 / 1**		
Chlordane	pMCL, EPA PP	EPA 505	mg/L	0.0001	*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**			*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**
Dalapon	pMCL	EPA 515.4	mg/L	0.2							*<0.001*	**0 / 1**		
Di(2-ethylhexyl)adipate	pMCL	EPA 525.2	mg/L	0.4	*<0.0006*	**0 / 6**	*<0.0006*	**0 / 6**			*<0.0006*	**0 / 6**	*<0.0006*	**0 / 6**
Di(2-ethylhexyl)phthalate	pMCL, EPA PP	EPA 525.2	mg/L	0.004	**0.0012 (*<0.0006*-0.078)**	**5 / 6**	**0.00082 (*<0.0006*-0.0014)**	**5 / 6**			*<0.0006*	**0 / 6**	*<0.0006*	**0 / 6**
Di(2-ethylhexyl)phthalate	pMCL, EPA PP	EPA 8720C	mg/L	0.004							*<0.004*	**0 / 1**		

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
Dibromochloropropane	pMCL	EPA 551.1	mg/L	0.0002							*<0.00001*	**0 / 1**		
Dinoseb	pMCL	EPA 515.4	mg/L	0.007							*<0.0002*	**0 / 1**		
Diquat	pMCL, PoLI	EPA 549.2	mg/L	0.02							*<0.0004*	**0 / 1**		
Endothall	pMCL	EPA 548.1	mg/L	0.1							*<0.005*	**0 / 1**		
Endrin	pMCL	EPA 505	mg/L	0.002	*<0.00001*	**0 / 6**	*<0.00001*	**0 / 6**			*<0.00001*	**0 / 6**	*<0.00001*	**0 / 6**
Ethylene Dibromide	pMCL	EPA 551.1	mg/L	0.00005							*<0.00001*	**0 / 1**		
Glyphosate	pMCL, PoLI	EPA 547	mg/L	0.7							*<0.006*	**0 / 1**		
Heptachlor	pMCL, EPA PP	EPA 505	mg/L	0.00001	*<0.00001*	**0 / 6**	*<0.00001*	**0 / 6**			*<0.00001*	**0 / 6**	*<0.00001*	**0 / 6**
Heptachlor Epoxide	pMCL, EPA PP	EPA 505	mg/L	0.00001	*<0.00001*	**0 / 6**	*<0.00001*	**0 / 6**			*<0.00001*	**0 / 6**	*<0.00001*	**0 / 6**
Hexachlorobenzene	pMCL	EPA 525.2	mg/L	0.001	*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**			*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**
Hexachlorocyclopentadiene	pMCL	EPA 525.2	mg/L	0.05	*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**			*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**
Lindane	pMCL, PoLI	EPA 505	mg/L	0.0002	*<0.00001*	**0 / 6**	*<0.00001*	**0 / 6**			*<0.00001*	**0 / 6**	*<0.00001*	**0 / 6**
Methoxychlor	pMCL	EPA 505	mg/L	0.03	*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**			*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**
Molinate	pMCL, UCMR 1	EPA 525.2	mg/L	0.02	*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**			*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**
Oxamyl	pMCL, PoLI	EPA 531.2	mg/L	0.05							*<0.001*	**0 / 1**		
Pentachlorophenol	pMCL, EPA PP	EPA 525.2	mg/L	0.001	*<0.00004*	**0 / 6**	*<0.001*	**0 / 6**			*<0.001*	**0 / 6**	*<0.001*	**0 / 6**
Picloram	pMCL	EPA 515.4	mg/L	0.001							*< 0.0001*	**0 / 1**		
Polychlorinated Biphenyls	pMCL	EPA 505	mg/L	0.0005	*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**			*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**
Simazine	pMCL, PoLI	EPA 525.2	mg/L	0.004	*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**			*<0.00005*	**0 / 6**	*<0.00005*	**0 / 6**
Thiobencarb	pMCL, sMCL, PoLI	EPA 525.2	mg/L	0.07/0.001	*<0.0002*	**0 / 6**	*<0.0002*	**0 / 6**			*<0.0002*	**0 / 6**	*<0.0002*	**0 / 6**
Toxaphene	pMCL, EPA PP	EPA 505	mg/L	0.003	*<0.0005*	**0 / 6**	*<0.0005*	**0 / 6**			*<0.0005*	**0 / 6**	*<0.0005*	**0 / 6**
2,3,7,8-TCDD (Dioxin)	pMCL, EPA PP	EPA 1613	mg/L	3.00E-08							*<1.96E-9*	**0 / 1**		
2,4,5-TP (Silvex)	pMCL	EPA 515.4	mg/L	0.05							*<0.0002*	**0 / 1**		
MCLs - Radionuclides														
Gross Alpha Particle (excluding radon and uranium)	pMCL	EPA 900.0	pCi/L	15							**3**	**1 / 1**		
Beta/photon emitters (K40 adjusted)	pMCL	EPA 900.0	pCi/L	50							< 2.51	**0 / 1**		
Radium-226	pMCL	EPA 903.1	pCi/L	5 (Combined)							**0.298±0.327**	**1 / 1**		
Radium-228	pMCL	EPA 904.0	pCi/L								*<0.78±0.395*	**0 / 1**		
Strontium-90	pMCL	EPA 905.0	pCi/L	8							*<0.589±0.268*	**0 / 1**		
Tritium	pMCL	EPA 906.0	pCi/L	20,000							*<216±125*	**0 / 1**		
MCLs - Disinfection By-Products (DPBs)														
Total trihalomethanes (TTHM)	pMCL	EPA 551.1	mg/L	0.08	**0.00053 (*<0.0005*-0.002)**	**7 / 12**					**0.0019 (0.00068-0.005)**	**12 / 12**	**0.012 (0.0037-0.039)**	**6 / 6**
Total Haloacetic acids (HAAs)	pMCL	SM6251B	mg/L	0.06	**0.0042 (*<0.002*-0.0089)**	**10 / 12**					*<0.002*	**0 / 12**	**0.094 (0.063-0.11)**	**6 / 6**
Trichloroacetic acid	-	SM6251B	mg/L	--	**0.0037 (0.0013-0.0069)**	**12 / 12**					*<0.001*	**0 / 12**	**0.025 (0.012-0.036)**	**6 / 6**
Dichloroacetic acid	-	SM6251B	mg/L	--	*<0.001 (<0.001*-0.002*)*	**3 / 12**					*<0.001*	**0 / 12**	**0.044 (0.026-0.058)**	**6 / 6**
Bromate	pMCL	EPA 317	mg/L	0.01	*<0.001*	**0 / 12**	**0.0034 (*<0.001*-0.009)**	**9 / 12**			*<0.001*	**0 / 12**	**0.0053 (*<0.001*-0.011)**	**4 / 6**
Chlorite	pMCL	EPA 300.1	mg/L	1							*<0.01*	**0 / 1**		
DDW Drinking Water Notification Levels (NLs)														
Boron	NL	EPA 200.7	mg/L	1	**0.29 (0.29-0.3)**	**3 / 3**			**0.29 (0.27-0.38)**	**13 / 13**	**0.18 (0.16-0.23)**	**13 / 13**	**0.63 (0.58-0.87)**	**6 / 6**
n-Butylbenzene	NL	EPA 524.2	mg/L	0.26							*<0.0005*	**0 / 1**		
sec-Butylbenzene	NL, EPA CCL	EPA 524.2	mg/L	0.26							*<0.0005*	**0 / 1**		
tert-Butylbenzene	NL	EPA 524.2	mg/L	0.26							*<0.0005*	**0 / 1**		

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
Carbon disulfide	NL	EPA 524.2	mg/L	0.16							<0.0005	0 / 1		
2-Chlorotoluene	NL	EPA 524.2	mg/L	0.14							<0.0005	0 / 1		
4-Chlorotoluene	NL	EPA 524.2	mg/L	0.14							<0.0005	0 / 1		
Diazinon	NL, UCMR 1, PoLI	EPA 525.2	mg/L	0.0012	<0.0001	0 / 6	<0.0001	0 / 6			<0.0001	0 / 6	<0.0001	0 / 6
Dichlorodifluoromethane (Freon 12)	NL	EPA 524.2	mg/L	1	<0.0005	0 / 1								
1,4-Dioxane	NL, UCMR 3	EPA 522	mg/L	0.001	<0.001	0 / 1	<0.001	0 / 6			<0.001	0 / 6	0.0032 (0.0029-0.0042)	6 / 6
Ethylene glycol	NL	EPA 8270C	mg/L	14							<0.04	0 / 1		
Formaldehyde	NL, EPA CCL	EPA 556	mg/L	0.1							0.026	1 / 1		
HMX (or Octogen)	NL	LC-MS-MS	mg/L	0.35							<0.0001	0 / 1		
Isopropylbenzene	NL	EPA 524.2	mg/L	0.77							<0.0005	0 / 1		
Methyl isobutyl ketone (MIBK)	NL	EPA 524.2	mg/L	0.12							<0.005	0 / 1		
Naphthalene	NL	EPA 524.2	mg/L	0.017							<0.0005	0 / 1		
N-Nitrosodiethyamine (NDEA)	NL, UCMR 2	EPA 521	ng/L	10	2.3 (<2-4.4)	8 / 10	<2 (<2-2.7)	4 / 14	<2 (<2-3)	5 / 14	<2	0 / 14	5.4 (<2-7.1)	4 / 6
N-Nitrosodimethylamine (NDMA)	NL, EPA PP, UCMR 2	EPA 521	ng/L	10	8.1 (4.1-17)	11 / 11	41 (27-60)	14 / 14	49 (34-77)	14 / 14	27 (20-32)	14 / 14	120 (84-150)	6 / 6
N-Nitrosodi-n-propylamine (NDPA)	NL, EPA PP, UCMR 2	EPA 521	ng/L	10	<2 (<2-76)	3 / 10	<2 (<2-66)	4 / 14	<2 (<2-78)	6 / 14	<2 (<2-2.9)	1 / 14	<2 (<2-19)	2 / 6
Propachlor	NL	EPA 525.2	mg/L	0.09	<0.00005	0 / 6	<0.00005	0 / 6			<0.00005	0 / 6	<0.00005	0 / 6
n-Propylbenzene	NL	EPA 524.2	mg/L	0.26							<0.0005	0 / 1		
RDX (Hexahydro-1,3,5-trinitro-1,3,5-tr	NL, UCMR 1&2	LC-MS-MS	mg/L	0.0003							<0.0001	0 / 1		
Tertiary butyl alcohol (TBA)	NL	EPA 524.2m	mg/L	0.012							<0.002	0 / 1		
1,2,3-Trichloropropane (1,2,3-TCP)	NL	EPA 524.2m	mg/L	5.00E-06							<0.0005	0 / 1		
1,2,4-Trimethylbenzene	NL, EPA PP	EPA 524.2	mg/L	0.33							<0.0005	0 / 1		
1,3,5-Trimethylbenzene	NL	EPA 524.2	mg/L	0.33							<0.0005	0 / 1		
2,4,6-Trinitrotoluene (TNT)	NL, UCMR 2	LC-MS-MS	mg/L	0.001							<0.0001	0 / 1		
DDW Drinking Water Archived Advisory Levels (aNLs)														
Aldicarb	aNL	EPA 531.2	mg/L	0.007							<0.0005	0 / 1		
Aldrin	aNL	EPA 505	mg/L	0.000002	<0.00001	0 / 6	<0.00001	0 / 6			<0.00001	0 / 6	<0.00001	0 / 6
Baygon	aNL	EPA 531.2	mg/L	0.03							<0.0005	0 / 1		
alpha-BHC	aNL	EPA 8081A	mg/L	0.01*/ 0.000015							<0.00005	0 / 1		
beta-BHC	aNL	EPA 8081A	mg/L	0.05*/ 0.000025							<0.00005	0 / 1		
Captan	NL, EPA CCL, Pol	EPA 8081/8082	mg/L	0.015							<0.00005	0 / 1		
Carbaryl	aNL, PoLI	EPA 531.2	mg/L	0.7							<0.0005	0 / 1		
Chloropicrin	aNL, PoLI	EPA 551.1	mg/L	0.05							0.0035	1 / 1		
Chloropropham (CIPC)	aNL	EPA 8321	mg/L	1.2							<0.002	0 / 1		
1,3-Dichlorobenzene	aNL	EPA 8270C	mg/L	0.6							<0.005	0 / 1		
Dieldrin	aNL, EPA PP	EPA 525.2	mg/L	0.000002	<0.0002	0 / 6	<0.00001	0 / 6			<0.0002	0 / 6	<0.0002	0 / 6
Dieldrin	EPA PP, aNL	EPA 505	mg/L	0.000002	<0.00001	0 / 6	<0.0001	0 / 6			<0.00001	0 / 6	<0.00001	0 / 6
Dimethoate	aNL, UCMR 2, PoLI	EPA 525.2	mg/L	0.001	<0.0001	0 / 6	<0.0001	0 / 6			<0.0001	0 / 6	<0.0001	0 / 6
2,4-Dimethylphenol	aNL, EPA PP	EPA 8270C	mg/L	0.1							<0.005	0 / 1		
Diphenamide	aNL	EPA 8141	mg/L	0.2							<0.0001	0 / 1		
Ethion	aNL	EPA 8141	mg/L	0.004							<0.0001	0 / 1		
Malathion	aNL, PoLI	EPA 525.2	mg/L	0.16	<0.0001	0 / 6	<0.0001	0 / 6			<0.0001	0 / 6	<0.0001	0 / 6
Methylisothiocyanate	aNL	EPA 131	mg/L	0.19							<0.001	0 / 1		
Methyl parathion	aNL	EPA 8141	mg/L	0.002							<0.0001	0 / 1		

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
Parathion	aNL	EPA 525.2	mg/L	0.04	*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**			*<0.0001*	**0 / 6**	*<0.0001*	**0 / 6**
Pentachloronitrobenzene	aNL	EPA 8270C	mg/L	0.02							*<0.01*	**0 / 1**		
Phenol	aNL, EPA PP	EPA 8270C	mg/L	4.2							*<0.005*	**0 / 1**		
2,3,5,6-Tetrachloroterephthalate (DCP	aNL	EPA 515.4	mg/L	3.5							**0.0001**	**1 / 1**		
Trithion	aNL	EPA 8081/8082	mg/L	0.007							*< 0.00005*	**0 / 1**		
EPA Unregulated Contaminant Monitoring Rule (UCMR) Lists 1 through 3														
Acetochlor	UCMR 1&2	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
EPTC	UCMR 1, PoLI	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
Metolachlor	UCMR 2	EPA 525.2	µg/L	--	*<0.05*	**0 / 6**	*<0.05*	**0 / 6**			*<0.05*	**0 / 6**	*<0.05*	**0 / 6**
Molybdenum	UCMR 3	EPA 200.8	µg/L	--	**58 (5-110)**	**2 / 2**			**6 (4-13)**	**13 / 13**	*<1*	**0 / 13**	**23 (20-59)**	**6 / 6**
N-nitroso-di-n-butylamine (NDBA)	UCMR 2	EPA 521	ng/L	--	**2.7 (<2-6.7)**	**5 / 10**	*<4 (<4-9.4)*	**4 / 14**	*<4 (<4-4.2)*	**4 / 14**	*<4 (<4-3.1)*	**1 / 14**	*<4 (<4-4.7)*	**2 / 6**
N-nitroso-methylethylamine (NMEA)	UCMR 2	EPA 521	ng/L	--	*<2*	**0 / 10**	*<2*	**0 / 14**	*<2*	**0 / 14**	*<2*	**0 / 14**	*<2 (<2-3)*	**1 / 6**
N-Nitrosopyrrolidine (NPYR)	UCMR 2	EPA 521	ng/L	--	*<2 (<2-2.7)*	**4 / 10**	*<2 (<2-3.3)*	**7 / 14**	**2.4 (<2-3.6)**	**10 / 14**	*<2*	**0 / 14**	**2.7 (<2-6.3)**	**4 / 6**
Strontium	UCMR 3	EPA 200.8	µg/L	--	**378 (360-396)**	**2 / 2**			**356 (318-426)**	**13 / 13**	*<5 (<5-3)*	**4 / 13**	**1557 (1452-1710)**	**6 / 6**
Terbacil	UCMR 1	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
EPA Clean Water Act Priority Pollutants (PPs)														
2,4-dinitrotoluene	EPA PP, UCMR 1	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
2,6-dinitrotoluene	EPA PP, UCMR 1	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
4,4-DDD	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
4,4-DDE	EPA PP, UCMR 1	EPA 525.2	µg/L	--	*<0.1 (<0.1-**0.021**)*	**1 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
4,4-DDT	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
Acenaphthene	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
Acenaphthylene	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
Aldrin	EPA PP	EPA 525.2	µg/L	--	*<0.01*	**0 / 6**	*<0.05*	**0 / 6**			*<0.05*	**0 / 6**	*<0.05*	**0 / 6**
Alpha-BHC	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
Alpha-endosulfan	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
Anthracene	EPA PP	EPA 525.2	µg/L	--	*<0.02*	**0 / 6**	*<0.02*	**0 / 6**			*<0.02*	**0 / 6**	*<0.02*	**0 / 6**
benzo(a) anthracene	EPA PP	EPA 525.2	µg/L	--	*<0.05*	**0 / 6**	*<0.05*	**0 / 6**			*<0.05*	**0 / 6**	*<0.05*	**0 / 6**
Benzo(b) fluoranthene	EPA PP	EPA 525.2	µg/L	--	*<0.02*	**0 / 6**	*<0.02*	**0 / 6**			*<0.02*	**0 / 6**	*<0.02*	**0 / 6**
Benzo(ghi) perylene	EPA PP	EPA 525.2	µg/L	--	*<0.05*	**0 / 6**	*<0.05*	**0 / 6**			*<0.05*	**0 / 6**	*<0.05*	**0 / 6**
Benzo(k) fluoranthene	EPA PP	EPA 525.2	µg/L	--	*<0.02*	**0 / 6**	*<0.02*	**0 / 6**			*<0.02*	**0 / 6**	*<0.02*	**0 / 6**
Beta-BHC	EPA PP	EPA 525.2	µg/L	--	*<0.1 (<0.1-**0.15**)*	**1 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
Beta-endosulfan	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
Bromoform	EPA PP	EPA 551.1	µg/L	--	*<0.5*	**0 / 12**					*<0.5*	**0 / 11**	*<0.5*	**0 / 6**
Butyl benzyl phthalate	EPA PP	EPA 525.2	µg/L	--	*<0.5*	**0 / 6**	*<0.5*	**0 / 6**			*<0.5*	**0 / 6**	*<0.5*	**0 / 6**
Chlorodibromomethane	EPA PP	EPA 551.1	µg/L	--	*<0.5*	**0 / 12**					*<0.5*	**0 / 11**	*<0.5 (<0.5-**0.56**)*	**1 / 5**
Chloroform	EPA PP	EPA 551.1	µg/L	--	**0.53 (<0.5-2)**	**7 / 12**					**1.6 (0.68-4.2)**	**11 / 11**	**11 (3.7-38)**	**6 / 6**
Chrysene	EPA PP	EPA 525.2	µg/L	--	*<0.02*	**0 / 6**	*<0.02*	**0 / 6**			*<0.02*	**0 / 6**	*<0.02*	**0 / 6**
Delta-BHC	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**
Di-N-Butyl Phthalate	EPA PP	EPA 525.2	µg/L	--	*<10*	**0 / 6**	*<1*	**0 / 6**			*<1*	**0 / 6**	*<1*	**0 / 6**
Di-n-octyl phthalate	EPA PP	EPA 525.2	µg/L	--	*<10*	**0 / 6**	*<0.1*	**0 / 6**			*<0.1*	**0 / 6**	*<0.1*	**0 / 6**

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
Dibenz(a,h) anthracene	EPA PP	EPA 525.2	µg/L	--	<0.05	0 / 6	<0.05	0 / 6			<0.05	0 / 6	<0.05	0 / 6
Dichlorobromomethane	EPA PP	EPA 551.1	µg/L	--	<0.5	0 / 12					<0.5	0 / 11	<0.5 (<0.5-0.96)	2 / 5
Diethyl Phthalate	EPA PP	EPA 525.2	µg/L	--	<0.5	0 / 6	<0.5	0 / 6			<0.5	0 / 6	<0.5	0 / 6
Dimethyl phthalate	EPA PP	EPA 525.2	µg/L	--	<0.5	0 / 6	<0.5	0 / 6			<0.5	0 / 6	<0.5	0 / 6
Endosulfan sulfate	EPA PP	EPA 525.2	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
Endrin	EPA PP	EPA 525.2	µg/L	--	<0.1	0 / 6	<0.2	0 / 6			<0.2	0 / 6	<0.2	0 / 6
Endrin aldehyde	EPA PP	EPA 525.2	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
Fluoranthene	EPA PP	EPA 525.2	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
Fluorene	EPA PP	EPA 525.2	µg/L	--	<0.05	0 / 6	<0.05	0 / 6			<0.05	0 / 6	<0.05	0 / 6
Hexachlorocyclopentadiene	EPA PP	EPA 525.2	µg/L	--	<0.05	0 / 6	<0.05	0 / 6			<0.05	0 / 6	<0.05	0 / 6
Indeno (1,2,3-cd) pyrene	EPA PP	EPA 525.2	µg/L	--	<0.05	0 / 6	<0.05	0 / 6			<0.05	0 / 6	<0.05	0 / 6
Isophorone	EPA PP	EPA 525.2	µg/L	--	<0.5	0 / 6	<0.5	0 / 6			<0.5	0 / 6	<0.5	0 / 6
Naphthalene	EPA PP	EPA 525.2	µg/L	--	<0.3	0 / 6	<0.3	0 / 6			<0.3	0 / 6	0.161 (<0.3-0.022)	2 / 6
PCB–1016 (Arochlor 1016)	EPA PP	EPA 505	µg/L	--	<0.08	0 / 6	<0.08	0 / 6			<0.08	0 / 6	<0.08	0 / 6
PCB–1221 (Arochlor 1221)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
PCB–1232 (Arochlor 1232)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
PCB–1242 (Arochlor 1242)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
PCB–1248 (Arochlor 1248)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
PCB–1254 (Arochlor 1254)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
PCB–1260 (Arochlor 1260)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
Phenanthrene	EPA PP	EPA 525.2	µg/L	--	<0.04	0 / 6	<0.04	0 / 6			<0.04	0 / 6	<0.04	0 / 6
Pyrene	EPA PP	EPA 525.2	µg/L	--	<0.05	0 / 6	<0.05	0 / 6			<0.05	0 / 6	<0.05	0 / 6
Pesticides of Local Interest (PoLI)														
Chlorothalonil (Draconil, Bravo)	PoLI	EPA 525.2	µg/L	--	<0.1	0 / 6	<0.1	0 / 6			<0.1	0 / 6	<0.1	0 / 6
Chlorpyrifos	PoLI	EPA 525.2	µg/L	--	<0.05	0 / 6	<0.05	0 / 6			<0.05	0 / 6	<0.05	0 / 6
Contaminants of Emerging Concern (CECs)														
1,7-Dimethylxanthine	CECs	LC-MS-MS	ng/L	--	24 (<10-900)	4 / 7	<10 (<10-170)	3 / 7			<10	0 / 6	<10 (<10-240)	2 / 6
2,4-D	CECs	LC-MS-MS	ng/L	--	<5 (<5-6.7)	1 / 7	<5 (<5-20)	1 / 7			<5	0 / 7	<5 (<5-98)	2 / 6
4-nonylphenol - semi quantitative	CECs	LC-MS-MS	ng/L	--	<100	0 / 7	<100	0 / 7			<100	0 / 7	<100	0 / 6
4-tert-octylphenol	CECs	LC-MS-MS	ng/L	--	280 (<50-790)	5 / 7	120 (<50-290)	5 / 7			<50	0 / 7	335 (<50-810)	5 / 6
Acesulfame-K	CECs	LC-MS-MS	ng/L	--	33000 (14000-85000)	7 / 7	21000 (2700-25000)	7 / 7			<20	0 / 7	77500 (14000-130000)	6 / 6
Acetaminophen	CECs	LC-MS-MS	ng/L	--	94 (<5-390)	5 / 7	6.9 (<5-890)	4 / 7			<5	0 / 7	58 (<5-420)	3 / 6
Albuterol	CECs	LC-MS-MS	ng/L	--	18 (<5-72)	5 / 7	<5 (<5-83)	2 / 7			<5 (<5-31)	1 / 7	5.7 (<5-16)	3 / 6
Amoxicillin (semi-quantitative)	CECs	LC-MS-MS	ng/L	--	2300 (1200-3700)	7 / 7	<20 (<20-320)	3 / 7			<20	0 / 7	33 (<20-820)	4 / 6
Andorostenedione	CECs, UCMR 3	LC-MS-MS	ng/L	--	<5 (<5-26)	1 / 7	<5	0 / 7			<5	0 / 7	<5 (<5-11)	2 / 6
Atenolol	CECs	LC-MS-MS	ng/L	--	460 (310-620)	7 / 7	110 (21-220)	7 / 7			<5	0 / 7	265 (120-460)	6 / 6
Atrazine	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Azithromycin	CECs	LC-MS-MS	ng/L	--	<20 (<20-3600)	1 / 7	<20 (<20-180)	1 / 7			<20	0 / 7	<20 (<20-670)	1 / 6
Bendroflumethiazide	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Bezafibrate	CECs	LC-MS-MS	ng/L	--	69 (54-120)	7 / 7	12 (<5-46)	5 / 7			<5	0 / 7	116 (27-250)	6 / 6

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
BPA	CECs	LC-MS-MS	ng/L	--	<10 (<10-66)	2 / 7	<10	0 / 7			<10	0 / 7	16 (<10-38)	3 / 6
Bromacil	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<200	0 / 7			<200	0 / 7	<200	0 / 6
Butalbital	CECs	LC-MS-MS	ng/L	--	<5 (<5-91)	2 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Butylparben	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5 (<5-8.3)	1 / 6
Caffeine	CECs	LC-MS-MS	ng/L	--	580 (110-1200)	7 / 7	190 (<5-430)	6 / 7			<5 (<5-12)	1 / 6	895 (55-1700)	6 / 6
Carbadox	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5 (<5-11)	1 / 7	<5	0 / 6
Carbamazepine	CECs	LC-MS-MS	ng/L	--	130 (120-200)	7 / 7	<5	0 / 7			<5	0 / 7	<5 (<5-5.3)	1 / 6
Carisoprodol	CECs	LC-MS-MS	ng/L	--	82 (<5-580)	5 / 7	71 (<5-470)	6 / 7			<5	0 / 7	260 (<5-2500)	5 / 6
Chloramphenicol	CECs	LC-MS-MS	ng/L	--	<10	0 / 7	<10	0 / 7			<10	0 / 7	<10	0 / 6
Chloridazon	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Chlorotoluron	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Cimetidine	CECs	LC-MS-MS	ng/L	--	190 (<5-3600)	5 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Clofibric Acid	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Cotinine	CECs	LC-MS-MS	ng/L	--	100 (25-200)	7 / 7	69 (21-130)	7 / 7			<10	0 / 7	180 (44-550)	6 / 6
Cyanazine	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
DACT	CECs	LC-MS-MS	ng/L	--	<5 (<5-6.9)	1 / 7	<5 (<5-40)	2 / 7			<5	0 / 7	<5 (<5-10)	1 / 6
DEA	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5 (<5-9.5)	2 / 6
DEET	CECs	LC-MS-MS	ng/L	--	300 (93-380)	7 / 7	95 (<10-220)	6 / 7			<10	0 / 7	390 (<10-1000)	5 / 6
Dehydronifedipine	CECs	LC-MS-MS	ng/L	--	67 (5.7-120)	7 / 7	100 (5.2-220)	7 / 7			<5	0 / 7	370 (99-610)	6 / 6
DIA	CECs	LC-MS-MS	ng/L	--	<5 (<5-12)	1 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Diazepam	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	7.1 (<5-11)	4 / 6
Diclofenac	CECs	LC-MS-MS	ng/L	--	58 (<5-170)	5 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Dilantin	CECs	LC-MS-MS	ng/L	--	120 (82-180)	7 / 7	58 (29-94)	7 / 7			<20	0 / 7	240 (170-270)	6 / 6
Diuron	CECs	LC-MS-MS	ng/L	--	31 (<5-96)	5 / 7	<5 (<5-47)	3 / 7			<5	0 / 7	37 (<5-280)	3 / 6
Erythromycin	CECs, EPA CCL	LC-MS-MS	ng/L	--	<10 (<10-120)	2 / 7	<10	0 / 7			<10 (<10-13)	1 / 7	15 (<10-43)	4 / 6
Estradiol	CECs, UCMR 3	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Estrone	CECs, UCMR 3	LC-MS-MS	ng/L	--	29 (12-320)	7 / 7	<5 (<5-6.2)	1 / 7			<5	0 / 7	<5 (<5-7.8)	2 / 6
Ethinyl Estradiol - 17 alpha	CECs, UCMR 3	LC-MS-MS	ng/L	--	<5 (<5-2500)	1 / 7	<5 (<5-520)	1 / 7			<5	0 / 7	<5 (<5-3400)	1 / 6
Ethylparaben	CECs	LC-MS-MS	ng/L	--	<20	0 / 7	<20	0 / 7			<20	0 / 7	<20	0 / 6
Flumeqine	CECs	LC-MS-MS	ng/L	--	<10	0 / 7	<10	0 / 7			<10	0 / 7	<10	0 / 6
Fluoxetine	CECs	LC-MS-MS	ng/L	--	18 (<10-27)	6 / 7	<10 (<10-11)	1 / 7			<10 (<10-19)	1 / 7	<10	0 / 6
Gemfibrozil	CECs	LC-MS-MS	ng/L	--	1200 (1000-1500)	7 / 7	<5 (<5-41)	1 / 7			<5	0 / 7	9 (<5-460)	3 / 6
Ibuprofen	CECs	LC-MS-MS	ng/L	--	46 (<10-220)	4 / 7	35 (<10-120)	5 / 7			<10	0 / 7	195 (<10-510)	4 / 6
Iohexal	CECs	LC-MS-MS	ng/L	--	9800 (7800-40000)	7 / 7	7600 (5400-11000)	7 / 7			<10 (<10-16)	1 / 7	29000 (3000-40000)	6 / 6

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
Iopromide	CECs	LC-MS-MS	ng/L	--	1600 (960-3500)	7 / 7	1100 (570-2800)	7 / 7			<5	0 / 7	4250 (2200-9400)	6 / 6
Isobutylparaben	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5 (<5-13)	1 / 6
Isoproturon	CECs	LC-MS-MS	ng/L	--	<100	0 / 7	<100	0 / 7			<100	0 / 7	<100	0 / 6
Ketoprofen	CECs	LC-MS-MS	ng/L	--	73 (39-170)	7 / 7	31 (<5-55)	6 / 7			<5	0 / 7	130 (89-160)	6 / 6
Ketorolac	CECs	LC-MS-MS	ng/L	--	10 (<5-19)	4 / 7	<5	0 / 7			<5	0 / 7	<5 (<5-7)	1 / 6
Lidocaine	CECs	LC-MS-MS	ng/L	--	250 (100-580)	7 / 7	16 (<5-110)	5 / 7			<5	0 / 7	78 (<5-340)	4 / 5
Lincomycin	CECs	LC-MS-MS	ng/L	--	46 (<10-74)	5 / 7	<10 (<10-110)	2 / 7			<10	0 / 7	<10	0 / 6
Linuron	CECs, PoLI	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5 (<5-12)	1 / 6
Lopressor	CECs	LC-MS-MS	ng/L	--	580 (350-1200)	7 / 7	<20 (<20-260)	3 / 7			<20	0 / 7	95 (<20-370)	4 / 6
Meclofenamic Acid	CECs	LC-MS-MS	ng/L	--	<5 (<5-280)	1 / 6	<5	0 / 7			<5	0 / 7	<5	0 / 6
Meprobamate	CECs	LC-MS-MS	ng/L	--	220 (130-350)	7 / 7	180 (87-280)	7 / 7			<5	0 / 7	335 (260-680)	6 / 6
Metazachlor	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Methylparaben	CECs	LC-MS-MS	ng/L	--	<20 (<20-28)	1 / 7	<20 (<20-20)	1 / 7			<20	0 / 7	<20	0 / 6
Metolachlor	CECs	LC-MS-MS	ng/L	--	<5	0 / 6	<5	0 / 7			<5	0 / 7	<5	0 / 6
Naproxen	CECs	LC-MS-MS	ng/L	--	28 (<10-240)	4 / 7	<10	0 / 7			<10	0 / 7	<10	0 / 6
Nifedipine	CECs	LC-MS-MS	ng/L	--	<20 (<20-150)	2 / 7	<20	0 / 7			<20	0 / 7	<20 (<20-66)	1 / 6
Norethisterone	CECs	LC-MS-MS	ng/L	--	<5 (<5-25)	2 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Oxolinic Acid	CECs	LC-MS-MS	ng/L	--	<10	0 / 7	<10	0 / 7			<10	0 / 7	<10	0 / 6
Pentoxifylline	CECs	LC-MS-MS	ng/L	--	11 (<5-80)	5 / 7	<5 (<5-11)	2 / 7			<5	0 / 7	<5 (<5-51)	3 / 6
Phenazone	CECs	LC-MS-MS	ng/L	--	<5 (<5-16)	1 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Primidone	CECs	LC-MS-MS	ng/L	--	49 (31-66)	7 / 7	24 (11-42)	7 / 7			<5	0 / 7	100 (<5-180)	5 / 6
Progesterone	CECs	LC-MS-MS	ng/L	--	<5 (<5-330)	2 / 7	<5 (<5-6.6)	1 / 7			<5	0 / 7	7 (<5-11)	3 / 6
Propazine	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Propylparaben	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Quinoline	CECs, EPA CCL	LC-MS-MS	ng/L	--	<5 (<5-130)	1 / 7	<5 (<5-41)	1 / 7			<5 (<5-94)	1 / 7	<5	0 / 6
Simazine	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Sucralose	CECs	LC-MS-MS	ng/L	--	37000 (26000-44000)	7 / 7	33000 (20000-40000)	7 / 7			<100	0 / 7	150000 (<100-180000)	5 / 6
Sulfachloropyridazine	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Sulfadiazine	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Sulfadimethoxine	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Sulfamerazine	CECs	LC-MS-MS	ng/L	--	<5 (<5-29)	1 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Sulfamethazine	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Sulfamethizole	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5	0 / 7			<5	0 / 7	<5	0 / 6
Sulfamethoxazole	CECs	LC-MS-MS	ng/L	--	800 (350-990)	7 / 7	32 (<5-140)	6 / 7			<5	0 / 7	104 (<5-490)	4 / 6
Sulfathiazole	CECs	LC-MS-MS	ng/L	--	<5	0 / 7	<5 (<5-5)	1 / 7			<5	0 / 7	<5	0 / 6

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	Pilot Influent (Secondary Effluent)		Ozone Effluent		MF Effluent		RO Permeate		RO Concentrate	
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured
TCEP	CECs	LC-MS-MS	ng/L	--	**290 (100-440)**	**7 / 7**	**320 (120-500)**	**7 / 7**			*<10*	**0 / 7**	**1200 (580-2000)**	**6 / 6**
TCPP	CECs	LC-MS-MS	ng/L	--	**470 (280-860)**	**7 / 7**	**340 (240-850)**	**7 / 7**			*<100*	**0 / 7**	**1550 (1200-2200)**	**6 / 6**
TDCPP	CECs	LC-MS-MS	ng/L	--	**460 (180-800)**	**7 / 7**	**300 (220-800)**	**7 / 7**			*<100*	**0 / 7**	**1450 (720-1700)**	**6 / 6**
Testosterone	CECs, UCMR 3	LC-MS-MS	ng/L	--	*<5 (<5-**18**)*	**1 / 7**	*<5*	**0 / 7**			*<5*	**0 / 7**	*<5*	**0 / 6**
Theobromine	CECs	LC-MS-MS	ng/L	--	*<10 (<10-**310**)*	**2 / 7**	*<10 (<10-**580**)*	**2 / 7**			*<10*	**0 / 7**	*<10 (<10-**920**)*	**2 / 6**
Theophylline	CECs	LC-MS-MS	ng/L	--	**430 (<20-1300)**	**5 / 7**	*<20 (<20-**1600**)*	**3 / 7**			*<20*	**0 / 7**	**135 (<20-1000)**	**3 / 6**
Triclosan	CECs	LC-MS-MS	ng/L	--	**140 (11-1600)**	**7 / 7**	*<10 (<10-**30**)*	**3 / 7**			*<10*	**0 / 7**	**11 (<10-92)**	**3 / 6**
Trimethoprim	CECs	LC-MS-MS	ng/L	--	**400 (200-730)**	**7 / 7**	*<5*	**0 / 7**			*<5*	**0 / 7**	*<5 (<5-**21**)*	**1 / 6**
Warfarin	CECs	LC-MS-MS	ng/L	--	*<5 (<5-**14**)*	**2 / 7**	*<5*	**0 / 7**			*<5*	**0 / 7**	*<5*	**0 / 6**

[1] Values for total coliform and *E. coli* are in the format geometric mean (range)

SM is Standard Methods for the Examination of Water and Wastewater; LC-MS-MS is Liquid Chromatography, tandem Mass Spectrometry; mg is milligram; L is Liter; µg is microgram; ng is nanograms; EPA is Environmental Protection Agency

NTU is Nephelometric Turbidity Units; cm is centimeter; MPN is Most Probable Number; mL is milliliter; MFL is Million Fibers per Liter; pCi is picocuries; TT is Treatment Technique; UV is ultraviolet

APPENDIX D

Pure Water Monterey Groundwater Replenishment Project: Recharge Impacts Assessment Report

Recharge Impacts Assessment Report

March 2015

Pure Water Monterey

Groundwater Replenishment Project

TODD GROUNDWATER

RECHARGE IMPACTS ASSESSMENT REPORT

PURE WATER MONTEREY GROUNDWATER REPLENISHMENT (GWR) PROJECT

March 2015

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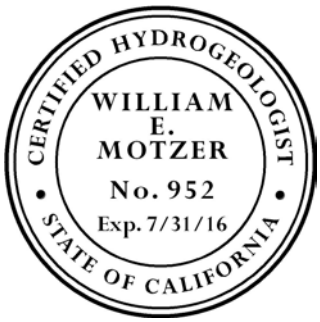

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Appendices

APPENDIX A: Todd Groundwater, Technical Memorandum, To: Bob Holden, PE, From: Phyllis Stanin, Selection of Recharge Location for GWR Project, Seaside Groundwater Basin, May 29, 2014.

APPENDIX B: HydroMetrics Water Resources Inc. (HydroMetrics), Memorandum to Mr. Bob Holden, Subject: Groundwater Replenishment Project Development Modeling, October 2, 2013

APPENDIX C: HydroMetrics WRI (HydroMetrics), Technical Memorandum, To: Bob Holden/MRWPCA, From: Stephen Hundt and Derrik Williams, GWR Project EIR: Project Modeling Results, January 12, 2015.

APPENDIX D: Groundwater Quality Analytical Program, Groundwater Analytical Results, MRWPCA Field Program, Tables D-1 and D-1A through D-1P.

1. INTRODUCTION

Monterey Regional Water Pollution Control Agency (MRWPCA), in partnership with Monterey Peninsula Water Management District (MPWMD), is developing the Proposed Pure Water Monterey Groundwater Replenishment (GWR) Project (Proposed Project) to provide a high-quality recycled water supply for the northern Monterey County area. The Proposed Project consists of two components: advanced treated water for injection in the Seaside Groundwater Basin to replace urban supplies (the GWR Facilities) and additional recycled water for irrigation supplies to be provided through the existing Castroville Seawater Intrusion Project (CSIP). Specifically, MRWPCA plans to construct and operate an advanced water treatment facility (AWTF) to produce up to 3,700 acre feet per year (AFY) of highly-purified recycled water for conveyance to and recharge in the Seaside Groundwater Basin. In addition, MRWPCA would deliver approximately 4,750 to 5,290 AFY of supplemental water to the CSIP area.

In accordance with the California Environmental Quality Act (CEQA), MRWPCA as the lead agency is preparing an Environmental Impact Report (EIR) for the Proposed Project. This report is being prepared to assess potential impacts of the Proposed Project on groundwater resources. Although the Seaside Basin recharge and CSIP delivery components of the Proposed Project are closely related, this impacts assessment report focuses on groundwater impacts from injection and recovery of the Proposed Project water (product water) in the Seaside Basin. Potential impacts from the irrigation water component are addressed separately in the EIR.

This recharge impacts assessment report provides details on proposed recharge facilities including injection wells (Injection Well Facilities) and general information on how the Proposed Project would be constructed and operated. In addition, an analysis of potential impacts from the Proposed Project on groundwater resources (including water levels and quality) is presented to support the EIR.

1.1. GWR FACILITIES

The Proposed Project would provide up to 3,700 AFY of product water for recharge in the Seaside Groundwater Basin (or Seaside Basin). The feed water for treatment at the new AWTF would be secondary-treated municipal wastewater from MRWPCA's Regional Treatment Plant (RTP). Prior to treatment at the RTP, the raw municipal wastewater would be augmented by urban stormwater/runoff, agricultural wash water, and runoff collected in local drainage ditches including the Reclamation Ditch, the Blanco Drain, and Tembladero Slough. The AWTF would include pre-treatment (using pre-screening, ozone, and potentially biologically activated filtration); membrane filtration; reverse osmosis (RO); advanced oxidation (AOP) using ultraviolet light (UV) and hydrogen peroxide; and product water stabilization with calcium and alkalinity.

The AWTF recycled water would be conveyed by pipeline from the AWTF to newly-constructed shallow and deep recharge (injection) wells in the north-central portion of the

Seaside Basin (Figure 1). Recharged water would be stored in the groundwater basin for subsequent extraction by California American Water Company (CalAm) using existing production wells. The Proposed Project would increase the basin yield and allow CalAm to reduce Carmel River diversions in compliance with a state order to secure replacement water supplies (MRWPCA, May 2013).

Recycled water would be recharged into the Seaside Basin's two primary aquifers used for water supply - the Paso Robles Aquifer and the underlying Santa Margarita Aquifer. Recharge would be accomplished through relatively shallow vadose zone wells (Paso Robles Aquifer) and deep injection wells (Santa Margarita Aquifer). Locations of the Proposed Project Injection Well Facilities site and proposed vadose zone and deep injection wells are shown on Figure 2.

This report focuses on the Proposed Project recharge, storage, and recovery operations and analyzes potential impacts from the Proposed Project on groundwater resources. The groundwater impacts assessment will provide technical support for the EIR.

1.2. REPORT GOAL AND OBJECTIVES

The goal of this report is to assist with development and implementation of the Proposed Project by developing and analyzing the recharge components of the project. Specifically, the recharge components include recharge wells (also referred to as injection wells), operational facilities, and the fate and transport of the recycled water in the groundwater basin. To achieve this goal, the following objectives have been identified for this report:

- provide the technical basis for Proposed Project recharge components including wells and operational facilities
- support the EIR with a groundwater impacts analysis
- outline potential steps for construction and operation of the recharge components of the Proposed Project
- provide a preliminary schedule for construction of recharge components
- incorporate existing studies for project development and implementation.

1.3. INCORPORATION OF RECENT STUDIES

Numerous studies have been conducted involving various aspects of the Proposed Project. Collectively, these studies provide the technical basis for project development and operations and support ongoing analyses including preparation of an EIR. Studies summarized below are the most relevant for the groundwater and recharge components of the Proposed Project and do not represent a comprehensive list. The following descriptions of the studies provide an understanding of how the work done by others is incorporated into this report.

1.3.1. MRWPCA Field Program

In December 2013 and January 2014, Todd Groundwater developed and implemented a field program (referred to herein as the MRWPCA field program or field program) in the vicinity of the Proposed Project Injection Well Facilities site. The field program involved data collection and testing through the 400 feet of vadose zone and installation and sampling of a new monitoring well drilled to a depth of 535 feet. The entire borehole was continuously cored and selected core samples were analyzed for hydraulic properties, mineralogy, and leaching potential. The new well, MRWPCA MW-1, is screened in the upper Paso Robles Aquifer and is capable of monitoring the water table beneath the site. MRWPCA MW-1 and five existing nearby production and monitoring wells were sampled to supplement existing groundwater quality data in the area. MRWPCA MW-1 and the five additional wells (FO-7 Shallow, FO-7 Deep, PRTIW, ASR MW-1, and Seaside 4) are shown on Figure 2.

The field program also included an analysis of potential geochemical changes in groundwater as a result of the Proposed Project. In conformance with the State Recycled Water Policy (California SWRCB, 2013), a Regional Water Quality Control Board may impose restrictions on a proposed groundwater replenishment project if the project changes the geochemistry of an aquifer thereby causing the dissolution of constituents from the geologic formation into groundwater. To assess if the Proposed Project has the potential to cause dissolution, laboratory leaching analyses were conducted on core samples to ensure the protection of groundwater beneath the Proposed Project's vadose zone wells. Results of the leaching analyses were further analyzed using geochemical modeling.

Results of the program have been documented and analyzed in a separate report prepared by Todd Groundwater (Todd Groundwater, 2015). The groundwater quality data collected during the MRWPCA field program, along with the results of the core leaching analyses and associated geochemical modeling, are incorporated herein (see sections 7.3 and 7.4) to assist with the assessment of potential impacts from the Proposed Project on groundwater quality.

1.3.2. Proposed Project Product Water Quality

MRWPCA constructed a GWR pilot treatment plant on the RTP site to evaluate treatment options for the AWTF and collected data to characterize the water quality of the product water and reverse osmosis concentrate by-product. The GWR pilot plant product water was analyzed for various constituents as the treatment process was adjusted and optimized. Analyses demonstrated that the product water would meet drinking water standards. However, the GWR pilot plant did not include a process to provide chemical stabilization, which would be included in the proposed AWTF to protect against corrosion in conveyance pipelines and recharge wells. The planned stabilization would also limit the potential for product water injected into the Proposed Project vadose zone wells to leach constituents from the geologic formation and impact groundwater quality as mentioned above. Bench scale chemical stabilization was conducted on the GWR pilot plant product water to simulate final water quality and to allow for evaluation of the leaching potential of the recycled water as part of the laboratory leaching analyses. Additional details and water

quality data of the bench scale water sample are provided in Section 7.3.4. Results of the leaching analyses and geochemical modeling are summarized in Section 7.3.5 of this report. Details of the analysis and an expanded discussion of the results are presented in the draft report on the field program (Todd Groundwater, 2015).

1.3.3. Groundwater Modeling with the Seaside Basin Watermaster Model

To provide a quantitative assessment of the Proposed Project impacts on water levels and other production wells, and to assess changing conditions relating to the potential for seawater intrusion, a basin-wide numerical model has been used. Specifically, the Seaside Basin Watermaster has constructed and calibrated a multi-layer transient groundwater flow model using MODFLOW 2005. HydroMetrics WRI (HydroMetrics), consultant to the Seaside Basin Watermaster, has been retained by MRWPCA to apply the Watermaster model to simulate potential impacts of the Proposed Project on groundwater resources. Results of the modeling are presented in a technical memorandum (TM), included as Appendix C of this report and summarized herein.

2. RECYCLED WATER DELIVERY FOR RECHARGE

MRWPCA has evaluated the amounts and availability of the Proposed Project source waters and has developed estimates of monthly deliveries of recycled water to the Seasisde Basin. On average, about 3,500 AFY would be delivered to the Seaside Basin, but monthly amounts would vary based on hydrologic conditions.

Specifically, the Proposed Project would incorporate the concept of a drought reserve account. During wet and normal years, the Project would convey an extra 200 acre feet (AF) of advanced treated water to the Seaside Basin for recharge and storage, up to a cumulative total of 1,000 acre feet. During dry conditions, the Project could reduce its deliveries to the Seaside Basin by as much water as had accumulated in the drought reserve. The Project water that is not delivered to the Seaside Basin would instead be used to augment irrigation supplies delivered through the CSIP. CalAm would continue to extract 3,500 AFY for municipal supplies by using the water stored in the drought reserve. These operational guidelines have been translated into potential monthly delivery amounts to the Seaside Basin as discussed in more detail below.

2.1. DELIVERY SCHEDULES AND OPERATION OF THE DROUGHT RESERVE ACCOUNT

MRWPCA has evaluated the availability and amounts of source waters, capacity of the AWTF, minimum delivery targets, and operational guidelines discussed above in order to develop potential delivery schedules for recharge to the Seaside Basin. Based on this analysis, there are eight potential delivery schedules that could occur, based on two water management decision points made in each year of GWR operation. These eight delivery schedules are presented in Table 1. The two management decisions that determine appropriate deliveries to the Seaside Basin are described below.

The first management decision would be made by October 1, the beginning of the water year,[1] and would dictate which of two delivery schedules is followed during October through March of that water year. The decision would be based on whether or not the drought reserve account is full (1,000 AF). If the account is full, the project would deliver monthly amounts from October through March based on average annual deliveries (highlighted in purple on Table 1; for example, see October through March deliveries for Schedule 2 and Schedule 8). If the account balance is less than 1,000 AF on October 1, then an additional 200 AF would be delivered from October through March (highlighted on Table 1 in blue; for example, see October through March delivery schedules 1, and 3 through 7). For wet or normal years, these two recharge schedules would produce a total of 3,700 AFY (Schedule 1) or a total of 3,500 AFY (Schedule 2) (Table 1).

[1] A Water Year is defined as October 1 through September 30, and is based on the annual precipitation pattern in California. The Water Year is designated by the calendar year in which it ends.

Table 1. Product Water Available for Injection

	Product Water Delivery Schedules for Seaside Basin Injection		Acre-Feet per Month (AF/month)												Total AFY	Add to Reserve	Available in Reserve
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep			
1	Drought Reserve <1,000 AF	Wet/Normal Year	331	321	331	331	299	331	288	297	288	297	297	288	3,700	200	-
2	Drought Reserve 1,000 AF	Wet/Normal Year	297	288	297	297	268	297	288	297	288	297	297	288	3,500	-	-
3	Drought Reserve <1,000 AF	Drought Year	331	321	331	331	299	331	255	263	255	263	263	255	3,500	200	200
4	Drought Reserve <1,000 AF	Drought Year	331	321	331	331	299	331	222	229	222	229	229	222	3,300	200	400
5	Drought Reserve <1,000 AF	Drought Year	331	321	331	331	299	331	189	196	189	196	196	189	3,100	200	600
6	Drought Reserve <1,000 AF	Drought Year	331	321	331	331	299	331	156	162	156	162	162	156	2,900	200	800
7	Drought Reserve <1,000 AF	Drought Year	331	321	331	331	299	331	124	128	124	128	128	124	2,700	200	1,000
8	Drought Reserve 1,000 AF	Drought Year	297	288	297	297	268	297	124	128	124	128	128	124	2,500	-	1,000

Maximum Monthly Injection Rates	Injection Rates in Gallons per Minute (gpm)												Maximum (gpm)
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	
Santa Margarita Aquifer (90%)	2,175	2,179	2,175	2,175	2,175	2,175	1,955	1,951	1,955	1,951	1,951	1,955	2,179
Paso Robles Aquifer (10%)	242	242	242	242	242	242	217	217	217	217	217	217	242
Total	2,417	2,422	2,417	2,417	2,417	2,417	2,173	2,168	2,173	2,168	2,168	2,173	2,422

The second management decision would be made in early Spring as to which schedule will be followed for deliveries in April through September. This decision would be based on whether or not the previous 6 months of precipitation has indicated a drought year and whether supplemental irrigation water is needed and available from the drought reserve account. This decision would be made by the Monterey County Water Resources Agency (MCWRA). If it is a wet/normal year, the delivery would follow the April through September delivery schedule shown for both Schedule 1 and Schedule 2. However, if MCWRA requests water from the drought reserve account during a drought year, the delivery schedule for April through September would follow one of the drought delivery schedules shown in green on Table 1. The selection of the drought schedule would be based on the then-current balance in the drought reserve account (as of April 1 – see last column on Table 1).

2.2. MAXIMUM DELIVERY FOR RECHARGE

The maximum monthly amount of advanced-treated recycled water available from any of the eight potential delivery schedules on Table 1 has been converted to a maximum monthly injection rate in gallons per minute (gpm) for each aquifer. These rates are summarized in the lower portion of Table 1. The maximum injection rates are estimated for planning purposes to design recharge facilities that will accommodate peak flows and to inform the number and spacing of injection wells. As shown in Table 1, the total maximum injection rate for any of the schedules is 2,422 gpm (lower right on Table 1). Assuming 90 percent of the water is injected into the deeper Santa Margarita Aquifer, deep injection wells need to accommodate an estimated peak flow of about 2,179 gpm (see Section 3.3.5.1 for an explanation on allocating recharge between the two aquifers). Assuming 10 percent of the water is injected into the Paso Robles Aquifer, shallow injection (or vadose zone) wells would need to be capable of injection rates up to about 242 gpm.

For the purposes of project planning and EIR analysis, recharge facilities are sized for these maximum rates incorporating conservative injection rates and allowing for down-time associated with well operation and maintenance. As actual operation is refined, monthly injection amounts can be balanced with operation at the AWTF, as needed. However, this approach provides future project flexibility and allows for evaluation of reasonable “worst-case” potential environmental impacts on groundwater resources associated with the recharge component of the Proposed Project.

3. PROJECT LOCATION AND HYDROGEOLOGIC SETTING

3.1. GROUNDWATER BASIN AND STUDY AREA

The Proposed Project Injection Well Facilities site is located within a portion of the Seaside Subbasin of the Salinas Valley Groundwater Basin as defined by the California Department of Water Resources (CDWR) in the Bulletin 118 description of California's groundwater basins (CDWR, 2004). The boundaries of the Seaside Subbasin and delineation of four subareas within the subbasin have been redefined by Yates et al. (2005) based on a reinterpretation of geologic faulting and groundwater flow divides. The northern basin boundary is based on a groundwater divide that is subject to movement with changing conditions in groundwater levels (Yates, et al., 2005; HydroMetrics, 2010).

The redefined subbasin covers about 20 square miles and is referred to as the Seaside Groundwater Basin, or simply Seaside Basin, in this report. The boundaries of the Seaside Groundwater Basin and four subareas are shown on Figure 1. Basin wells (including production and monitoring wells) are also shown on the figure to highlight areas of groundwater development. Figure 2 includes production and monitoring wells in the vicinity of the Proposed Project Injection Well Facilities.

The Proposed Project Injection Well Facilities would be located within the northeastern-most subarea of the Seaside Groundwater Basin, referred to as the Northern Inland Subarea (Figure 1). The site is close to the Northern Coastal Subarea where most of the basin's groundwater pumping occurs (as indicated by the relatively large number of wells on Figure 1). Groundwater production also occurs in the Southern Coastal Subarea and the Laguna Seca Subarea.

Historically, only minimal pumping has occurred within the Northern Inland Subarea. Of the three wells in the subarea shown on Figure 1, only one well - the City of Seaside Reservoir Well (identified on Figure 2) - has provided water supply. The other two wells in the Northern Inland Subarea are monitoring wells. The subarea has remained largely undeveloped as a result of its long-term use as a large firing range by the U.S. Army on the former Fort Ord military base, which closed in 1994.

The southern subareas are considered less hydraulically connected to the Proposed Project Injection Well Facilities area and are not included in the Study Area for the impact analysis. Accordingly, for the purposes of the impact analysis, the Study Area is defined as the Northern Inland and Northern Coastal subareas of the Seaside Groundwater Basin.

3.1.1. Seaside Basin Adjudication

The Seaside Basin was adjudicated by the California Superior Court on March 27, 2006, establishing groundwater extraction rights in the basin. A court-appointed Watermaster has been formed to execute the requirements of the adjudication. The court decision requires a decrease in pumping after three years from the effective date of the adjudication (and

additional pumping reductions over time) unless the Watermaster has secured additional sources of water from outside the basin for injection into the basin or for replacing pumping (i.e., in lieu replenishment). Further, the Watermaster has responsibilities with respect to securing replenishment water from outside the basin to offset the over-production in the basin.

3.1.2. Groundwater Use

Groundwater pumping in the Seaside Groundwater Basin provides water supply for municipal, irrigation (primarily golf courses), and industrial uses. Historically, about 70 to 80 percent of the pumping has occurred in the Northern Coastal Subarea, with additional pumping occurring in the Laguna Seca Subarea supplemented by small amounts in the Southern Coastal Subarea. CalAm is the largest pumper in the basin accounting for about 79 percent of the groundwater pumped in water year (WY) 2013[2] (Watermaster, 2013).

Available annual pumping in the Coastal subareas and total basin production over the last 20 years are shown on Figure 3. Over this time period, production in the Coastal subareas has averaged about 4,000 AFY and total basin production has averaged about 5,000 AFY.

Prior to basin adjudication in 2006, pumping exceeded sustainable yield and contributed to significant basin-wide water level declines. Over-pumping in the coastal subareas resulted in water levels declining below sea level at the coast, placing aquifers at risk of seawater intrusion. In particular, basin pumping increased after a 1995 order by the State Water Resources Control Board (SWRCB) placed constraints on out-of-basin supplies (Figure 3).

Since 2008, groundwater pumping has declined. Pumping in coastal subareas averaged about 4,505 AFY from 1996 through 2008, but has decreased to about 3,288 AFY from 2009 through 2013 (Watermaster production records). For comparison purposes, the court established a natural safe yield for the coastal subareas of between 1,973 AFY to 2,305 AFY during the Seaside Basin adjudication (California Superior Court, 2006).

The production data in Figure 3 do not include injection and recovery from the nearby Monterey Peninsula Aquifer Storage and Recovery Project (ASR Project) where about 1,100 AFY has been injected and/or recovered from 2010 through 2012. Details of that project are summarized in the following subsection.

3.1.3. ASR Project

The ASR Project is operating in the Seaside Basin downgradient and within about 1,000 feet from the Proposed Project Injection Well Facilities site. CalAm and MPWMD are in partnership in implementing the ASR Project, which involves the injection of treated Carmel River Basin groundwater into a series of ASR wells for seasonal storage in the basin and subsequent recovery for drinking water supply.

[2] Water Year (WY) 2013 begins October 1, 2012 and ends September 30, 2013.

Currently, Carmel River Basin water (extracted from riverbank wells) is treated to drinking water standards and conveyed to the ASR wells for recharge when excess water is available (e.g., periods when flows in the Carmel River exceed fisheries bypass flow requirements). The ASR wells are also planned for injection of product water from a proposed ocean desalination plant to be developed by CalAm.

As of 2014, four ASR wells have been installed along General Jim Moore Boulevard in the City of Seaside, California (Figure 2). ASR-1 and ASR-2 are located about 1,000 feet northwest of the Proposed Project Injection Well Facilities site. ASR-3 and ASR-4 are located about 1,600 feet to the northwest of the Proposed Project wells (Figure 2).

The amount of Carmel River water injected varies from year to year depending on availability; specifically, diversions from the Carmel River for ASR injection are limited to certain times of the year and are allowed only when minimum flows are present at certain gages on the Carmel River (i.e., to provide adequate fish passage). Table 2 summarizes river water that has been injected and recovered as part of the ASR Project for the last five complete water years.

Table 2. Injection and Recovery Volumes, ASR Project

Water Year	ASR Injection (AFY)	ASR Recovery (AFY)
2010	1,110	0
2011	1,117	1,110
2012	131	1,117
2013	294	644
2014	0	0
Total	2,652	2,871

Although data in Table 2 indicate that the ASR Project has recovered more water than injected over the last four years, the table does not include the full historical record of all of the injected water as the first ASR test well was drilled in 1998. A regulatory order requires that the injected Carmel River water be extracted to meet demands, and the project is not operated for the long-term replenishment of basin aquifers (i.e., recharge that is kept in the basin without extraction) (Watermaster, 2012).

3.1.4. Watermaster Numerical Model

In 2009, the Seaside Basin Watermaster completed construction of a numerical groundwater flow computer model for the basin using the model code MODFLOW 2005 (HydroMetrics, 2009). The model provides a basin-wide tool for evaluating protective water levels and various groundwater management strategies.

The Watermaster model covers approximately 76 square miles of the Salinas Valley Groundwater Basin including the Seaside Groundwater Basin. In order to represent the hydrostratigraphy and simulate three-dimensional flow in the basin, the model was constructed with five layers. Model layers generally correspond to observed hydrostratigraphic units[3] as follows:

- Layer 1 - Older Dune deposits and Aromas Red Sand
- Layers 2 and 3 - Upper and Middle Paso Robles Aquifer
- Layer 4 - Basal clay layers (approximately 80 feet thick) typically observed in the Lower Paso Robles Formation, where present
- Layer 5 - Santa Margarita Aquifer (including the Purisima Formation where present).

Additional details on the basin hydrostratigraphy and aquifers are discussed in Section 4 of this report.

The Watermaster model is a transient model that has been calibrated over a 22-year period from January 1987 through December 2008 and is capable of simulating groundwater levels over a wide variety of hydrologic conditions. The model includes conditions that occur during the drought period of the early 1990s and relatively wet periods such as 1998 and 2005. Boundary conditions and additional details on the Watermaster model are documented in a report on model construction and calibration (HydroMetrics, 2009).

The model provides a valuable quantitative tool for the evaluation of the Proposed Project and potential impacts to basin water levels and wells. HydroMetrics has been contracted by MRWPCA to apply the model to simulate aquifer response to various conditions including No-Project conditions and conditions associated with the Proposed Project. Modeling results are provided in the appendices and summarized in the impacts section of this report (Section 7).

3.2. PROPOSED PROJECT INJECTION WELL FACILITIES SITE

The Proposed Project Injection Well Facilities would be located along a strip of land on the eastern boundary of the City of Seaside, California and about 1.5 miles inland from Monterey Bay (Figure 1). Facilities would be constructed within an approximate 150-feet wide corridor of land about 3,000 feet long (Figure 2). The corridor would begin approximately 1,200 feet south of Eucalyptus Road, and would extend south-southwest for approximately 3,000 feet toward General Jim Moore Boulevard. The southwestern end of the Injection Well Facilities site would be approximately 200 feet east of General Jim Moore Boulevard.

The Proposed Project Injection Well Facilities would be situated along existing unimproved roads of former Fort Ord lands and along the edge of two parcels that are proposed for

[3] A hydrostratigraphic unit can be defined as a formation, part of a formation, or groups of formations in which there are similar hydraulic characteristics allowing for grouping into aquifers or confining layers (aquitards).

conveyance from the Fort Ord Reuse Authority to the City of Seaside. This property boundary has been identified by the City of Seaside as functioning as a utility right-of-way corridor where the Proposed Project wells could be located for minimum interference with future land use plans. The site was selected using the following criteria:

- upgradient of existing CalAm production wells for efficient recovery of recharged project water that has comingled with native groundwater and ASR-injected Carmel River water
- within areas of favorable aquifer properties for replenishment and groundwater production, such as relatively high transmissivity and sufficient aquifer thickness
- sufficiently deep water table to provide a large local storage volume
- close to pumping depressions[4] to provide replenishment water to areas of declining water levels.

Over the last few years, several alternate proposed project Injection Well Facilities locations within the Seaside Basin were considered for project development. Two locations, previously referred to as the Coastal location and the Inland location, were considered favorable and were evaluated in 2009 during early project development. Since that time, further analyses have been conducted and the Coastal location has been eliminated from consideration due to hydrogeologic conditions, engineering factors, and costs. A discussion of the selection of the current Proposed Project Injection Well Facilities location as the preferred location over the Coastal location is documented in a TM provided in Appendix A (Todd Groundwater, May 2014). The current Proposed Project site Injection Well Facilities has been modified slightly from the previously considered inland location to optimize project performance.

3.2.1. Physical Setting

The Proposed Project Injection Well Facilities are located on an upper coastal plain of low hills and mature dunes that slopes northward toward the Salinas Valley and westward toward Monterey Bay (approximately 1.5 miles to the west) (Figure 1). The Proposed Project Injection Well Facilities area is characterized by rolling hills and closed depressions. The area is currently undeveloped and surrounded by natural vegetation that is cross-cut by unimproved roads and trails associated with former military activities (Figure 2). An access road to a small water reservoir is across Eucalyptus Road from the northern-portion of the Proposed Project Injection Well Facilities area. This reservoir and adjacent groundwater well have been used historically for irrigation at a golf course west of General Jim Moore Boulevard (Figure 2).

3.2.2. Topography

The ground surface elevation rises across the groundwater basin from sea level at the coast to more than 800 feet above mean sea level (msl) in the southeastern portions of the basin.

[4] As groundwater is pumped, water levels are lowered in the aquifer creating a zone of water levels lower than ambient levels, and referred to as a cone of depression around the pumping well(s).

For the area shown on Figure 2, ground surface elevations rise to about 550 feet msl in the east central portion of the map. Along Eucalyptus Road, ground surface elevations vary from about 470 feet msl at the monitoring well identified as FO-7 to about 430 feet msl at the recently drilled monitoring well identified as MRWPCA MW-1, down to about 340 feet msl at General Jim Moore Boulevard and at ASR-1 (Figure 2). Ground surface elevations along the Proposed Project area vary from about 455 feet msl at proposed DIW-1, 396 feet msl at DIW-2, sloping downward to about 300 feet msl at DIW-4.

3.2.3. Climate and Hydrology

The Proposed Project Injection Well Facilities area receives about 14.5 inches of annual rainfall (Yates, et al., 2005). Runoff on the rolling hills collects in low areas and provides recharge to the Seaside Groundwater Basin. Recharge from deep percolation of rainfall (and minor amounts of irrigation) in the Northern Inland Subarea has averaged about 1,080 AFY from 2003 through 2007 (HydroMetrics, 2009). This amount represents 99 percent of the total recharge estimated for this undeveloped subarea (HydroMetrics, 2009). (Additional sources of recharge allow for the natural safe yield from adjacent coastal subareas to be higher as noted in Section 3.1.2).

3.2.4. Land Use

The Proposed Project Injection Well Facilities would be located on a portion of the former Fort Ord military base, which provided training and staging for U.S. troops from 1917 to 1994. The proposed site is on the northwestern edge of a large upland area referred to as the Inland Ranges (HLA, 1994). The Inland Ranges consist of about 8,000 acres bounded by Eucalyptus Road to the north, Barloy Canyon Road to the east, South Boundary Road to the south, and General Jim Moore Boulevard to the west. For environmental investigation and remediation purposes on former Fort Ord lands, a portion of the area is also referred to as Site 39. The general area of the Inland Ranges and the area of the Proposed Project wells are shown on Figure 4.

Site 39 contained at least 28 firing ranges that were used for small arms and high explosive ordnance training using rockets, artillery, mortars and grenades. Range 18 (HA-18) and Range 19 (HA-19) are the closest ranges to the Proposed Project Injection Well Facilities location (approximately 200 feet south and east), with Range 48 (HA-48) farther east (Figure 4).

Considerable expended and unexploded ordnance (UXO) have been documented in various areas of Site 39. The specific ordnance types include rounds from shotguns, mortars, M74 rockets, recoilless rifles, aircraft, grenades, artillery, howitzers, mines, anti-tank weapons (bazookas), bombs, naval ordnance, Bangalore torpedoes, C-4, TNT, military dynamite, and shaped charges. Functions for these items included high explosives, heat generating, armor piercing, white phosphorous, smoke tracer, illumination, incendiary, and photo flash devices. As a result of the spontaneous ignition of a white phosphorous grenade in August 2009, a Munitions and Explosives of Concern (MEC) sweep was conducted at Range 48. This surface sweep removed MEC or MEC-like items using physical and demolition methods.

Beginning in 1984, numerous environmental investigation and remediation activities have occurred on Site 39. During these investigations, metals and various compounds associated with explosives have been detected in soil. Remediation has been more extensive in areas targeted for redevelopment, an area that includes the Proposed Project Injection Well Facilities site.

Most of these lands are now controlled by the Fort Ord Reuse Authority (FORA), the organization responsible for the planning, financing, and implementing the conversion of former Fort Ord military lands to civilian activities. FORA has signed an Environmental Services Cooperative Agreement (ESCA) with the U. S. Army to allow transfer of approximately nine parcels (3,340 acres) that were associated with military munitions (e.g., unexploded ordnance (UXO) or munitions and explosives of concern (MEC)). Under ESCA, FORA is responsible for addressing munitions response actions. FORA and their contractors are working with regulatory agencies including the California Department of Toxic Substances Control (DTSC) and the U.S. Environmental Protection Agency (USEPA) to conduct munitions remediation activities, scheduled for completion by 2015.

Most of the ESCA parcels, including the area of the Proposed Project wells, will ultimately be transferred to the City of Seaside. The ESCA parcels that contain the Proposed Project Injection Well Facilities were less impacted by former Fort Ord activities than other parcels associated with Site 39 and have already been cleared of MEC and approved for future development. The Proposed Project wells are purposefully located along the southern-southeastern edge of the parcels and are not expected to interfere with future re-development by the City of Seaside (Figure 4). By spacing the wells along the parcel boundary, it is anticipated that any visual or noise concerns would also be minimized in comparison to a configuration where multiple deep injection wells were operating closer together.

3.3. HYDROSTRATIGRAPHY AND TARGET AQUIFERS

The Seaside Groundwater Basin consists of semi-consolidated to consolidated sedimentary units overlying relatively low permeability rocks of the Miocene Monterey Formation and older crystalline rocks. The sedimentary units consist of deep marine sandstones of Tertiary age overlain by a complex Quaternary-age sequence of continental deposits and shallow Quaternary-age dune deposits. In general, the sedimentary units dip northward and thicken into the Salinas Valley.

The basin has been structurally deformed by geologic folding and faulting. In particular, sedimentary units in the southern portion of the basin have been uplifted and displaced along the Ord Terrace and Seaside faults, which create some hydraulic separation, referred to as compartmentalization, within the basin. Both faults are generally south of the Proposed Project Injection Well Facilities. However, one interpretation of the Ord Terrace fault trace (Yates, et al., 2005) indicates that the fault trends relatively close (within 1,000 feet) to the southern Proposed Project wells (DIW-4 and VZW-4) and could potentially result in some hydraulic separation between the project wells and the closest municipal well to

the southwest, Seaside No. 4 (Figure 2). This uncertainty would not affect the Proposed Project operations. As a conservative assumption, the hydrogeologic investigation assumes that the wells are hydraulically connected.

Two main sedimentary units provide the source of groundwater supply for existing pumping operations in the Seaside Basin: the continental Quaternary-age (Pleistocene) Paso Robles Formation and the Tertiary-age (Miocene) Santa Margarita Sandstone. Permeable units in these two geologic formations are referred to herein as the Paso Robles and the Santa Margarita aquifers. Although the Santa Margarita Aquifer is more homogeneous than the Paso Robles Aquifer, both are defined by a series of stratified layers rather than a single continuous sand unit.

The two aquifers are overlain by Quaternary-age units including undifferentiated sediments, eolian sand deposits, and the consolidated Aromas Formation (CDWR, February 2004; Yates et al., 2005). Although these shallow units are highly permeable in most areas, the deposits occur generally above the water table and are only saturated in coastal areas. As such, these shallow units do not contribute substantially to the basin's water supply.

Aquifer parameters and groundwater conditions associated with each of the two target aquifers in the Proposed Project Injection Well Facilities area are discussed in more detail below. Also included is a discussion of vadose zone properties of the older dune sands and Aromas Sand beneath the proposed site to assist in design of recharge wells (vadose zone wells) for the Proposed Project. A geologic cross section, shown on Figure 5, illustrates the subsurface conditions beneath the area. The location of the cross section and corresponding wells are shown on Figure 2. Subsurface conditions and aquifer parameters in the Proposed Project Injection Well Facilities area are also summarized on Table 3 and discussed in the following sections.

Table 3. Estimated Subsurface Conditions in Proposed Project Area

	Aromas Sand / Older Dune Deposits	Paso Robles Aquifer	Santa Margarita Aquifer	Data Sources
Lithology	Fine brown sand, silty sand, some medium to coarse sand, minor silt and clay.	Heterogeneous package of interbeds of sand, silt, and clay mixtures. Average bed thickness of	Fine- to medium-grained well sorted sand to silty sand; sandy silt in lower portions of formation; minor	1, 2, 3
Interval Thickness	400 feet	250 feet	280 feet	1, 2
Percent Sand	92%	52%	74%	2
Depth	Surface sediments	356 feet	609 feet	Figure 5; Ground surface elev.
Groundwater Conditions	unsaturated	unconfined	semi-confined	4, 5
Aquifer Parameters				
Transmissivity (T)	Not applicable; unsaturated locally	659 feet^2/day to 1,524 feet^2/day	11,377 to 13,947 feet^2/day 24,003 feet^2/day	1, 5, 6, 7, 8, 9
Horiz. Hydraulic Conductivity (K_h)	350 feet/day	20 feet/day	63 feet/day	2, 6
Vertical Hydraulic Conductivity (K_v)	70 feet/day	0.66 feet/day to 16 feet/day	0.63 feet/day	1, 3, 7
Storativity (S)	0.24 to 0.40 (sand); 0.04 to 0.09 (silt; silty sand)	0.12	0.0018 0.00258	1, 4, 5
Average Coastal Subarea Production	Not applicable; unsaturated locally	Est. 500 AFY (15% of total coastal production)	Est. 2,500 AFY (85% of total coastal production)	9, 10
Area Water Levels Below Sea Level	Not applicable; unsaturated locally	900 acres	>2,000 acres	9

Data Sources: 1.Todd Groundwater, 2014; 2.Padre, 2002; 3. HydroMetrics, 2006; 4. ASR Systems, 2005; 5. MPWMD, 2002; 6. Yates et al., 2005;7. Fugro, 1998. 8. HydroMetrics, 2009; 9. Hydrometrics, 2013; 10. MPWMD, 2014.

3.3.1. Older Dune Sands/Aromas Sand

The shallowest geologic deposits at the Proposed Project Injection Well Facilities site are composed of recent and older eolian sands and older continental deposits of Pleistocene age referred to herein as the Older Dune Sands/ Aromas Sand or Aromas Sand. The unit has been described as also including fluvial and coastal terrace deposits, as well as flood-plain and other basin deposits (Yates, et al., 2005; HydroMetrics, 2009).

The entire sequence was recently cored in a boring for a recently-installed monitoring well by Todd Groundwater in the Proposed Project Injection Well Facilities area (see MRWPCA MW-1 on Figure 2). The unit was described on a geologic log and selected core samples were analyzed at various laboratories to evaluate lithology and mineralogy, porosity and permeability, infiltration rates, leaching potential, and other factors to support the Proposed Project development. Complete laboratory results are documented and analyzed in a separate report (Todd Groundwater, February 2015).

Geologic core descriptions from MRWPCA MW-1 indicate that the Aromas Sand is approximately 400 feet thick in the Proposed Project Injection Well Facilities area and is composed primarily of fine-grain sand (about 92 percent sand) with minor amounts of silt and clay. The upper 300 feet is the most homogeneous with generally higher permeability values. As previously shown on Table 3, the unit is associated with high horizontal hydraulic conductivity (350 feet per day) and vertical hydraulic conductivity (70 feet per day) as estimated from laboratory core data.

The geologic unit is illustrated on the cross section on Figure 5 and ranges from about 225 feet at ASR-1 up to about 400 feet thick at MRWPCA MW-1 and monitoring well FO-7. Also shown on the cross section are geophysical logs for the three existing wells that provide readings of electrical (resistivity) measurements throughout the borehole. Although the logs are provided for illustrative purposes only (without ohm-meter or other electrical scales), log curves show relatively high readings in the Aromas Sand (shaded in orange) [5], generally indicative of higher permeability sediments. The Aromas Sand is unsaturated in the Proposed Project Injection Well Facilities area as indicated by the deeper water levels shown on the cross section (water table and potentiometric surface, Figure 5).

Also projected onto the cross section are schematic diagrams of Proposed Project wells (Figure 5). In particular, vadose zone wells (labeled VZW-1 and shown on Figure 2) would be used for recharge into the shallow aquifer. The advanced treated water recharged through vadose zone wells would be released into the Aromas Sand for percolation to the water table. Selection of vadose zone wells as a recharge method is discussed in subsequent sections of this report. Details of the Proposed Project wells, including preliminary designs, are provided in Section 4.

[5] Logs were unavailable in the upper portions of ASR-1 and FO-7 due to shallow surface casings. Log in MRWPCA MW-1 is a cased-hole induction log.

3.3.2. Paso Robles Aquifer

Beneath the Aromas Sand is the Paso Robles Formation (Figure 5). The formation is heterogeneous and contains interbeds of sand, silt, and clay mixtures (Yates et al., 2005). Silt and clay layers are described by a variety of colors including yellow-brown, reddish brown, whitish gray, and dark bluish gray, indicating a variety of depositional and geochemical environments. These continentally-derived deposits are discontinuous and difficult to correlate from well to well in the basin.

The formation is saturated in the Proposed Project Injection Well Facilities area (and coastal areas) and forms the shallow aquifer in the basin (referred to as the Paso Robles Aquifer herein). Permeable units in the Paso Robles aquifer are screened in several production wells downgradient of the Proposed Project Injection Well Facilities area.

The heterogeneous nature of the aquifer can be seen on the electric logs from FO-7, ASR-1, and MRWPCA MW-1 in the Proposed Project Injection Well Facilities area (Figure 5). As shown from the logs, resistivity readings (right of the depth columns) are highly variable throughout the Paso Robles Aquifer, indicating interbeds of varying thicknesses. The upper 50 to 100 feet of the aquifer appear to contain a higher percentage of sand, indicating relatively higher permeability. These sands are screened in MRWPCA MW-1. Below the upper sand unit, the formation becomes more heterogeneous and generally more fine-grained. A lower, more permeable layer in the Paso Robles aquifer is screened in FO-7 at about 600 feet deep (about -125 feet msl). Using an approximate sand indicator of 25 ohm-meters on the electric log of a nearby Paso Robles test well, the overall Paso Robles aquifer is estimated to contain about 52 percent sand (Table 3).

3.3.2.1. Paso Robles Aquifer Parameters

The ability of an aquifer to transmit, store, and yield reasonable quantities of water is reflected in aquifer parameters including transmissivity (T), horizontal hydraulic conductivity (K or K_h), and storativity (S). These parameters for the Paso Robles Aquifer have been compiled and reviewed by previous investigators in the basin (Fugro, 1997; Yates et al., 2005; HydroMetrics, 2009). In the Proposed Project Injection Well Facilities area, representative aquifer parameters include a T value of about 659 square feet per day (ft^2/day) to 1,524 ft^2/day, a K value of 20 ft/day and an S value of 0.12 (dimensionless), reflecting an effective porosity of 12 percent. These parameters for the Paso Robles Aquifer are listed in Table 3.

3.3.2.2. Groundwater Recharge in the Paso Robles Aquifer

The Paso Robles aquifer is recharged mainly from surface infiltration of precipitation (HydroMetrics, 2009). The formation crops out in the eastern portion of the basin where rainfall infiltrates directly into the aquifer units (Yates, et al., 2005). In the Proposed Project Injection Well Facilities area, recharge occurs by percolation through the surficial deposits of the Aromas Sand.

3.3.2.3. Groundwater Production in the Paso Robles Aquifer

The Paso Robles Aquifer is less productive than the deeper Santa Margarita Aquifer, but is screened in several production and monitoring wells near the Proposed Project Injection Well Facilities area. In particular, the Paso Robles is screened in production wells Paralta, Ord Grove, PRTIW, MMP, and Seaside 4, all located within about 1,000 feet west of General Jim Moore Boulevard. In addition, the Reservoir well, located east of General Jim Moore Boulevard and north of Eucalyptus Road, is also screened in the Paso Robles Aquifer. The Paralta and Ord Grove wells are also screened in the deeper aquifer.

Because many wells are screened in both the Paso Robles Aquifer and the Santa Margarita Aquifer, the contribution of the Paso Robles Aquifer to basin production is not known with certainty. Estimates by previous investigators (Yates et al., 2005) indicate that an average of about 40 percent of the coastal area production was from the Paso Robles Aquifer in 2000 through 2003. However, with additional wells in the Santa Margarita Aquifer and changes in production over time, the current contribution from the Paso Robles Aquifer is estimated to be less. Recent analysis indicated that only about 20 percent of the basin pumping was from the Paso Robles Aquifer (HydroMetrics, October 2013 – see Appendix B).

It is expected that this declining trend in Paso Robles Aquifer production will continue into the future as the main producer in the Coastal Subareas, CalAm, transitions from their older wells that were primarily Paso Robles Aquifer wells, to the newer (and higher capacity) wells (i.e., Ord Grove, Paralta, ASR wells), which are primarily Santa Margarita Aquifer wells. Accordingly, the planned 10% allocation of GWR recharge to the Paso Robles Aquifer is reasonable as a future approximation, as further described in subsequent sections of this report (i.e., Section 3.3.5).

3.3.3. Santa Margarita Aquifer

The Santa Margarita Sandstone of Pliocene/Miocene age underlies the Paso Robles Aquifer throughout most of the Seaside Basin. The aquifer consists of a poorly-consolidated marine sandstone approximately 250 feet thick in the Northern Coastal subarea of the basin. The unit has apparently been eroded near the southern basin boundary due to uplift from folding and faulting along the Seaside and Chupines faults (Yates et al., 2005).

The Miocene/Pliocene Purisima Formation overlies the Santa Margarita Sandstone in some areas. This unit has been described in more detail along the coast and has been grouped with the Santa Margarita Aquifer in Layer 5 of the basin groundwater model (HydroMetrics, 2009). The Purisima Formation is difficult to delineate using subsurface data and is either thin or not present beneath the Proposed Project Injection Well Facilities area.

The Santa Margarita Aquifer is shown on the cross section on Figure 5. The more homogeneous nature of the Santa Margarita aquifer is illustrated on the geophysical logs for ASR-1 and FO-7. The aquifer is approximately 280 feet thick in the Proposed Project Injection Well Facilities area and contains about 74 percent sand (with the remainder containing sandy silt and minor clay). The aquifer is about 600 feet deep in the Proposed Project Injection Well Facilities area as indicated on Figure 5.

3.3.3.1. Santa Margarita Aquifer Parameters

A review of Santa Margarita Aquifer parameters in the Proposed Project Injection Well Facilities and coastal areas indicated an average T value of 11,377 ft^2/day (Fugro, 1997; Padre, 2002). More recent aquifer tests in ASR-1 indicated a similar, but slightly higher, T value of 13,947 ft^2/day (Padre, 2002). The Watermaster model has a T value of about 24,000 ft^2/day in the Proposed Project Injection Well Facilities area.

Storativity (S) values have been estimated at 0.0018 and 0.00258 (dimensionless) for the Santa Margarita aquifer, indicating semi-confined to confined conditions. The confined nature of the aquifer suggests that groundwater replenishment can raise water levels more quickly and to higher levels than an equivalent amount of recharge in an unconfined aquifer. Parameters for the Santa Margarita Aquifer are summarized in Table 3.

3.3.3.2. Santa Margarita Aquifer Recharge

Most of the recharge to the Santa Margarita Aquifer is assumed to occur by leakage from the overlying Paso Robles Formation, especially in areas where the lower Paso Robles is relatively permeable (Yates, et al., 2005; HydroMetrics, 2009). Recharge also enters the Santa Margarita Aquifer from subsurface inflow from other subareas and north of the basin boundary. Although the Santa Margarita crops out east of the Seaside Groundwater Basin, recharge occurring in the outcrop area has been interpreted to flow with groundwater toward the Salinas Valley away from the Seaside Groundwater Basin.

3.3.3.3. Santa Margarita Aquifer Production

Coastal pumping in the Santa Margarita Aquifer was estimated to average about 2,500 AFY from 1999-2003, or about 60 percent of the coastal subarea production. Recent changes in wells and production intervals indicate that this percentage has increased. Basin-wide, the total production from the Santa Margarita is estimated to be about 80 percent (HydroMetrics, 2013, see Appendix B).

3.3.4. Groundwater Occurrence and Flow

As discussed above, groundwater occurs under unconfined and confined conditions in the Seaside Basin. Prior to groundwater development, groundwater flow patterns were generally from inland areas toward the coast. Currently, groundwater flow patterns are controlled by local groundwater pumping and subarea pumping depressions. In addition, groundwater flow patterns are altered near certain subarea boundaries where geologic faulting and other discontinuities have compartmentalized groundwater. In particular, the boundary between northern and southern subareas appears to impede groundwater flow. As pumping has lowered water levels in the northern subareas, changes in water levels and flow patterns across the boundary to the south have become more pronounced, with water levels in the southern subarea remaining higher and less influenced by pumping gradients.

In the Proposed Project Injection Well Facilities area, the unconfined water table occurs in the Paso Robles Aquifer leaving the overlying Aromas Sand unsaturated (Figure 5). To be specific, the water table occurs at a depth of about 400 feet below ground surface (bgs). Groundwater within the Santa Margarita Aquifer is semi-confined by low permeability units

in the basal sediments of the Paso Robles Aquifer. Although some leakage occurs, water levels are different in the two aquifers. Differences are less near wells that are pumping from both aquifers. Beneath the Proposed Project Injection Well Facilities area, the potentiometric surface[6] in the Santa Margarita Aquifer is generally about 5 to 10 feet lower than the water table (Figure 5).

Water levels have been monitored in the Seaside Basin for at least 25 years. These data document the decline of water levels in the mid-1990s and a recent partial recovery of water levels in some areas. In general, changes in water levels have occurred in response to changes in groundwater production and ASR operation.

Figure 6 shows a long-term hydrograph of a well in the Northern Coastal Subarea, the PCA East well, to illustrate water level trends and fluctuations since 1989 in coastal areas of the basin. The curve highlighted in orange on Figure 6 represents water levels in the Paso Robles Aquifer and the lower curve represents water levels in the Santa Margarita Aquifer. Figure 7 shows hydrographs in two monitoring wells close to the Proposed Project Injection Well Facilities area, FO-7 and Paralta Test Well (located adjacent to the Paralta production well). Note that data for these wells are displayed from 1994 to 2013, a shorter time interval than shown for the PCA East Well on Figure 6. Similar to the PCA East well, FO-7 also consists of two monitoring points: a shallow well screened in the Paso Robles Aquifer, and a deep well screened in the Santa Margarita Aquifer. The Paralta Test well is screened in both aquifers and represents average water levels, although most of the water appears to be coming from the Santa Margarita Aquifer. Locations of the wells with hydrographs on Figures 6 and 7 are shown on Figure 8.

Hydrographs and water level contour maps are discussed in the following sections.

3.3.4.1. Water Levels in the Paso Robles Aquifer

As shown on Figure 6, water levels in the Paso Robles Aquifer (PCA East – Shallow) have fluctuated between about minus 1 foot below msl to about 7 feet above msl over the last 24 years. Water levels declined below sea level in the mid-1990s in response to increases in groundwater production. Most of the subsequent groundwater production occurred in the deeper Santa Margarita Aquifer and water levels in the Paso Robles Aquifer rose near the coast. Since that time, water levels in the PCA well have stabilized at about two to seven feet above msl. However, water levels remain below msl farther inland where a pumping depression persists (Figure 8).

An additional hydrograph for the Paso Robles Aquifer is shown on the top graph on Figure 7. Water levels in FO-7 (shallow curve shown in orange) illustrate water table conditions about 3,000 feet north of the Proposed Project Injection Well Facilities. Since 1994, the water table in FO-7 has declined from elevations above 20 feet msl in the mid-1990s to about 15 feet msl and have averaged 14.5 feet since 2006 (Figure 7). This decline is consistent with

[6] The level to which water rises in a well.

downgradient pumping in both aquifers that has created a localized pumping depression in the Northern Coastal Subarea.

Figure 8 shows the pumping depression by the closed contour of 0 feet msl (sea level) on the water level contour map (contours from HydroMetrics, 2013). This map, representing water levels measured in July and August 2013, shows water levels below msl covering an area of almost 1,000 acres (also covering about one-half of the Northern Coastal Subarea). Groundwater flow in both the Northern Coastal and Northern Inland subareas is controlled by the depression. Shallow groundwater beneath the Proposed Project Injection Well Facilities area flows west toward the center of the depression where water levels are lower than - 40 feet below msl.

The map also shows that the water levels in the adjacent Southern Coastal Subarea are not significantly influenced by the pumping depression. Contours in that subarea indicate westerly groundwater flow toward the coast and provide some evidence of compartmentalization of the groundwater system across the subarea boundary.

3.3.4.2. Water Levels in the Santa Margarita Aquifer

Water levels have declined in the Santa Margarita Aquifer at a much faster rate than in the Paso Robles Aquifer. As shown on Figure 6, the potentiometric surface of the semi-confined Santa Margarita Aquifer indicates a long-term decline in the PCA East (Deep) well since the mid-1990s with only seasonal recovery. The high rate of decline is likely related to both the increase in Santa Margarita Aquifer pumping as well as the lower S value of the semi-confined aquifer. In general, the rate of decline has been less since about 2006 as a result of the adjudication of the groundwater basin and subsequent changes in pumping rates. Nonetheless, water levels have been below sea level in the coastal PCA East (Deep) well since 1995, increasing the risk of seawater intrusion.

Figure 7 shows similar trends and fluctuations on two hydrographs from Santa Margarita wells closer to the Proposed Project Injection Well Facilities area (FO-7 is about 3,000 feet north and Paralta Test Well is about 1,300 feet to the northwest, see Figure 8 for well locations). Water levels in the Paralta Test Well are generally higher than in FO-7 (Deep), likely due to the well screens installed in both the Paso Robles and the Santa Margarita Aquifers. Although the trends and fluctuations are more similar to the Santa Margarita water levels, the contribution from the Paso Robles Aquifer would raise overall water levels in the well. Water levels in the Paralta Test Well show greater seasonal fluctuations than observed in FO-7 due to its proximity to large pumping wells (Figure 7).

Figure 9 shows the widespread area of water level declines on a recent water level contour map for the Santa Margarita Aquifer (contours from HydroMetrics, 2013). The map shows that water levels are below msl over almost all of the Northern Coastal Subarea and a large portion of the Northern Inland Subarea. The lowest water levels are below -40 feet msl, similar to the low levels in the Paso Robles Aquifer (Figures 6 and 7). Water levels beneath the Proposed Project Injection Well Facilities area range from about -10 feet msl to about -30 feet msl.

The water level contour map also indicates that the pumping depression extends beyond the northern basin boundary but does not extend into the Southern Coastal subbasin. Similar to conditions in the Paso Robles Aquifer, groundwater in the Santa Margarita Aquifer in the Southern Coastal Subarea appears to be compartmentalized by geologic faulting and relatively unaffected by pumping to the north.

3.3.5. Proposed Project Target Aquifers

Hydrogeologic and groundwater data indicate that both aquifers in the Seaside Basin could be recharged to increase basin yield. As shown by the water level contour maps in Figures 8 and 9, water levels in both aquifers have fallen below sea level, placing them both at risk for seawater intrusion.

To increase the basin yield and well production as envisioned in the Proposed Project, replenishment would occur to prevent adverse impacts on basin water levels. If an aquifer is pumped but not directly recharged, water levels may exhibit a short-term decline in one aquifer and a rise in the other. Although most of the groundwater production (and corresponding water level declines) has occurred within the Santa Margarita Aquifer, numerous production wells are also screened in the Paso Robles Aquifer.

These and other considerations for incorporating each aquifer into the Proposed Project are summarized in Table 4. Relative benefits and limitations are listed for comparison between the two aquifers. Issues are focused on the ability to recharge the Proposed Project's recycled water in a cost effective manner in order to allow basin yield to be increased. Based on the information discussed above and summarized in Table 4, the Proposed Project would include recharge into both of the basin aquifers.

Table 4. Aquifer Considerations for the Proposed Project Injection Well Facilities Site

Issue	Paso Robles Aquifer		Santa Margarita Aquifer	
	Relative Benefit	Relative Limitation	Relative Benefit	Relative Limitation
Aquifer Characteristics	Relatively shallow and thick aquifer.	More heterogeneous, interebedded with low permeability units, lower sand content, and lower hydraulic conductivity (K) values.	More permeable and homogeneous with a larger percentage of sand and higher K values.	Deep aquifer, occurring at depths greater than 600 feet locally.
Groundwater Occurrence and Recharge Methods	Unconfined groundwater allows for surface recharge. Deep water table creates large storage volume. Some downward leakage recharges underlying Santa Margarita Aquifer.	Interbeds limit downward migration of recharge in some areas. Lower K values limit injection capacity. Local test wells only capable of injecting about 350 gpm.	Semi-confined groundwater will respond more quickly to the same amount of recharge than in the shallower unconfined aquifer. High K values allow for high injection capacity. Local ASR wells inject >1,000 gpm.	Semi-confined groundwater has less storage. Direct recharge will require relatively expensive deep injection wells.
Water Levels and Recovery of Product Water	Water levels below sea level over large area. Several downgradient production wells screened in both aquifers.	Water level declines occur over a smaller area than Santa Margarita declines. Fewer wells are screened in the Paso Robles Aquifer.	Water levels declines are more severe, cover a larger area, and are below sea level throughout the Northern Coastal Subarea.	May require more coordination with nearby ASR operations.

3.3.5.1. Groundwater Modeling for Aquifer Allocation

The amount of recycled water from the Proposed Project allocated to the Paso Robles Aquifer and the Santa Margarita Aquifer can be varied to meet a variety of Proposed Project objectives including increasing basin yield, raising water levels, and providing adequate underground retention time of recycled water to meet regulatory requirements (see Section 4.1.4). The primary objective of the Proposed Project is to replenish the groundwater basin in a manner that allows for increased production in existing basin wells.

To support project planning, HydroMetrics applied the Watermaster groundwater model to determine the optimal allocation of recycled water injection between the two aquifers. Criteria for determining the optimal allocation included the following:

- capability of existing drinking water wells to capture the recharged recycled water
- minimizing loss of injected recycled water to ocean outflow
- balancing inflows and outflows with no groundwater storage changes.

A TM prepared by HydroMetrics documents the modeling assumptions and results. That TM is provided in Appendix B of this report (HydroMetrics, October 2013). Three scenarios were simulated as summarized in Table 5 below.

Table 5. Aquifer Allocation of Recharge Water in Model Scenarios

Model Scenario	Paso Robles Recharge	Santa Margarita Recharge
1	100%	0%
2	0%	100%
3	20%	80%

Based on the results of the modeling and application of evaluation criteria, an aquifer allocation between 80 percent and 100 percent of recharge to the Santa Margarita Aquifer (accompanied by 20 percent to 0 percent of recharge to the Paso Robles Aquifer) was judged optimal to allow increased production with minimal impacts to basin storage. Based on these results, the following recycled water injection allocations were proposed: 90 percent for the Santa Margarita Aquifer and 10 percent for the Paso Robles Aquifer. This allocation also approximates the production allocation from each aquifer screened in existing production wells.

3.3.6. Methods Considered for Groundwater Recharge

In order to select the most cost effective groundwater recharge method for the Proposed Project, Todd Groundwater examined various recharge methods for both aquifers. A summary of this examination is provided in the subsequent sections.

3.3.6.1. Paso Robles Aquifer Recharge Method

Several recharge methods were considered for recharge into the Paso Robles Aquifer: surface recharge basins, vadose zone wells, and deep injection wells.

3.3.6.1.1. Surface Recharge Methods

Surface recharge basins were considered for the Proposed Project, given their long performance record in California and relative ease of construction and maintenance. However, surface recharge basins capable of recharging the total amount of water for the Proposed Project would require a large surface area of relatively flat land (estimated at about 10 acres) in a hydrogeologically-favorable location. MRWPCA determined that purchase of such a large parcel in the project area would be very expensive, even if land could be located. Even though recharge into the Paso Robles Aquifer was eventually allocated to be only a small percentage of project water, a surface basin would have a larger visual impact than using subsurface methods such as injection wells. In addition, subsurface methods can be spaced for minimal overall land disturbance. Also, the travel time for recharge water to reach the aquifer would be maximized in surface basins. For these and other reasons, surface recharge methods were eliminated from further consideration.

3.3.6.1.2. Deep Injection Wells

Deep injection wells for the Paso Robles Aquifer recharge were considered but eliminated after a hydrogeologic review of a test injection well that had been installed near the Proposed Project Injection Well Facilities. Specifically, MPWMD drilled a Paso Robles test injection well, PRTIW, for potential storage and recovery of surface water in the Paso Robles Aquifer. PRTIW is located west of General Jim Moore Boulevard across from the ASR-1 wellfield (Figure 2).

Injection testing in PRTIW indicated relatively low injection rates of approximately 350 gpm (compared to the nearby ASR Project and Proposed Project wells in the Santa Margarita Aquifer, which are expected inject approximately 1,000 gpm), due to the lower hydraulic conductivity of the aquifer. The rate was deemed inadequate for an economical injection well by MPWMD, and the well is now being used for monitoring and for extracting water for irrigation supplies. Even though injection of 350 gpm might be considered an acceptable rate for the Proposed Project, it is unlikely that such a rate could be sustained on a long-term basis. Because of the heterogeneity and overall lower permeability in the Paso Robles Aquifer, injection capacity is likely to decrease more rapidly than in the more permeable Santa Margarita Aquifer. Lower permeability aquifers can be more susceptible to physical and biological processes that clog pores and restrict groundwater flow.

3.3.6.1.3. Vadose Zone Wells

A vadose zone well is an injection well installed in the unsaturated zone above the water table. These wells typically consist of a large-diameter borehole with a casing/screen assembly installed with a filter pack. The well is used as a conduit for transmitting water into the subsurface, allowing infiltration into the vadose zone through the well screen and percolation to the underlying water table. Creating this pathway is advantageous for replenishment projects where surficial soils or the shallow subsurface contain clay layers or other low permeability impediments to deep percolation. Vadose zone wells allow

replenishment water to bypass shallow layers, reaching the water table faster and along more direct pathways. In addition, replenishment water quality can potentially benefit from soil-aquifer treatment (SAT) in the lower vadose zone prior to arrival at the water table.

Historically, vadose zone wells have been used in the U.S. with varying success, primarily functioning as disposal wells, or "dry wells" and often used for lower quality wastewater or stormwater. The primary disadvantage to using vadose zone wells is the difficulty of repairing wellbore/aquifer damage from physical or biological clogging once it occurs in the well. Typical well development and rehabilitation techniques cannot be conducted on wells screened in the vadose zone. However, the high quality recycled water anticipated for injection for the Proposed Project would be less likely to create potential clogging. Further, design specifications can be incorporated to mitigate clogging and other factors that decrease well performance such as air entrainment.

Over the last 15 years, vadose zone wells have been used successfully in similar areas for recharging recycled water. In particular, the City of Scottsdale, Arizona operates approximately 35 active vadose zone wells (with 27 additional backup wells) for groundwater recharge of recycled water at their Water Campus. Recharge capacity on a per well basis averages about 200 gpm to 400 gpm with some wells capable of injection rates higher than 1,000 gpm. Wells are spaced about 100 feet apart. MRWPCA visited the City to review details of the project. City technical staff provided information and data from these wells in support of the Proposed Project (City of Scottsdale, personal communication, July 16, 2007; July 27, 2007).

Some of the advantages and disadvantages of using vadose zone wells are listed below. Advantages of incorporating vadose zone wells into the Proposed Project include:

- greater certainty of migration pathways into the subsurface compared to surface basins
- ability to by-pass shallow low permeability layers, if any
- less land requirement than surface recharge basins
- no evaporation losses
- less expensive to construct compared to injection wells.

Some disadvantages of using vadose zone wells include:

- limited methods to develop or rehabilitate wells to address lost capacity due to clogging
- limited recharge rates
- air entrainment can reduce recharge capacity if wells are not operated properly.

Because of prior data gaps associated with the physical characteristics and recharge capability of the deep vadose zone at the Proposed Project Injection Well Facilities site, the MRWPCA field program focused on core samples and laboratory analyses throughout the vadose zone to about 130 feet below the water table. Results of the field program and

laboratory analyses were used to confirm design features of the vadose zone wells for the Proposed Project (Section 4.2). Complete results of the vadose zone characterization are documented in a separate report on the field program (Todd Groundwater, February 2015).

3.3.6.2. Santa Margarita Aquifer Recharge Method

Due to the semi-confined groundwater conditions in the Santa Margarita Aquifer, deep injection wells are the only viable method for groundwater replenishment. Although some vertical natural recharge occurs from the Paso Robles Aquifer into the Santa Margarita Aquifer, the amount and timing are uncertain. As noted above (Section 3.3.3.3), most of the extraction in the Northern Coastal Subarea is from the Santa Margarita Aquifer. Direct injection into the aquifer would allow for immediate benefits to water levels in that aquifer and allow downgradient wells to recover the recycled water in a more direct manner.

Successful use of deep injection wells in the Santa Margarita Aquifer has already been demonstrated at the nearby MPWMD ASR Project. Located only about 1,000 feet to 1,600 feet from the Proposed Project Injection Well Facilities site, these wells provide site-specific information on aquifer properties, injection capacity, well design, and costs. According to MPWMD, ASR wells are capable of sustaining injection rates of 1,000 gpm to 1,500 gpm. Testing data in ASR-1 indicated a T value of 104,325 gallons per day per foot (gpd/ft) and a specific capacity of 55 gallons per minute per foot of drawdown (gpm/ft) dd (Padre, 2002). Collectively these data, along with ongoing operational data, indicate that only three to four deep injection wells (allowing for down time associated with well maintenance) would be needed for the Proposed Project to recharge recycled water, a number that is feasible for the Proposed Project.

In addition to these site-specific data, there are four operating groundwater replenishment injection projects in California that have demonstrated the viability of long-term deep injection of recycled water. One example is the project implemented by the Orange County Water District (OCWD). For more than 36 years, OCWD has injected recycled water (and diluent water until 2008) into the Talbert Barrier, a line of more than 40 injection wells creating a hydraulic barrier to seawater along the Orange County coast. A second example is the West Coast Basin Barrier Project in nearby Los Angeles County, where recycled water (and potable water) has been injected into aquifers associated with the West Coast Basin Barrier Project since 1995. The barrier consists of an 8-mile line of about 150 injection wells from the Los Angeles airport to the Palos Verdes peninsula. Both projects have replenished various aquifers, increased the sustainable yield of the basins, and impeded the further intrusion of seawater.

4. PROPOSED PROJECT WELLS

The conceptual layout and preliminary design for the Proposed Project wells are based on the amount of recycled water available for replenishment (see Section 2) and the local hydrogeology (see Section 3). General specifications suggested for the two types of injection wells (vadose zone well and deep injection well) are summarized in Table 6.

Table 6. Proposed Project Well Specifications

Potential Project Specification[1]	Paso Robles Aquifer	Santa Margarita Aquifer
Depth to Aquifer Top	371 feet	623 feet
Depth to Aquifer Bottom	623 feet	903 feet
Depth to Water	382 feet	404 feet
Recharge Method	Vadose Zone Well	Deep Injection Well
Groundwater Occurrence	Unconfined	Semi-Confined to Confined
Transmissivity	659 to 1,524 ft^2/day	11,377 to 13,947 ft^2/day
Hydraulic Conductivity	20 ft/day	63 ft/day
Number of Wells	4	4
Injection Capacity per well	500 gpm	1,000 gpm
Total Injection Capacity	2,000 gpm	4,000 gpm
Extraction Capacity per well (for well maintenance)	NA	2,000 gpm

[1] Assumes project well configuration as shown on Figure 2 with an average ground surface elevation of 379 feet, mean sea level (msl). Depths are average depths for all wells.
ft^2/day – square foot per day; gpm = gallons per minute; NA – not applicable

The injection wells would be constructed on a parcel of land (APN-031-211-001-000) that is currently owned by FORA and scheduled for re-conveyance to the City of Seaside (City). This conceptual project configuration has been presented to the City in informational meetings but has not yet been formally approved by FORA or the City. The City, through its Municipal Code Ordinance, has placed prohibitions and restrictions on construction of wells on certain FORA parcels. However, the Proposed Project Injection Well Facilities would be located on a parcel that is not on the City's prohibited/restricted construction list. The only Municipal Code restriction for this parcel involves soils management during construction activities, which would be readily incorporated into the Proposed Project well Technical Specifications and drilling program requirements.

The Proposed Project injection well locations are shown on Figure 10 along with other project components including back-flush basins and monitoring wells. Estimated ground

surface elevation, depth to water and the aquifers encountered in each proposed well are presented in Table 7.

Table 7. Proposed Project Wells

GWR PROJECT WELLS	GSE[1]	Groundwater Elevation[2]	Depth to Water	Paso Robles[3]		Santa Margarita		Well Depth
				Depth to Top	Depth to Base	Depth to Top	Depth to Base	
	ft, msl	ft, msl	ft, bgs	ft, bgs	ft, bgs	ft, bgs	ft, bgs	ft, bgs
Santa Margarita Deep Injection Wells (DIW)								
GWR-DIW-1	455	-22	477	425	645	700	1000	1020
GWR-DIW-2	395	-30	425	395	647	647	947	967
GWR-DIW-3	365	-30	395	365	605	605	865	885
GWR-DIW-4	299	-18	317	299	539	539	799	819
Average	378.5	-25	404	371	609	622.75	902.75	922.75
Paso Robles Vadose Zone Wells (VZW)								
GWR-VZW-1	455	-5	460					200
GWR-VZW-2	395	-20	415					200
GWR-VZW-3	365	-30	395					200
GWR-VZW-4	299	-15	314					150
Average	379	-18	396					187.5

[1]Ground Surface Elevation (GSE) based on Ord_Topo_Polyline shapefile from Marina Coast Water District, 2013.
[2]Water levels from July/August 2013 estimated from HydroMetrics WY 2013 SW Intrusion Analysis Report, December 2013, Figures 28 and 29.
[2]Groundwater elevation and depth to water represents the water table for the VZWs and the Santa Margarita potentiometric surface for DIWs.
[3]Aquifer geometry estimated from cross section analysis.
bgs = below ground surface
msl = mean sea level (negative indicates below sea level)

4.1. DEEP INJECTION WELLS

Key considerations for the design of Proposed Project deep injection wells include:

- sufficient capacity to accommodate delivered recycled water from the AWTF
- sufficient number of wells to plan for well maintenance and repairs offline
- adequate well spacing to minimize hydraulic mounding interference with other project wells or nearby ASR Project wells
- location sufficiently close to existing production wells to allow the efficient recovery of recycled water
- location with sufficient distance from downgradient production wells to comply with regulatory requirements regarding response and retention times (see Section 4.1.4).

These proposed design considerations are summarized in the following sections.

4.1.1. Deep Injection Well Capacity

Although MPWMD has installed four successful deep injection (and recovery) wells at the nearby ASR Project, the manner in which the Proposed Project deep injection wells would be operated may result in a slightly different well capacity than the ASR wells. Compared to the ASR Project wells, the Proposed Project wells would receive recycled water on a more continuous basis, would inject water at a more consistent rate over time, and would not be used for recovery of injected water (which would be accomplished through existing

downgradient production wells). Injection wells would only be pumped (backwashed) periodically for well maintenance.

In consideration of these factors, a design injection rate slightly lower than the ASR Project wells has been selected for the Proposed Project. Injection capacity at the nearby ASR wellfield is estimated at approximately 1,500 gpm/well. Therefore, a slightly more conservative injection rate of 1,000 gpm/well is estimated for the Proposed Project. This rate would minimize local mounding and long-term stress on the wells.

4.1.2. Number of Deep Injection Wells

Table 1 (in Section 2) presents potential recycled water delivery schedules to provide an average of 3,500 AFY and a maximum of 3,700 AFY of recycled water for Seaside Basin recharge. A key criterion is that the deep injection wells must be capable of accepting the maximum daily injection rate for recycled water from the AWTF for the Santa Margarita Aquifer. As shown in Table 1, the maximum rate for Santa Margarita injection is estimated at 2,179 gpm. With an injection capacity of 1,000 gpm/well, a minimum of three deep injection wells with total design capacity of 3,000 gpm would be required.

Although three wells appear to have sufficient capacity to handle the proposed recycled delivery schedules, extra injection capacity would be desirable to account for well maintenance/down time and potential decreases in well capacity over time. For planning purposes, an injection well is assumed to be operational about 80 percent of the time. Although decreasing injection capacity with time would be managed through well maintenance (back-flushing), the exact maintenance schedule is difficult to predict. Because a well might be down for maintenance (or other reasons) at a time when the maximum injection rate would be required, it is reasonable to incorporate a fourth deep injection well into the Proposed Project.

Accordingly, a total of four deep injection wells are proposed for the project, designated as DIW-1 through DIW-4 on Figure 10. The four proposed wells would provide a total operational capacity of 4,000 gpm, allowing capacity to be reduced to 3,000 gpm when any one well goes offline.

4.1.3. Location and Spacing of Deep Injection Wells

As shown on Figure 10, the deep injection wells have been sited with approximately 1,000 feet between Proposed Project wells. A minimum 1,000-foot spacing is also maintained between each Proposed Project well and the closest downgradient well. There are technical and regulatory considerations for the location and spacing of these wells. Because the injection wells would be operated continuously (except during routine maintenance), water levels are expected to rise or “mound” around the injection wells and expand over time until steady state conditions are reached. As these groundwater mounds overlap in the subsurface, groundwater gradients increase and injection rates may decrease as the well becomes less efficient. Increased spacing between wells (based on the aquifer’s hydraulic properties) can minimize the impacts of this hydraulic interference. In addition, spacing

between the injection wells and downgradient production wells is considered to balance the timely recovery of recharged water with longer retention times required by state regulations (see section 4.1.3.2). These considerations are discussed in more detail below.

4.1.3.1. Hydraulic Interference

For the four deep injection wells that target the same confined aquifer, the proposed well spacing considers the potential for hydraulic interference due to groundwater mounding. Preliminary modeling conducted in 2005 for the CalAm ASR Project indicated that well spacing of about 1,000 feet between wells screened in the Santa Margarita Aquifer would result in only minor interference (ASR Systems, April 2005). Because the hydraulic properties assumed for that modeling are similar to those anticipated beneath the project Injection Well Facilities site, the 1,000-foot spacing is incorporated for the Proposed Project. By moving wells back to the edge of the parcel, the Proposed Project wells would also retain 1,000 feet spacing from the ASR wellfields to minimize interference with ASR operation.

4.1.3.2. Response Retention Time

The SWRCB Division of Drinking Water (formerly the California Department of Public Health) has adopted Groundwater Replenishment Regulations (SWRCB Regulations) for the recharge of recycled water (SWRCB, June 2014). The SWRCB Regulations contain requirements for underground retention time of recycled water that could also potentially affect well spacing. For example, recycled water must be retained underground for a sufficient period of time (as proposed by a project sponsor as part of the California Water Code project permitting[7]) to identify and respond to any treatment failure so that inadequately treated recycled water does not enter a potable water system (referred to as the response retention time). The response retention time has to be at least two months. The 1,000-feet distance between Proposed Project wells and the closest downgradient production wells is expected to result in a travel time of approximately one year. Therefore, the proposed configuration of the Proposed Project wells would readily meet the minimum required response retention time.

4.1.3.1. Underground Retention Time

Additional requirements in the SWRCB Regulations were also considered for well locations and spacing. According to the SWRCB Regulations, a groundwater replenishment project must achieve a 12-log enteric virus reduction using at least three treatment barriers, one of which can be underground retention time with a 1-log reduction per month up to 6 months (6-logs). Notwithstanding the effectiveness of the RTP and AWTF in controlling pathogens, the Proposed Project includes a conservative goal of achieving up to a 6-log virus reduction credit by keeping the recycled water underground for six months prior to arrival at the closest downgradient production wells (ASR-1, ASR-2, and City of Seaside 4 – see Figure 10).

This underground retention time will be demonstrated through a field tracer test after project implementation in compliance with the SWRCB Regulations. For planning purposes, the Watermaster groundwater model has been used to predict or estimate underground retention times for Proposed Project wells. When a model is used to demonstrate the travel

[7] This process includes submittal of an Engineering Report for approval by the SWRCB Division of Drinking Water and review by the CRWQCB.

time, the required retention time is doubled to account for uncertainty in the method of analysis as required by the SWRCB Regulations. Therefore, the model needs to demonstrate a travel time of one year to allow for a six-month credit. Preliminary modeling indicates that seven of the eight Proposed Project wells would meet the one year requirement needed to assume a 6-log virus reduction credit prior to a tracer test. However, modeling indicates that recycled water injected into one injection well, DIW-3, could reach ASR-1 in less than one year (shortest time of 327 days) under certain pumping conditions during five years of the 25-year simulation period. The fastest travel time of 327 days is 38 days short of the model-based one-year travel time project planning goal.

While the necessary underground retention time of six months remains applicable to the Proposed Project, a tracer test, rather than modeling alone, will be needed to demonstrate the project can meet the underground retention time to claim a 6-log reduction credit. Until that test can occur, it is assumed for planning purposes that the estimated minimum 10.5 to 11 months travel time from DIW-3 to the nearest extraction well will limit the reduction credit to a 5-log credit for the Proposed Project. For the conservative purposes of the EIR analysis, it is anticipated that a 5-log reduction credit can be achieved based on modeling results and future revisions would be based on an actual tracer test that is initiated after project startup. Model results are discussed in detail in Section 7. Documentation of the particle tracking associated with the modeling of the Proposed Project is provided in the TM by HydroMetrics (January 2015), included in this report as Appendix C.

4.1.4. Preliminary Deep Injection Well Design

Incorporating some of the successful design features already tested in MPWMD ASR wells, a preliminary well design for a Proposed Project deep injection well has been developed. The exact well depth and screen placement may be determined based on field results during project construction. Current design criteria are summarized in Table 8. A preliminary deep injection well construction diagram is shown on Figure 11.

Table 8. Summary of Design Criteria For Proposed Project Injection Wells

Component/Parameter	Criteria
Number of Santa Margarita injection wells	4
Average depth to water	400 feet
Injection rate per well	1,000 gpm
Discharge rate per well	2,000 gpm
Average well depth	909 feet
Casing size and materials	18-inch outer diameter (OD) stainless steel
Screen assembly	230 feet stainless steel wirewrap
Pump for back-flush	400 horse power (Hp)

4.2. VADOSE ZONE WELLS

Similar to deep injection wells, well capacity and well spacing are also key considerations for vadose zone wellfield design. However, pathways and transport of the product water from the AWTF are also important considerations. Recent data from the MRWPCA field program was used to analyze a preliminary vadose zone well design and operational parameters for the Proposed Project. Complete results of the field program are presented in a separate report (Todd Groundwater, February 2015). For planning purposes, the vadose zone well layout is shown on Figure 10 and discussed in more detail below.

4.2.1. Well Capacity

MRWPCA collected site-specific data during the 2013-2014 field program to better assess potential injection capacity and optimize well design for recharging the Paso Robles Aquifer. Based on core samples and geologic logging in MRWPCA MW-1, the vadose zone appears more homogeneous and permeable than the saturated zone of the Paso Robles Aquifer. Hydraulic conductivity data from core samples indicate the potential for high injection rates. An analysis of vadose zone well capacity presented in the field program report (Todd Groundwater, February 2015) indicated that one vadose zone well could likely recharge the entire allocation of 242 gpm. The analysis suggests that with about 100 feet of screen, an injection rate of approximately 500 gpm could be achieved. This analysis is supported by the large storage capacity in the vadose zone beneath the Proposed Project Injection Well Facilities site.

Thin, low-permeability silt and clay zones were more prevalent in the lower portions of the vadose zone that could potentially decrease injection rates or result in long travel times to the water table. A comparison of these zones with geologic descriptions in the closest production wells (Reservoir Well and PRTIW) indicate that these layers are not likely continuous over the Proposed Project Injection Well Facilities area.

4.2.2. Number of Wells

With an estimated injection capacity of 500 gpm, only one vadose zone well would be needed to accommodate the anticipated delivery of product water. As shown in Table 1 (Section 2), the maximum injection rate estimated for the Paso Robles Aquifer is 242 gpm.

However, more than one well is recommended for several reasons. First, the long-term injection capacity of vadose zone wells is uncertain and may also represent very long travel times. Vadose zone wells are subject to clogging and cannot be redeveloped using conventional techniques. Vadose zone wells are much less expensive than deep injection wells and can be incorporated into the Proposed Project at a much lower cost. In addition, the extra capacity would provide the Proposed Project with operational flexibility. If unanticipated well problems arise, additional vadose zone capacity would allow injection to continue while wells are being repaired or replaced. If monitoring indicates that certain target recharge areas are being under-supplied to the Paso Robles Aquifer, additional

vadose zone wells would allow recharge to be targeted in specific areas. Accordingly, four vadose zone wells are being incorporated into the Proposed Project design.

4.2.3. Spacing and Location of Wells

The locations of the vadose zone wells along the 3,000 feet corridor are less sensitive to the criteria for placing the deep injection wells with respect to the distance to the nearest downgradient production well. In particular, vadose zone wells are less sensitive to the requirement for underground retention time described previously (Section 4.1.3.1). Average linear groundwater velocities are lower in the Paso Robles Aquifer due to lower permeability, which adds to the travel time to production wells. In addition, travel time is lengthened by the additional time needed for water to percolate from vadose zone well screens to the water table.

In addition, the spacing between wells is considered less critical for hydraulic interference than deep injection well spacing, given the large storage volume in the vadose zone and the relatively small amounts of injection planned for the vadose zone wells. Well spacing at the Scottsdale Water Campus was only a few hundred feet for wells of similar depth and injection rates as the Proposed Project. Further, there is no spacing requirement between deep injection wells and vadose zone wells because they are recharging separate aquifers.

For planning purposes, it is proposed that one vadose zone well would be placed next to each of the four deep injection wells, resulting in a well spacing of 1,000 feet between vadose zone wells (Figure 10). This configuration provides some construction and operational conveniences in that deep and shallow wells are in close proximity for monitoring and maintenance.

4.2.4. Preliminary Well Design

Based on the above analysis of the Proposed Project, a preliminary vadose zone well design has been developed. The preliminary well design incorporates some of the appropriate design features from the City of Scottsdale's successful vadose zone wells including well and casing diameter and materials. Most of the City of Scottsdale's recent wells consist of a 30-inch to 48-inch diameter borehole containing a 12-inch to 18-inch PVC casing/screen assembly with approximately 100 feet of slotted screen. Wells were typically drilled to a depth of 150 to 180 feet and installed with a filter pack from the bottom of the well up to a surface seal. The vadose zone beneath Scottsdale consists of permeable alluvial sediments with the water table at a depth of approximately 400 feet, conditions similar to the Proposed Project Injection Well Facilities site (City of Scottsdale, personal communication, July 27, 2007).

One of the early operational problems experienced by the City of Scottsdale was lost capacity due to air entrainment, a situation remedied by maintaining a full water column in the recharge pipe and preventing cascading water in the well (Marsh, et al., 1997). Casing failures also have occurred in some wells and appear to correlate to the placement and

operational pressure of the injection line at the well screen (City of Scottsdale, personal communication, July 16, 2007).

Over time, the City of Scottsdale has modified their well design to install one or more small-diameter recharge lines to the bottom of the well (e.g., a 4-inch PVC casing referred to as an eductor line). The well design also incorporates transducer tubes, ventilation lines, and lines to access the gravel pack (City of Scottsdale, personal communication, July 27, 2007). These three additional components allow for more accurate monitoring, less chance of air entrainment, and ability to add to the gravel pack, respectively.

Based on the information reviewed from the Scottsdale vadose zone wells and site-specific conditions investigated during the recent MRWPCA field program, design criteria have been developed for the Proposed Project wells as summarized in Table 9. A preliminary vadose zone well construction diagram is provided on Figure 12.

Table 9. Summary of Design Criteria for Proposed Vadose Zone Wells

Component/Parameter	Criteria
Number of wells	4
Depth to water table	380 feet
Borehole diameter	48 inches to 150 feet; 30 inches to 200 feet
Casing/Screen diameter	18-inch OD PVC with 100 feet slotted casing (100 slot)
Injection	4-inch OD PVC eductor line
Injection capacity	500 gpm
Annular material	Artificial filter pack or gravel
Monitoring equipment	Transducer

4.3. WELL MAINTENANCE AND BACK-FLUSHING OPERATIONS

Deep injection wells would need to be pumped periodically to maintain injection capacity, a process known as back-flushing. Injection rates typically decrease with time as a result of numerous conditions that can clog the well such as air entrainment, filtration of suspended or organic material, bacterial growth, precipitates due to geochemical reactions, swelling of clay colloids, dispersal of clay particles due to ion exchange, and/or mechanical compaction of aquifer materials (Fetter, 1988). Clogging rates are often directly related to the presence of solids in the recharge water and indirectly related to the permeability of the aquifer (i.e., higher clogging rates are typically correlated to lower permeability aquifers). Pumping reverses the flow in the well, alters the geochemical environment, and dislodges some of the clogging particles.

4.3.1. Back-flushing Rates and Schedule

Back-flushing is typically conducted at pumping rates higher than injection rates. In a plugging survey published by Pyne (2005), injection rates averaged about 75 percent of extraction rates, but that percent varied widely from project to project. At the nearby ASR Project, MPWMD back-flushes the wells at about twice the injection rate. For planning purposes, it is assumed that the Proposed Project would also back-flush the deep injection wells at twice the injection rate. Accordingly, the deep injection wells would be designed for an injection rate of 1,000 gpm, and back-flushing would be conducted at 2,000 gpm.

The optimal back-flushing schedule and required pumping volumes would be determined once the injection wells are operational. At one Arizona project, injection well operators found that frequent pumping for short periods on a daily basis was the most effective schedule for re-establishing declining capacity (Bouwer, 2002). Other operators have found monthly pumping to be adequate.

The nearby MPWMD ASR wellfield site contains a small back-flush basin that holds approximately 240,000 gallons of water to accommodate several hours of weekly pumping. Because the Proposed Project recycled water will contain relatively low suspended or total dissolved solids (TDS), clogging rates of the deep injection wells may be lower than observed at nearby ASR wells. However, because the Proposed Project wells are being completed in the same aquifer as the ASR wells, and because the injectate for the ASR Project is also relatively low in solids content, weekly pumping is being assumed for planning purposes. Regardless of the pumping frequency, a facility for retention and recharge of the discharged water would be constructed.

For planning purposes, a back-flush schedule similar to the one established at the nearby ASR wellfields would be incorporated into the Proposed Project. The ASR operations suggest that the proposed deep injection wells would be pumped for approximately four hours each on a weekly basis at a pumping rate of 2,000 gpm (twice the estimated injection rate). The actual amount of backflushing would be based on operational needs established in the field, but this schedule represents a reasonable maximum for evaluation of potential impacts. This schedule would produce approximately 480,000 gallons per well per week for discharge into a back-flush basin.

4.3.2. Back-flush Basin Location

In order to facilitate the back-flushing operation, a small surface basin would be constructed near the Proposed Project wells. Water would be piped to the basin, allowed to infiltrate the permeable sediments on the open basin bottom, and percolate down to the water table. By allowing the water to recharge, pumped water would be conserved. This approach for infiltration of back-flushed water was conceptually approved by the SWRCB Division of Drinking Water (Division of Drinking Water, 2014). A preliminary design of the basin and other back-flushing appurtenances has been conducted for MRWPCA by E2 Consulting Engineers.

Several sites have been considered for the proposed back-flush basin location. Although only one site would be needed to support the Proposed Project, three potential sites are shown on Figure 10. The northeastern-most site is the preferred location for the Proposed Project due to its proximity to DIW-1 and DIW-2, the two wells likely to be installed first during the construction phase of the project. The northeastern basin location is also situated on a relatively flat area along the comparatively steep grade of the Proposed Project area.

Two alternate basin sites have been conceptualized at the southern portion of the Proposed Project Injection Well Facilities site near General Jim Moore Boulevard. One site is of similar design to the northeastern basin alternative and is situated at the lowest ground surface elevation of the Proposed Project Injection Well Facilities area (refer to the southern area of blue shading on Figure 10). That basin would be capable of receiving and recharging back-flush water from the Proposed Project wells via a gravity-flow pipeline.

A third location for a back-flush basin is identified northwest of the second location and within 100 feet of General Jim Moore Boulevard. This larger, and potentially deeper basin, was originally identified by MPWMD as an alternative site for back-flush water from the ASR Project wells. The basin is located within a natural depression, referred to as the San Pablo depression due to its proximity to San Pablo Avenue (see Figure 10). Discussions between MPWMD and MRWPCA indicated that there may be some efficiency for sharing a back-flush basin. However, basin construction has not yet been approved and MPWMD has been considering other discharge options in addition to the San Pablo depression.

4.3.3. Back-flush Basin Design

The basin would be constructed on the Aromas Sand, which comprises the upper 300- to 400-feet of vadose zone beneath the Proposed Project Injection Well Facilities area. This geologic unit was recently evaluated in a nearby monitoring well MRWPCA MW-1 (Figure 10). Core samples throughout the vadose zone were collected and analyzed for vertical permeability values to assist with the design. Laboratory permeability values vary widely from more than 100 feet per day in the most permeable sand zones to less than 0.01 feet per day in silty clay intervals. However, samples above about 277 feet contain very little fine-grained sediment (silt or clay). The lowest permeability value above that depth is about 14 inches per hour (or 28 feet per day). MPWMD corroborated this laboratory infiltration rate with observed infiltration rates of about one foot/hour during the first hour of discharge at the existing ASR back-flush basin (located between ASR-1 and ASR-2 and about 1,000 feet from the preferred Proposed Project back-flush basin location, see Figure 10).

Although the vertical permeability value of 28 feet per day may not translate into a long-term infiltration rate, the laboratory data and geologic core samples from MRWPCA MW-1 indicate that the upper 277 feet of the vadose zone is capable of rapid infiltration and storage of water discharged into a back-flush basin. Further, these rates suggest that the basins would be empty on a regular basis for drying and periodic tilling to break up any surficial clogging. For planning purposes, a conservative design infiltration rate of six feet per day is assumed. That rate is judged reasonable, given that it is only about 20 percent of the lowest permeability value recorded in the upper 277 feet of the vadose zone.

Based on these data, E2 Consulting Engineers has developed a preliminary design for the back-flush basin at the Proposed Project Injection Well Facilities site. The preliminary design covers a footprint of approximately 180 feet by 50 feet and would be located between DIW-2 and DIW-3 in the general vicinity of the northeastern-most location shown on Figure 10.

4.3.4. Vadose Zone Wells and Back-flushing

Although vadose zone wells are also subject to clogging, they are constructed above the water table and cannot be readily back-flushed. The injection rate decline in those wells will not be known until the Proposed Project injection begins. However, there are many factors associated with the Proposed Project that would compensate for this potential issue. First, injection design rates are much smaller than indicated by recent permeability data for the Aromas Sand (Todd Groundwater, February 2015). Second, only about 10 percent of the total recycled water produced by the AWTF is currently planned for injection into vadose zone wells. With the assumed conservative injection rate and the smaller amounts of water available for injection, wells would not be needed full time and can dry between injection cycles. This would encourage die-off of any bacterial growth in the well. In addition, the Proposed Project recycled water would be highly treated with very low suspended or dissolved solids that could clog wells. Finally, more vadose zone wells are being incorporated into the Proposed Project than the anticipated volumes suggest are needed. If vadose zone wells are capable of 500 gpm as planned, four wells would provide a capacity of 2,000 gpm. However, a total capacity of only about 242 gpm is needed to handle the maximum amount of water allocated for the Paso Robles Aquifer (see Table 1). Collectively, these factors indicate that vadose zone wells can be incorporated successfully into the Proposed Project without back-flushing.

Even if all of the factors above are not sufficient to maintain injection capacity, there is the potential to install temporary equipment into the vadose zone wells to flush the annular space and pump out water that subsequently flows into the well. This method may be considered if injection rates in vadose zone wells cannot be sustained or managed with the number of wells proposed. The current design of the back-flushing detention basin would be capable of handling this small amount of extra water on a temporary basis if needed.

4.4. MONITORING WELLS

New monitoring wells and a monitoring well program are incorporated into the Proposed Project to demonstrate ongoing project performance and to comply with existing regulations. Objectives of the monitoring well program would be to comply with SWRCB and Central Coast Regional Water Quality Control Board (CRWQCB) regulatory requirements by:

- collecting baseline water quality samples prior to startup of the Proposed Project
- monitoring groundwater levels and water quality; the well design would allow for sample collection from each aquifer receiving recycled water
- siting one downgradient well with groundwater travel times (underground retention time) no less than two weeks and no more than six months from the Proposed

Project injection wells (well also has to be greater than 30 days travel time from the nearest drinking water source)

- siting an additional downgradient well between the Proposed Project Injection Well Facilities and the nearest downgradient potable water supply (in addition to the downgradient monitoring well used to demonstrate retention time).

The monitoring wells would also be used to collect data as part of the tracer study (or studies) to demonstrate an underground recycled water retention time of at least six months for a 6-log virus reduction credit and the response retention time that would be developed as part of the California Water Code project permitting process for the Proposed Project.

4.4.1. Monitoring Well Locations

The number and location of appropriate monitoring wells will be negotiated with the SWRCB Division of Drinking Water and CRWQCB for the Proposed Project. Proposed monitoring wells would satisfy the regulations described above and allow for proper monitoring of project performance. After the completion of one field tracer test, results may eliminate the need for one or more monitoring wells located close to remaining injection wells. Further, it appears from preliminary particle tracking results that several injection wells could be monitored by one set of downgradient monitoring points. Nonetheless, the locations of the monitoring wells have not yet been optimized and approved by the SWRCB Division of Drinking Water or CRWQCB. Accordingly, two monitoring well locations for each of three injection well clusters are assumed for the purposes of the impacts analysis.

Following this conservative assumption, the Proposed Project could incorporate up to six downgradient monitoring wells in each aquifer (12 monitoring points) on the north, central, and south portions of the project area, resulting in monitoring wells at six locations (GWR MW-1 through GWR MW-6 on Figure 10). At each of the six monitoring well locations, two adjacent, but separate boreholes would be drilled in close proximity (within about 20 feet) of each other at the same location – one for the Paso Robles Aquifer and one for the Santa Margarita Aquifer (referred to as a well cluster). These six well clusters would result in 12 monitoring points at six locations. For simplicity, each well cluster is referred to as one monitoring well in the text and on the figures.

This monitoring well distribution would allow two downgradient well clusters between each of three injection wells (DIW-2, DIW-3, and DIW-4) and the closest production wells (ASR-1 and ASR-2 for DIW-2 and DIW-3 and Seaside No. 4 for DIW-4). Due to the location and distance of DIW-1 from the nearest downgradient well, GWR MW-2 would also provide monitoring of DIW-1 and no additional wells in the eastern project area are envisioned (Figure 10).

Three of the downgradient monitoring well clusters (GWR MW-1, GWR MW-3, and GWR MW-5) would be located within about 100 feet of three Proposed Project injection wells (DIW-2, DIW-3, and DIW-4) to allow near-injection monitoring and to accommodate tracer testing in compliance with the SWRCB Regulations (SWRCB, 2014). According to the

regulations, the near-injection monitoring well would monitor subsurface transport times between two weeks and six months (SWRCB, 2014). This well can also serve as the monitoring well for an injectate tracer test. Three additional downgradient monitoring well clusters, GWR MW-2, GWR MW-4, and GWR MW-6, would be located about halfway between the Proposed Project and the nearest drinking water well in order to monitor groundwater conditions with more than 30 days of transport time away from the drinking water well (SWRCB, 2014).

MRWPCA MW-1 and FO-7 (shallow and deep) would provide upgradient data to support the monitoring program by serving as control wells (Figure 10). Sampling of these wells in January 2014 included an expanded analyte list to provide background water quality data.

5. WELL CONSTRUCTION ACTIVITIES

The field construction program involves construction and testing of the Proposed Project wells as described in this section. The actual timing of construction, equipping, and hook-up of the proposed wells would be coordinated with construction of the Proposed Project facilities being developed by others.

5.1. FIELD PLANNING

Prior to the initiation of the proposed well construction field program (referred to simply as field construction program in this section), numerous planning activities would be required including:

- identification of specific field activities
- sequencing and scheduling of events
- development of Technical Specifications for wells and the drilling and testing program
- selection of qualified contractors
- assistance to MRWPCA for permit applications, as needed
- confirmation of sampling protocols
- coordination with analytical laboratories
- preparation of field documents that may be required by FORA or the City such as Health and Safety Plans, Traffic Control Plans, Hazardous Materials Plan, and/or Noise Control Plans.

Logistics for the proposed field construction program would include any mitigation measures that may be required by the EIR.

5.1.1. Permits

The numerous permits required for the Proposed Project are documented in the EIR. The primary permits related to well drilling and construction are listed below.

5.1.1.1. Fort Ord Reuse Authority (FORA) Right-of-Entry

Until the ESCA parcels have been cleared by FORA (scheduled for 2015), a Right-of-Entry (ROE) permit will be required for any field work conducted in the Proposed Project Injection Well Facilities area. MRWPCA would be required to submit a workplan for proposed field activities and an ROE application with a reimbursement agreement for application review. For the recently-completed MRWPCA field program, this ROE permit process was initiated in March 2013, but not completed until September 2014 (18 months later). Although there are some efficiencies that have been learned during this initial application phase, long lead times would still be required for FORA ROEs for the proposed field construction program.

5.1.1.2. City of Seaside Conditional Use Permit and Encroachment Permit

The City of Seaside has established operating procedures for any projects involving soil disturbance or groundwater wells within the former Fort Ord lands (Chapter 15.34, Seaside Municipal Code, also referred to as the Ordnance Ordinance). Permit conditions are applicable to projects that disturb greater than 10 cubic yards (yds^3) of soil on certain parcels identified as having munitions or explosives of concern or a project involving a well installation or groundwater replenishment (limited to parcels having a groundwater covenant as defined by the ordinance that restricts groundwater use).

The Proposed Project Injection Well Facilities would be located on portions of two parcels (APN 031-151-048-000 and APN 031-211-001-000) that are not associated with a groundwater covenant in the Ordnance Ordinance but are associated with some construction restrictions. These include no soil disturbance without a soils management plan, notification of possible MEC, and access requirements.

The City will also require a Conditional Use Permit (CUP) to be approved by the Planning Commission. Currently, the City views the wells associated with the Proposed Project as a utility that requires a CUP application and fee.

5.1.1.3. Monterey County

Monterey County Drinking Water Protection Services, Environmental Health Bureau requires a permit for all water supply and monitoring wells. Application forms can be downloaded from the Environmental Health Bureau website for the monitoring wells. For the proposed injection wells, the Drinking Water Protection Services should be contacted directly. The applications must be signed by the property owner; for this project, an encroachment permit from a municipality (e.g., City of Seaside) can be submitted in lieu of a property owner signature. For the recent monitoring well, a signature from FORA was also required because they were the land owner at that time. Application fees are required for each well.

5.1.1.4. California Department of Water Resources (CDWR) and Monterey County Water Resources Agency (MCWRA)

All wells drilled in California, including monitoring and injection wells, require a permit from the CDWR. Such permits, including required completion of a Driller's Log, would be secured by the drilling contractors used for Proposed Project. In Monterey County, MCWRA has a cooperative agreement with the CDWR to manage the Driller's Log permits. Also, DEH provides paperwork from the Monterey County DEH well construction permit process (described above) to MCWRA.

5.1.1.5. CRWQCB and SWRCB Division of Drinking Water

Currently, groundwater replenishment projects must obtain a permit from the CRWQCB (Waste Discharge Requirements and/or Waste Discharge and Water Reclamation Requirements) in accordance with California Water Code Sections 13523 and 13523.1. This process entails submittal of a Report of Waste Discharge to the CRWQCB and an Engineering Report for review by the CRWQCB and approval by the SWRCB Division of Drinking Water. The Division of Drinking Water issues a conditional approval letter, which contains

provisions for the CRWQCB to include in the permit. Effective July 1, 2014, California Water Code Section 13528.5 provides the SWRCB (and hence the Division of Drinking Water) with the authority to issue groundwater replenishment permits. At this time is it is not known if or when the Division of Drinking Water might take over the permitting responsibility from the CRWQCB.

An additional permit for well construction may also be required by the CRWQCB. If drilling methods result in application to land of cuttings or drilling fluids/development water, a Notice of Intent may be required to comply with a state-wide General Order (No. 2003-0003-DWQ). This General Order allows the CRWQCB to grant a permit through an administrative approval process for *General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality*. General Order No. 203-0003-DWQ applies to well development discharge, monitoring well purge water discharge, and boring waste discharge.

5.1.1.6. U. S. Environmental Protection Agency (USEPA) Injection Well Registration

The USEPA administers the Underground Injection Control (UIC) Program, which contains requirements for various classes of injection wells in the state. Injection wells associated with the Proposed Project are designated as Class V wells under the UIC program. Any injection project planned in California must meet the State Sources of Drinking Water Policy, which ensures protection of groundwater quality for drinking water supplies, and therefore a USEPA permit would not be necessary. However, the wells must be registered on the UIC injection well database maintained by USEPA.

5.1.2. Well Technical Specifications

Technical Specifications would be developed for each of the Proposed Project injection wells and monitoring wells. These detailed documents would provide a preliminary well design and describe methods and standards for each well. The specifications would also identify requirements for drilling cuttings and fluid disposal, and use of local utilities, if allowed. In addition, specifications would provide constraints associated with the ROE or other permits not obtained by the drilling contractor. The documents would require preparation and implementation of a site-specific health and safety program.

5.2. Installation and Testing of Deep Injection Wells

The drilling of a deep injection well would require sufficient space for drilling rig access and for storage of temporary wastes such as drilling fluid and cuttings from the borehole. In general, a relatively small site (smaller than about 100 feet by 100 feet) can be accommodated, but may result in increased well costs if staging and equipment storage is limited or if onsite equipment cannot be located for optimal construction operations. However, such a site may not be sufficient to support additional project components such as pits or holding tanks for well discharge. Technical specifications would be based on the drilling site available.

5.2.1. Drilling

The proposed deep injection wells would be drilled with rotary drilling methods similar to those employed for the ASR wellfield. Those wells were drilled using reverse rotary drilling methods and polymer-based drilling fluids to minimize deep invasion of fluids into the formation. Similar methods would be used for the Proposed Project wells to minimize borehole impacts from drilling fluids. Cuttings from the borehole would be logged by a California Certified Hydrogeologist. Open-hole geophysical logging would also be conducted.

It is anticipated that at least one of the Proposed Project monitoring wells would be installed prior to the installation of the proposed deep injection well. This would provide site-specific information and inform details of injection well design. The well would also provide a monitoring point during injection well testing.

5.2.2. Design, Installation, and Development

The proposed deep injection well design would incorporate 18-inch to 24-inch diameter production casing and a wire-wrap stainless steel screen. Screen selection and filter pack design would be developed using both cuttings from the adjacent proposed monitoring well in addition to data collected from nearby ASR wells. Mechanical and pumping techniques would be used to develop the well after installation. Video logs would be conducted in the final wellbore to document well construction and ensure appropriate down-hole conditions for equipping.

5.2.3. Testing and Equipping

Both variable (step) and constant discharge pumping test and constant injection tests would be completed in the proposed injection wells. An 8- to 24-hour test length would be sufficient for the variable and constant rate tests. Flowmeter surveys would be conducted following pumping and injection testing to identify water movement within the wellbore. For planning purposes, it is assumed that both static and dynamic flow testing will be conducted.

The variable and constant rate discharge tests would be conducted immediately following installation and well development and would provide aquifer parameters to support final well design. Injection testing could be conducted after the constant rate discharge tests, but would require product water that may not be available at the time of well construction. As such, injection testing may be delayed unless an adequate alternative water source is available for testing purposes.

At the end of the constant rate discharge test, a water quality sample would be collected to confirm local groundwater quality. Constituents targeted for analysis would be based on compliance with the SWRCB and CRWQCB requirements. The well would be disinfected with chlorine to control any bacterial growth introduced during installation.

A 400 horsepower, variable speed pump for the proposed injection wells is assumed for planning purposes and costs. Additional requirements for wellhead equipment and surface connections are being developed with others on the Proposed Project team.

To maintain injection capacity, the wells would need to be taken offline for periodic pumping to back-flush the well screens and repair or prevent physical clogging. Details for the back-flush basin were discussed previously in this report (Section 4.3). This water would not be lost from the project, but would be allowed to percolate back into the groundwater basin.

5.3. INSTALLATION AND TESTING OF VADOSE ZONE WELLS

The drilling, installation, and testing of the proposed vadose zone wells would likely require less surface area than the proposed deep injection wells. Currently, the proposed vadose zone wells are planned to be on the same well sites as the proposed deep injection wells to minimize construction and ground disturbance to a smaller area than would otherwise be needed.

5.3.1. Drilling

The proposed vadose zone wells would be drilled using the bucket auger drilling method. The field data and results from the drilling, logging, and installation of GWR MW-1 and DIW-1 would be used to confirm the depth and placement of well screens. Grab samples in the vadose zone well boreholes would be logged by a certified California Hydrogeologist during drilling to assist in final vadose zone well design. Open-hole geophysical logging (including induction logging and other logs suitable for the unsaturated zone) would be conducted to assist in stratigraphic characterization. The final logging program would depend on the quality of the data collected in DIW-1. The usefulness of additional logging, such as a video log, would be evaluated based on results of the initial field investigation and pilot testing.

5.3.2. Design and Installation

The preliminary vadose zone well design is discussed in Section 4.2.4 and shown on Figure 12. An 18-inch diameter casing would be set in a borehole drilled to below 200 feet. The annular space would be filled with a high quality gravel pack appropriately sized to avoid plugging the formation with filter-pack fines during long-term injection. Dry chlorine would be mixed with the gravel pack during installation to control bacterial growth that may have been introduced during well installation. Air vents and a transducer tube would also be installed in the annular space of the well.

The casing would be perforated over an approximate 100-foot interval to optimize the open area for recycled water recharge. An eductor tube (typical 4-inch diameter) would be installed in the casing and used to introduce water into the wellbore in a manner that avoids turbulent flow in the open casing and potential air entrainment. The eductor tube would be installed with an orifice plate on the bottom or a variable orifice valve to introduce specified

sustained or variable flows. An air vent would also be installed in the casing to allow air to escape while being displaced by the water.

5.3.3. Pilot Testing and Monitoring

Injection testing would be conducted to establish a wetting front and estimate long-term injection rates. A one-month test is assumed to be sufficient to inform any well design modifications for the remaining wells. In general, the subsequent three vadose zone wells would be installed in the same manner as the first vadose zone well, which is considered a pilot well.

To allow for monitoring during pilot testing, a small-diameter boring would be drilled adjacent to the pilot vadose zone well to install temperature probes or other monitoring devices to track the wetting front of the project water as it percolates through the vadose zone. This monitoring would provide valuable information for the demonstration of underground retention time associated with the SWRCB Regulations (SWRCB, 2014).

Hook-up to the conveyance system may incorporate a butterfly valve that allows automatic recharge operation at each well. All wells would be equipped with a high water level alarm. Well hook-ups and onsite water supply lines would be coordinated with pipeline and surface equipment designs by others. Once installed, the vadose zone wells would require a relatively small surficial footprint and can be incorporated into the Proposed Project close to deep injection wells.

5.4. Drilling, Installation and Development of Monitoring Wells

The Proposed Project monitoring wells would be drilled with the direct or reverse rotary method. Wells would either be installed as well clusters (separate casings in two smaller boreholes) or nested wells (two casings in one larger borehole) in order to monitor both the Paso Robles and Santa Margarita Aquifers at each monitoring well location. For planning purposes, well clusters are assumed.

Geologic samples from all boreholes would be logged by a California Certified Hydrogeologist. Geophysical logging would be conducted to supplement geologic data from the well cuttings.

Casing diameter would need to be sized to accommodate a sampling pump sufficiently large to lift a groundwater sample from depths greater than 400 feet (minimum 3-inch outer diameter). Wells would be drilled to similar depths as the closest proposed deep injection well and screened similar to injection wells for the Santa Margarita Aquifer. For the Paso Robles Aquifer monitoring, well casings would be screened across the upper-most permeable zones and close to the water table in order to track shallow recharge from the proposed vadose zone wells.

5.5. GROUNDWATER MONITORING PROGRAM

Following installation, all of the Proposed Project monitoring wells and deep injection wells would be sampled and analyzed to collect baseline water quality data in conformance with SWRCB Division of Drinking Water and CRWQCB requirements.

6. PROPOSED PROJECT INJECTION WELL FACILITIES: SEQUENCING AND SCHEDULE

Field planning for the Proposed Project Injection Well Facilities would begin soon after certification of the Final EIR. One of the initial steps in field planning would involve the preparation of Technical Specifications for the wells and applications for drilling permits. The FORA right-of-entry permit for the recently installed monitoring well took approximately 14 months to secure.

The field activity sequencing could consider some alternate scheduling to minimize construction time while providing some flexibility for unanticipated subsurface conditions that would impact well drilling. A list of steps describing the potential sequencing of the Proposed Project well program is provided below. Well locations are shown on Figure 10. The field program generally begins in the north (DIW-1) and ends in the south (DIW-4).

1. Mobilize a bucket auger rig to the field to install surface conductor casing at the two northern monitoring well sites (GWR MW-1 and GWR MW-2). Then move the auger rig to each of the four deep injection well sites (DIW-1, DIW-2, DIW-3, and DIW-4 for conductor casing installation. Surface casings may also be installed for GWR MW-3 and MW-4 before the bucket auger rig is released. Each surface casing is assumed to be installed in one day including rig mobilization.

2. As soon as the bucket auger rig completes the casing at GWR MW-1, mobilize a reverse rotary drilling rig to the field to drill, log, install, and develop two well clusters (Shallow and Deep) at the first monitoring well location. Data from GWR MW-1 would be used to finalize the pre-drilling design of DIW-1. The reverse rig can then be moved to GWR MW-2 to complete the monitoring wells on the north end of the site. Monitoring wells would need to be the first wells installed to allow for collection of baseline groundwater data prior to project startup. A small pump rig can be moved onto GWR MW-2 to complete the monitoring wells while the reverse rotary rig is moved to DIW-1.

3. The reverse rotary rig would drill and install DIW-1. The pump rig would be brought onto DIW-1 for well development and pumping/injection testing, allowing the reverse rig to move to DIW-2. Pumping test would be conducted initially with the pump rig. The injection testing may be delayed, depending on the availability of source water; product water would not be available initially after well completion. The remaining DIW wells would be drilled in a similar manner with the pump rig following the reverse rig.

4. Monitoring well clusters at GWR MW-3 and MW-4 can be completed with the reverse rotary rig after completion of the deep injection wells. Alternatively, an additional reverse rotary rig could be brought in to complete the monitoring well program prior to drilling DIW-4. In that way, hydrogeologic data in the southern

Proposed Project area could be obtained that might inform well design modifications for DIW-4. In addition, baseline sampling events would need to be conducted prior to injection into DIW-4.

5. Mobilize a bucket auger rig to the field to drill a pilot vadose zone well, VZW-1. The vadose zone program could begin after the installation of DIW-1 or after all deep injection wells and monitoring wells are installed. It is recommended that at least the two northern monitoring wells and DIW-1 be completed prior to construction of vadose zone wells. This would allow analysis of the site-specific hydrogeologic data collected during the drilling of the three wells to ensure an optimal pre-drilling design of the vadose zone wells. The first vadose zone well should be viewed as a pilot well or test well to allow testing of the injection capacity prior to installation of the remaining wells. The injection capacity of 500 gpm/well used in project planning is highly conservative, given the thick and permeable sands in the vadose zone. In addition, the maximum amount of injection into the Paso Robles Aquifer is small (277 gpm) and may be accommodated with fewer wells. However, this testing and sequencing of wells would allow optimization and modification of vadose zone well design, as necessary.

6. An additional, small-diameter boring would be installed adjacent to the pilot vadose zone well and equipped with temperature probes or other vadose zone monitoring devices to allow tracking of the wetting front with the initial pilot well testing. The boring could be installed in close proximity to the vadose zone well and would not require additional construction space than has already been allocated for the EIR evaluation. A 30-day (approximate) pilot test would be conducted in VZW-1 to quantify the injection capacity of the vadose zone at that location and to inform future well design.

7. Construction and installation of the back-flush basin could be conducted during the initial drilling of DIW-1 to provide a temporary location for well testing water. Alternatively, other arrangements could be made for testing water, allowing the back-flush basin construction to be completed during conveyance piping and wellhead equipping. It is assumed that pipeline installation would be best conducted soon after the drilling program has been completed to allow for injection testing.

Depending on the timing of other activities, the field program could also be completed in phases. For example, GWR MW-1, MW-2, DIW-1 and DIW-2 could be completed in an initial phase to allow for tracer testing and groundwater modeling prior to installation of the remaining program wells. Phasing would be controlled by the amount and timing of product water available for injection.

7. GROUNDWATER IMPACTS ASSESSMENT

The Seaside Groundwater Basin is an important resource for a reliable water supply for the Monterey Bay area. Increased replenishment of basin aquifers has many benefits including locally higher groundwater levels and increased basin yield, while mitigating the effects of over-pumping during the dry season. Potential impacts from the Proposed Project on water levels, quantity, and quality are described in this section.

7.1. GROUNDWATER LEVELS AND QUANTITY

In order to predict the transport of recycled water in the groundwater system and to evaluate potential impacts of the Proposed Project on groundwater levels and quantity, HydroMetrics has conducted groundwater modeling using the Seaside Basin groundwater flow model. The modeling of the Proposed Project builds on previous modeling runs that were used during project development to allocate project water between the two basin aquifers (HydroMetrics, October 2013). The initial project development modeling was described previously in this report (Section 3.3.5.1); the TM documenting the project development modeling results is included in this report as Appendix B. The Proposed Project modeling is included in this report as Appendix C.

The Proposed Project modeling incorporated the proposed delivery schedule and drought reserve account as described in Section 2. The appropriate delivery schedule of the eight schedules shown on Table 1 was assigned to each year of project operation in the modeling based on hydrology and the balance of the drought reserve account. The amounts used for injection for each year of the 25-year simulation are documented in an attachment at the end of the HydroMetrics TM (Appendix C).

A brief summary of the Proposed Project modeling in Appendix C and implications for project impacts on groundwater resources are discussed in the following sections.

7.1.1. Modeling Approach

The Proposed Project modeling was conducted using the predictive model setup that the Watermaster has developed previously for analyzing future conditions in the basin. The predictive model covers a 33-year period from 2009 through 2041. The Proposed Project well operations are currently anticipated to begin in 2017. For purposes of the modeling analysis, the injection was simulated as beginning in October 2016 to cover the entire Water Year (WY) 2017 and allow for a 25-year analysis of the project.

The Proposed Project modeling was also conducted using reasonable assumptions of future operation of production wells in the basin. Production wells were assumed to be pumping in the model based on court-allocated pumping and agreements associated with the Seaside Basin adjudication. CalAm production wells (and the ASR wells) were assumed to be the recovery (extraction) wells for the Proposed Project product water based on existing well capacity and water demand (see Appendix C).

The Proposed Project modeling also incorporated a quantitative assessment of future operations of the ASR Project. This assessment was developed by MPWMD, which coordinates the ASR injection and extraction operations under cooperative agreements with CalAm. The assessment was based on historical hydrologic conditions on the Carmel River between 1987 and 2008 and approved rules of ASR operation. This allowed MPWMD to predict both injection and recovery schedules at each ASR well over time. By incorporating this assessment into the model setup, the Proposed Project was evaluated during a full range of ASR injection and recovery (pumping) conditions (see Appendix C).

7.1.2. Modeling Results

The Proposed Project modeling simulated the travel time between injection wells and the closest production wells under the varying hydrologic and pumping conditions throughout the 33-year simulation, incorporating all of the associated delivery schedules in Table 1. The Proposed Project modeling also evaluated changes in water levels at eight production wells over time and assessed the potential for the Proposed Project to potentially affect the risk for seawater intrusion. Full modeling results are presented in Appendix C and summarized below.

7.1.2.1. Flow Paths and Travel Time to Production Wells

The travel time analysis, a modeling process referred to as particle tracking, evaluated the transport of recycled water from injection well to production (extraction) wells. The analysis allows the visualization of groundwater flow paths and provides details for demonstrating compliance with the underground retention time requirements in the SWRCB Regulations.

For the particle tracking analysis, “particles” (acting as a simulated tracer of the recharged water) were released at each of the eight proposed injection well sites (four deep injection wells and four vadose zone wells) in every month of the 25-year simulation when the Proposed Project was in operation. This ensured that the fastest travel time under numerous combinations of pumping and ASR operations could be identified. Particles were simulated as being released around the edges of each model cell containing an injection well and tracked as the water flows downgradient in the groundwater system. Particles were tracked until they reached a cell containing a production well. Tracking from the edges of cells (rather than at the well within the cell) allows for a thorough examination of particle transport, but is also conservative in that it eliminates the additional distance a particle would travel between the actual well and the edge of a cell.

The fastest flow paths as indicated by the model particle tracking simulations are shown on Figure 13. The upper map on Figure 13 shows simulated flow paths from the deep injection wells and the lower map shows the paths from the vadose zone wells. Simulated flow paths from the deep injection wells are being influenced by the dynamic system created by changes in pumping and injection in both production and ASR wells. As shown, the shortest simulated flow paths are from DIW-3 to the nearby ASR wells (shown in red on the top of Figure 13). Simulated vadose zone flow paths are not impacted by the ASR wells, which are screened in the deeper Santa Margarita Aquifer. Recycled water injected in the vadose zone wells flows downgradient unimpeded until arrival at wells that are at least partially screened

in the Paso Robles Aquifer (e.g., Paralta, Luzern). Injection at VZW-1 does not arrive at any production well during the travel time simulation shown in Figure 13, but provides replenishment to the local Paso Robles Aquifer as water flows downgradient.

The fastest travel times for each of the injection wells are tabulated by HydroMetrics (Appendix C) and reproduced in Table 10. The shading for each injection well in Table 10 generally corresponds to the colors of the respective well flow paths on Figure 13.

Table 10. Simulated Fastest Travel Times between Injection and Extraction Wells, in days

Extraction Well	Well of Origin of Particles with Fastest Travel Time (Days)							
	DIW-1	DIW-2	DIW-3	DIW-4	VZW-1	VZW-2	VZW-3	VZW-4
ASR 1&2	-	371	327	1,780	-	-	-	-
ASR 3&4	724	-	-	3,074	-	-	-	-
Luzern	-	-	-	-	-	-	3,140	-
Ord Grove	3,718	1,952	1,052	1,497	-	-	-	4,250
Paralta	506	521	852	2,076	-	5,114	-	-

Note: - = no particle traveling between wells

As shown in Table 10, simulated travel times vary considerably from each injection point to a production well. The deep injection wells provide water to six different wells (including four ASR wells, Paralta, and Ord Grove), varying from 327 days (about 11 months) to more than 3,000 days (more than eight years). Simulated travel times are longer for the injection into the vadose zone wells, but water is still being added to basin storage, which increases hydraulic gradients and groundwater flow toward downgradient wells.

Regarding the underground retention time in the SWRCB Regulations, it appears that project water would remain in the groundwater system for at least six months, which would provide the Proposed Project with the maximum allowed 6-log virus removal credit. However, the demonstration of retention time with groundwater modeling requires a one-year travel time for approval of the six-month credit; DIW-3 does not meet the one-year requirement for all conditions (including the fastest simulated travel time for DIW-3 shown in Table 10). Although the simulated travel times from all injection wells meet the one-year requirement during 20 of the 25-year GWR simulation period, simulated travel times for injection in DIW-3 during five years of the simulation are between 327 days and 365 days. The shortest simulated travel time from DIW-3 to ASR-1/ASR-2 is 327 days, 38 days short of the 365-day simulated travel time needed for the maximum 6-log removal credit. The modeling does, however, support at least a 5-log removal credit. The six-month credit would be re-evaluated as part of the tracer testing to be conducted after the Proposed Project begins operation.

7.1.2.2. Groundwater Levels

Because the Proposed Project would provide additional water for downgradient extraction, the project would result in both higher and lower water levels in existing basin wells over time depending on the timing of extraction and the buildup of storage in the basin. An examination of eight key production wells was completed by HydroMetrics and presented for the entire 33-year simulation period (including 25 years of GWR project operation) (HydroMetrics, January 2015, in Appendix C). These hydrographs illustrate simulated changes in water levels over time at various locations within the basin with and without the Proposed Project. Hydrographs for all eight wells (with one hydrograph representing both ASR-1 and ASR-2) are presented and discussed in the HydroMetrics TM (see Appendix C). Four example hydrographs comparing the *Proposed Project* with a *No Project* scenario are presented on Figures 14 and 15, representing deep and shallow water levels, respectively.

7.1.2.2.1. Deep Water Levels

Figure 14 presents water levels representing two ASR wells closest to the Proposed Project Injection Well Facilities (ASR-1 and ASR-2) and a downgradient production well, Ord Grove 2. Well locations are shown on Figure 10 (Ord Grove 2 is labeled Ord Grove on the figure). On both Figures 14 and 15, the *No Project* scenario is represented by the blue line and the GWR *Project* scenario is represented by the green line. The Proposed Project is simulated to begin in late 2016 (WY 2017); prior to that time period, the water levels for the *No Project* and *Project* scenarios are the same (Figures 14 and 15).

In general, simulated deep water levels (Figure 14) rise in the ASR and Ord Grove wells soon after the Proposed Project is implemented in late 2016. Although simulated water levels continue to rise and fall due to seasonal fluctuation associated with water demand and pumping, water levels do not fall to the lower levels observed in 2011 – 2016. The general rise in water levels occurs under both *Project* and *No Project* conditions. This change is primarily due to the decrease in overall basin pumping as required under the adjudication. For the ASR wells, simulated water levels under the *Proposed Project* scenario are similar to or slightly higher than the *No Project* water levels.

An exception to this occurs during a drought cycle, generally represented by the time period 2031 – 2035, when simulated water levels associated with the Proposed Project are one to nine feet lower than under *No Project* conditions. During that time, the ASR wells are pumping to recover GWR Project water under *Project* conditions, but the ASR wells are not operating under *No Project* conditions. ASR wells are idle during *No Project* conditions because, during drought conditions, no water is available to be extracted from the Carmel River Alluvial Aquifer for ASR injection and no stored water is available for ASR recovery. Because the simulated pumping for the *Project* conditions causes water levels in the wells to fluctuate more than for the *No Project* conditions, simulated water levels are lower on a seasonal basis under the *Project* conditions during a simulated drought cycle. This impact is seen as beneficial overall in that simulated water levels are not lowered significantly and only for a short duration, while simulated groundwater pumping and water supply has been increased during a drought. Under both scenarios, overall simulated water levels remain higher than current levels.

For the Ord Grove well (Figure 14), simulated water levels are relatively similar for the *Project* and *No Project* scenarios from project implementation to about 2029. At that time, *Proposed Project* simulated water levels are generally lower (up to about 10 feet lower), but typically less than about five feet lower during the bottom of each pumping cycle. Again, this is due to the increased pumping allowed by the increased recharge of the Proposed Project. Also, the simulated lower water levels during the drought cycle are higher than the low levels reached prior to the initiation of the Proposed Project. Because simulated water levels are higher than current levels while production is being increased in the basin, the Proposed Project is considered to have a beneficial impact on water supply without a significant adverse impact to groundwater levels and wells.

7.1.2.2.2. Shallow Water Levels

Figure 15 documents changes in simulated water levels under both *Project* and *No Project* scenarios, as illustrated by the Luzern and PCA-W Shallow wells (both screened in the Paso Robles Aquifer). Similar to the deeper hydrographs, simulated water levels generally rise under both *Project* and *No Project* conditions due to an overall decrease in basin pumping. After the Proposed Project is initiated, the Luzern well is pumped to recover the recharged water, although the water has not yet arrived in the vicinity of the well. This creates slightly lower simulated water levels (up to about seven feet) in early stages of the Proposed Project. This also occurs in the PCA-W Shallow well, but the difference is only a few feet because this well is not being pumped to recover Project water. With time, simulated water levels in the Luzern and PCA-W wells rise under the *Project* scenario as Project recharge water moves downgradient toward these wells. The benefit of additional recharge is demonstrated by higher simulated water levels associated with the Proposed Project during drought conditions for both of these wells (beginning in about 2030).

Importantly, simulated water levels do not fall below pre-project levels and do not fall below the Protective Elevation for seawater intrusion (see the Protective Elevation line on PCA-W Shallow well on Figure 15). These Protective Elevations have been determined by the Seaside Basin Watermaster to provide target water levels that are considered to protect the basin from the adverse consequences of seawater intrusion (HydroMetrics, 2009). Although other coastal wells remain below Protective Elevations with and without the Proposed Project, the changes predicted to be associated with the Proposed Project are demonstrated by the hydrograph of PCA-W Shallow, the closest coastal well. These data indicate that the Proposed Project will not exacerbate the risk for seawater intrusion compared to the *No Project* conditions.

7.1.2.3. Groundwater Quantity

The modeling simulations of the Proposed Project recover only the water recharged to the aquifers. As such, the Proposed Project would not result in a significant change in groundwater storage in the basin because the water being injected would eventually be extracted for municipal use. Further, the Proposed Project would increase basin yield and groundwater supply.

7.2. IMPACTS ASSESSMENT ON GROUNDWATER LEVELS AND QUANTITY

Based on the results of the modeling and groundwater analyses, potential impacts of the Proposed Project on groundwater levels and quantity are compared to thresholds of significance as developed from CEQA guidance.

7.2.1. Thresholds of Significance

Appendix G of the 2013 CEQA Guidelines provides the following question to be addressed as part of the Proposed Project EIR regarding groundwater resources:

> *Would the Proposed Project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?*

The criterion above was applied to the results of the groundwater modeling as summarized in the following section. Additional CEQA questions and significance criteria have been developed for addressing water quality. The analysis of groundwater quality is provided in Section 7.3 with the impacts analysis and the significance criteria provided in Section 7.4.

7.2.2. Analysis of Potential Impacts

As discussed above, simulated water levels are sometimes lower under the *Project* scenario because of increased pumping at existing extraction wells. However, simulated water levels are lowered only about 10 feet or less and would be lowered for a relatively short duration, typically for a few months. In addition, simulated water levels are generally higher than pre-project levels. As such, none of the municipal or private production wells would experience a reduction in well yield or physical damage. All existing wells would be capable of pumping the current level of production or up to the permitted production rights.

In addition, analysis of the closest shallow coastal well (PCA-West Shallow) indicates that increased pumping of project water would not result in water levels falling below elevations protective of seawater intrusion. Although it would take time for the beneficial impacts of recharge to reach coastal pumping wells, the increased pumping of nearby Paso Robles production wells would only reduce water levels about two feet near the coast. The closest coastal well, PCA-W shallow remains above Protective Elevations for the duration of the model simulation period.

In addition, there would be no adverse impacts to the quantity of groundwater resources. Because the Proposed Project would only recover the amount of water injected, there would be no long-term change in groundwater storage associated with the Proposed Project.

7.3. EXISTING GROUNDWATER QUALITY AND PROPOSED PROJECT RECYCLED WATER QUALITY

In order to evaluate potential impacts on water quality from the Proposed Project, both ambient groundwater quality and quality of the Proposed Project recycled water are characterized. The characterization of ambient groundwater quality establishes a baseline for a water quality impacts assessment in support of the EIR. The characterization incorporates available data and previous investigations, and also summarizes the results of new geochemical evaluations regarding the interaction of the existing geologic sediments in the Proposed Project area with product water generated from the GWR pilot/demonstration treatment facility[8]. Those geochemical analyses are presented more fully in a separate report on the MRWPCA field program (Todd Groundwater, February 2015).

The Proposed Project Injection Well Facilities study area shown on Figure 2 was used as the focus of the groundwater quality characterization. In order to incorporate additional available water quality data, the study area was expanded about 2,000 feet to the west to include five additional production wells. Water quality data were also evaluated for: 1) the Carmel River water, which is injected into nearby ASR wells; and 2) predicted recycled water quality to be produced at the AWTF and to be injected into the Seaside Basin. The geochemical evaluation utilized data from the advanced treatment pilot testing and bench scale chemical stabilization, which did not include all of the new source waters to be treated at the RTP and subsequently treated at the proposed AWTF. However, the data are a reasonable representation for purposes of the EIR. Types of data and analyses are described in the subsequent sections of this report.

7.3.1. Data Sources

Previous investigations on groundwater quality in the Seaside Groundwater Basin were reviewed including Fugro (1998), Yates et al. (2005), and HydroMetrics (2009). Recent annual reports developed by the Watermaster contain evaluations of potential seawater intrusion (HydroMetrics, 2013). Information was also reviewed in the Final Salt and Nutrient Management Plan (SNMP), which includes summaries of ambient groundwater quality including concentrations of TDS, nitrate, and other constituents (HydroMetrics, 2014).

Recent and historical groundwater quality data for the Proposed Project Injection Well Facilities study area were provided by MPWMD and CalAm. These data were supplemented with recent data collected by Todd Groundwater in association with the MRWPCA field program. Data provided from these sources are summarized in Table 11 and described in the following sections.

[8] A description of the water quality of the Proposed Project product water is provided in Section 7.3.4. based on a bench-scale stabilized sample from the pilot treatment facility.

Table 11. Source of Groundwater Quality Data

Water Quality Database	Data Source		
	MPWMD	Cal-Am	MRWPCA
# Wells	14	8	6
Time Period	1990-2012	2010 - 2013	2014
Anions	x	x	x
Metals (including major cations)	x	x	x
Conventional Chemistry Parameters	x	x	x
Chlorinated Pesticides and PCBs	x	x	x
Nitrogen and Phosphorus Pesticides	x	x	x
Organic Analytes	x	x	x
Chlorinated Acids	x	x	x
Carbamates		x	x
Volatile Organic Compounds (VOCs)	x	x	x
Semivolatile Organic Compounds		x	x
Haloacetic Acids		x	x
Herbicides		x	x
Nitroaromatics and Nitramines (Explosives)			x
Other (e.g., isotopes)			x

PCBs – Polychlorinated Biphenyls
Organic Analytes – including 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane (EDB), diquat, endothall, glyphosate
Carbamates – organic compounds derived from carbamic acids

7.3.1.1. MPWMD Groundwater Quality Monitoring Program

MPWMD conducts a basin-wide groundwater monitoring program with support from the Seaside Basin Watermaster. Components of the program also serve as the monitoring program for the ASR Project. An electronic database in Access© format was provided by MPWMD for this analysis. The database included the Watermaster monitoring program data along with historical groundwater quality data dating back to 1990. Data from 14 wells were used in the water quality characterization.

7.3.1.2. CalAm Production Well Monitoring

CalAm monitors the water quality from their production wells in the basin in compliance with drinking water requirements per California Water Code, Title 22. These data were provided to Todd Groundwater in Excel© format for eight production wells in the water quality study area and included samples from 2010 through 2013.

7.3.1.3. Water Quality Analyses from MRWPCA Field Program

From December 2013 through February 2014, Todd Groundwater conducted a field program for MRWPCA in support of the Proposed Project. The program included a detailed vadose zone analysis, installation and sampling of a new monitoring well (MRWPCA MW-1), and groundwater sampling from five additional wells in the Proposed Project Injection Well Facilities area including two upgradient monitoring wells (FO-7 Shallow and FO-7 Deep) that

had not previously been sampled for groundwater quality. The field program, including all testing and analyses, is documented in a separate report (Todd Groundwater, February 2015). Groundwater sampling results were incorporated into this report to support the water quality impacts assessment. Wells sampled during the field program are summarized in Table 12.

Table 12. Wells Sampled in 2013-2014 Proposed Project Field Program

Well	Well Type	Screened Aquifer	Well Depth (feet, bgs)	Screen Interval (feet, bgs)
MRWPCA MW-1	Monitoring	Paso Robles	521	421 - 446; 466 - 516
FO-7 Shallow	Monitoring	Paso Robles	650	600 - 640
FO-7 Deep	Monitoring	Santa Margarita	850	800 - 840
PRTIW	Irrigation	Paso Robles	460	345 - 445
ASR MW-1	Monitoring	Santa Margarita	740	480 - 590; 610 - 700
Seaside Muni 4	Production	Santa Margarita	560	330 - 350; 380 - 420; 430 - 470; 490 - 550

Notes: All wells sampled January/February 2014. bgs = below ground surface.

An expanded list of constituents was analyzed in these samples (compared to the list of constituents available from monitoring at other basin wells) including:

- chemicals including explosives associated with former Fort Ord activities
- constituents in the SWRCB Regulations
- constituents of emerging concern (CECs) as included in the SWRCB Recycled Water Policy
- isotopic data to support hydrogeologic analysis
- data to support geochemical modeling in order to analyze the compatibility of the Proposed Project recycled water with ambient groundwater.

Laboratory analyses of groundwater samples collected at these six wells are presented in Appendix D (as Tables D-1A through D-1P).

7.3.1.4. Water Quality Database

Data sets from the sources described above were compiled into an Access© database. This database was used to characterize groundwater quality and identify potential constituents of concern for the Proposed Project water quality impacts assessment.

7.3.2. Groundwater Quality Characterization

The available data representing general groundwater chemistry were checked for accuracy and then evaluated using various geochemical techniques, as summarized in this section.

7.3.2.1. Geochemical Analysis and Methodology

Major cation (calcium, magnesium, sodium, potassium) and anion (chloride, sulfate, bicarbonate and carbonate) analyses were plotted on standard Stiff, Trilinear (Piper), Schoeller diagrams (see Hem, 1989), and Brine Differentiation (BDP) plots. Analyses reported in milligrams per liter (mg/L) were recalculated to milliequivalents per liter (meq/L) to evaluate water chemistry and possible sources of groundwater recharge. In the absence of total bicarbonate data, reported total calcium carbonate ($CaCO_3$) concentrations were recalculated to bicarbonate (HCO_3^-) using a conversion factor from Hounslow (1995). To validate the general mineral data, a cation-anion balance error analysis was conducted using the groundwater data.

For geochemical plotting purposes, the most recent available data were used for wells near the Proposed Project Injection Well Facilities. The six wells included in the MRWPCA field program contained the most recent sampling (January or February 2014). Data from July 2012 through November 2013 were used for all other wells except the Ord Terrace well, which contained a more complete data set from September 2009.

7.3.2.2. Analytical Accuracy Using Charge Balance and Cation/Anion Ratios

A cation-anion balance (also known as a charge balance) was calculated for the available analytical data. This is a method by which water quality analytical accuracy is checked to ensure that the water is electrically neutral (hence the term, *charge balance*). For an ideal charge balance, the sum of the anions in milliequivalents per liter (meq/L) should equal the sum of cations in meq/L (Hounslow, 1995).

The charge balance is usually expressed by the equation:

$$\textbf{Balance} = (\sum \text{cations} - \sum \text{anions}) / (\sum \text{cations} + \sum \text{anions}) * 100$$

If the calculated cation-anion balance is less than 10 percent, then the data are assumed to be accurate. If the resulting balance is greater than 10 percent, then one or more of the following conditions may apply:

- the data are inaccurate
- other constituents, such as trace metallic ions or organic ions, may have been present that were not analyzed
- the water was very acidic and hydrogen ions were not present.

Another accuracy check is the ratio of the total cations/total anions, which is also calculated in meq/L. If the ratio equals 1.0, or is at least between 0.90 and 1.10, the data are considered to be accurate. Because a limited number of cations and anions were analyzed, a cation-anion balance of less than 10 percent is assumed to be accurate. Results of the charge balance and cation/anion ratio are provided in Table 13.

Table 13. Charge and Cation-Anion Balance for Groundwater Data Accuracy

Well Designation	Aquifer Screened	Total Cation/Anion Ratio	Target Ratio Accuracy	Charge Balance (%)	Target Balance Accuracy %
Darwin	Paso Robles	0.84	0.9-1.10	-8.81	≤ 10
Military	Paso Robles	0.91	0.9-1.10	-4.851	≤ 10
Seaside Mid. School	Paso Robles	0.96	0.9-1.10	-2.13	≤ 10
MRWPCA MW-1	Paso Robles	1.018	0.9-1.10	0.87	≤ 10
FO-7 Shallow	Paso Robles	1.32	0.9-1.10	13.61	≤ 10
PRITW Mission	Paso Robles	0.84	0.9-1.10	-8.70	≤ 10
City of Seaside Muni 4	Paso Robles	0.97	0.9-1.10	-1.44	≤ 10
ASR-2	Santa Margarita	1.17	0.9-1.10	7.93	≤ 10
ASR-3	Santa Margarita	0.78	0.9-1.10	-12.65	≤ 10
Ord Terrace Shallow	Santa Margarita	0.94	0.9-1.10	-3.15	≤ 10
Ord Terrace Deep	Santa Margarita	1.01	0.9-1.10	0.61	≤ 10
ASR-1 (SMTIW)	Santa Margarita	1.04	0.9-1.10	1.82	≤ 10
Seaside Middle School	Santa Margarita	0.84	0.9-1.10	-8.23	≤ 10
FO-7 Deep	Santa Margarita	1.04	0.9-1.10	1.94	≤ 10
ASR MW-1	Santa Margarita	1.037	0.9-1.10	1.82	≤ 10
Paralta	Both	1.016	0.9-1.10	0.80	≤ 10
Ord Grove	Both	2.00	0.9-1.10	-0.12	≤ 10
ASR Injectate	Treated Surface Water	1.02	0.9-1.10	0.81	≤ 10
GWR Pilot Water	GWR Pilot Plant	1.05	0.9-1.10	2.50	≤ 10

As shown in Table 13, most of the data are within acceptable limits for both the cation/anion ratio and the charge balance. Wells with data slightly outside of the target accuracy limits (shaded values on Table 13 for either cation/anion ratio or charge balance) include Darwin, FO-7 shallow, PRTIW Mission, ASR-2, ASR-3, Seaside Middle School, and Ord Grove. In addition, the groundwater sample from FO-7 Shallow was associated with elevated turbidity that has likely interfered with the metals analytical data and impacted the accuracy check above. Results indicate that the data for wells that do not meet accuracy criteria are most susceptible to inaccurate metals analysis, but are still usable for overall water chemistry. For the purposes of this analysis, all data summarized in Table 13 are presented and reviewed; where water chemistry interpretations are consistent with other data sets in the same aquifer, data are judged reasonable for inclusion. Metals concentrations for the samples that do not meet accuracy criteria are judged less reliable and are not used solely for characterizations of water quality.

7.3.2.3. Water Source Geochemical/Fingerprinting Diagrams

Stiff Diagrams are straight-line plots of cation and anion concentrations in meq/L. Data points are plotted along four parallel horizontal axes on each side of a vertical axis.

Individual points are then connected to produce a polygonal pattern. The patterns or shapes of the polygons can be compared to typical standard patterns for groundwater or seawater or compared to polygons from other wells to identify samples of similar water chemistry. The most recent water quality samples (2009 – 2014) from the combined database were plotted as Stiff diagrams and displayed on a Proposed Project Injection Well Facilities study area map as shown on Figure 16. Diagrams are color-coded to indicate the well construction and the aquifer represented by the polygons. Yellow and green Stiff diagrams indicate a well screened in the Paso Robles Aquifer or the Santa Margarita Aquifer, respectively, while the orange Stiff diagrams indicate screens in both aquifers. Also shown on the map is a Stiff diagram representing the treated Carmel River water injectate for the ASR wellfields (labeled ASR injectate).

The stiff diagrams on Figure 16 show differences in the groundwater signatures between the shallow (Paso Robles) and deep (Santa Margarita) aquifers in the Seaside Basin. In general, wells screened in the Paso Robles Aquifer show lower concentrations of major ions, especially sodium (Na) and potassium (K), calcium (Ca), chloride (Cl), and bicarbonate (HCO_3). Concentrations of these ions are consistently higher in the deeper Santa Margarita Aquifer. Wells that are screened in both aquifers show a signature more similar to the deeper Santa Margarita water signature, indicating that the Santa Margarita Aquifer is contributing more water to the well than the Paso Robles Aquifer.

The ASR injectate has a geochemical signature that is different from most of the aquifer signatures in the basin. Because the injectate is sourced from surface water (i.e., the Carmel River system water), the water chemistry is less mineralized than the Seaside Basin ambient groundwater. The ionic concentrations for the ASR injectate are lower than in the Santa Margarita Aquifer and the injectate appears to have slightly higher magnesium and sulfate content than most wells in the Paso Robles Aquifer. Although not clearly demonstrated by the Stiff diagrams on Figure 16, recent TDS concentrations in the ASR-1 and ASR-2 wells indicate mixing with the injectate (HydroMetrics, March 2014).

Trilinear (Piper) Diagrams allow characterization of water chemistry and comparison of water quality analyses. Cation (Ca, magnesium (Mg), and Na+K) concentrations in meq/L are expressed or normalized as a percentage of the total cations, which are plotted on a triangle in the lower left portion of the diagram. Total anions (carbonate (CO_3)+HCO_3, sulfate (S), and Cl) are plotted on a triangle in the lower right portion of the diagram. The cation-anion plots are then projected onto a central diamond-shaped area, combining both cation and anion distributions. Groundwater with similar geochemistry will generally plot together in similar locations; therefore, groundwater from different sources may be identified by their bulk or intrinsic chemical compositions, which also may be classified as to water type.

The water quality analytical data from the Proposed Project Injection Well Facilities study area wells are plotted on the Trilinear diagram on Figure 17. Data from wells screened in the Paso Robles (yellow) Aquifer, the Santa Margarita Aquifer (green), and both aquifers (orange) are color-coded on the diagram to facilitate aquifer comparisons. Data from an ASR injectate sample (blue) and a sample from the Proposed Project recycled water (GWR)

pilot plant (purple) are also included for comparison. Details of the sample from the GWR pilot plant are provided in section 7.3.4.

The Trilinear diagram (Figure 17) shows that groundwater in both aquifers range from neutral-type to sodium-potassium-type (for cations) and bicarbonate-carbonate-type, to neutral-type, to chloride-type (for anions). In the diamond portion of the diagram, the groundwater samples from both shallow and deep aquifers are generally clustered together toward the center, suggesting that shallow aquifer groundwater is mixing with deep aquifer groundwater. There is some slight differentiation among the two aquifers. Most of the groundwater samples from the Paso Robles wells (yellow) group toward a more sodium-chloride (saline) signature (Figure 17).

The ASR injectate appears slightly different from the groundwater signature, especially with respect to bicarbonate (lower) and sulfate (slightly higher). Several samples from ASR wells plot close to the ASR injectate sample, indicating mixing of the two waters.

The GWR pilot plant recycled water plots as sodium-potassium-type and bicarbonate-carbonate-type mostly because of the added calcium carbonate, calcium chloride and carbon dioxide gas used to stabilize the AWTF water. The signature appears more chemically distinct and plots near the edge of other data points.

Schoeller (Water Source/Fingerprint) Diagrams. Although the Trilinear diagram may be used to differentiate between some water chemistry signatures, differences are often indistinguishable except in percentage amounts. Schoeller diagrams plot the actual concentrations in meq/L of specific cations and anions and can offer a more detailed assessment of water chemistry. Schoeller diagrams are therefore used in conjunction with Trilinear diagrams for typing or fingerprinting different water sources. In general, water from similar sources (e.g., sources may include surface water, groundwater influenced by surface recharge, regional older groundwater) will often plot in a similar pattern on a Schoeller diagram. Cations and anions are shown on the diagram's x-axis while actual concentrations are depicted on the diagram's y-axis. Concentration points are then connected providing a "linear" pattern or "fingerprint" for each analysis.

Figure 18 shows the Schoeller diagram analysis for the Proposed Project Injection Well Facilities study area wells. Samples are color-coded similar to the Trilinear diagram to facilitate analysis. ASR injectate and GWR pilot plant recycled water analyses are also shown for comparison purposes.

The Schoeller diagram confirms the interpretation from the Stiff diagrams in that the Paso Robles Aquifer (yellow) contains groundwater at lower ionic concentrations than the Santa Margarita Aquifer (green). For wells screened in both aquifers (i.e., Paralta, Luzern, and Ord Grove – shown in orange), the Schoeller signature is more similar to the Santa Margarita Aquifer, indicating more contribution from that aquifer to the well sample. However, because there is some overlap in the signatures, it also appears that there is infiltration/mixing of groundwater from the upper to lower aquifer.

The ASR injectate (blue) also appears to be influencing the Santa Margarita Aquifer. GWR pilot plant recycled water, shown for future comparison purposes only, has a unique signature with lower concentrations of Mg and SO_4. This signature is similar to Schoeller signatures for advanced treated (RO) water samples that Todd Groundwater has observed for other recycled water projects.

Brine Differentiation (BDP) Plots. The Brine Differentiation Plot (BDP) was developed by Hounslow (1995) to differentiate brine-contaminated waters from waters of other origins using major constituents commonly available in a water quality analysis. Molar concentrations of calcium divided by calcium plus sulfate on the vertical axis and sodium divided by sodium plus chloride on the horizontal axis are plotted on this type of diagram. The BDP also allows for waters to be plotted in a finite range from 0 to 1.0 on both axes and to determine mixing lines if present. Also, fields for brines, evaporates (i.e., precipitated salts), and seawater can be delineated. One of the advantages of the BDP is that straight- and curved-line mixing ratios can be shown, particularly if end member concentrations (such seawater or brackish water) are known.[9] To determine different water sources, the BDP can be used in conjunction with the Schoeller Diagram.

The BDP on Figure 19 for study area wells shows scattered analytical data without a discernible straight- or curve-line mixing of groundwater. However, the ASR injectate plots close to the ASR wells as expected and plots in a distinct area from other wells. The BDP appears to be a better indicator than the other plots of the mixing of injectate with groundwater in the ASR wells where most of the injection has occurred (ASR-1 and ASR-2). Finally, it is important to note that the GWR pilot plant sample signature is quite distinctive and separate, confirming the Schoeller Diagram signature. These data indicate that Proposed Project product water will be sufficiently distinct from groundwater to allow for use as an intrinsic tracer in tracking the injected recycled water in the subsurface. An *intrinsic tracer* refers to a naturally occurring constituent or compounds already present in water that can distinguish the sample from ambient groundwater. The term is used in opposition to an *extrinsic tracer* – one that is artificially introduced into groundwater (e.g., boron). Per the SWRCB Regulations, the tracer study conducted to validate residence time can use an intrinsic tracer if approved by the Division of Drinking Water and with a safety factor applied (0.67 month credit per month of time estimated using the intrinsic tracer).

7.3.2.4. Concentrations of TDS in Groundwater

As indicated from the geochemical analysis, the ionic concentrations and water chemistry signatures are generally distinct between the Paso Robles and the Santa Margarita aquifers. This interpretation is also mirrored in the concentrations of TDS in groundwater in the Proposed Project Injection Well Facilities study area. Figure 20 shows a map of recent (2012 - 2014) TDS concentration ranges for the samples used in the analysis.

Using the data ranges in the legend, Figure 20 indicates that all of the TDS measurements in the wells were below the California secondary maximum contaminant level (MCL) Upper

[9] End members are waters having two distinct isotopic or chemical compositions with other samples ranging between the two.

Consumer Acceptance Contaminant Level Range of 1,000 mg/L, although some were above the Recommended Consumer Acceptance Contaminant Level Range of 500 mg/L. TDS levels ranged from 190 mg/L in FO-7 Shallow (Paso Robles Aquifer) to 668 mg/L in ASR-2 (Santa Margarita Aquifer). In general, wells screened in the Paso Robles Aquifer have lower TDS concentrations than in the Santa Margarita Aquifer with the 500 mg/L level serving as a reasonable dividing concentration for comparative purposes. For example, all wells screened only in the Paso Robles Aquifer are below 500 mg/L (green on Figure 20). Most of the Santa Margarita wells have recent concentrations above 500 mg/L (yellow on Figure 20), except Paralta (screened in both aquifers), SMS Deep, ASR-3, and FO-7 Deep. The wells did not show a wide variation in TDS concentrations over time.

7.3.3. Potential Constituents of Concern and Other Groundwater Analyses

To supplement the characterization of general groundwater chemistry, the water quality database was reviewed for potential constituents of concern defined for this assessment as regulated constituents (those with MCLs) and constituents associated with former military activities at Fort Ord. Some of these constituents had not been analyzed previously in groundwater beneath the Proposed Project Injection Well Facilities area. To address this data gap, groundwater from the six wells sampled in the field program (Table 12 in Section 7.2.1.3) have been analyzed for more than 300 constituents/parameters. In addition to regulated constituents and former Fort Ord constituents, the six groundwater samples were also analyzed for CECs as defined in the SWRCB Recycled Water Policy and other constituents not previously monitored routinely in local groundwater.

7.3.3.1. Constituents Exceeding California Primary MCLs

For the more than 300 constituents and parameters analyzed in each of the six wells for this monitoring event, only two wells, FO-7 Shallow and MRWPCA MW-1, detected any constituents that did not meet the California primary MCLs for drinking water standards. These detections, along with turbidity values, are summarized in Table 14.

Table 14. Constituents Exceeding California Primary MCLs

Analyte	Method	Units	MDL	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	California Primary MCL
Turbidity	**SM2130B**	**NTU**	**0.040**	**10**	**550**	**71**	**5***
Aluminum (Al)	EPA 200.8	µg/L	8.0		3,700	2,700	1,000
Arsenic (As)	EPA 200.8	µg/L	0.28		210		10
Barium (Ba)	EPA 200.8	µg/L	0.12		1,200		1,000
Chromium (Cr) Total	EPA 200.8	µg/L	0.32		790		50
Lead (Pb) Total	EPA 200.8	µg/L	0.080		42		15
Gross Alpha	7110B	pCi/L	3.00		125 ±5		15
Gross Beta	7110B	pCi/L	4.0		114 ±2		50
Combined Radium	calculated	pCi/L	1.00		38.3 ±2.4		5

*5 NTU is a secondary MCL; turbidity is included on the table for comparison purposes only.

As shown in Table 14, the only constituents that were analyzed at concentrations above primary MCLs were five metals and several radiogenic parameters. These constituents are the ones most affected by elevated turbidity in groundwater samples; as shown on the table, the well with the most exceedances (FO-7 Shallow) is the well with the highest turbidity value (550 NTU). Further, the only other well with an exceedance (MRWPCA MW-1) also detected elevated turbidity (71 NTU). FO-7 Deep did not detect any constituents above primary MCLs, but the slightly elevated turbidity value of 10 NTU correlated to slightly elevated detections in other metals (see Appendix D, Table D-1B). No exceedances of primary MCLs were recorded in any of the wells with turbidity values of 10 NTU or less.

Due to the relatively slow velocities within groundwater systems and the natural filtering associated with aquifer materials, groundwater does not typically contain solids that would result in the elevated turbidity values shown above. Rather, it is more likely that aquifer particles or other solids are being entrained in the groundwater samples and interfering with the laboratory analysis. Collectively, these data indicate that suspended small particles of aquifer material or pre-development solids are being analyzed by the laboratory methods (i.e., causing analysis interference) rather than dissolved constituents on which water quality standards are based. Therefore, the concentrations of certain metals and radiogenic parameters are not representative of actual concentrations in groundwater.

As previously discussed, the small-diameter casings and deep water table have limited the ability to develop these three monitoring wells in order to produce a turbid-free groundwater sample for analysis. As such, future sampling programs will incorporate techniques such as field filtering to minimize the effects of turbidity.

7.3.3.2. Former Fort Ord Constituents

Given the historical land use of the former Fort Ord lands, the MRWPCA field program included groundwater analyses for chemicals of concern associated with former Fort Ord activities. The six groundwater samples from the MRWPCA field program were analyzed for 17 explosive compounds (nitroaromatics and nitramines) by U.S. EPA Method 8330B. In addition, two metals associated with explosive compounds (beryllium and lead) were also analyzed. These data were compared to available California primary drinking water MCLs and California Notification Levels (NLs)[10] and are summarized in Table 15.

[10] NLs are non-regulatory, health-based advisory levels established by the SWRCB Division of Drinking Water (formerly CDPH) for contaminants in drinking water for which MCLs have not been established. A NL represents the concentration of a contaminant in drinking water that the Division of Drinking Water has determined does not pose a significant health risk, but warrants notification to the local governing body.

Table 15. Groundwater Analyses for Explosives and Associated Metals

Constituent	Wells with Detections*	Minimum Reporting Limit (RL)	Detected or Reported Concentration	California Primary MCL	California NL	Comments
		µg/L				
Explosives*						
HMX (cyclotetramethylene tetranitramine)	None	0.099-0.12	ND	None	350	
RDX (cyclotrimethylene trinitramine) (cyclonite)	None	0.099-0.12	ND	None	0.3	
1,3,5- TNB (trinitrobenzene)	None	0.20-0.22	ND	None	None	
1,3-dinitobenzene	None	0.098-0.12	ND	None	None	
3,5-dinitoaniline	None	0.098-0.30	ND	None	None	
TETRYL (2,4,6 trinitro-phenylmethyl-nitramine)	None	0.10-0.12	ND	None	None	
nitrobenzene	None	0.099-0.12	ND	None	None	
4-Amino-2,6-dinitrotoluene	None	0.098-0.11	ND	None	None	
2-amino-4,6-dinotrotoluene	None	0.098-0.11	ND	None	None	
2,4,6-trinitrotoluene (TNT)	None	0.098-0.11	ND	None	1	
2,6-DNT (dinitrotoluene)	FO-7 Shallow	0.20	0.070***	None	None	high turbidity
	FO-7 Deep	0.23	0.064***	None	None	slightly turbid
	ASR MW-1	0.10	0.037***	None	None	
2,4-DNT (dinitrotoluene)	None	0.10	ND	None	None	
2-nitrotoluene	None	0.11	ND	None	None	
4-nitrotoluene	None	0.098-0.12	ND	None	None	
3-nitrotoluene	None	0.098-0.12	ND	None	None	
NG (nitroglycerine) (triniroglycerol)	None	0.99-1.2	ND	None	None	
pentaerythritol tetranitrate	None	0.49-0.56	ND	None	None	
Metals**						
Beryllium (Be)	ASR-2	0.050	0.7	4.0		
	FO-7 Shallow	0.020	0.68			high turbidity
	MRWPCA MW-1	0.020	0.044			turbid
Lead (Pb)	ASR-1	0.020	0.78	15.0		
	ASR-2	0.010	3.0			
	FO-7 Shallow	0.020	**42.0**			high turbidity
	FO-7 Deep	0.080	1.3			slightly turbid
	PRTIW: Mission Memorial	0.020	0.061			
	MRWPCA MW-1	0.020	1.3			turbid
	Paralta	0.001	3.0			

Notes:

* Nitroaromatics and nitramines by U.S. EPA Method 8330B: Samples received and submitted by Alpha Analytical Laboratory, Ukiah, CA to ALS Environmental (ALS), Kelso, WA on February 5, 2014; analyzed by ALS on February 8, 2014.

****** Metals by U.S. EPA Method 200.8 analyzed by Alpha Analytical Laboratory, Ukiah, CA, February 5-11, 2014.

***Constituent also detected in laboratory blank indicating a laboratory contaminant that may not be present in groundwater. All detections were below Reporting Limits (J values) and are not quantifiable.

ug/L = micrograms per liter or parts per billion (ppb)

MCL = Maximum Contaminant Level for drinking water

ND = Not detected above the method detection level for any of the samples from the six wells.

As shown in Table 15, the only explosive constituent detected in groundwater samples was 2,6-DNT (dinitrotoluene). This constituent was also detected in laboratory blank samples, which are samples of laboratory water (not groundwater) analyzed for quality assurance/quality control (QA/QC) purposes. Detections of this constituent at similar levels in the laboratory blank sample indicate that 2,6-DNT is likely a laboratory contaminant and not actually present in groundwater. Although the constituent may be present in several groundwater *samples*, the laboratory blank data suggest that it was introduced into the samples in the laboratory. Further, detections of 2,6-DNT in FO-7 Shallow, FO-7 Deep, and ASR MW-1 were below the laboratory reporting level (RL), meaning that the concentration of 2.6-DNT in samples is too low to be quantified. Given the laboratory QA/QC data for 2,6-DNT, the low levels of the detections, and the absence of additional explosives in groundwater, data indicate that groundwater has not been impacted locally from explosives associated with former Fort Ord activities.

For the metals analysis, both beryllium and lead – as naturally occurring substances – were detected in several groundwater wells above the reporting limits. Beryllium was detected in groundwater collected from ASR-2, FO-7 Shallow, and MRWPCA MW-1, although all of the detections met the California Primary MCL for drinking water. Other wells in the database did not detect beryllium above the laboratory reporting limits.

Lead was also detected in groundwater collected from ASR-1, ASR-2, FO-7 Shallow, FO-7 Deep, Mission Memorial PRTIW, MRWPCA MW-1, and Paralta. The detection in FO-7 Shallow (42 ug/L) was above the MCL (15 ug/L), but appears anomalous with respect to other detections of lead in the database. The concentration of 42 ug/L is the highest concentration in the database by an order of magnitude, which included lead analyses from 13 wells sampled from 2011 through 2014. The second highest concentration was detected in ASR-2 at 3.0 ug/L (also included on Table 15). Except for FO-7 Shallow, all of the detections were below the MCL for lead.

As previously mentioned, the 2014 sampling of FO-7 Shallow was the first time that this small-diameter monitoring well had been sampled for water quality since its original sampling upon well completion. Sampling produced a highly turbid sample (550 NTU), likely relating to the inability to properly develop the well when installed in 1994 as a water level monitoring well. As such, the metals analytical data are likely the result of particle interference and are not likely representative of dissolved lead concentrations in groundwater.

Given the absence of explosives and the relatively low levels of beryllium and lead (with the exception of FO-7 Shallow where data appear to be inaccurate as explained above), the data do not indicate that former Fort Ord activities have impacted groundwater in the existing wells near the Proposed Project Injection Well Facilities site.

7.3.3.3. Constituents of Emerging Concern

As defined in the Recycled Water Policy, constituents of emerging concern (CECs) are chemicals in personal care products (PCPs), pharmaceuticals including antibiotics,

antimicrobials, agricultural and household chemicals, hormones, food additives, transformation products and inorganic constituents. These chemicals have been detected in trace amounts in surface water, wastewater, recycled water, and groundwater and have been added to the monitoring requirements for any project involving recharge of recycled water.

The SWRCB Recycled Water Policy CEC monitoring requirements were based on the recommendations of an expert panel. As part of the SWRCB Regulations for injection projects, a project sponsor must recommend CECs for monitoring in recycled water and groundwater in the Engineering Report in addition to the Recycled Water Policy CEC requirements. For injection projects that produce recycled water using RO and AOP, the monitoring requirements in the Recycled Water Policy only apply to recycled water prior to and after treatment (no groundwater sampling). The following CECs are health-based indicators, treatment/performance based indicators, or both as shown below:

- 17-*β*-estradiol - steroid hormone (health-based indicator)
- Caffeine – stimulant (health-based and performance-based indicator)
- N-nitrosodimethylamine (NDMA) – disinfection byproduct (health-based and performance-based indicator)
- Triclosan – antimicrobial (health-based indicator)
- N,N-diethyl-metatoluamide (DEET) – personal care product (performance-based indicator)
- Sucralose – food additive (performance-based indicator)

None of the CECs currently have either primary MCLs for drinking water. For NDMA, the current NL is 0.01 µg/L.

To provide baseline conditions for these CECs in the Seaside Groundwater Basin, the six wells sampled in the recent MRWPCA field program were analyzed for the six CECs and other pharmaceuticals/PCPs included in U.S. EPA Laboratory methods 1625M and 1694 (APCI and ESI+). Groundwater samples were analyzed from ASR MW-1, City of Seaside 4, FO-7 Shallow, FO-7 Deep, PRTIW Mission Memorial, and MRWPCA MW-1. Full results are provided in Appendix D, Table D-1N. Detections of the six CECs are summarized in Table 16.

Table 16. Groundwater Sample Analyses for CECs

Constituent*	Wells with Detections**	Minimum Reporting Limit (RL)	Detected or Reported Concentration	Comments
		µg/L***		
NDMA (nitrosodimethylamine)	PRTIW (Mission Memorial)	0.002	0.0054	NL =0.01
17-β-estradiol	None	0.001	ND	
Triclosan	None	0.002	ND	
Caffeine	FO-7 Deep	0.001	0.0027	
	MRWPCA MW-1		0.0068	
DEET (n,n-diethyl-m-toluamide)	FO-7 Deep	0.001	0.0023	
	MRWPCA MW-1		0.0060	
Sucralose	None	0.005	ND	

Notes:

* NDMA by EPA Method 1625M; 17-β-estradiol and triclosan by EPA Method 1694-APCI; caffeine, DEET, and sucralose by U.S. EPA 1694-ESI+.

** Groundwater analyzed from wells ASR-1, City of Seaside 4, FO-7 Shallow, FO-7 Deep, PRTIW Mission Memorial, and MRWPCA MW-1.

*** Analyses reported on laboratory analytical data sheets in nanograms per liter (ng/L) or parts per trillion. Converted to micrograms per liter (µg/L) or parts per billion (ppb).

Samples received by Alpha Analytical Laboratory, Ukiah, CA; submitted to Weck Laboratories, Inc. (Weck), City of Industry, CA, on February 5, 2014; analyzed by Weck from February 11 to February 19, 2014.

MCL = Maximum Contaminant Level for drinking water.

ND = Not detected.

NL = Notification level.

As indicated in Table 16, NDMA was detected in groundwater collected from the PRTIW well at 0.0054 µg/L (below the NL); caffeine was detected in FO-7 Deep and MRWPCA MW-1 at 0.0027 and 0.0068 µg/L, respectively (below the Drinking Water Equivalent Level [DWEL] of 0.35 µg/L per Anderson et al., 2010).[11] DEET was detected in FO-7 Deep and MRWPCA MW-1 at 0.0023 and 0.0060 µg/L, respectively (below the DWEL of 81 µg/L per Intertox, 2009). Estradiol (17-β), triclosan, and sucralose were not detected above reporting limits in groundwater collected from any of the six wells.

These data represent the first time that CECs have been analyzed in the Seaside Basin and serve as initial background data. The data will be confirmed through future groundwater sampling events that will support the monitoring program proposed in the Proposed Project's Engineering Report. Nonetheless, only a few constituents were detected at very low levels (all less than 0.01 ug/L) and meet advisory or safe health concentrations.

[11] The DWEL is the amount of a substance in drinking water that can be ingested daily over a lifetime without appreciable risk.

7.3.3.4. Local Anthropogenic Impacts or Contaminant Plumes

A search of the study area was conducted on the California Department of Toxic Substances Control (DTSC) *EnviroStor* web site (www.envirostor.dtsc.ca.gov) and the SWRCB *Geotracker* web site (http://geotracker.waterboards.ca.gov). The goal of the search was to identify any potential industrial sites or activities that could contribute to groundwater contamination from previous site uses, spills, and/or chemical releases in the Proposed Project Injection Well Facilities study area.

Both *EnviroStor* and *Geotracker* listed the 28,016-acre Fort Ord Military Reservation as an active Federal Superfund site and listed munitions as the contaminant of primary concern. Additionally, *Geotracker* identified two adjacent sites on the former Fort Ord lands as gasoline contamination sites: (1) the 14th Engineers Motor Pool and (2) Building 511. These are active sites currently undergoing investigations and are located about 1.8 miles to the northeast. However, both sites are outside of the groundwater basin and are not a threat to groundwater in the Proposed Project Injection Well Facilities area.

Other environmental sites have been identified in the basin, including numerous leaking underground storage tank sites, but none were in the Proposed Project Injection Well Facilities area. Specifically, there were no environmental contaminant sites identified in the area between Proposed Project recharge and downgradient extraction wells. Replenishment activities would not be expected to impact any contaminant plumes, if any, located outside of this area.

7.3.4. Proposed Project Recycled Water Quality

Trussell Technologies, Inc. (Williams, et al., 2014) provided recycled water samples to Todd Groundwater in support of the MRWPCA field program. The samples were developed to represent the Proposed Project product water quality for the purposes of laboratory tests and geochemical analyses. The samples were RO permeate collected from the MRWPCA GWR pilot advanced water treatment plant. Trussell Technologies stabilized the RO permeate using a bench-scale post-treatment stabilization unit to better approximate the water quality anticipated for the product water from the proposed AWTF.

To develop the bench-scale water samples, Trussell Technologies used several strategies for full-scale RO permeate stabilization to mimic goals established for the OCWD's Groundwater Replenishment System (GWRS), a similar project that used advanced treatment to meet regulatory requirements. (See Section 3.3.6.2, for more information on the OCWD's GWRS) The first chemical stabilization step consisted of the addition of calcium as calcium chloride ($CaCl_2$) and sodium hydroxide (NaOH) to increase alkalinity. Then, CO_2 gas was bubbled into the RO water to decrease the pH to a target goal. This process produced approximately 32 L of product water for incorporation into the field program.

These samples - referred to herein as stabilized pilot water samples or pilot water - closely represent the final Proposed Project recycled water quality for the purposes of the field program objectives. The primary objective was to use representative recycled water samples to conduct laboratory leaching tests on vadose zone cores. These data have

supported geochemical modeling (summarized in the following sections). Details of the leaching tests and geochemical modeling results are presented in a separate report on the field program (Todd Groundwater, February 2015).

To support the EIR impacts analysis herein, the GWR pilot plant water samples were also analyzed for general minerals, physical characteristics, and metals. The GWR pilot plant water was analyzed by McCampbell Analytical Laboratory. The analytical methods and sample results are presented in Table 17.

Table 17. Stabilized Pilot Water Analysis

Analyte	Method	Units	Reporting Limit (RL)	Results	MCL or NL	Basin Plan Objective or Guideline[e]
Inorganics:						
Alkalinity (total)	SM 2320B	mg/L	0.10	**37.4**	---	---
Ammonia (NH_3) (total as nitrogen)	EPA 350.1	mg/L	0.10	**1.3**	---	<5
Bicarbonate (HCO_3^-)	SM 2320B	mg/L	1.00	**37.4**	---	<90
Carbonate (CO_3^{2-})	SM 2320B	mg/L	1.00	ND	---	---
Chloride (Cl^-)	EPA 300.15	mg/L	1.00	**21.0**	250[b]	<106
Chlorine (Cl_2)	SM 4500-Cl DE	mg/L	0.40	**2.9**	---	---
Dissolved oxygen (DO) @ 21.8 °C	SM 4500 OG	mg DO/L	1.00	**8.94**	---	---
Hydroxide (OH^-)	SM 2320B	mg/L	1.00	ND	---	---
Sulfate*		mg/L	0.5	ND	250[b]	---
Physical Parameters:						
Langelier Saturation Index @ 21.8 °C	calculated	–	–	**–1.6**	---	---
Oxidation-Reduction Potential (ORP) @22.3 °C	SM 2580B	mV	10.0	**629.0**	---	---
pH @ 25 °C	SM 4500H+B	pH units	0.05	**7.45**	---	Normal Range
Specific conductivity (EC) @ 25 °C	SM 2510B	µmohs/cm or µS/cm	10.0	**127.0**	900[b]	<750
Total Dissolved Solids (TDS)	SM 2540C	mg/L	10.0	**74.0**	500[b]	480
Metals (cations):						
Antimony (Sb)	EPA 200.8	µg/L	0.50	ND	6[c]	---
Arsenic (As)	EPA 200.8	µg/L	0.50	ND	10[c]	100
Barium (Ba)	EPA 200.8	µg/L	5.0	ND	1,000[c]	---
Beryllium (Be)	EPA 200.8	µg/L	0.50	ND	4[c]	100
Cadmium (Cd)	EPA 200.8	µg/L	0.25	ND	5[c]	10
Calcium (Ca)	EPA 200.8	µg/L	1,000	**9,200**	---	---
Chromium (Cr)	EPA 200.8	µg/L	0.50	ND	50[c]	100
Cobalt (Co)	EPA 200.8	µg/L	0.50	ND	---	50
Copper (Cu)	EPA 200.8	µg/L	0.50	ND	1,000[a]	200
Iron (Fe)	EPA 200.8	µg/L	20.0	ND	300[a]	5,000
Lead (Pb)	EPA 200.8	µg/L	0.50	ND	15[c]	5,000
Magnesium (Mg)	EPA 200.8	µg/L	20.0	ND	---	---
Manganese (Mn)	EPA 200.8	µg/L	20.0	ND	50[a]	200
Mercury (Hg)	EPA 200.8	µg/L	0.025	**0.032**	2[c]	10
Molybdenum (Mo)	EPA 200.8	µg/L	0.50	ND	---	10
Nickel (Ni)	EPA 200.8	µg/L	0.50	ND	100[c]	200
Selenium (Se)	EPA 200.8	µg/L	0.50	ND	50[c]	20
Silver (Ag)	EPA 200.8	µg/L	0.19	ND	100[a]	---
Sodium (Na)	EPA 200.8	µg/L	1,000	**18,000**	---	<69,000
Thallium (Tl)	EPA 200.8	µg/L	0.50	ND	2[c]	---
Vanadium (V)	EPA 200.8	µg/L	0.50	ND	50[d]	100
Zinc (Zn)	EPA 200.8	µg/L	5.0	**5.5**	5,000[a]	

Notes:
GWR pilot plant water provided by Trussell Technologies, Oakland, CA delivered to TODD Groundwater on February 12, 2014.
Received and analyzed by McCampbell Analytical, Inc., Pittsburg, CA on February 13-26, 2014.
* Sulfate (SO_4) analysis proved by Trussell Technologies.
µg/L = micrograms per liter or parts per billion (ppb). mg/L = milligrams per liter or parts per million (ppm).
mV = millivolts. µmohs/cm = micomohs per centimeter equivalent to microSiemans per centimeter (µS/cm).
EC = Electrical conductivity. EPA = U.S. Environmental Protection Agency. ND = Not detected or below reporting limit (RL).
SM = Standard Method.

a. Secondary MCL.
b. Secondary MCL recommended range.
c. Primary MCL.
d. NL.
e. Groundwater objectives for protection of the municipal and domestic supply use are MCLs and not repeated in this column. The numbers in the column are the more stringent of the guidelines for irrigation or objectives for agricultural water use.
f. Part of SAR determination.

7.3.5. Geochemical Compatibility Analysis

When two water types with different water chemistry are mixed (such as the Proposed Project recycled water and groundwater), the compatibility of the waters requires examination. Geochemical reactions in the groundwater system in the vicinity of the well and in the aquifer beyond could potentially result in precipitation or dissolution of constituents (e.g., precipitation of silica or dissolution of metals). These reactions could contribute to clogging in the well and/or pore throats or alter groundwater quality thorough dissolution in the vadose zone or aquifer. In particular, injection in the vadose zone could lead to leaching of natural or anthropogenic constituents that could impact groundwater quality. A geochemical assessment is also helpful in identifying potential adverse reactions that may lead to well scaling or biofouling.

The potential for geochemical incompatibility would be addressed at the proposed AWTF by including a stabilization step in the treatment process to ensure that recycled water is stabilized and non-corrosive. Other injection projects such as the OCWD GWRS provide chemical stabilization for these purposes. Further, no adverse impacts have been observed at the nearby ASR wellfields where ASR injectate has a different water chemistry than native groundwater; this injectate has some similar components of water chemistry to the Proposed Project recycled water that are relevant to compatibility.

To estimate geochemical issues that would need to be addressed through treatment design or operational adjustments at the AWTF, a geochemical assessment was performed using the data from the MRWPCA field program (Todd Groundwater, February 2015). The GWR pilot plant water was provided to McCampbell Laboratories under chain of custody protocol to use in laboratory leaching tests on vadose zone core samples. Stabilized GWR pilot plant water was used for the laboratory extraction process of nine core samples and analyzed for a suite of constituents to provide a preliminary estimate of leaching potential. These tests provide a conservative estimate of the potential for leaching constituents from the vadose zone during injection associated with the Proposed Project. The analysis is considered conservative because the GWR pilot plant water is slightly more aggressive (as indicated by

the negative value of the Langelier Saturation Index on Table 17) than the anticipated final AWTF water.

Due to the unconsolidated nature of the core samples and limitations with extraction methods, the laboratory results were compromised by elevated turbidity in some of the leachate samples (Todd Groundwater, February 2015). Notwithstanding the limitations of the results, the leaching tests provided valuable information on which constituents represented the highest potential for leaching and identified potential geochemical reactions that warranted further investigation through geochemical modeling.

Geochemical modeling was conducted with a series of PHREEQC and PHAST geochemical model codes by Mahoney Geochemical Consulting LLC, Lakewood, CO (See Appendix G in Todd Groundwater, February 2015). The modeling was used to analyze the potential for dissolution (leaching) of chromium, arsenic, and lead from the vadose zone sediments (including samples from the Aromas Sand and Paso Robles Aquifer).

The modeling indicated that trace amounts of chromium adsorbed onto the hydrous ferric oxide coatings of the sand grains represented the highest potential for leaching. However, this leaching does not represent a long-term effect due to the limited total amount of chromium available in the sediments. The maximum concentration in the zone of saturation was estimated to be about 4.0 ug/L after one year of injection – a concentration substantially below the total chromium MCL of 50 ug/L.

Although arsenic and lead were also determined to be present in vadose zone sediments, those constituents were more strongly adsorbed to the oxides than chromium. Consequently, only small amounts are predicted to be released into solution as the injected water flows through the Aromas Sand, resulting in sustained but low concentrations of about 4 µg/L for arsenic and approximately 0.7 µg/L for lead. Concentrations in the zone of saturation meet water quality standards. None of the analyses indicated that groundwater concentrations would exceed regulatory standards for any of the leached constituents.

Additional geochemical analyses indicated that aquifer clogging from calcite precipitation would be unlikely due to the low concentrations of calcium and bicarbonate. Extensive biofouling of injection wells was also evaluated and determined to be unlikely given that the low concentrations of nitrogen and phosphorus in the AWTF product water would not tend to stimulate microbial growth.

In addition to impacts from the vadose zone wells, the analysis examined the potential for impacts to the Santa Margarita Aquifer from recharge into deep injection wells. Results indicated that the potential for such impacts were unlikely. Risk of trace metal desorption during injection of recycled water into the Santa Margarita Formation was inferred from previous studies of injected Carmel River water. The two injected water types have similar pH and oxidation-reduction potential, and are therefore expected to have similar effects with respect to adsorption/desorption processes. Previous studies found no indications that significant metal concentrations would be released into solution, and those results can reasonably be extended to injection of recycled water.

None of the modeling results indicated that groundwater would be geochemically incompatible with AWTF product water or that the project would have a significant impact on groundwater quality. Complete results of the geochemical analyses and modeling are presented in the draft report on the MRWPCA field program (Todd Groundwater, February 2015).

In addition to this work, to support the assessment of compliance with the SWRCB Regulations and the CRWQCB and the pilot testing, a one-year monitoring program was conducted from July 2013 to June 2014 for five of the potential source waters. Regular monthly and quarterly sampling was carried out for the RTP secondary effluent, agricultural wash water, and Blanco Drain drainage water. Limited sampling of stormwater from Lake El Estero was performed due to seasonal availability, and there was one sampling event for the Tembladero Slough drainage water.

An assessment conducted by Nellor (2015) reviewed the analytical results of source water monitoring, the water quality results of the GWR pilot plant testing (using ozone, MF, and RO), the stabilized RO sample (see Table 17 in this report), information on the predicted performance and water quality of the proposed full-scale AWT Facility based on other existing groundwater replenishment projects, and related research/studies. Based on the results of that assessment, the Proposed Project will comply with the:

- SWRCB Regulations (for groundwater replenishment), including MCLs, NLs, total organic carbon, and other numeric water quality-based requirements; and
- Central Coast Water Quality Control Plan objectives and guidelines for protection of groundwater uses (municipal and domestic water supply, agricultural water supply, and industrial use).

7.3.6. Salt and Nutrient Management Plan

A Salt and Nutrient Management Plan (SNMP) has been prepared for the Seaside Basin to comply with requirements in the SWRCB's Recycled Water Policy (HydroMetrics, March 2014). The SNMP was developed with basin stakeholder input through the Seaside Basin Watermaster and has been adopted by the MPWMD Board. The final SNMP has been submitted to the CRWQCB.

As documented in the SNMP and confirmed herein, ambient groundwater generally exceeds Basin Plan objectives for TDS in many areas of the basin, while nitrate and chloride concentrations generally meet Basin Plan objectives. As indicated by the water quality analyses of the stabilized GWR pilot plant water (discussed above), TDS, nitrate, and chloride all meet Basin Plan objectives. Further, these concentrations are generally lower than average concentrations in groundwater. As such, recharge of the Seaside Basin using the Proposed Project recycled water would not adversely impact salt and nutrient loading in the basin and would provide benefits to local groundwater quality.

7.4. POTENTIAL GROUNDWATER QUALITY IMPACTS

The assessment of potential impacts from the Proposed Project on local groundwater resources is based on the preceding characterization of groundwater and recycled water.

7.4.1. Thresholds of Significance

Appendix G of the 2013 CEQA Guidelines provides the primary question relating to potential GWR impacts on groundwater quality is as follows:

> *Would the project violate any water quality standards or otherwise degrade water quality?*

The following factors were developed for the Proposed Project to clarify how this question would be applied in the impact analyses. Implementation of the Proposed Project would be considered to have a significant impact on groundwater quality if:

- The Proposed Project, taking into consideration the proposed treatment processes and groundwater attenuation and dilution, were to:
    - Impact groundwater so that it would not meet a water quality standard (e.g., Basin Plan beneficial uses and water quality objectives, including drinking water MCLs established to protect public health).
    - Degrade groundwater quality subject to California Water Code statutory requirements for the Division of Drinking Water, and to the SWRCB Anti-degradation Policy and Recycled Water Policy.
- The Proposed Project were to result in changes to basin recharge such that it would adversely affect groundwater quality by exacerbating seawater intrusion.

7.4.2. Potential Degradation of Groundwater Quality

As described in the previous sections, the Proposed Project recycled water would be treated and stabilized to meet all drinking water quality objectives. As shown on Table 17 and discussed above, TDS (74 mg/L) and nitrogen (1.3 mg/L as total N) would also meet Basin Plan objectives. Further, the Proposed Project recycled water is expected to be higher quality water than ambient groundwater with respect to TDS, chloride, and nitrate. As such, the Proposed Project would not result in the groundwater failing to meet groundwater objectives or beneficial uses. Rather, the Proposed Project recycled water would have a beneficial effect on local groundwater quality from the injection of high quality water that meets objectives and has low TDS and chloride concentrations.

7.4.3. Impacts on Seawater Intrusion

As demonstrated by the modeling by HydroMetrics (Appendix C) and discussed above (Section 7.1.2.2.2), the Proposed Project is not expected to cause water levels to fall below elevations that are protective against seawater intrusion.

The Proposed Project would incorporate operational monitoring to track impacts on water levels from recharge and pumping. Real-time modifications can be incorporated into the operation of the Proposed Project to address any short-term water level declines, if needed. For example, during the primary pumping period, more water can be directed to the deeper aquifer where existing water level declines are more widespread.

The Proposed Project would provide basin replenishment to meet the primary objective of increasing basin production to replace a portion of the CalAm water supply as required by state orders. The impact analysis indicates that the Proposed Project would not exacerbate seawater intrusion. However, it is noted that seawater intrusion cannot be prevented by this project alone. Water levels are below sea level at the coast in the Santa Margarita Aquifer and the Proposed Project would not raise levels over the long term. However, the short term rise in water levels associated with the Proposed Project during the winter when pumping is less will prevent significant water level declines during the summer when pumping increases. A more complete analysis of water level impacts associated with the Proposed Project is provided in the TM in Appendix C.

7.4.4. Geochemical Compatibility of GWR Product Water and Groundwater

As discussed in Section 7.3.5 above, the results of the MRWPCA field program and geochemical modeling indicate that injection of project recycled water through both vadose zone wells and deep injection wells will not have a significant adverse impact on groundwater quality (Todd Groundwater, February 2015). A brief summary of key conclusions from the analysis are provided below:

- Chemicals associated with the former Fort Ord activities, including soluble nitroaromatic compounds (explosives), perchlorate, or certain organic constituents, were not detected in core samples or groundwater samples and are not expected to impact groundwater quality.
- Potential changes in injected recycled water quality beneath vadose zone wells from geochemical reactions between recycled water and formation materials along vertical flow paths are small. The analysis of leaching of chromium, arsenic, and lead indicated that concentrations in the zone of saturation are expected to be very low and would meet water quality standards.
- Aquifer clogging by calcite precipitation is unlikely to be a problem for the Proposed Project. In the Aromas Sand, calcium and bicarbonate concentrations are below saturation levels. Ambient groundwater in the Paso Robles Formation is at saturation with respect to calcite, but given the pH of the injected water, calcite would not be expected to precipitate.
- Biofouling would not likely pose a problem for the injection wells because the injected water is very low in nitrogen and phosphorus and would not tend to stimulate microbial growth.
- Based on the water chemistry of the GWR pilot plant water and observations from the ASR wellfield, adverse impacts from geochemical incompatibility are unlikely in the Santa Margarita Aquifer in the vicinity of the deep injection wells.

7.4.5. Conclusions of the Impacts Assessment for Groundwater Quality

Based on the groundwater characterization, recent groundwater sampling results, stabilized pilot water quality/chemistry and projected AWTF water quality (i.e., highly treated recycled water), and results from the MRWPCA field program, the following conclusions are offered:

- Stabilized GWR pilot plant water samples and projected AWTF product water meet SWRCB Regulations for groundwater replenishment projects and Basin Plan groundwater quality standards, including drinking water MCLs. Further, the treatment processes that would be incorporated into the AWTF would be selected and operated to ensure that all water quality standards would be met in both the recycled water and groundwater. A monitoring program would document project performance.
- Stabilized GWR pilot plant water samples and projected AWTF product water exhibit much lower concentrations of TDS and chloride than in ambient groundwater and would be expected to provide a localized benefit to groundwater quality. Such a benefit would expand over time with continuous injection from the Proposed Project wells.
- No documented groundwater contamination or contaminant plumes have been identified in the Proposed Project area. Therefore, injection associated with the Proposed Project would not exacerbate existing groundwater contamination or cause plumes of contaminants to migrate.
- Injection of AWTF recycled water would not degrade groundwater quality. A monitoring plan would be implemented to meet CRWQCB and SWRCB Division of Drinking Water requirements.
- The Proposed Project recycled water would be stabilized as part of the AWTF to ensure no adverse geochemical impacts. Geochemical modeling associated with the MRWPCA field program indicated that no adverse groundwater quality impacts are expected from leaching or other geochemical reactions.
- The Proposed Project would result in both higher and lower water levels in wells throughout the basin at various times. Although water levels would be slightly lower during some time periods, the difference is generally small and judged insignificant.
- Modeling indicates that the Proposed Project would not lower water levels below protective levels in coastal wells and would not exacerbate seawater intrusion.

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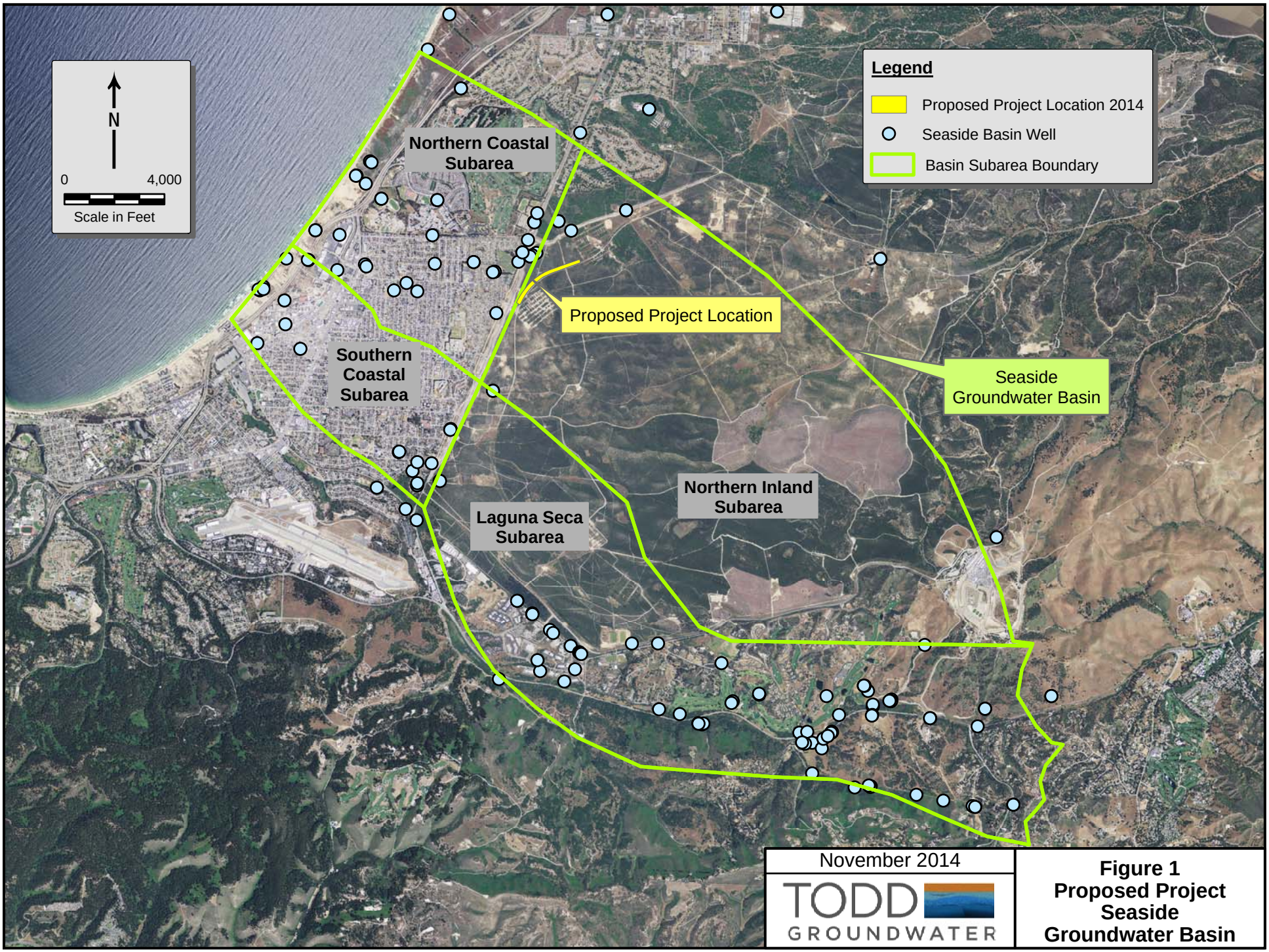
FIGURES

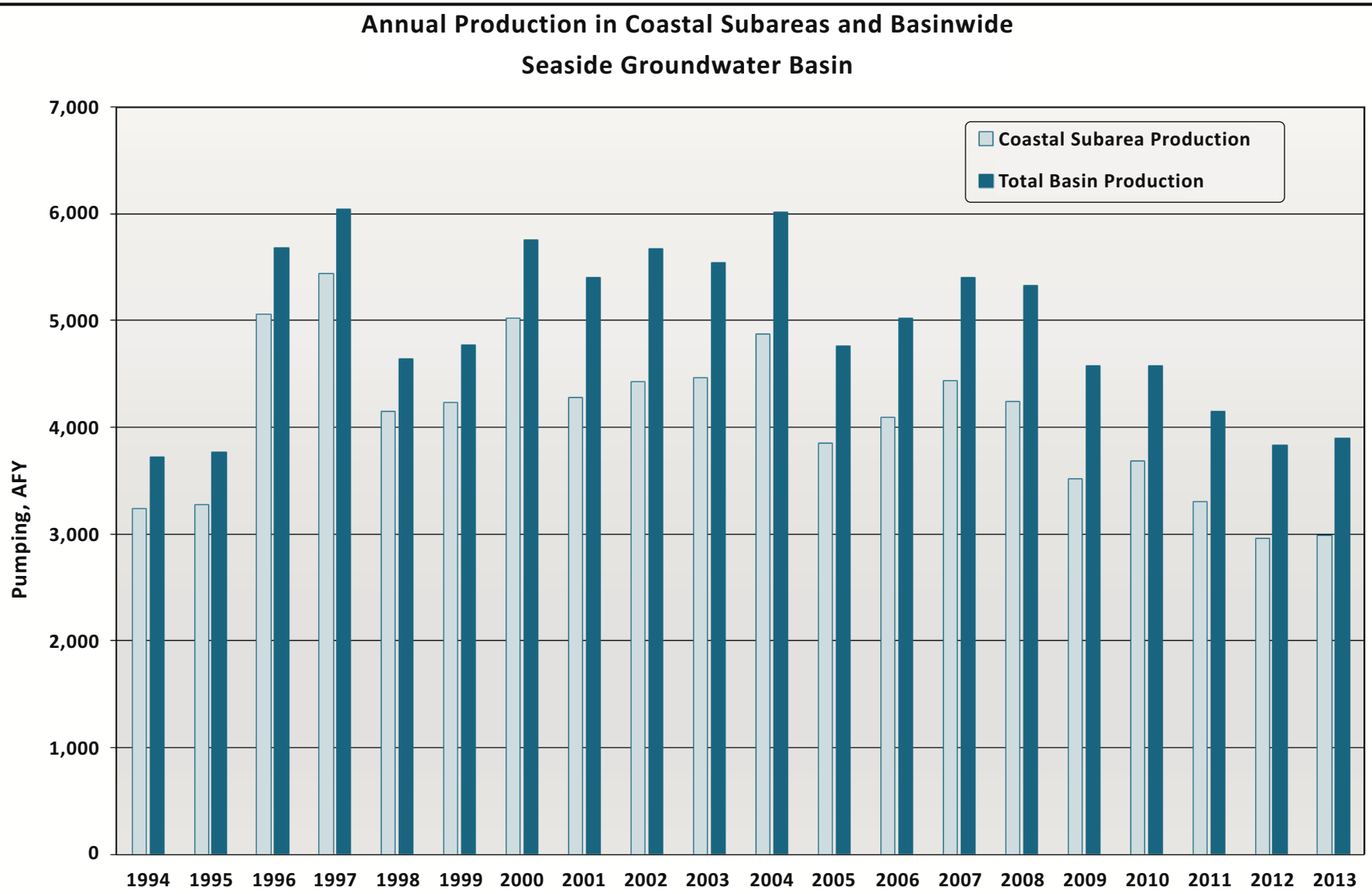


November 2014

TODD GROUNDWATER

Figure 1
Proposed Project
Seaside
Groundwater Basin

Figure 2
Proposed GWR
Project Location Map

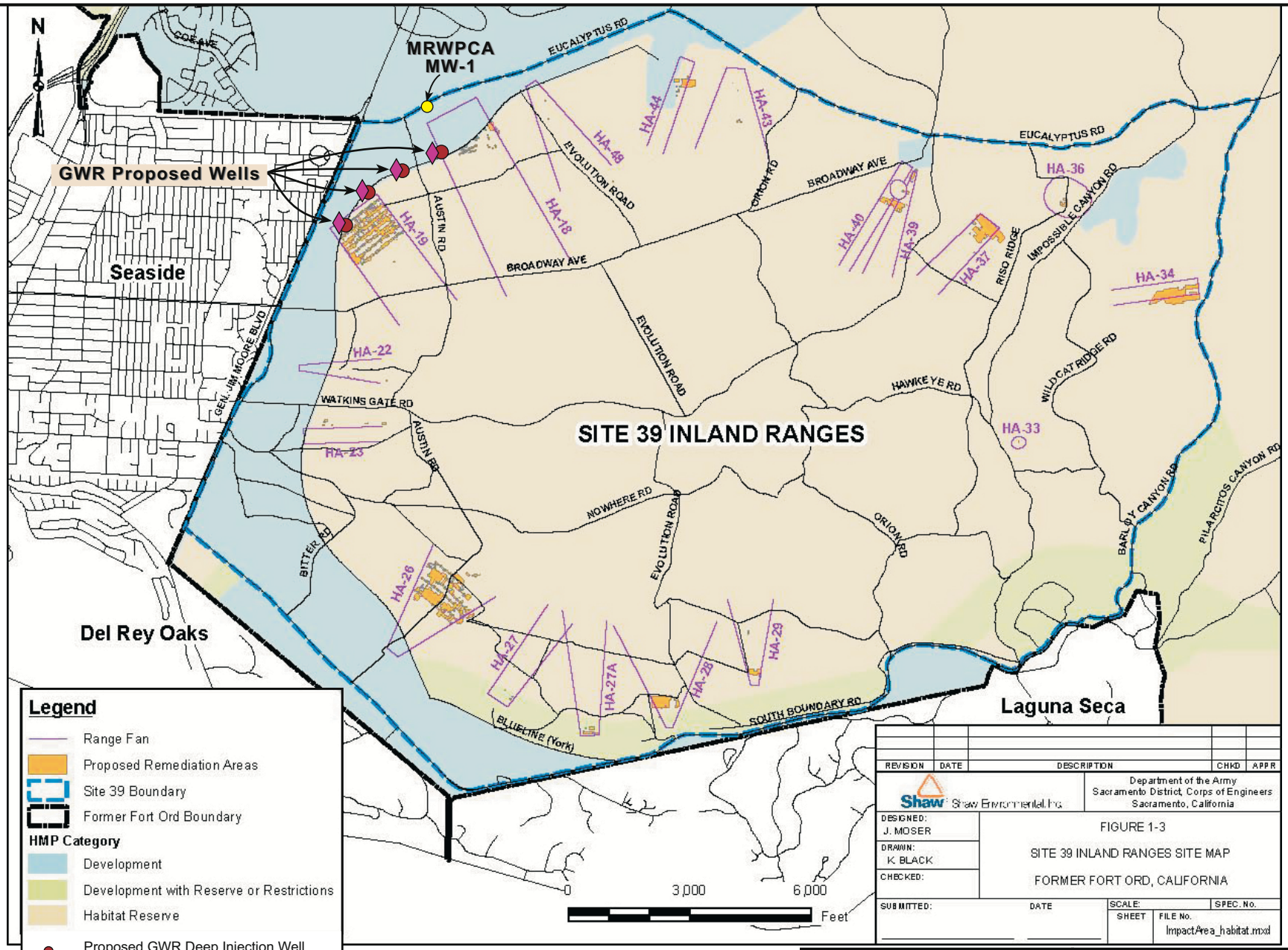


Notes: 1994 - 2001 data by Reporting Period (July 1- June 30). 2001 - 2013 data by Water Year (October 1 - September 30).
Pumping data do not include ASR injection or recovery amounts.

May 2014

TODD GROUNDWATER

Figure 3
Coastal and Basin-wide Groundwater Production

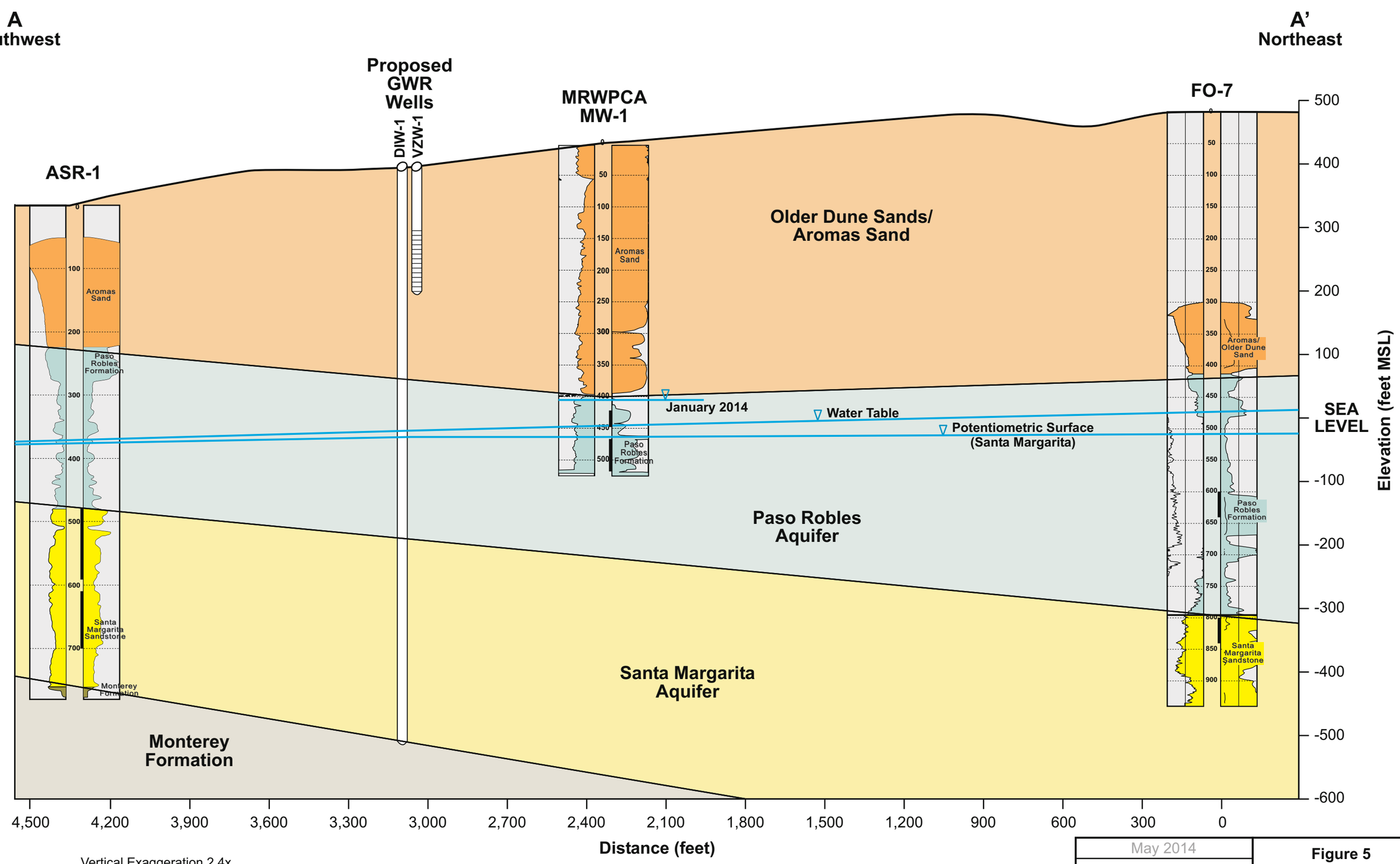


Modified from: Shaw Environmental, 2009.

May 2014

TODD GROUNDWATER

Figure 4
Former Fort Ord Inland Ranges and Proposed Project Wells



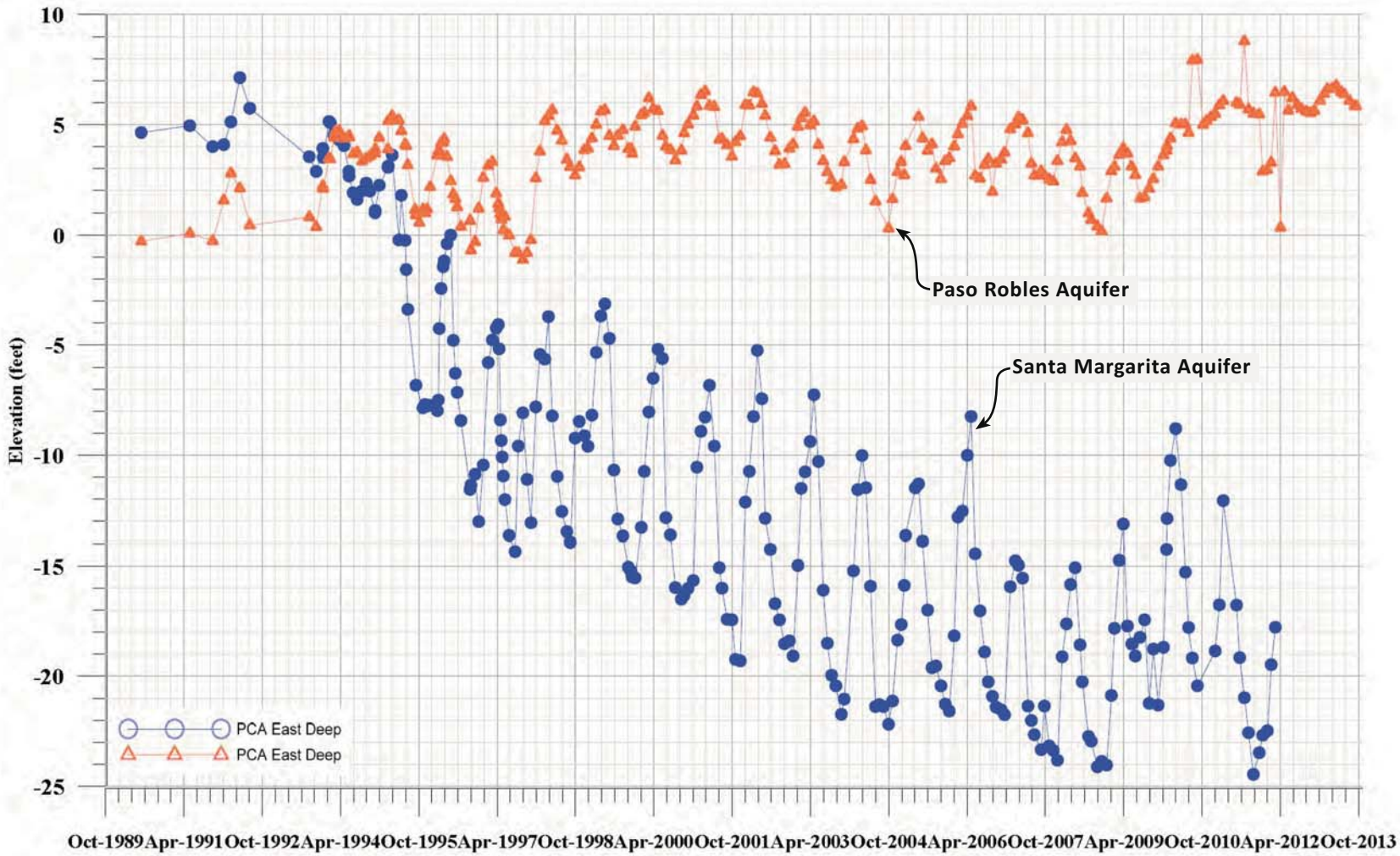
Vertical Exaggeration 2.4x

Water levels from July/August 2013 contour maps in HydroMetrics, December 2013.
Water table in MRWPCA MW-1 measured by Todd Groundwater, January 2014.

May 2014

TODD GROUNDWATER

Figure 5
Cross Section A - A' across Proposed Project Site



MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

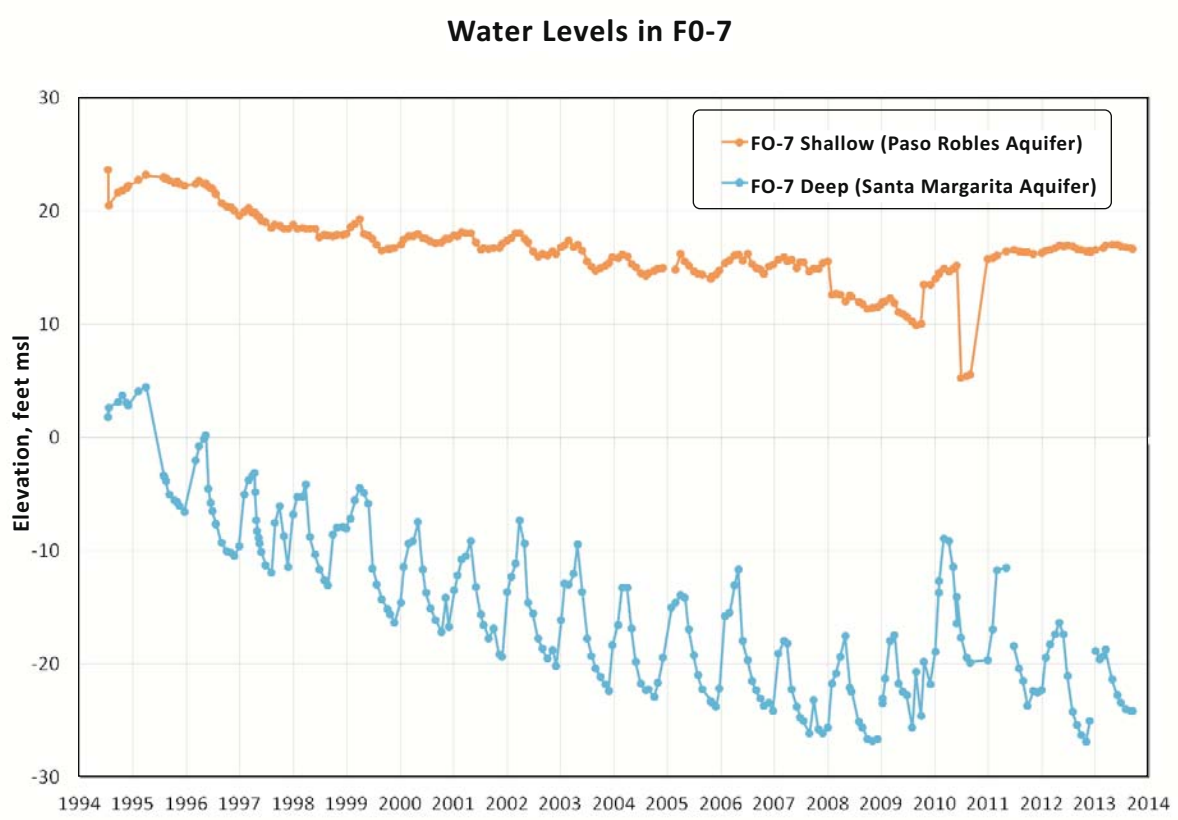
PCA East (Deep) (15S/1E-15K4)
Screened from 650-700 (Tsm)
Wellhead Elevation 68.54 MSL
DWR Driller Log No. 338402
Datasource: MPWMD

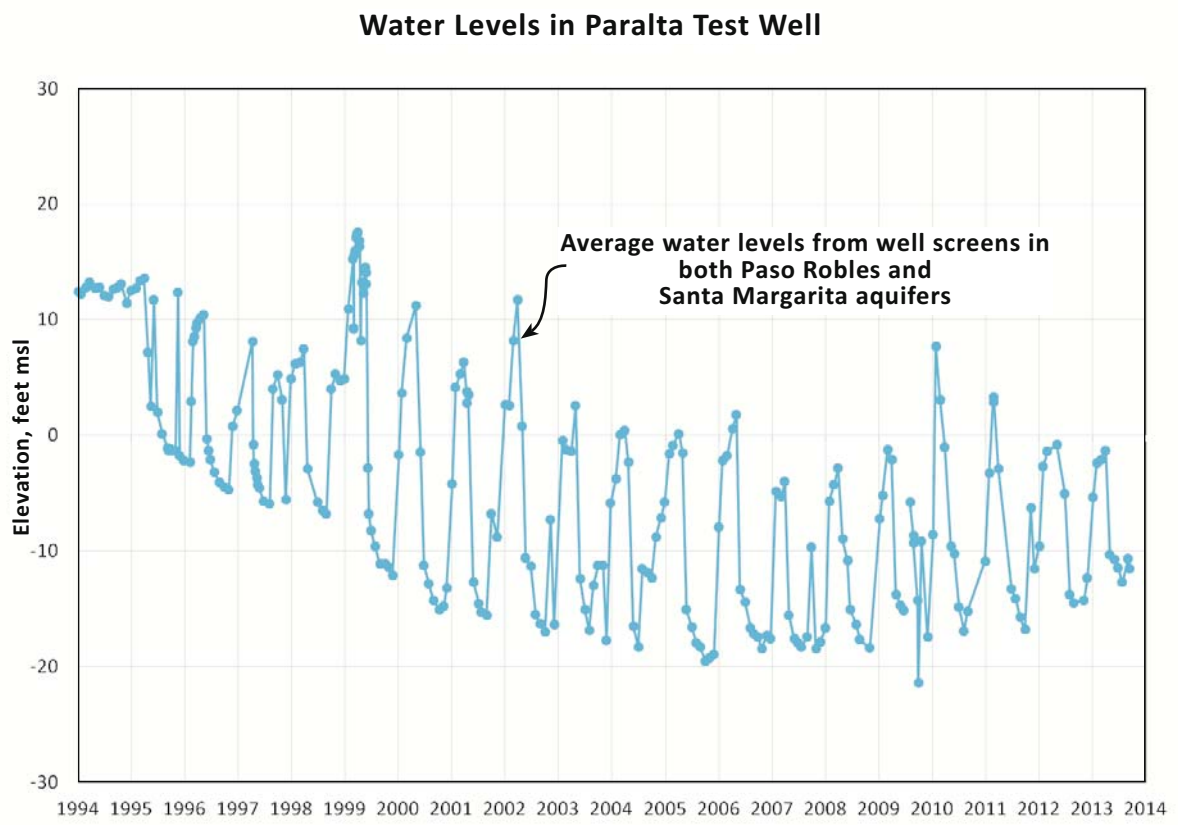
PCA East (Shallow) (15S/1E-15K5)
Screened from 350-400 (QTp)
Wellhead Elevation 68.51 MSL
DWR Driller Log No. 338402
Datasource: MPWMD

May 2014

TODD GROUNDWATER

Figure 6
Long-term Hydrograph
Coastal Subareas

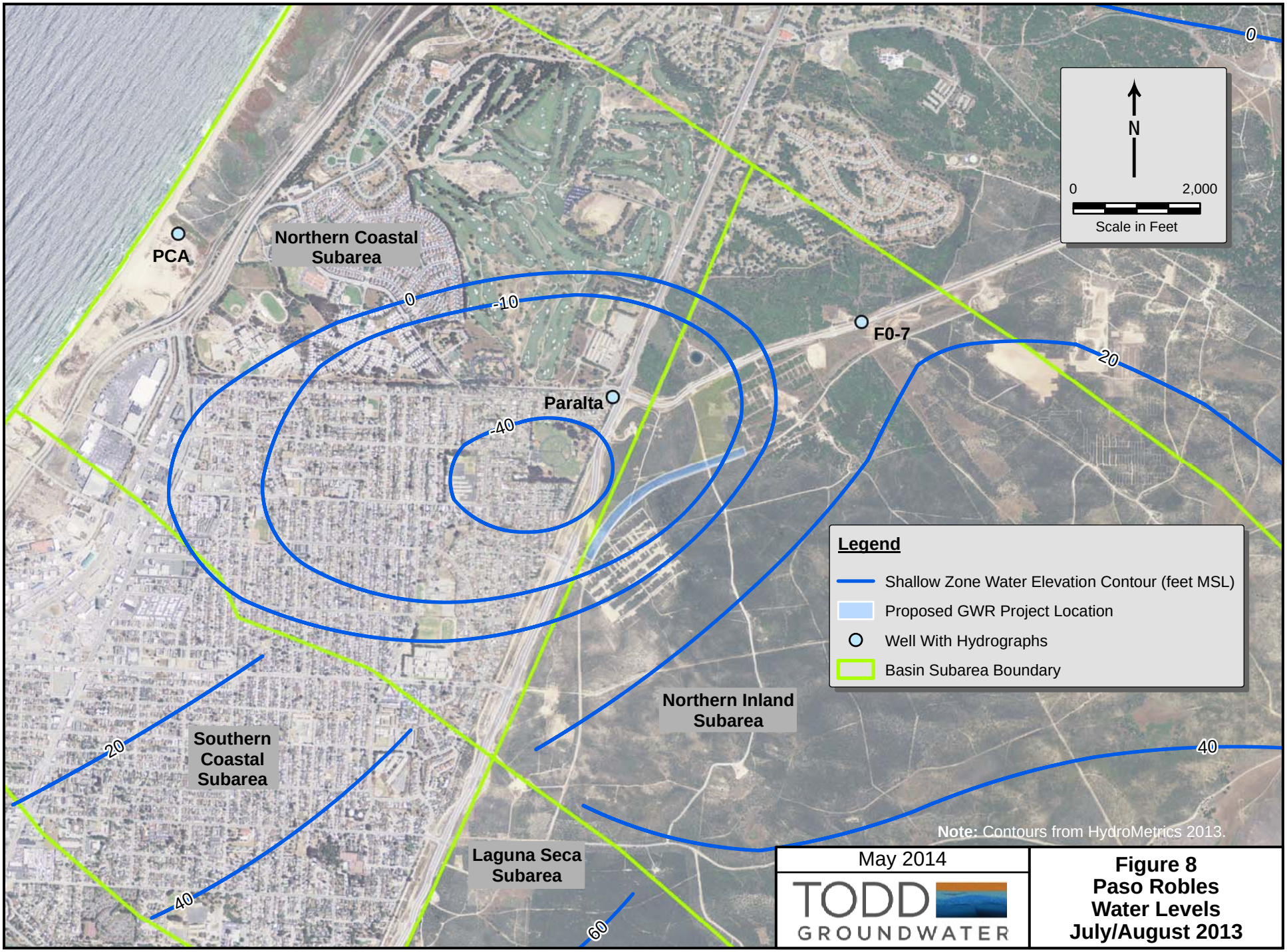




May 2014

TODD GROUNDWATER

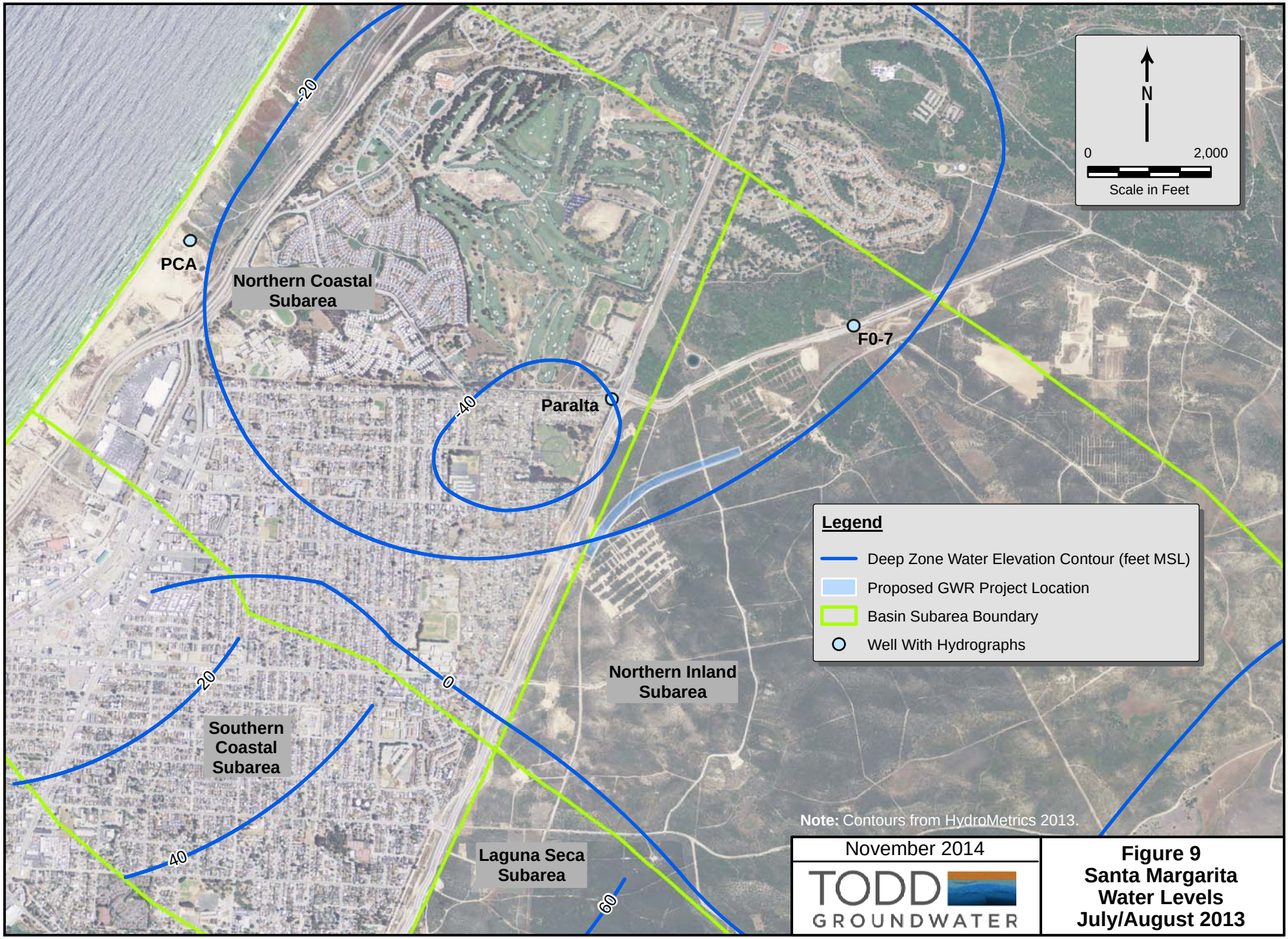
Figure 7
Hydrographs near Proposed Project Area



May 2014

TODD GROUNDWATER

Figure 8
Paso Robles Water Levels
July/August 2013



November 2014

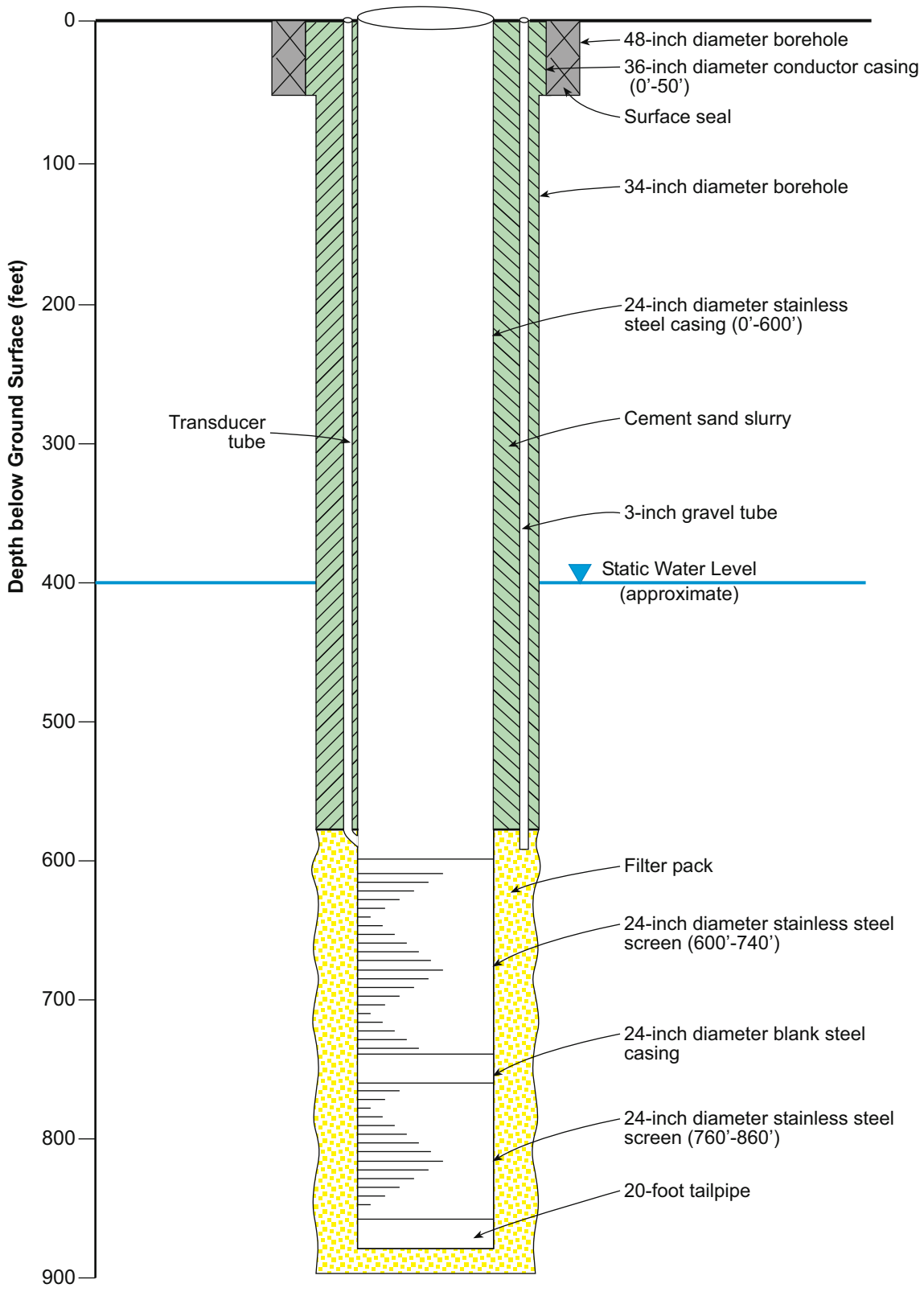
TODD GROUNDWATER

Figure 9
Santa Margarita Water Levels
July/August 2013

August 2014

TODD GROUNDWATER

Figure 10
Proposed
Project Components

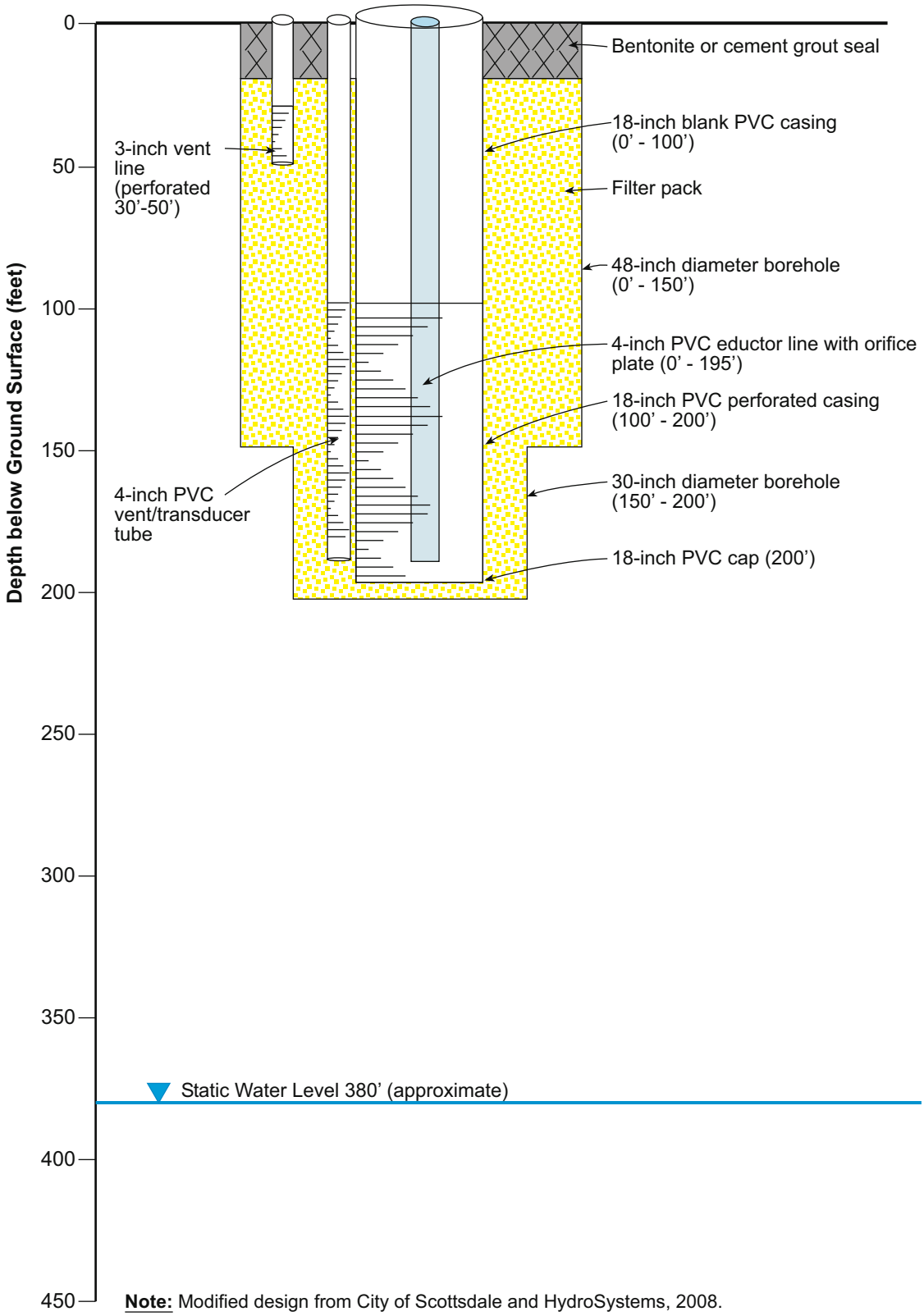


Note: Some design components incorporated from Pueblo Water Resources, 2002.

August 2014

TODD GROUNDWATER

Figure 11
Proposed Deep Injection Well Construction Diagram
GWR Project

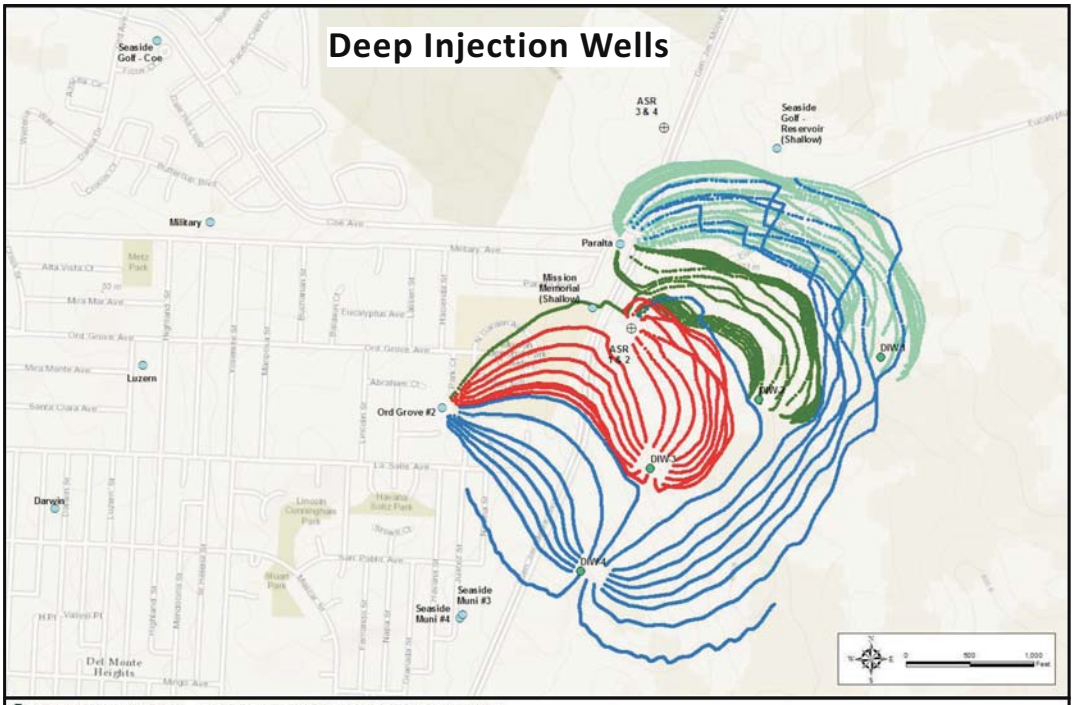


Note: Modified design from City of Scottsdale and HydroSystems, 2008.

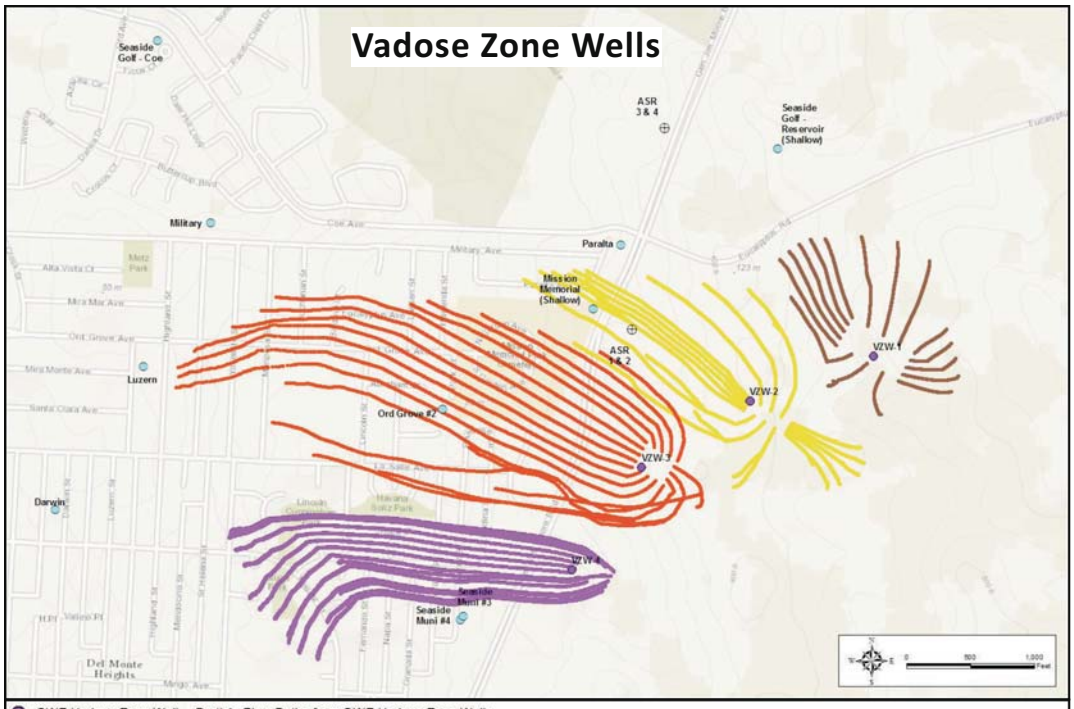
November 2014

TODD GROUNDWATER

Figure 12
Proposed Vadose Zone Well Construction Diagram GWR Project



Particle Paths from a Single Release in Deep Injection Wells



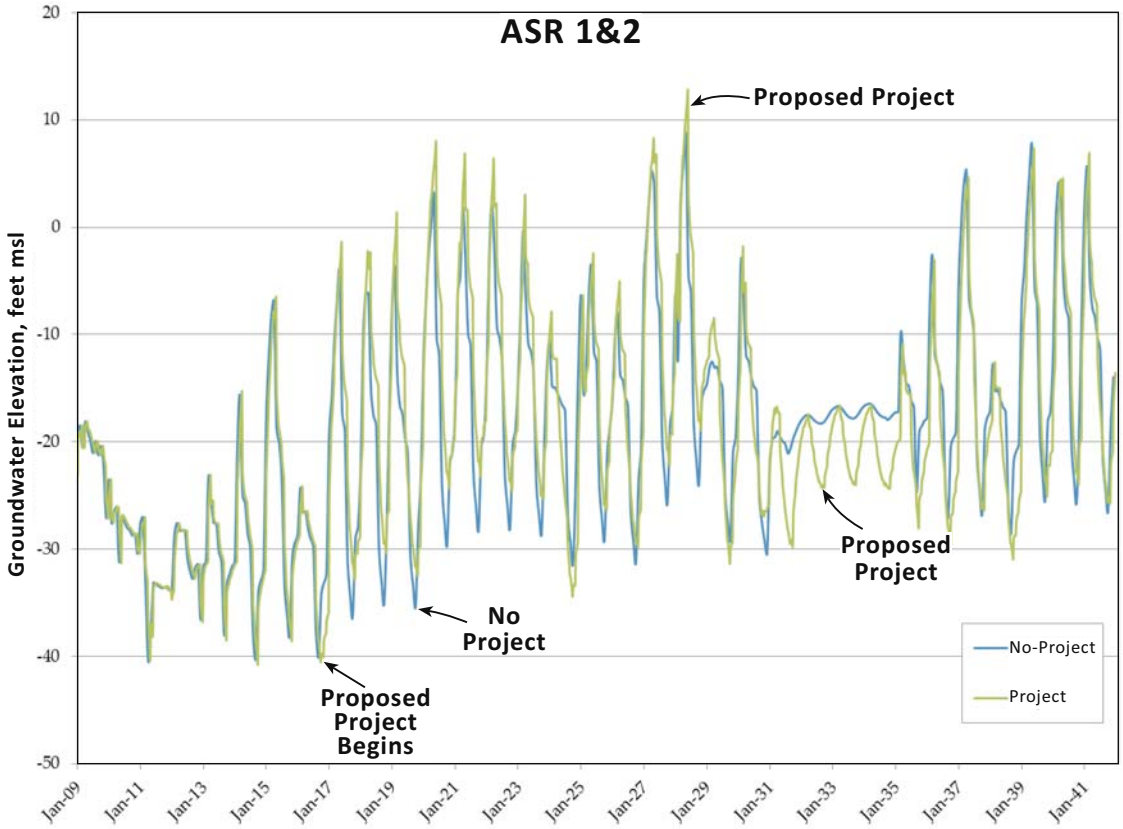
Particle Paths from a Single Release in Vadose Zone Wells

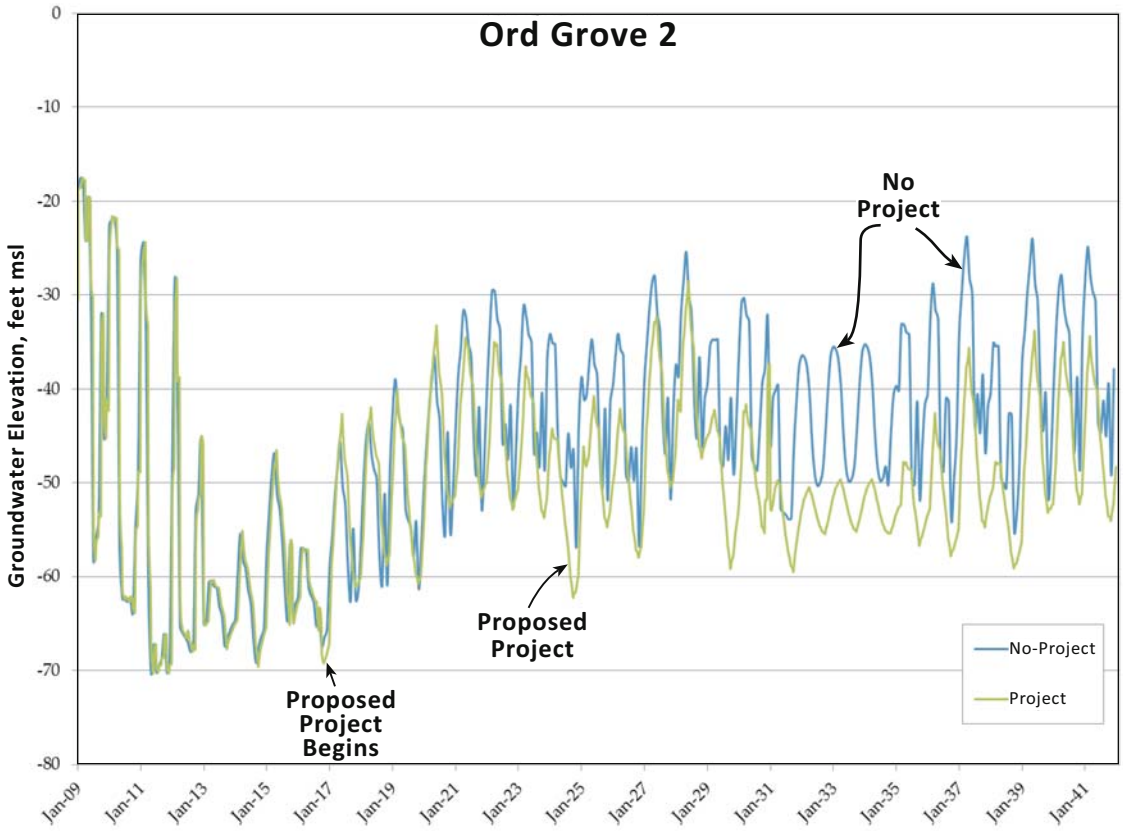
Source: Hydrometrics, November 2014 (See Technical Memorandum in Appendix C)

November 2014

TODD GROUNDWATER

Figure 13
Modeled Flowpaths
Proposed Project





Source: Hydrometrics, November 2014 in Appendix C

November 2014

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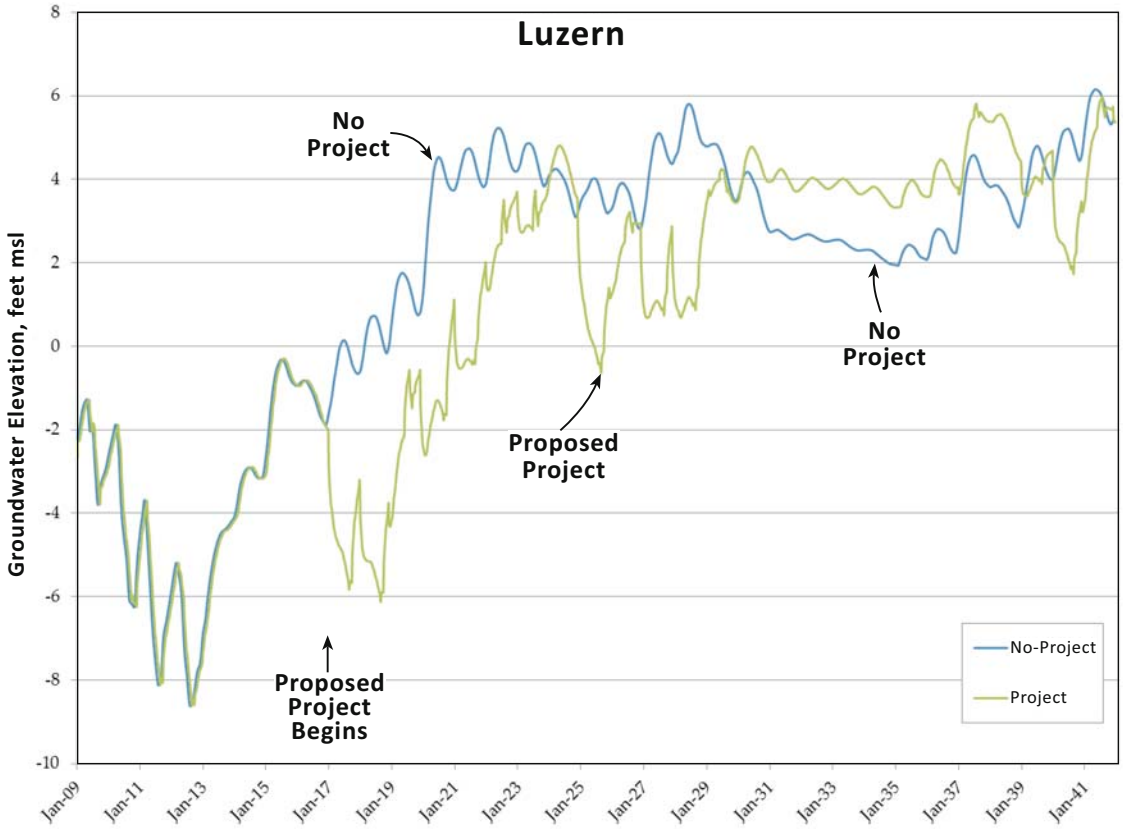
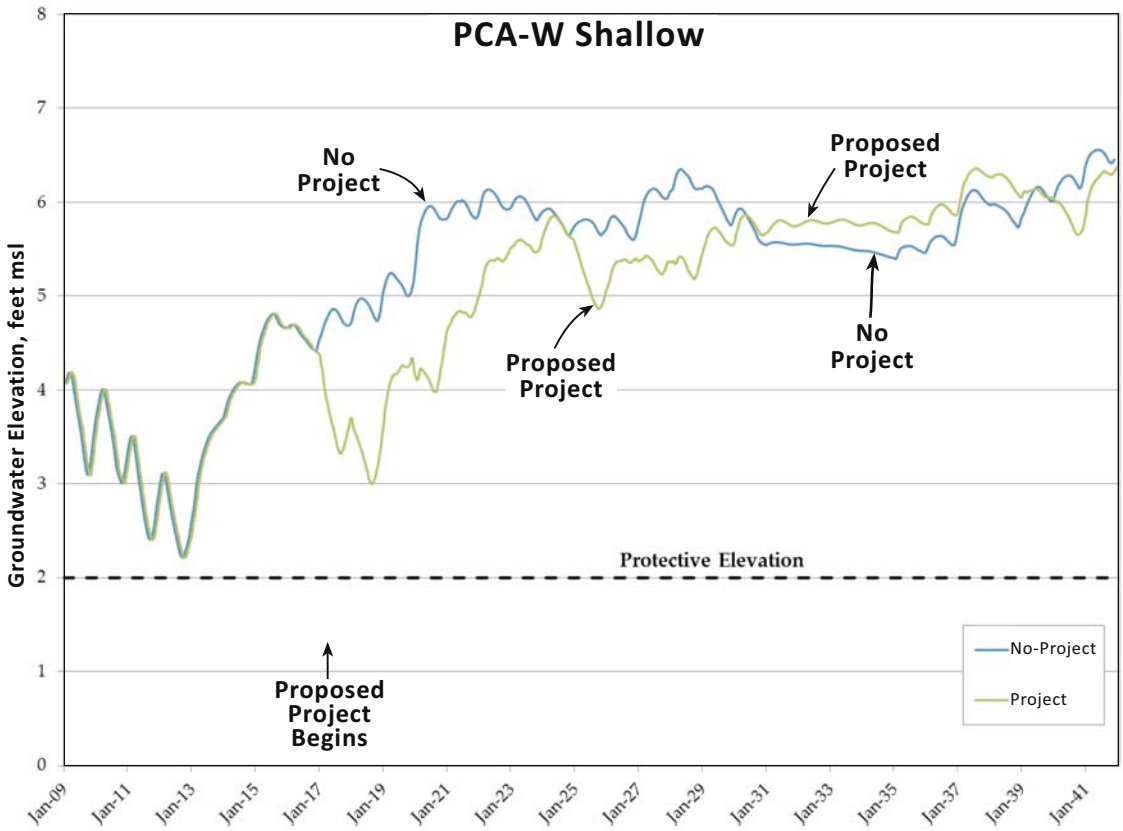
Figure 14
Proposed Project Impacts to Deep Water Levels





Source: Hydrometrics, November 2014 in Appendix C

November 2014

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Figure 15
Proposed Project Impacts to Shallow Water Levels

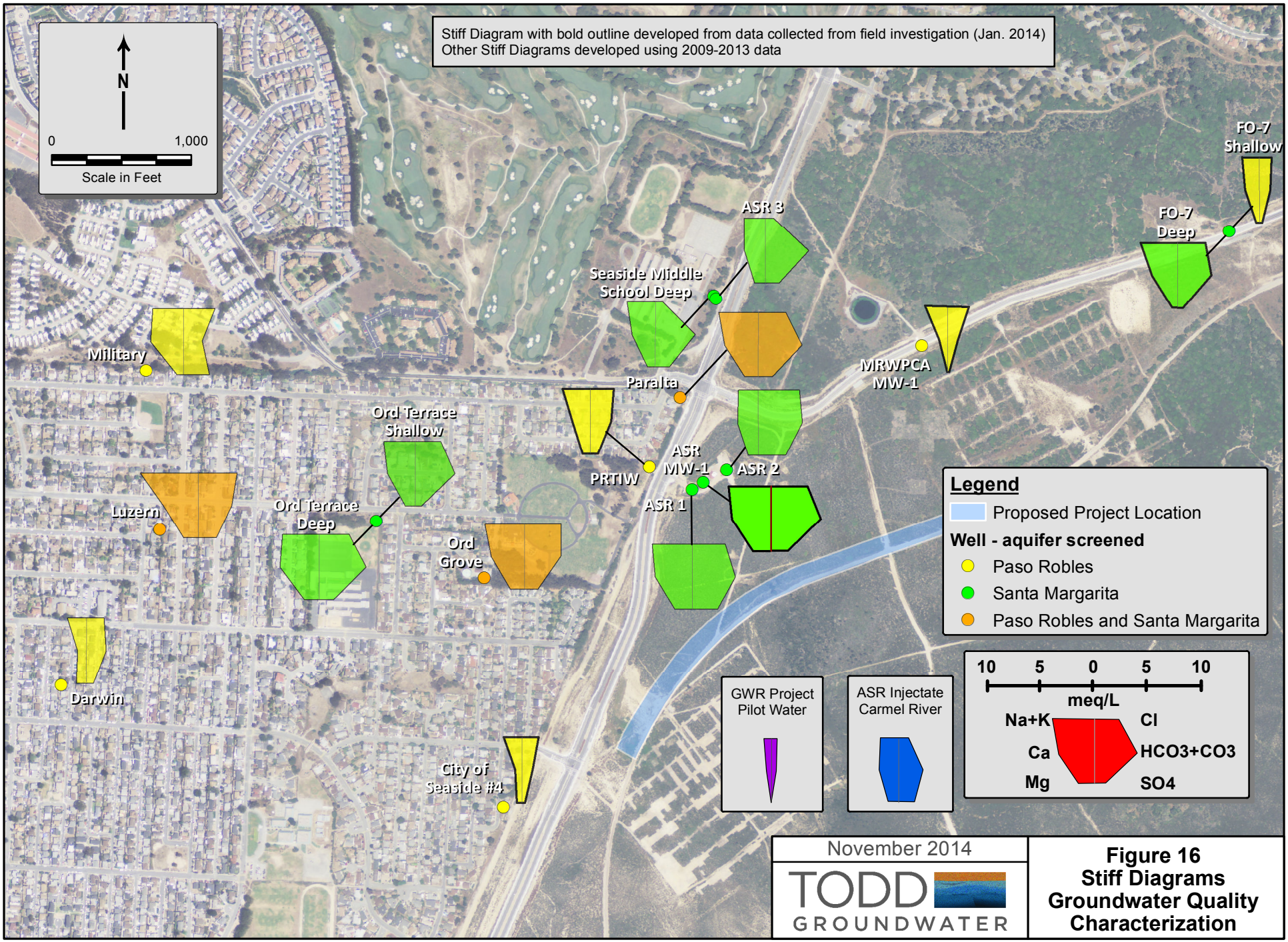

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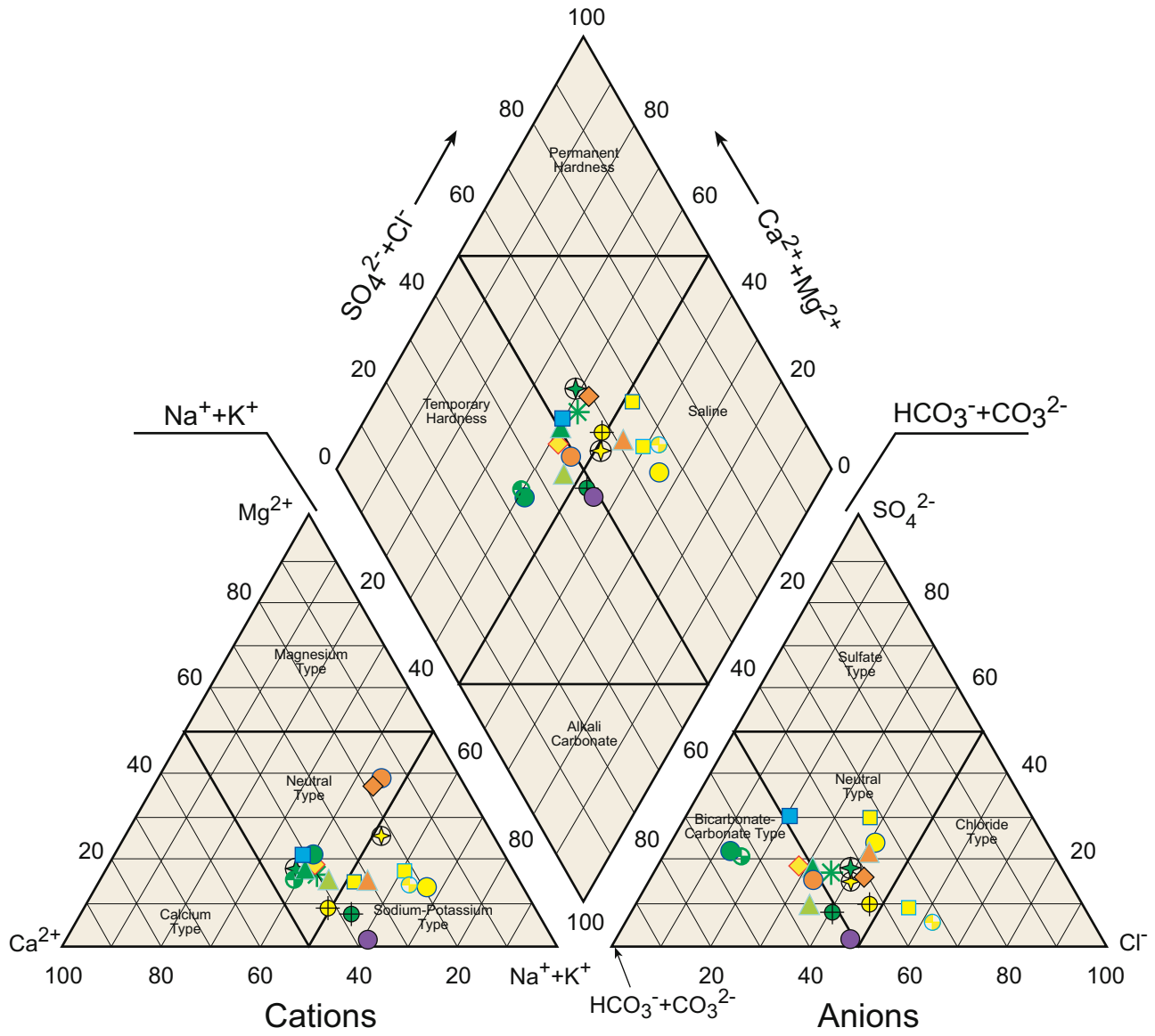
Figure 16
Stiff Diagrams
Groundwater Quality Characterization



Legend

Paso Robles Aquifer

- Darwin
- Military
- Seaside Middle School Shallow
- City of Seaside 4
- MRWPCA MW-1
- FO-7 Shallow
- PRITW Mission Memorial

Both Aquifers

- Paralta
- Luzern
- Ord Grove

Santa Margarita Aquifer

- ASR-2
- ASR-3
- Ord Terrace
- ASR-1
- Ord Terrace Shallow
- Seaside Middle School Deep
- FO-7 Deep
- ASR MW-1

ASR Injectate

- ASR Injectate - Carmel River
- GWR Pilot Water

May 2014

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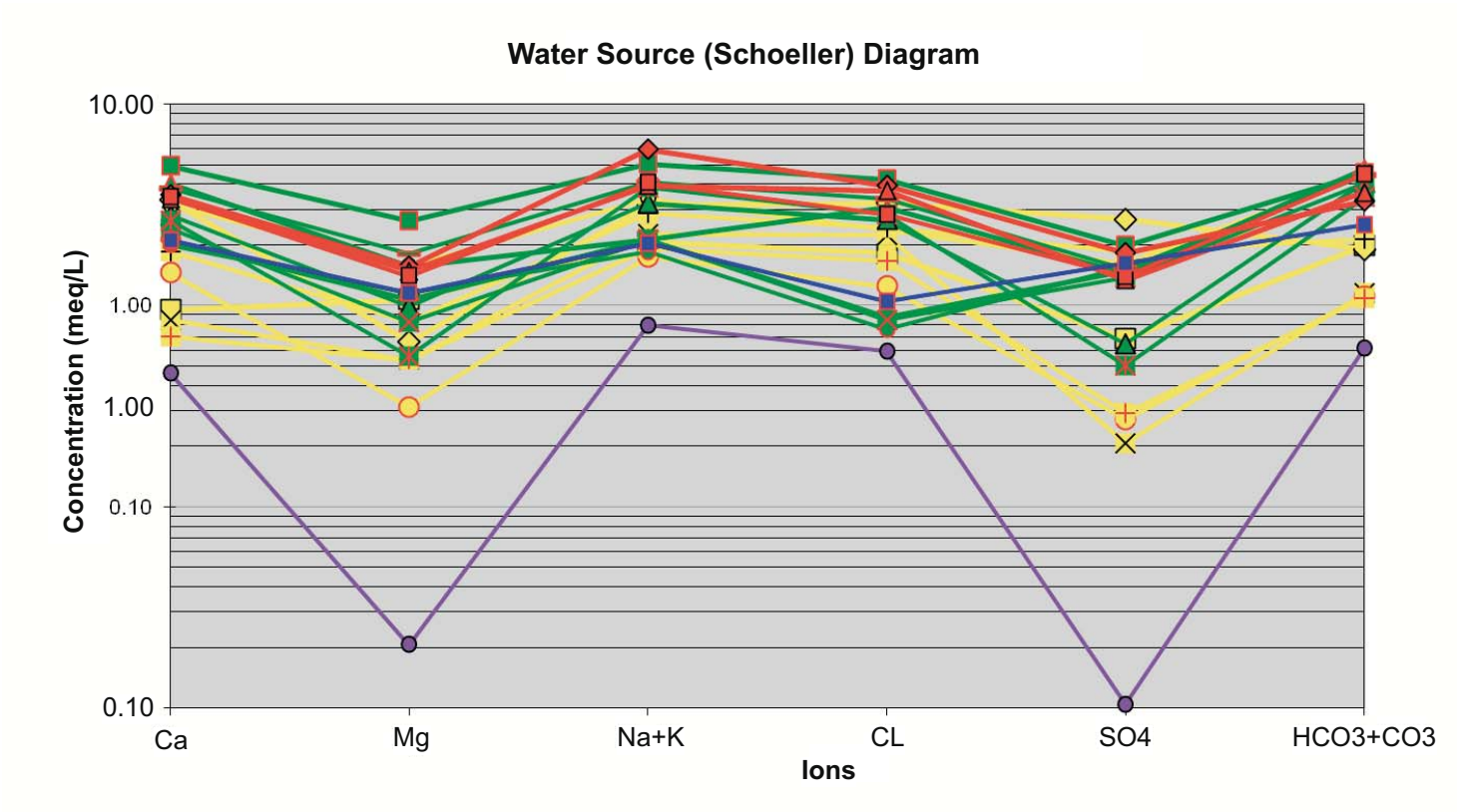
Figure 17
Trilinear Diagram
Groundwater Chemistry near Proposed Project



Legend

Paso Robles Aquifer
- Darwin
- Military
- Seaside Middle School Shallow
- MRWPCA MW-1
- PRITW Mission Memorial
- FO-7 Shallow
- City of Seaside 4

Santa Margarita Aquifer
- ASR-1
- ASR-2
- ASR-3
- Ord Terrace Shallow
- Ord Terrace Deep
- Seaside Middle School Deep
- FO-7 Deep
- ASR MW-1

Both Aquifers
- Luzern
- Ord Grove
- Paralta

- ASR Injectate - Carmel River
- GWR Pilot Water

May 2014

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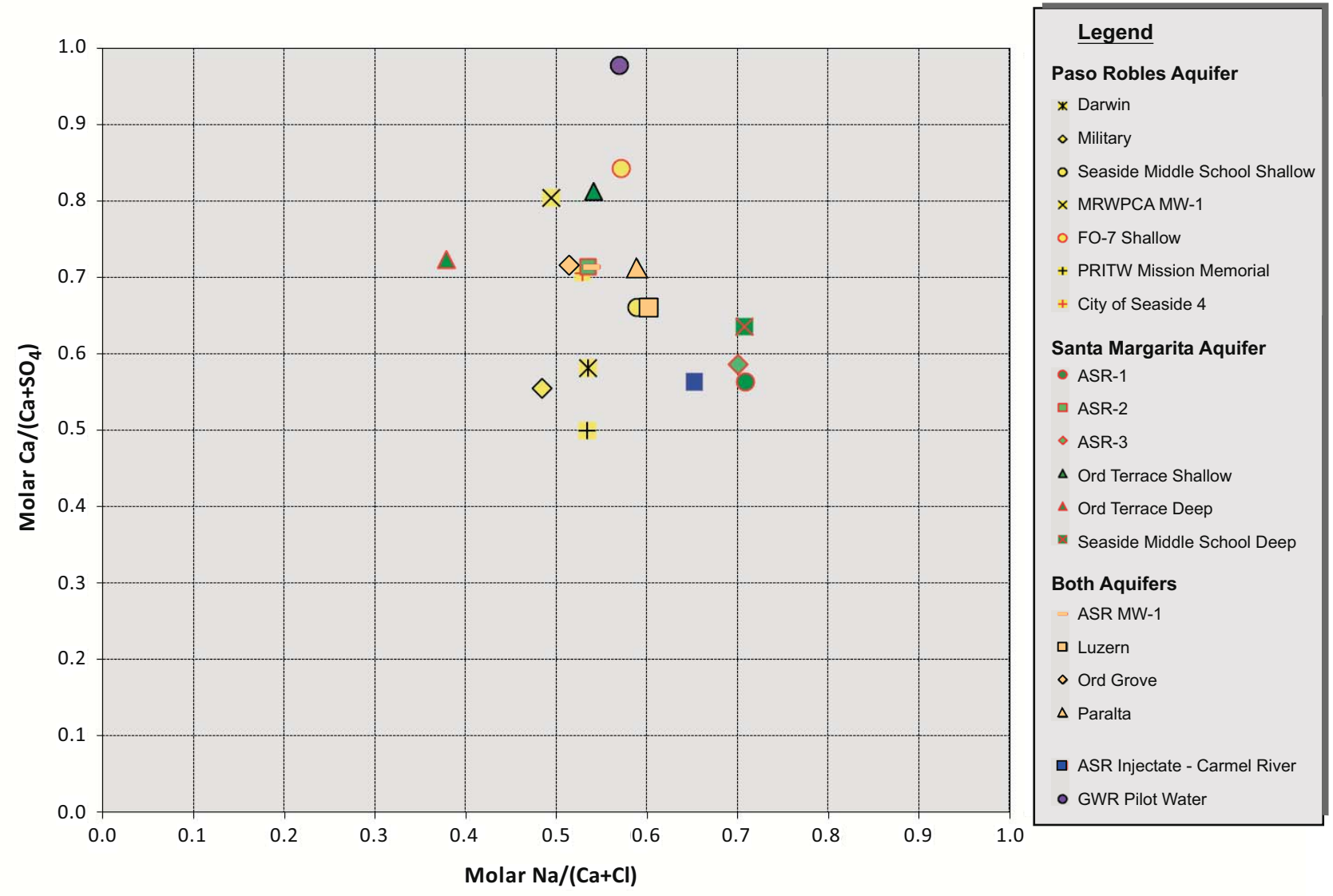
Figure 18
Schoeller Diagram
Wells near
Proposed Project



November 2014

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Figure 19
Brine Differentiation Plot
Wells near Proposed Project

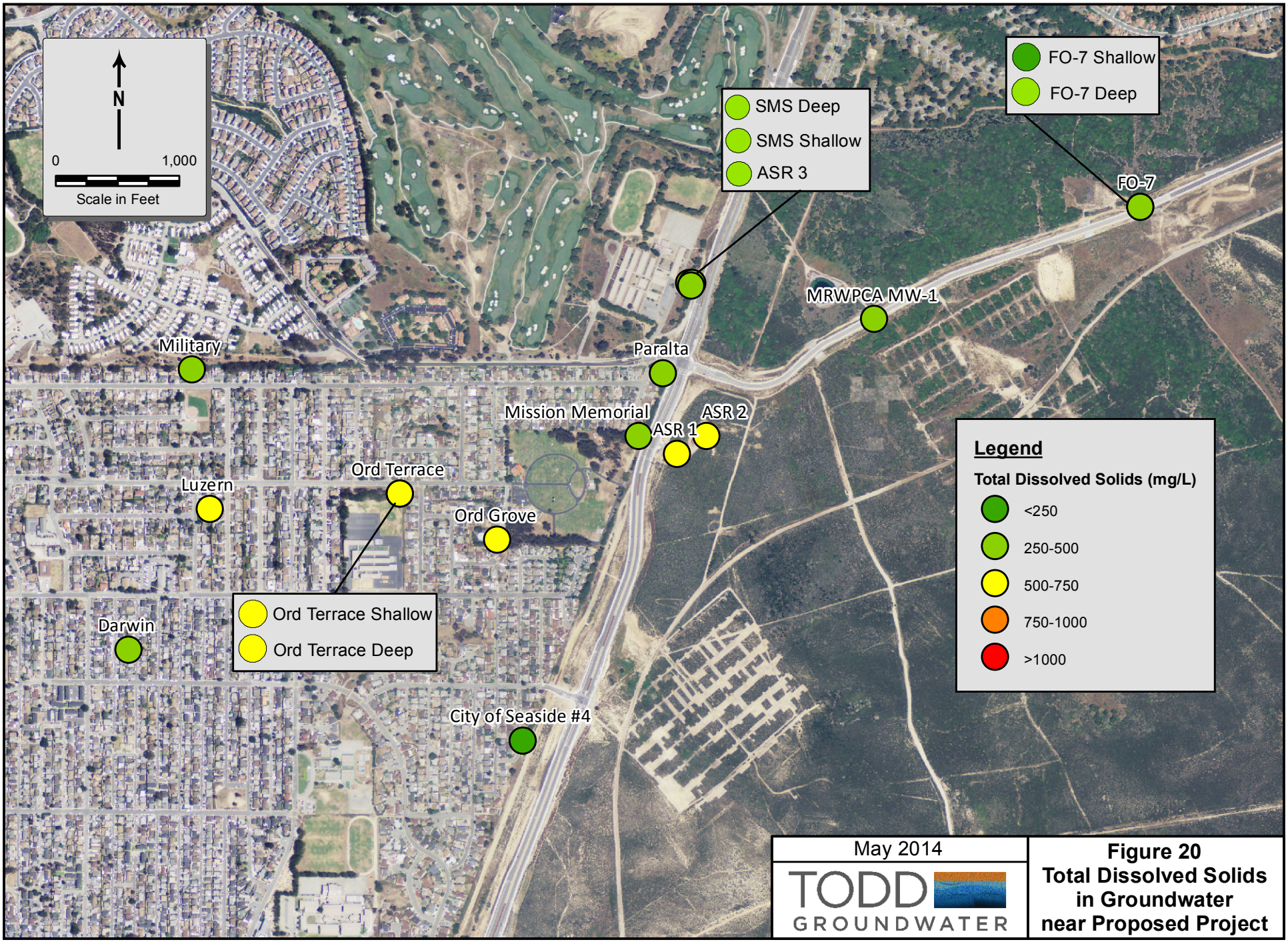

Figure 20
Total Dissolved Solids in Groundwater near Proposed Project

APPENDIX A

Todd Groundwater Technical Memorandum Selection of Recharge Location for GWR Project, Seaside Groundwater Basin, May 29, 2014

May 29, 2014

TECHNICAL MEMORANDUM

To: Bob Holden, PE
Monterey Regional Water Pollution Control Agency (MRWPCA)

From: Phyllis Stanin, Vice President/Principal Geologist

Re: Selection of Recharge Location for GWR Project
Seaside Groundwater Basin

Monterey Regional Water Pollution Control Agency (MRWPCA) has been developing the Groundwater Replenishment (GWR) Project (also, Proposed Project), which involves advanced treatment of various water sources for conveyance and recharge into the Seaside Groundwater Basin (Seaside Basin). In that basin, declining water levels and overdraft conditions have placed drinking water aquifers at risk of seawater intrusion. These conditions have resulted in court-imposed limits on groundwater extraction for drinking water. The Proposed Project offers a reliable source of recharge to increase basin yield without exacerbating the risk of seawater intrusion.

Over the last several years, MRWPCA has considered various locations for recharge in the Seaside Basin. Two preliminary recharge locations were identified and evaluated in 2009 during early project development. The western-most location consists of two parcels along Highway 1 and is referred to as the former Coastal Location (Figure A-1). An eastern location, referred to as the former Inland Location, was delineated as a strip of land along Eucalyptus Road, which crossed the northern boundary of the Seaside Groundwater Basin (Figure A-1). As shown on Figure A-1, the current proposed location is a curved strip of land about 2,000 feet southwest of the former Inland Location. The purpose of this memorandum is to document the selection of the proposed location for implementation of the GWR project.

BACKGROUND

In 2013, the former Inland Location was re-located to an adjacent parcel approximately 2,000 feet southwest based on hydrogeologic and engineering criteria including:

- ensure that recharged water remains within the Seaside Basin
- locate recharge immediately upgradient of pumping depressions to mitigate declining water levels
- decrease conveyance and pumping costs by re-locating to areas of lower ground surface elevations.

The proposed recharge location (or *proposed location*) consists of a relatively narrow strip of land approximately 3,000 feet in length (Figure A-1). The strip is located along a parcel boundary between proposed development by the City of Seaside and open space associated with former Fort Ord lands. The parcel, currently owned by the Fort Ord Reuse Authority (FORA), will be conveyed to the City of Seaside when remediation activities on certain other former Fort Ord lands have been completed.

Although both the proposed location and former Coastal Location have benefits for the development of the Proposed Project, the proposed location on Figure A-1 has been selected for implementation. That location is currently under evaluation in an Environmental Impact Report (EIR) being prepared by MRWPCA. The selection of the proposed location instead of the former Coastal Location also involved hydrogeologic, engineering, and cost considerations.

In July 2013, the Seaside Basin Watermaster (Watermaster) conducted an evaluation of recharge at various inland and coastal locations, including the southern parcel of the former Coastal Location (Figure A-2). For that evaluation, HydroMetrics WRI (HydroMetrics), applied a basin-wide groundwater flow model to simulate changes in water levels resulting from recharge of various amounts and at various locations within the basin (HydroMetrics, July 19, 2013). That analysis provided technical information relevant to the selection of the proposed location. The results of the Watermaster modeling and the selection of the proposed location are described in this memorandum.

PROJECT OBJECTIVES

In order to meet the Proposed Project's primary objective of providing recharge to the Seaside Groundwater Basin to replace a portion of Cal-Am's water supply, the Proposed Project must:

- be cost effective
- comply with water quality regulations
- meet Cal-Am's scheduling needs.

Secondary project objectives include:

- assist in preventing seawater intrusion in the Seaside Basin
- assist in diversifying Monterey County's water supply portfolio
- provide additional water that could be used for crop irrigation through the Salinas Valley Reclamation Project and Castroville Seawater Intrusion Project system.

HYDROGEOLOGIC CONSIDERATIONS

Hydrogeologic conditions at the former Coastal Location were compared to the proposed location in order to select the optimal site for GWR project development as summarized in the following sections.

Injection Capacity is less certain at the former Coastal Location.
Different characteristics in hydrostratigraphy of the Santa Margarita Aquifer have been documented at the former Coastal Location that could impact implementation of the Proposed Project. A 2007 field investigation conducted by the Watermaster resulted in an improved understanding of the coastal hydrostratigraphy near the former Coastal Location (Feeney, 2007). During that investigation, four deep monitoring wells were installed along the coast as part of a sentinel monitoring program to protect against seawater intrusion. Two of these wells, SBWM-3 and SBWM-4, are within 2,000 feet and 1,350 feet from the former Coastal Location, respectively. Figure A-2 shows these two wells and the outline of the southern parcel of the former Coastal Location (labeled *MRWPCA South Location*) (HydroMetrics, July 19, 2013).

Data from these two wells indicate significant differences in the Santa Margarita Aquifer compared to inland areas. In brief, the Santa Margarita Aquifer – the primary target for the Proposed Project – may be thin or absent at the former Coastal Location. This interpretation is illustrated on a cross section developed by Feeney (2007). A portion of that cross section including the two monitoring wells close to the former Coastal Location is shown on Figure A-3. The approximate location of the former Coastal Location is projected onto the section. As shown on the figure, the Santa Margarita Aquifer is interpreted to be very thin (less than 100 feet thick) in SBWM-4 and absent in SBWM-3. The section is replaced with a relatively thick sequence of the Purisima Formation. Although the Purisima Formation appears to be hydraulically connected to the Santa Margarita Aquifer and may also function as an aquifer, the formation appears to be less permeable based on geologic and geophysical logs (Feeney, 2007). In addition, the permeability of this unit was assigned a lower hydraulic conductivity value in the basin-wide groundwater flow model (HydroMetrics, 2009).

Decreased permeability would likely result in a lower injection rate, which would require more wells than are currently planned at the proposed location for the same amount of recharge. In addition, injection wells in a low permeability formation may be more susceptible to clogging. Deep aquifers may have limited storage if porosity is also lower. At a minimum, the former Coastal Location would require an additional deep aquifer testing program to determine the feasibility of deep injection wells prior to project implementation. Such a program would negatively impact project objectives by affecting both the cost and schedule of the Proposed Project.

In contrast, the Santa Margarita Aquifer near the proposed location is approximately 300 feet thick, with relatively high permeability. Within about 1,000 feet to 1,300 feet of the proposed location, four successful ASR wells are screened in the Santa Margarita Aquifer and operated for both injection and recovery. These wells have relatively high transmissivity values of about 100,000 gallons per day per foot (gpd/ft) and relatively high specific capacities that range from about 27 gallons per minute per foot of drawdown (gpm/ft dd) to more than 60 gpm/ft dd (Padre, 2002; Pueblo, 2012). These observations suggest that fewer wells would be needed at the proposed location, reducing project costs.

The Proposed Location is upgradient of existing production wells.
The water level contour map on Figure A-2 shows contours of the potentiometric surface of the Santa Margarita Aquifer (equivalent to the *Deep Zone* as labeled on the map). Contours indicate that water levels are below sea level throughout the Northern Coastal Subarea and are deeper than -60 feet below mean sea level (msl) in the area of numerous production wells (black circles), forming a pumping depression (Figure A-2). The proposed location is located upgradient of numerous production wells and closer to the pumping depression than the former Coastal Location. Most of the production wells shown in this area are owned and operated by Cal-Am and will be pumped to recover recycled water being recharged by the Proposed Project. Essentially all of the recharged water will flow toward these wells under existing groundwater flow conditions.

Deeper water table at the proposed location allows more storage in the vadose zone.
The water table beneath the proposed location occurs at an average depth of about 400 feet below ground surface (bgs). Further, data from a recent MRWPCA field program indicate very high porosity and permeability values in the vadose zone, providing a large storage volume for recharge of recycled water.

In contrast, the water table beneath the former Coastal Location is only about 115 feet bgs. The relatively shallow water table limits vadose zone storage. Under these conditions, mounding of the recharge water could reduce injection rates over time.

Recharge at the Former Coastal Location would result in project water being lost to ocean outflow.
Injection in both deep and shallow wells will result in groundwater mounding and radial groundwater flow away from the injection wells. Depending on the then-current water levels, recharged water would flow both inland toward the pumping depression and coastal toward the ocean. This groundwater flow pattern would result in some amount of recharge being lost to ocean outflow that could not be recovered through existing wells. The mound would provide some protection against seawater intrusion that would allow water levels to be lowered inland through increased pumping. However, there is uncertainty associated with the lateral and vertical extent of mounding at the former Coastal Location; it is unclear what adverse impacts would result from allowing water levels to decline inland. In summary, a portion of the recharged water may not be recoverable.

ENGINEERING AND COST CONSIDERATIONS

In addition to the hydrogeologic considerations, several components of the preliminary GWR project design were factors in the location selection process. For example, a conceptual project design developed in 2009 indicated higher project costs with the former Coastal Location. At that time, both the former Inland and Coastal locations were assumed to connect to the proposed Regional Urban Water Augmentation Pipeline (RUWAP), which enters the basin along General Jim Moore Boulevard as shown on Figure A-1 (see the purple line labeled proposed pipeline). For the former Coastal Location, a connecting pipeline would have to be routed through residential and urban development and then across both

parcels of the former Coastal Location. For the former Inland Location (and the proposed location), a connecting pipeline could be routed to Eucalyptus Road. Preliminary costs developed for the water supply lines indicated higher costs for the routing to the former Coastal Location. Given the hydrogeologic uncertainty at the former Coastal Location, more project wells would have to be connected and maintained, also resulting in increased costs.

GROUNDWATER MODELING

The groundwater modeling conducted by the Watermaster allowed comparison of the effectiveness of various recharge locations for protection against seawater intrusion. Although these simulations were not conducted specifically to evaluate the Proposed Project, the modeling simulates the aquifer response to injection at both inland and coastal locations similar to those evaluated for the Proposed Project. Model results were summarized in a Technical Memorandum titled *Groundwater Modeling Results of Coastal Injection in the Seaside Basin* (HydroMetrics, July 2013). Relevant sections of that memorandum are summarized below.

Two modeling scenarios, referred to as Scenario 0 and Scenario 1, simulated 1,000 AFY of injection at each of two locations including an inland and coastal location. Figure A-2 shows a map from the HydroMetrics memorandum that identifies the modeled injection locations. The simulated coastal locations are shown by red parcels labeled "Modeled Coastal Injection Locations[1]" in the map legend of Figure A-2. The simulated inland location is shown by an arrow (labeled *Inland Injection Location* on Figure A-2) and coincides with the ASR wellfield located near the proposed GWR project location (also labeled on Figure A-2).

The effectiveness of each injection location was judged by the ability to raise water levels in coastal wells to levels protective of seawater intrusion. These protective levels had been established by the Watermaster in previous evaluations (HydroMetrics, December 2013). To illustrate the model results, simulated water levels in a nearby coastal monitoring well cluster, MSC Shallow and MSC Deep, are shown on Figure A-4. Results for other coastal wells vary, but Scenarios 0 and 1 track similarly (with a difference of only a few feet or less) for the four wells presented in the memorandum (HydroMetrics, July 2013). Although the figure contains results from numerous model scenarios (Scenarios 0 through 7 as shown on the legend), Scenario 0 and Scenario 1 are the comparable results from the coastal and inland injection locations. Except for Baseline and Scenario 0, all scenarios involve injection at the coastal location and vary amounts and timing of recharge. Although the curves are difficult to differentiate on Figure A-4, the curves from Scenarios 0 and 1 are labeled and track very closely for both of the well clusters.

Results of the simulations indicate that injection at the former Coastal Location raises coastal water levels higher and faster than inland injection, but only by a small amount (less

[1] The HydroMetrics northernmost coastal location is the same as the southern parcel of the former GWR Coastal Location – compare Figures A-1 and A-2. HydroMetrics reports that modeling results were very similar between the two coastal locations shown on Figure A-2.

than two feet). The memorandum concludes that coastal injection achieves protective water levels one to ten years faster than inland injection, depending on the well. This means that the coastal injection curves labeled on Figure A-4 for both MSC Shallow and Deep reach the line labeled Protective Water Level before the inland injection curves (also labeled on Figure A-4). While this conclusion is correct, the inland injection curves are very close to the line and demonstrate that injection inland is also effective at raising water levels near the coast.

Further, Scenario 5 shows that coastal injection of 1,900 AFY raises water levels very high in both clusters, and within about 35 feet of the ground surface. With the GWR project injection of approximately 3,500 AFY, water levels would rise even higher, suggesting that the former Coastal Location has limited storage. Scenario 4 indicated that protective water levels at the coast could be maintained at about 850 AFY, significantly below the water available for injection for the Proposed Project. In addition, a significant portion of the injected water leaves the basin as coastal outflow, potentially limiting the amount of water that could be recovered.

While the modeling suggests that the former Coastal Location may be slightly more effective at achieving protective water levels in a shorter amount of time, the inland location also raises water levels along the coast and has more storage.

SUMMARY

Based on the hydrogeologic analysis, preliminary project design including costs, and recent groundwater modeling by the Watermaster, the following conclusions can be made.

- The proposed location provides more hydrogeologic certainty than the former Coastal Location for project development. The Santa Margarita Aquifer may be thin or absent at the former Coastal Location.
- A deep aquifer testing program to reduce this uncertainty would adversely impact the project's schedule and cost.
- More injection wells may be required at the former Coastal Location for the same amount of recharge at an inland location, reducing the cost effectiveness of the project.
- The proposed location is close to proven ASR wells in the Santa Margarita Aquifer with favorable injection rates.
- The proposed location is adjacent to and upgradient of most of the water supply wells that will recover the Proposed Project's recharged water.
- The proposed location provides sufficient storage to accommodate all of the GWR project water. Both locations are not needed. Storage at the former Coastal Location is less certain.
- Injection at the former Coastal Location would increase loss of GWR water to ocean outflow, potentially reducing the amount of GWR water that could be recovered.
- Water supply lines and conveyance costs may be more expensive for the former Coastal Location.

- The proposed location is more supportive of the primary project objectives than the former Coastal Location.
- Although the former Coastal Location may be more effective at meeting the secondary project objective of assistance in preventing seawater intrusion, the proposed location also meets that objective. Specifically, the proposed location supports an increase in basin production without exacerbating the risk for seawater intrusion.

REFERENCES

Feeney, Martin B., PG, CHg, Seaside Groundwater Basin Watermaster, Seawater Sentinel Wells Project, Summary of Operations, For Seaside Groundwater Basin Watermaster, with assistance from Pueblo Water Resources, Inc., October 2007.

HydroMetrics WRI (HydroMetrics), Water Year 2013, Seawater Intrusion Analysis Report, Seaside Basin, Monterey County, California, prepared for: Seaside Basin Watermaster, December 2013.

HydroMetrics Water Resources Inc. (HydroMetrics), Technical Memorandum, To: Seaside Groundwater Basin Board of Directors, From: Georgina King and Derrik Williams, July 19, 2013, Subject: Groundwater Modeling Results of Coastal Injection in the Seaside Basin.

HydroMetrics Water Resources Inc. (HydroMetrics), Seaside Groundwater Basin Modeling and Protective Groundwater Elevations, prepared for: Seaside Basin Watermaster, November 2009.

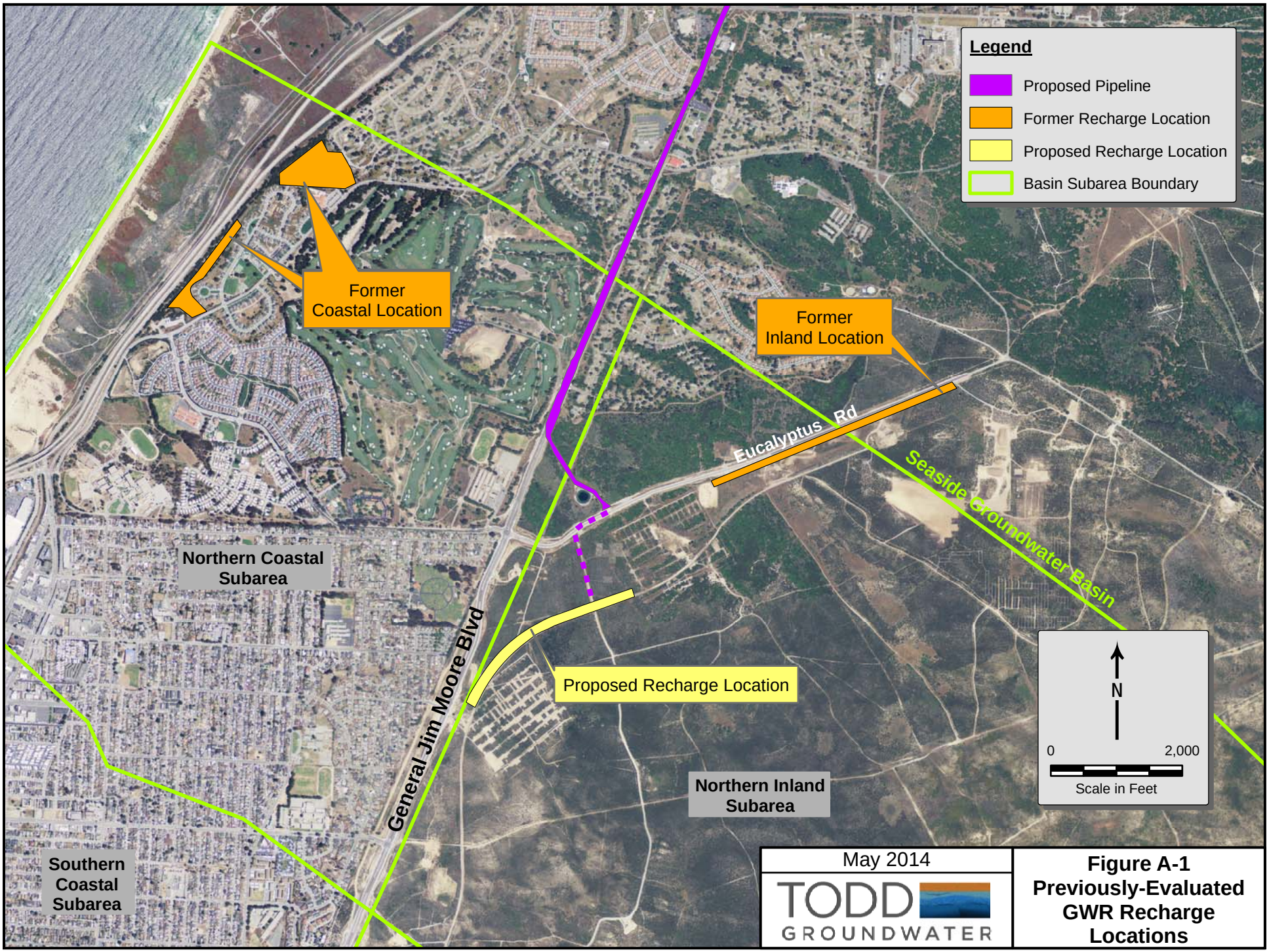

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Figure A-1
Previously-Evaluated GWR Recharge Locations

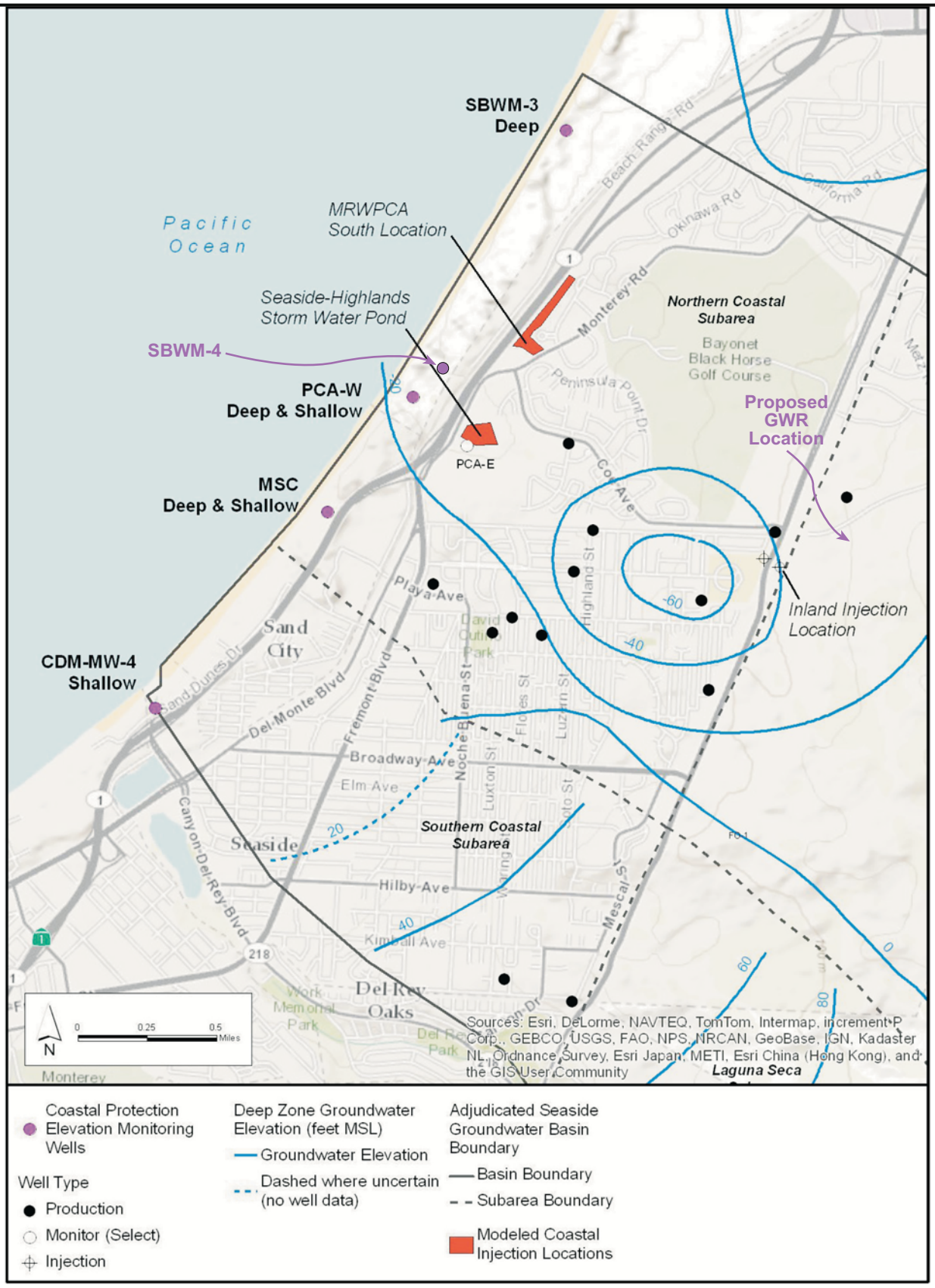

Figure 1: Modeled Injection Locations

Modified from: HydroMetrics, July 19, 2013.

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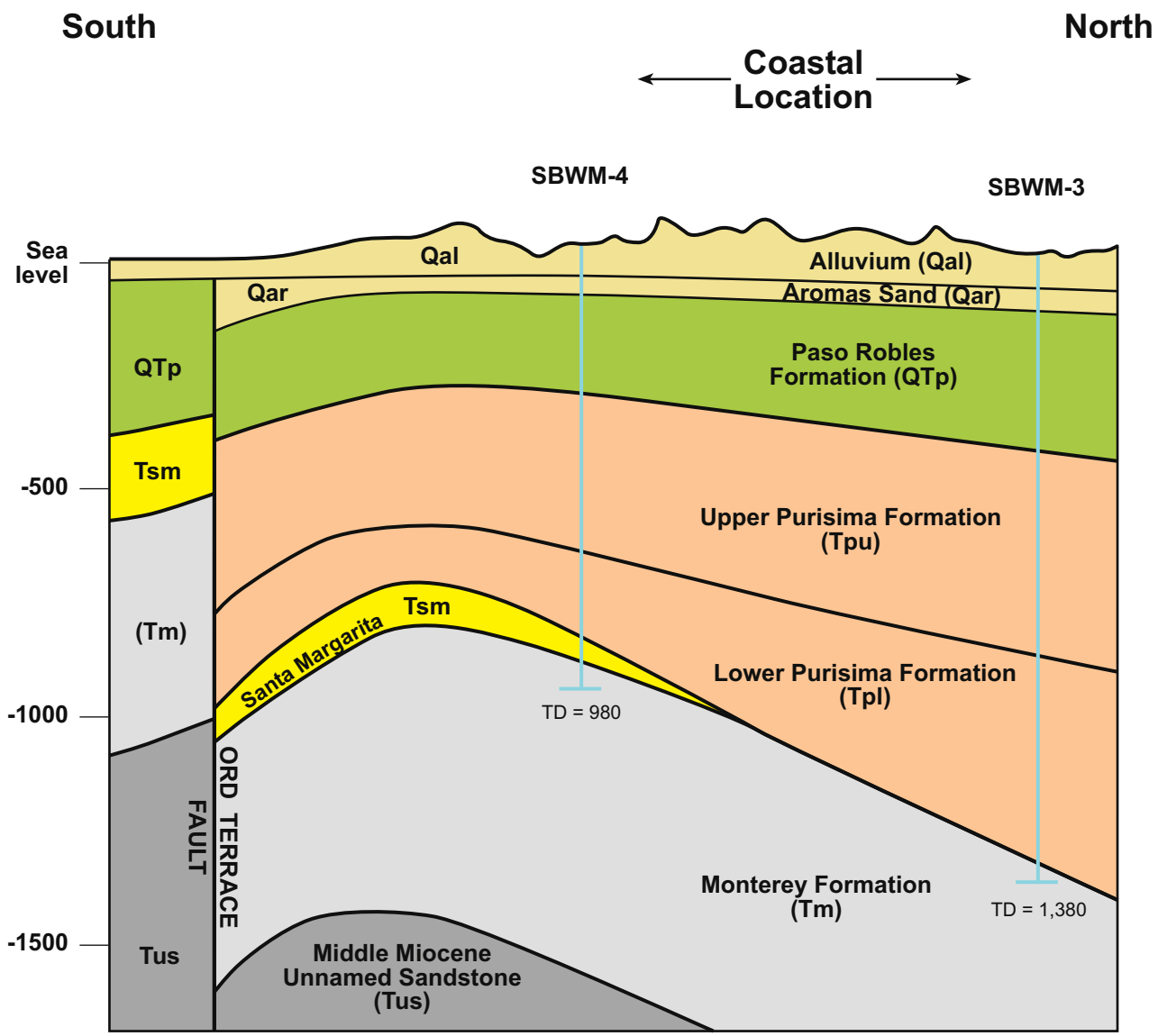
Figure A-2
Modeled Coastal Injection Location



From: Feeney (2007), reproduced from a portion of Figure 3 with labels and colors added.

May 2014

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Figure A-3
Hydrogeology near the Former Coastal Location

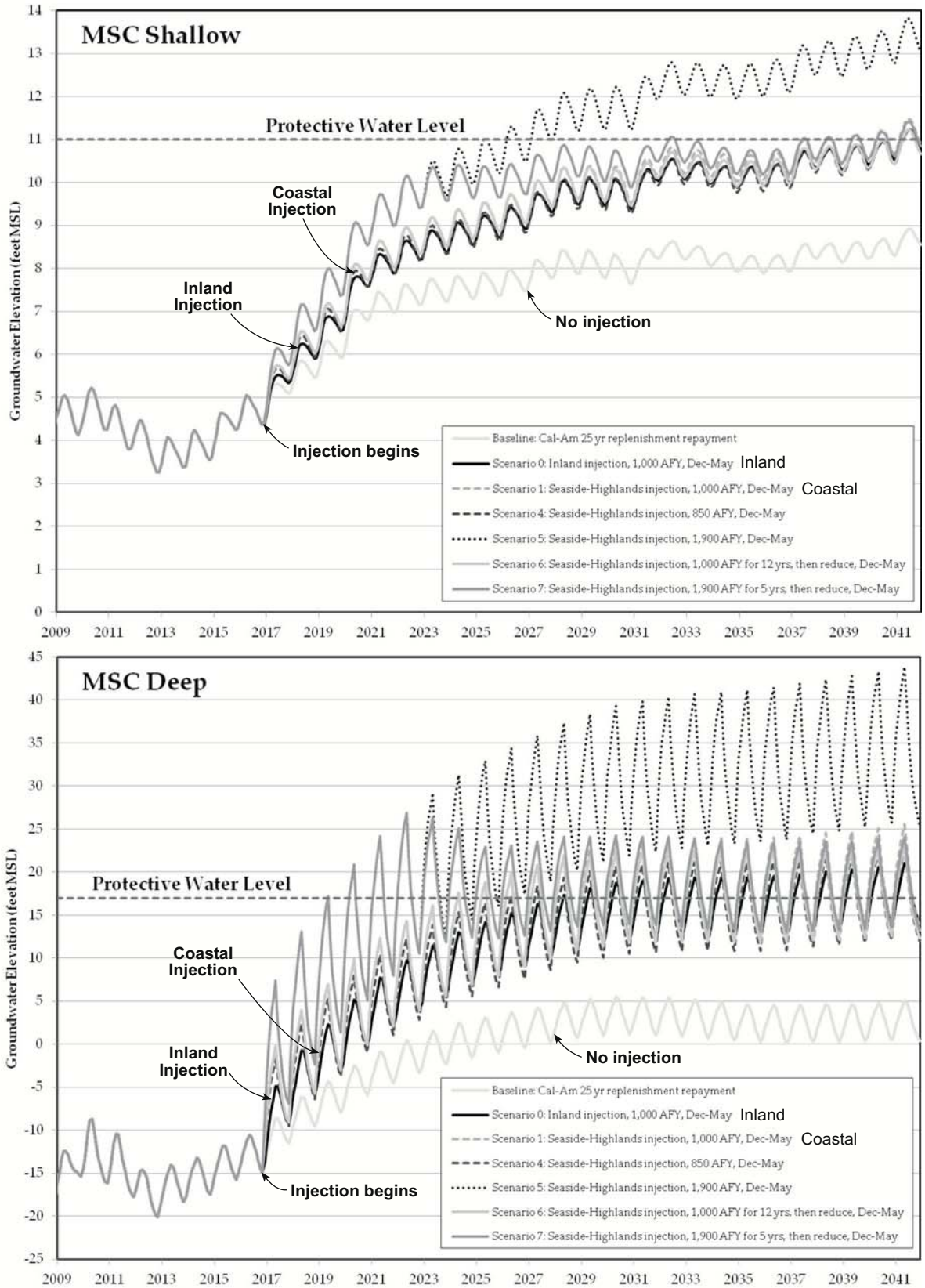

Figure 2: Predicted Groundwater Elevations and Protective Elevations for the MSC Wells

From: HydroMetrics, July 19, 2013.

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Figure A-4
Coastal Injection Modeling Results

APPENDIX B

HydroMetrics Memorandum

Groundwater Replenishment Project Development Modeling, October 2, 2013

HydroMetrics WRI

519 17th Street, Suite 500
Oakland, CA 94612

Mr. Bob Holden
Monterey Regional Water Pollution Control District
5 Harris Court, Bldg. D
Monterey, CA 93940

October 2, 2013

Subject: Groundwater Replenishment Project Development Modeling

Dear Mr. Holden:

The letter below discusses the results of modeling completed in support of the Groundwater Replenishment Project (GWR) project development efforts.

The GWR is a central component of the Monterey Regional Water Pollution Control Agency's (MRWPCA's) plans to maintain a sustainable supply of fresh water to its customers. The GWR will recharge an average of 3,500 acre-feet (AF) of water into the Seaside groundwater basin throughout the year. This recharge will be matched by an increase of 3,500 AF per year of additional extraction from the basin. While this strategy produces no net change to the average water balance of the basin, the location and the timing of recharge and extraction may alter the flow dynamics of the basin. The impact that the recharged water has, whether it will produce additional storage that can be extracted or whether it force extra water to flow offshore or into the Salinas basin, depends upon the details of the project.

Background and Approach

Our simulations incorporated certain assumptions about the recharge and pumping. These assumptions were detailed discussed in a letter from HydroMetrics WRI dated August 29, 2013. We assumed the recharge will be distributed evenly throughout the year. The increased pumping will follow a seasonal cycle based upon the observed current seasonal water demand of Cal-

Am customers. The additional extraction of GWR water is projected to occur entirely through six existing wells:

- ASR 1- 4
- Ord Grove #2
- Paralta
- Luzern
- Playa #3
- Plumas #4

Tentative sites have been selected for the placement of GWR vadose zone wells and deep injection wells. Up to four vadose zone wells have been proposed for delivering water into the shallow Paso Robles formation, and up to three deep injection wells have been proposed for injecting water into the deep Santa Margarita formation.

Four model simulations were conducted to investigate the impact of different strategies for recharging the GWR water. These simulations consisted of one baseline scenario in which no GWR water is recharged or extracted, and three scenarios in which the GWR water is recharged to the Paso Robles and Santa Margarita formation in varying proportions. The proportion of water recharged into each formation is shown in Table 1.

Table 1: Recharge Distribution in Model Scenarios

	Percent Recharged into Paso Robles	Percent Recharged into Santa Margarita
Scenario 1	100%	0%
Scenario 2	0%	100%
Scenario 3	20%	80%

The first and second scenario are included as end-member cases to predict the most extreme impacts expected from the project, and to compare the behavior of shallow versus deep injection. The third scenario recharges water in accordance with the historical pumping distribution in the Seaside basin: historically, Cal-Am extracts approximately 80% of its water from the deeper Santa Margarita Formation and 20% from the shallow Paso Robles Formation.

Model Setup

To model the scenarios, HydroMetrics WRI extended the 2012 TAC baseline model. The baseline model originally simulated the Seaside Basin through 2030. The model was extended from 2030 through 2041 for these simulations. The year 2041 was chosen using the assumption that Cal-Am's repayment would begin in 2017, and the repayment would take 25 years.

All boundary conditions for the added simulation period are held constant at their 2030 levels. These include the general head boundaries along the coast, constant head boundaries adjacent to the Salinas Basin, and all no flow boundaries.

The same hydrology (rainfall and recharge) used in previous model runs was applied to the baseline scenario and all pumping scenarios. To extend the hydrology through the predictive period, the 1987 through 2008 hydrology data were repeated for model years 2009 through 2030, and 2031 through 2041 (Figure 1). Because there are only 22 years of hydrology data between 1987 and 2008, these 22 years have been repeated in succession through 2041. By using this hydrology, even during the period January 2009 to present when actual hydrology is known, the model runs can be used to compare relative groundwater levels but not to assess absolute Basin conditions.

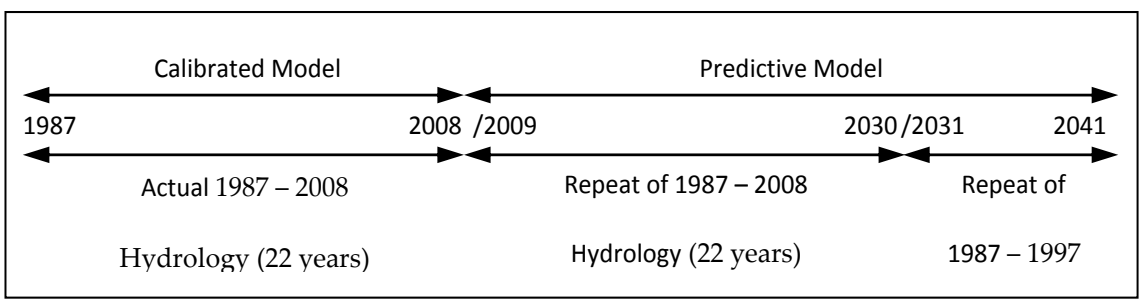


Figure 1: Repetition of Hydrology for Predictive Model

Deep injection is simulated in the model as wells that are located in the fifth, and lowest, model layer using MODFLOW's well package. The vadose zone wells are simulated in the model by applying water to the surface of the appropriate model cells using MODFLOW's recharge package. While conceptually the water is applied near the surface, the recharge package will deliver this water to the shallowest layer that remains saturated during any stress period. As a result, the

water recharged through the vadose zone wells is not always applied to the top model layer, and the application layer varies throughout the simulation.

Performance Measures

The GWR's purpose is to provide potable water to Cal-Am. Water recharged by GWR must be available for extraction by Cal am wells. Performance measures must therefore show that the recharged water is not lost to the ocean or nearby basins. Two criteria were used to assess each scenario's performance: whether the project increased outflow to the ocean, and whether the project increased or decreased overall storage in the basin. Because the recharge of GWR water is intended solely for storage and reuse in the short term, we believe that the ideal scenario would result in no long-term changes in the amount of water stored in the basin and would not alter the flow that occurs through any of the basin boundaries. Therefore, the best scenario is the one that is most similar to the baseline.

Coastal Outflow Criterion

Outflow from the Seaside Basin to the ocean was the primary criterion used to assess project performance. A project that increases the amount of outflow to the ocean is theoretically recharging water that cannot be captured by Cal-Am. The best scenarios are those that do not increase outflow to the ocean.

The amount of water flowing to the ocean was estimated by analyzing the flow at every cell along the model's general head boundary (GHB) that simulates the ocean boundary. These flows were summarized for all cells within boundaries of the adjudicated basin. Only flows directed from the basin to the ocean were summarized: inflow from the ocean was not part of the performance criterion.

Figure 1 through Figure 4 show the results for model layers 1, 3, 4, and all for all layers combined. Layer 2 is not shown because it only experienced inflow and layer 5 is not shown because we have assumed that the Santa Margarita aquifer is not directly connected to the ocean. Each figure comprises two graphs. The top graph shows the overall outflow rates in acre-feet per day for each scenario and for the entire model period. The bottom graph shows the difference in the outflow rate between the recharge scenarios and the baseline scenario. On this figure positive values indicate that a scenario has more outflow than the baseline, and negative values indicate that a scenario has less outflow than the baseline.

Scenario 1, with 100% of recharge occurring through the vadose wells, has the greatest outflow for each of the model layers. Scenarios 2 and 3 have outflows that are much more similar to the baseline, with scenario 2 tending to have less outward flow than baseline and scenario 3 switching between less and more outward flow than baseline over time.

A comparison of the outflow from layer 1 (Figure 1) and the outflow from all layers (Figure 4) reveals that most of the increased total outflow are accounted for by layer 1. This is the layer in which recharge usually occurs, and which is most removed from the deep Santa Margarita formation from which the majority of Cal-Am's water is pumped. This demonstrates that concentrating recharge in the shallow Paso Robles Formation will results in water flowing tot the coast without percolating into the deeper formations.

These results suggest that scenario 2 with 100% of water injected through the deep injection wells will lose the least amount of water to the coast, while scenario 3, with 80% injected through the deep injection wells, and 20% through the vadose wells will have the least overall impact on the flow along the coast.

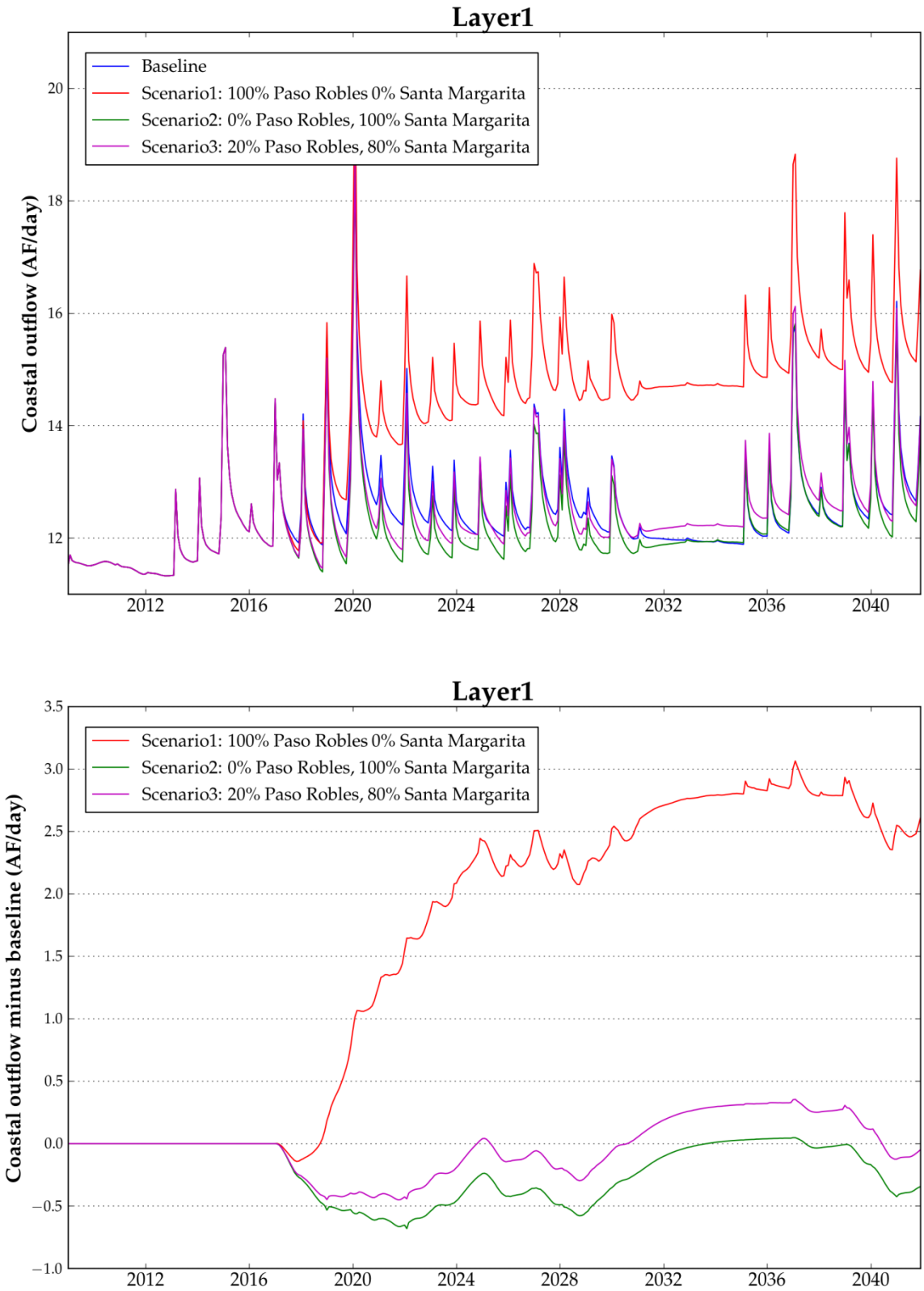


Figure 1: Coastal Outflow along Layer 1 General Head Boundary

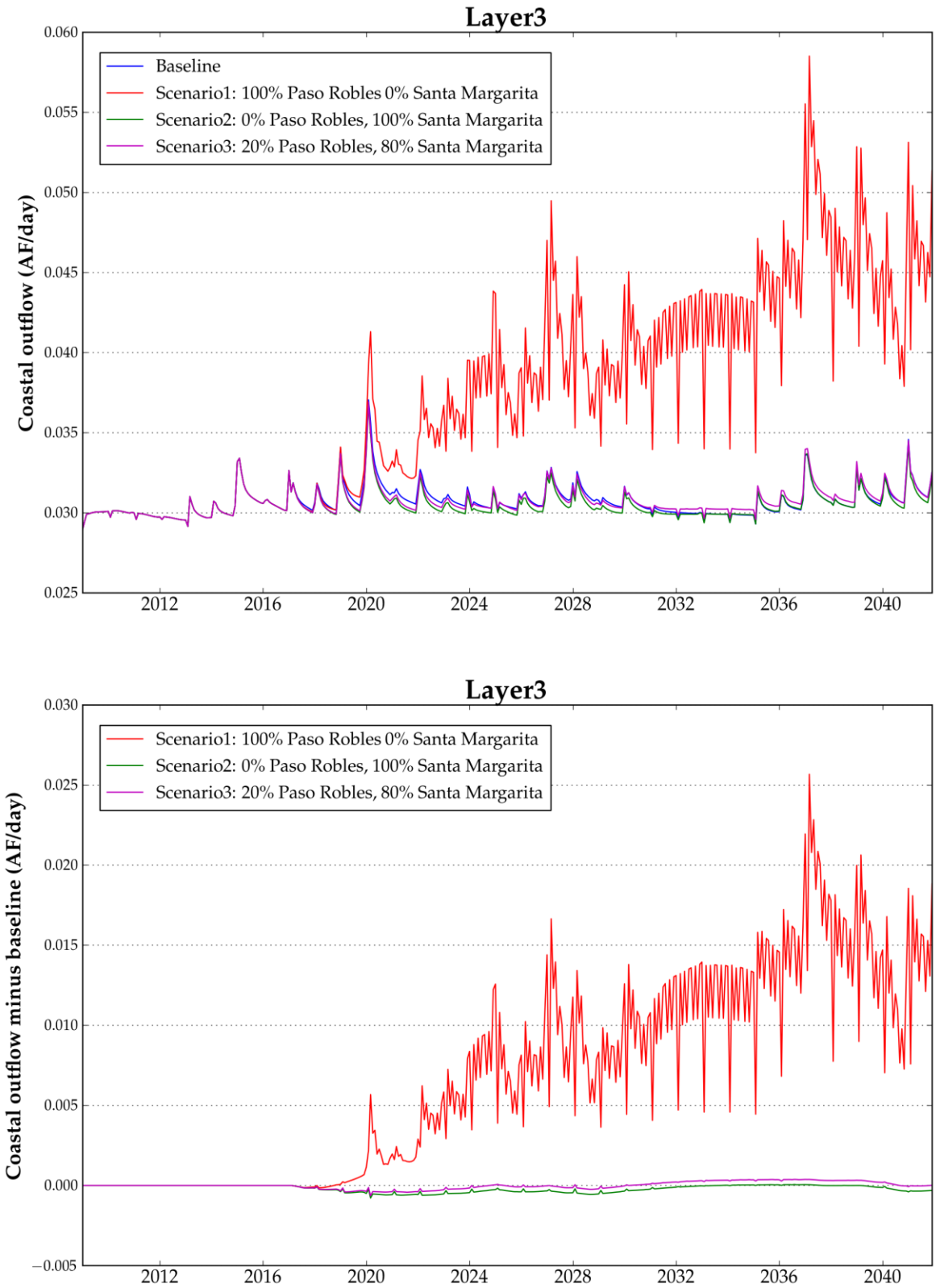


Figure 2: Coastal Outflow along Layer 3 General Head Boundary

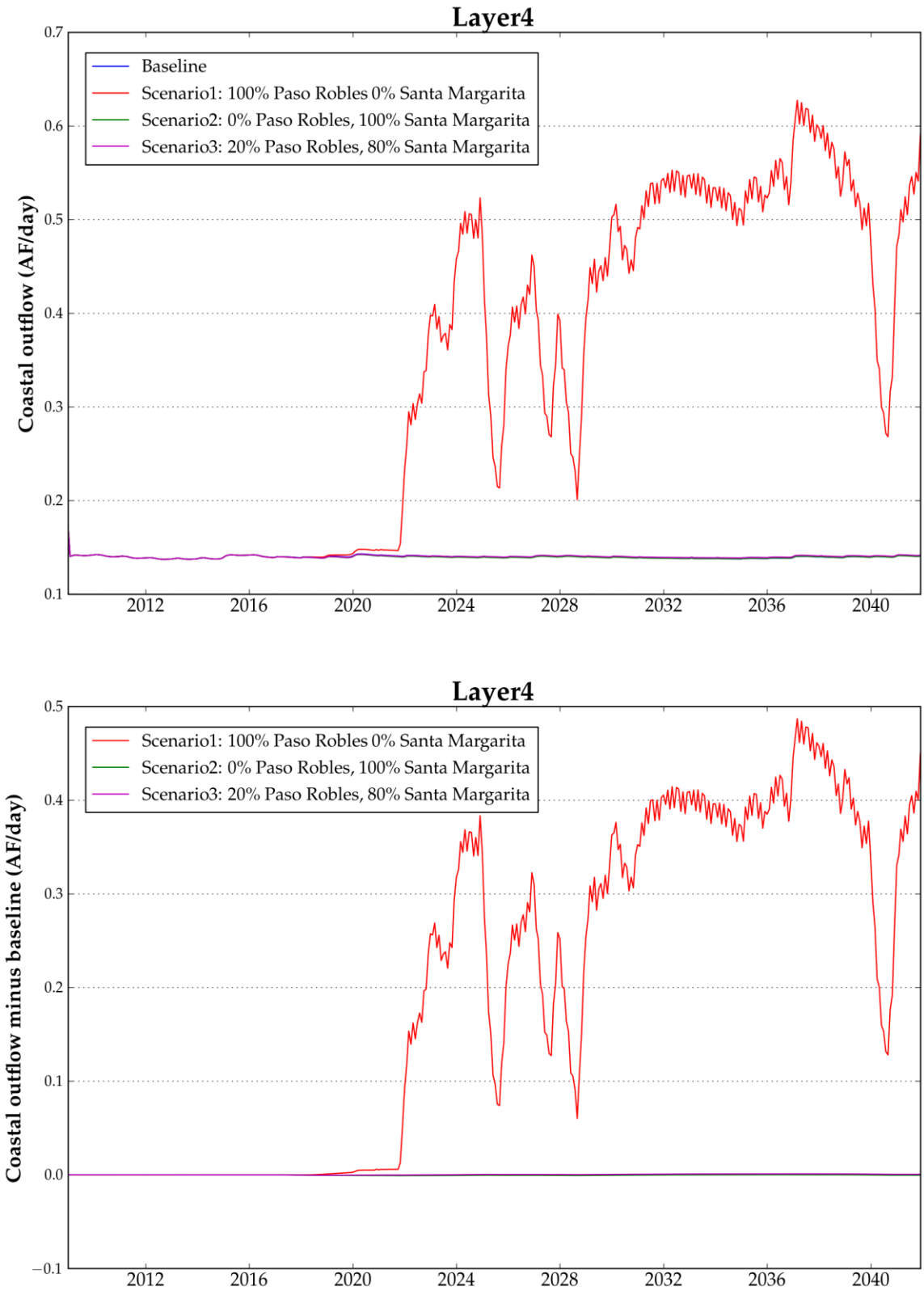


Figure 3: Coastal Outflow along Layer 4 General Head Boundary

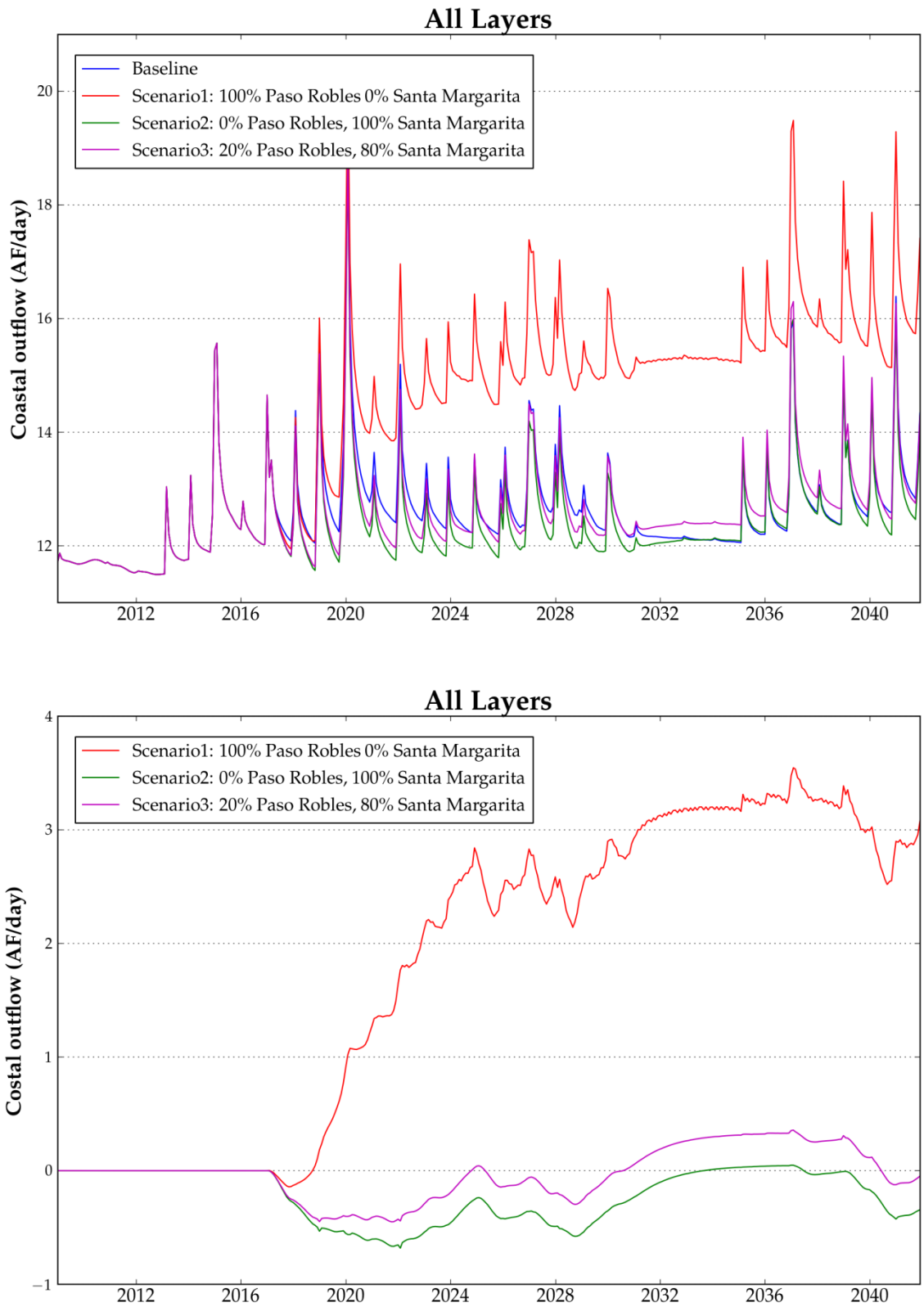


Figure 4: Coastal Outflow along Layers 1-4 General Head Boundaries

Storage Changes Criterion

The change in the amount of water stored in the basin under each simulation was a second criterion for assessing the impact caused by GWR recharge. A basin in which inflows and outflows are balanced over time will have no average change in storage (at the same time that it will have stable water levels). The inflows and outflows of the Seaside Basin are not currently balanced, but as stated above, it is not the goal of the GWR project to change the water balance. As with the outflow criterion, the changes in storage for each scenario were compared to those of the baseline to assess the performance of each scenario, with the smallest difference indicating the least impact.

Table 2 shows the total volumetric changes in storage, with positive numbers indicating increases in the amount of water in storage and negative numbers indicating decreases in the amount of water in storage. The imbalance present in scenario 1 between the shallow layers that are recharged and the deep layers that are preferably pumped can be plainly seen. Under this scenario there is a large increase in storage in the shallow layers and a large decrease in storage in deep layer 5. These results show that the largest changes occur within the adjudicated basin, but that there are also differences in the storage occurring outside of the adjudicated basin. This indicates that changes in flow are taking place along the inland boundaries and not just the coastal boundary. This was not investigated further.

Table 3 shows the difference in the volumetric storage changes for each scenario compared to the baseline, and Table 4 expresses these as a percent of the total volume of GWR water. Positive values indicate that a scenario has more water in storage than baseline conditions and negative values indicate that a scenario has less water in storage than baseline conditions. These results indicate that scenarios 2 and 3 do a much better than scenario 1 at minimizing changes in the basin relative to the baseline. Each scenario shows changes in storage that only a few percent of the total water recharged (and extracted) with the GWR project. Scenario 2 appears better if the scope is limited to the adjudicated basin while scenario 3 appears better if the entire model region is considered.

Table 2: Total Change in Storage (AF)

Scenario	Adjudicated Basin						Outside of Adjudicated	Entire Model
	Layer1	Layer2	Layer3	Layer4	Layer5	All Layers		
Baseline	1,794	95	-198	-858	-3,738	-2,905	-35,079	-37,984
Scenario1	2,895	19,406	5,871	3,664	-15,626	16,211	-49,993	-33,782
Scenario2	1,697	-78	-17	-824	-1,528	-749	-32,498	-33,247
Scenario3	1,772	2,651	786	-364	-4,723	121	-36,811	-36,690

+ : More into Storage (higher water levels/ pressure)

- : Less into Storage (lower water levels/ pressure)

Table 3: Difference from Baseline

Scenario	Adjudicated Basin						Outside of Adjudicated	Entire Model
	Layer1	Layer2	Layer3	Layer4	Layer5	All Layers		
Scenario1	1,102	19,311	6,070	4,523	-11,889	19,116	-14,914	4,202
Scenario2	-97	-173	182	34	2,210	2,156	2,581	4,737
Scenario3	-22	2,556	984	495	-986	3,026	-1,732	1,294

+ : More into Storage (higher water levels/ pressure)

- : Less into Storage (lower water levels/ pressure)

Table 4: Difference from Baseline as Percent of Total Recharged Water (AF)

Scenario	Adjudicated Basin						Outside of Adjudicated	Entire Model
	Layer1	Layer2	Layer3	Layer4	Layer5	All Layers		
Scenario1	1.2%	21.8%	6.9%	5.1%	-13.5%	21.6%	-16.9%	4.8%
Scenario2	-0.1%	-0.2%	0.2%	0.0%	2.5%	2.4%	2.9%	5.4%
Scenario3	0.0%	2.9%	1.1%	0.6%	-1.1%	3.4%	-2.0%	1.5%

+ : More into Storage (higher water levels/ pressure)

- : Less into Storage (lower water levels/ pressure)

Conclusion

These analyses suggest that recharging between 80% and 100% of GWR water into the Santa Margarita formation through deep injection wells will result in minimal disturbance to the basin and to only small amounts of water being lost to outflow from basin. These results are consistent with the idea that the water should be delivered into the same formations from which water is drawn.

If you have any questions, do not hesitate to contact me.

Sincerely,

Derrik Williams

Derrik Williams, President
HydroMetrics Water Resources Inc.

APPENDIX C

HydroMetrics Technical Memorandum

GWR Project EIR: Project Modeling Results, January 12, 2015

TODD GROUNDWATER

HydroMetrics WRI

1814 Franklin St, Suite 501
Oakland, CA 94612

TECHNICAL MEMORANDUM

To: Bob Holden/MRWPCA

From: Stephen Hundt and
Derrik Williams

Date: January 12, 2015

Subject: GWR Project EIR: Project Modeling Results

Executive Summary

The Monterey Regional Water Pollution Control Agency (MRWPCA) is developing a Groundwater Replenishment (GWR) project for the Seaside Basin. This project will recharge the Seaside groundwater basin with high quality purified water. The current analysis seeks to assess the environmental impacts of operating the GWR project, in fulfillment of the GWR project's Environmental Impact Report (EIR) requirement.

The calibrated groundwater model of the Seaside Groundwater Basin (HydroMetrics WRI, 2009) was used to estimate impacts from the GWR Project. A predictive model incorporating reasonable future hydrologic conditions was developed for this impact analysis. The groundwater model was calibrated through 2008; therefore the predictive model begins in 2009. The predictive model simulates a 33 year period: from 2009 through 2041.

Simulated future Carmel River flows were based on historical flow records. The amount of Carmel River water available for winter injection into the Seaside Basin was estimated by Monterey Peninsula Water Management District (MPWMD) staff. They compared historical daily streamflows with minimum streamflow requirements for each day, and then identified how much water could be extracted from the Carmel River for injection each month.

Future water demand for Cal-Am was estimated from historical demands for the period 2001-2010. Roughly two-thirds of the total Cal-Am demand was predicted to be met by

extraction of native groundwater, injected Carmel River water, and injected GWR water. The monthly pumping rate within each year was distributed in proportion to the total monthly demand, with modifications made to compensate for capacity reductions caused by ASR injection.

Model results show that the GWR project is generally neutral compared to the no project conditions. Groundwater elevations are generally similar under the project conditions as under the no project conditions, with increasing groundwater elevations experienced under both scenarios. These higher groundwater levels will tend to slow or stop seawater intrusion.

Particle tracking was used to estimate the travel time of GWR water from the point of recharge to the closest point of extraction. Particle tracking showed that the shortest travel time for any recharged GWR water is about 11 months. Travel times of less than 12 months occur in 5 years out of the 25-year simulation period when the GWR project is in operation.

Project Description

The Monterey Regional Water Pollution Control Agency (MRWPCA) is developing a Groundwater Replenishment (GWR) project for the Seaside Basin. This project will recharge the Seaside groundwater basin with high quality purified water and deliver lesser quality recycled water to the Castroville Seawater Intrusion Project (CSIP). California American Water Company (Cal-Am) will recover 3,500 AFY of the recharged water through existing production wells in the basin, based on demand and well capacity/availability. The project will also include a groundwater banking program that will build a drought reserve account of up to 1,000 AF of water in the Seaside Basin during normal and wet years. The extra recharge during normal and wet years will be offset by an increase in CSIP deliveries and a corresponding decrease in Seaside groundwater basin injection during dry years when water is in the reserve account. The locations of the project's facilities, along with other operating production wells, are shown on Figure 1.

HydroMetrics Water Resources Inc. (WRI) has completed groundwater flow and particle tracking simulations of the proposed GWR project. This simulation was undertaken to predict impacts on groundwater levels and the fate and travel time of injected GWR water. This modeling was completed in support of the GWR project's environmental impact report (EIR).

Figure 1: Production and GWR Injection Well Locations

Model Background and Assumptions

The calibrated groundwater model of the Seaside Groundwater Basin (HydroMetrics WRI, 2009) was used to estimate the impacts from the GWR Project. A predictive model incorporating reasonable future hydrologic conditions was developed for this impact analysis. The groundwater model was calibrated through 2008; therefore the predictive model begins in 2009. The predictive model simulates a 33 year period: from 2009 through 2041. The GWR project was assumed to start in October 2016 and was operating throughout the remaining 25 years of the simulation. Recent estimates indicate that the project start-up may be delayed until late 2017, but the project was simulated with the previous start date to provide an additional year of analysis.

Predicted Hydrology Assumptions

The hydrology (rainfall and recharge) used to calibrate the groundwater model was applied to the predictive model. To extend the hydrology through the predictive period, the 1987 through 2008 hydrology data were used to simulate model years 2009 through 2030, and the 1987 through 1997 hydrology data were then repeated for 2031 through 2041 (Figure 2). This is the approach that has been adopted for all predictive models of the Seaside Basin since 2009. By using this hydrology, even during the period January 2009 to present when actual hydrology is known, the model runs can be used to compare relative groundwater levels but not to assess absolute Basin conditions.

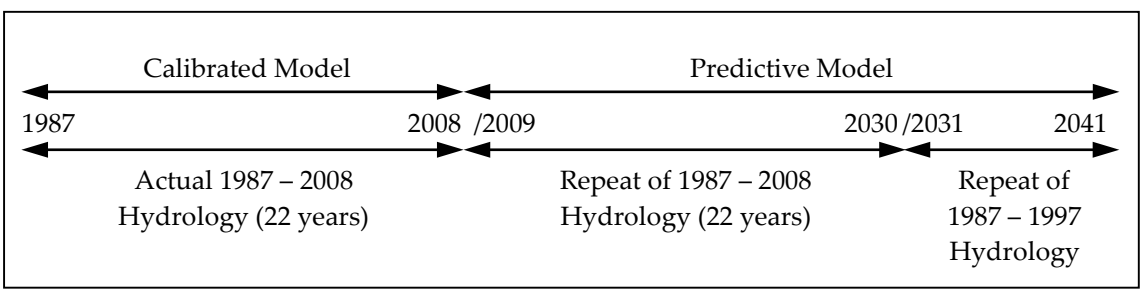


Figure 2: Repetition of Hydrology for Predictive Model

Predicted Carmel River Flow and Injection Assumptions

Monterey Peninsula Water Management District (MPWMD) estimated the amount of Carmel River water available for ASR injection for the predictive simulation based on historical streamflow records. Because the future simulated hydrology is based on the historical hydrology between 1987 and 2008, the future streamflows are expected to be

the same as the historical streamflows. MPWMD staff compared historical daily streamflows between water year 1987 and water year 2008 with minimum streamflow requirements for each day. This allowed MPWMD to identify how many days in each month ASR water could be extracted from the Carmel River. Using a daily diversion rate of 20 acre-feet per day, MPWMD calculated how many acre-feet of water from the Carmel River could be injected into the ASR system each month. Figure 3 shows the estimated available monthly ASR injection volumes for the predictive simulation. Appendix A includes the historic and projected ASR Wells Site injection schedule that was developed by MPWMD. The Carmel River water available for injection was divided between the ASR 1&2 Well Site and the ASR 3&4 Well Site according to the historic division.

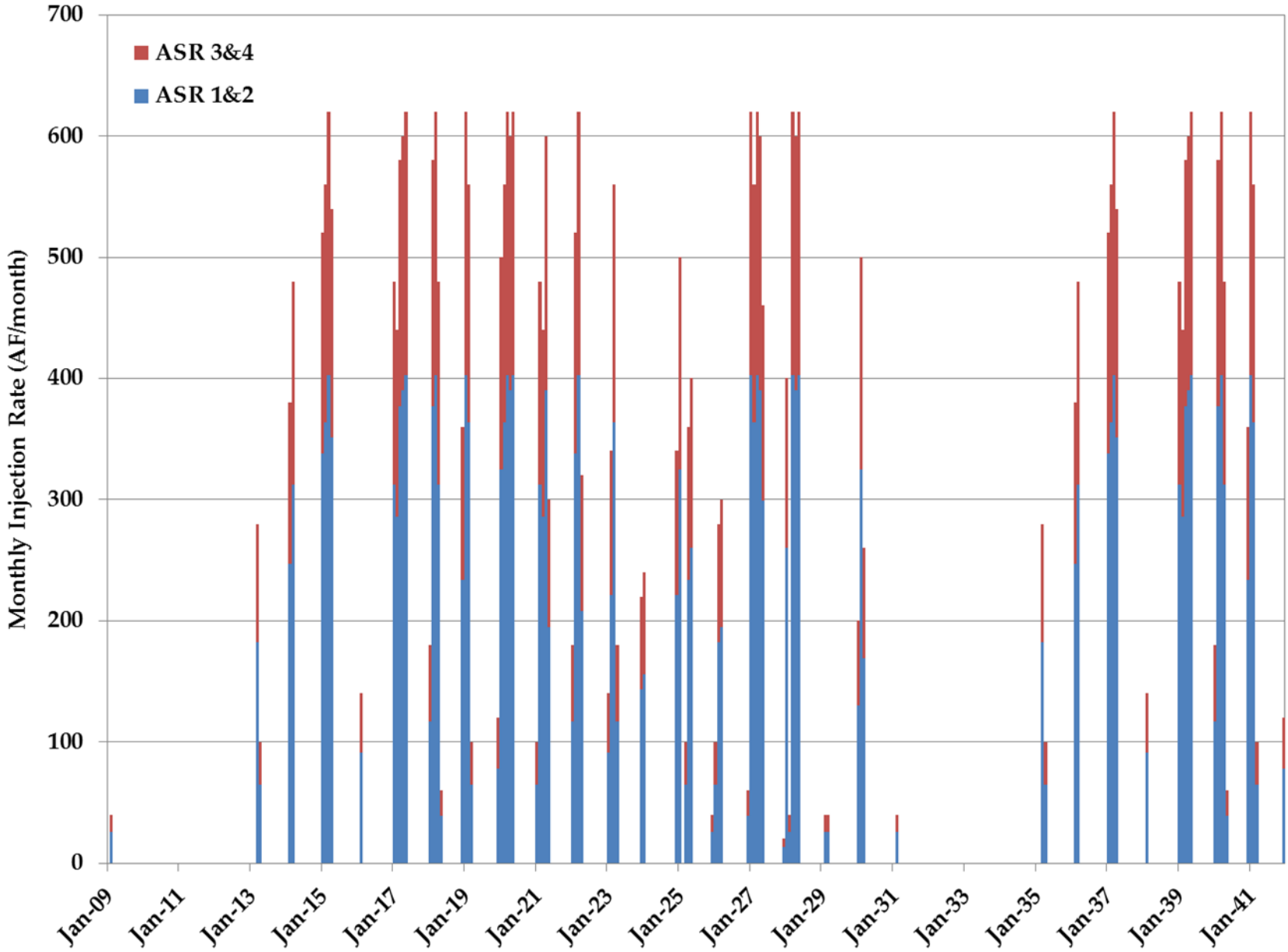


Figure 3: Estimated Monthly Carmel River ASR Injection Volumes

PREDICTED GWR RECHARGE ASSUMPTIONS

GWR Project water is recharged through four deep wells and four vadose zone wells in the predictive model. The simulated GWR project recharges varying volumes of water each year, with an average of 3500 acre-feet recharged per year. Of this, 90% of the water is delivered to the Santa Margarita aquifer through four deep injection wells, and the remaining 10% is delivered to the Paso Robles aquifer through four vadose zone well. The amount of water recharged each year depends upon whether the predicted hydrology is in a drought or non-drought year, and upon the rules for banking and delivering water to CSIP. Figure 4 shows the volume of water recharged by the GWR project for each water year. While the annual recharge of GWR water varies from year to year, the recovery of water through Cal-Am's pumping wells is maintained at a constant 3500 acre-feet every year. A monthly recharge schedule that includes an accounting and description of the CSIP banking and delivery program is shown on the 11 x 17 sized table at the end of this technical memorandum.

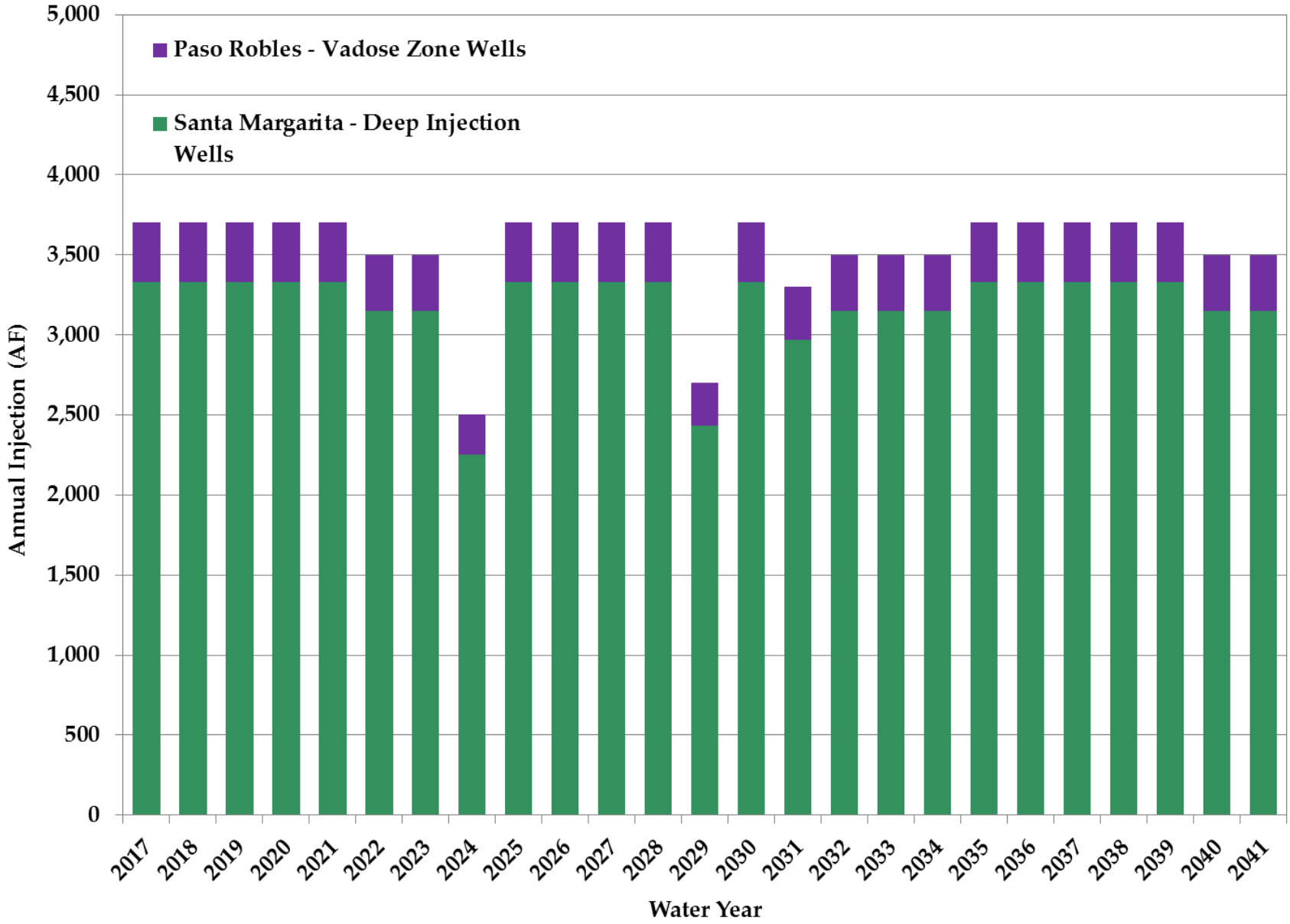


Figure 4: Annual GWR Recharge

PREDICTED PUMPING ASSUMPTIONS

HydroMetrics WRI made a number of assumptions about future pumping rates by various entities in the Seaside Basin. These assumptions were consistent with assumptions developed for previous modeling exercises in the basin. Pumping assumptions were developed for standard producers, alternative producers, golf courses, and Cal-Am.

WATER YEAR 2009 THROUGH WATER YEAR 2012 PUMPING

Actual pumping and injection data for all wells from January 2009 through December 2012 are included in the predictive simulation.

MUNICIPAL PUPMPING FROM WATER YEAR 2013 ONWARDS

Predicted pumping by the City of Seaside and the City of Sand City follows the triennial reductions prescribed in the Amended Decision (California American Water v. City of Seaside et al., 2007). These pumping reductions are designed to reduce basin-wide pumping to the approximate safe yield of 3,000 acre-feet per year by 2021.

CAL-AM PUMPING FROM WATER 2013 ONWARDS

A number of assumptions were necessary to estimate Cal-Am's monthly pumping rates and pumping distribution. Assumptions about Cal-Am's future pumping constraints and future demands are discussed below.

Cal-Am Pumping Constraints

Predicted Cal-Am pumping comes from the five existing Cal–Am wells, and two ASR sites. The five existing Cal-Am wells are:

- Luzern #2
- Ord Grove #2
- Paralta
- Playa #3
- Plumas #4

Data supplied by Cal-Am show that the pumping capacity of their five existing wells is 3,653 gallons per minute, or 16 acre-feet per day. Based on conversations with the Monterey Peninsula Water Management District (MPWMD), we assumed that each

ASR well site could produce 1,750 gallons per minute. The total pumping capacity of all seven wells is therefore 7,153 gallons per minute, or 31.6 acre-feet per day.

Information from MPWMD helped determine when ASR wells are unavailable for pumping. MPWMD developed the future injection and extraction schedule of the ASR wells based upon their historical monthly operation from October 1986 to 2008. This historical timeframe aligns with the observed climate and hydrologic pattern that are used to specify the future climate and hydrologic pattern in the groundwater model. The MPWMD injection and extraction schedule identifies months when ASR wells are not available to pump groundwater, either because they are being used for injection or they are resting. For months when the ASR wells were not available, Cal-Am's pumping capacity was set to 16.1 acre-feet per day. For months when the ASR wells were available, Cal-Am's pumping capacity was set to 31.6 acre-feet per day.

Cal-Am Water Demand

The monthly distribution of Cal-Am's total water demand was used to estimate a likely monthly distribution of future pumping. The total demand from Cal-Am customers in the Seaside Basin is currently supplied from a variety of sources. Groundwater pumping may become a more significant source of Cal-Am's supply in the future. Cal-Am's historical demand numbers were provided by MPWMD. The values are based on average water deliveries for the years 2001-2010.

Table 1 shows the calculations used to estimate Cal-Am's future monthly pumping demand. The current average monthly demand, shown in acre-feet in the second column, is the measured demand provided by MPWMD. It is worth noting that the maximum monthly demand of 1,490 acre-feet (48 acre-feet per day) far exceeds the assumed combined well capacity of about 31.6 acre-feet per day.

The third column shows the percentage of Cal-Am's demand by month. We assumed that the maximum demand month of July represents a time when Cal-Am is pumping at its full capacity of 31.6 acre-feet per day. The demand for each other month, shown in column 4, was scaled as a percentage of this full capacity. For example, we calculated that Cal-Am only pumps 64% of its capacity in March, because the March demand is only 64% of the July demand. Column 5 shows the amount of water Cal-Am would likely pump in any month. Column 5 values are calculated by multiplying the percentages in column 4 by the full pumping capacity of 31.6 acre-feet per day.

Table 1: Cal-Am Estimated Seasonal Demand

Month	Cal-Am Current Average Monthly Demand (AF)	Percent of Annual Production	Percent of July Production	Estimated Future Monthly Pumping (AF)
October	1242	8.96%	0.83	816
November	1005	7.25%	0.67	660
December	900	6.49%	0.60	591
January	871	6.28%	0.58	572
February	814	5.87%	0.55	534
March	947	6.83%	0.64	622
April	1049	7.57%	0.70	689
May	1307	9.43%	0.88	858
June	1400	10.10%	0.94	919
July	1490	10.75%	1.00	978
August	1469	10.60%	0.99	965
September	1363	9.84%	0.92	895

Based on these calculations, Cal-Am's total future annual pumping demand is 9,099 acre-feet per year.

Annual water available for Cal-Am pumping

Cal-Am's future pumping from the Seaside basin will be drawn from three pools of water:

- Native groundwater
- Groundwater replenishment (GWR) project water
- Aquifer storage and recovery (ASR) project water

The availability of these resources is graphed on Figure 5. This graph consists of the three components listed above.

- The native water (red) is subject to triennial reductions through 2021. After 2021, the amount of pumping native water is held constant. This pool of water also includes pumping for Security National Guaranty, Inc. (SNG, a groundwater pumper) development which increases from 2013 through 2017.

- GWR water (green) is projected to become available in 2017, and supply 3500 acre-feet every year.
- ASR water (blue) availability is subject to weather conditions. The maximum amount that can be pumped annually is 1,500 acre-feet. Less is pumped during dry years.

The dashed purple line on Figure 5 is Cal-Am's estimated total future annual pumping demand of 9,099 acre-feet per year. The water available for pumping from the three pools of water is projected to be less than the pumping demand for all years. The dashed orange line is the annual demand that Cal-Am could reasonably pump, given the reductions in capacity that take place when the ASR wells are unavailable for extraction.

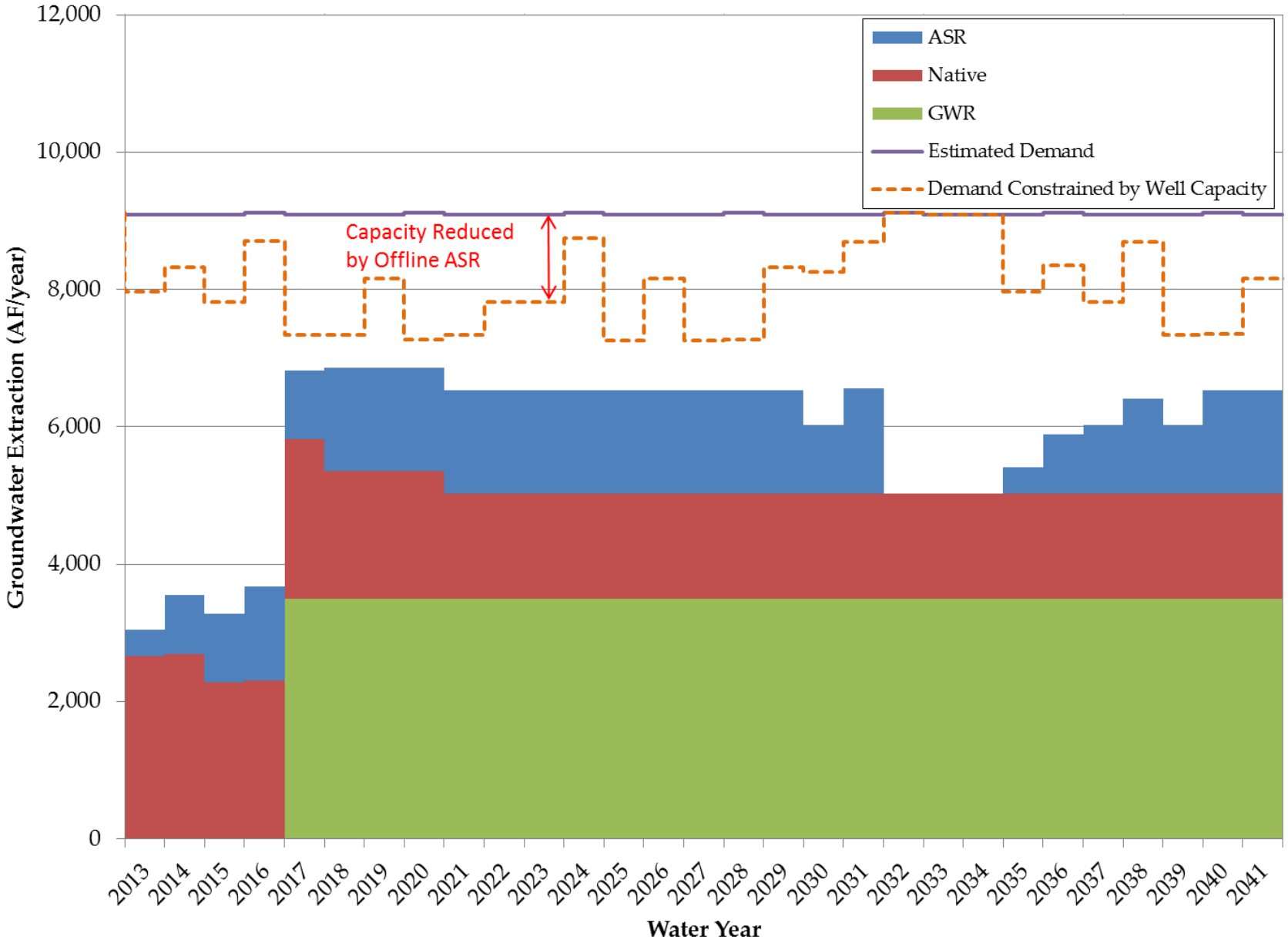


Figure 5: Annual Cal-Am Water Allocation by Water Right Source

Pumping Allocation by Well

When no ASR water is being extracted, Cal-Am's monthly pumping from the Seaside Basin is allocated among their available wells with the following order of preference:

- Ord Grove #2
- Paralta
- ASR wells
- Luzern
- Playa #3
- Plumas #4

The total demand during any month was first allocated to the Ord Grove Well up to its capacity. Demand was then allocated to the Paralta Well up to its capacity, and so on. The ASR wells are considered unavailable for extraction if they are injecting water, or have injected water at any time during the previous 3 months. The projected injection schedule was used to flag months during which the ASR wells would be unavailable. During months when ASR wells are not available for pumping, the order of preference continues directly from the Paralta Well to the Luzern well. This generally occurs during early summer, when total pumping is high and the ASR has recently injected excess spring rainfall. Figure 6 shows the monthly pumping by well.

When ASR water is being extracted, the ASR wells are preferentially used to extract ASR water. If the ASR wells' capacity is inadequate to extract all ASR water, the remaining ASR water is allocated to the remaining wells as described above. If the ASR wells' capacity is greater than the ASR water allocated during a month, then the ASR wells remain available to extract native and GWR water up to their remaining capacity.

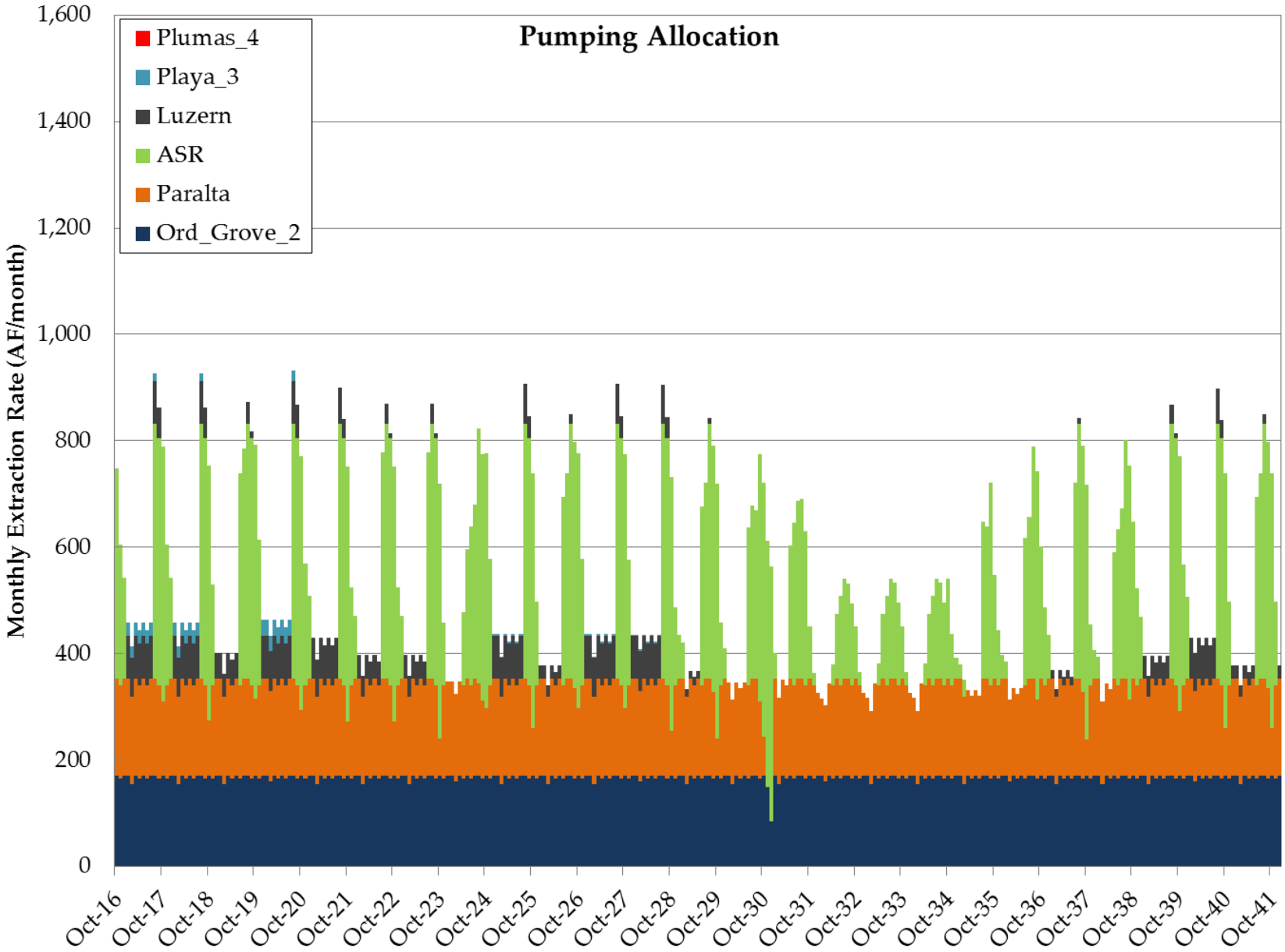


Figure 6: Monthly Pumping Totals by Well

GOLF COURSE PUMPING FROM WATER YEAR 2013 ONWARDS

Predicted golf course pumping is based on the hydrologic year. For example, pumping in January 2015 equals the amount pumped in January 1993, because the simulated 2015 hydrology is based on 1993 hydrology. This ensures that the demand corresponds to the hydrology. If the amount pumped by a Producer pre-adjudication exceeded the Producer's adjudicated right, pumping was capped at the Producer's adjudicated amount.

Additional golf course pumping adjustments accounted for in the simulation are:

- The Bayonet and Blackhorse golf courses pump no water until September, 2016. This is based on an in-lieu replenishment program the City of Seaside has with its golf course pumping. Under this program, Marina Coast Water District provides water in-lieu of the City pumping from the Seaside Basin. The City expects to start pumping its golf course wells again starting September 2016.

- In 2007, Bayonet and Black Horse golf courses had irrigation upgrades that have reduced irrigation demand by approximately 10% from historical amounts.

- The City of Seaside expects to begin pumping an average of 360 AFY from its wells for golf course supply starting in September 2016. These projected quantities were used rather than basing demand on the hydrology year.

PREDICTED ALTERNATIVE PRODUCER AND PRIVATE PUMPING

Predicted alternative producer pumping is set at measured Water Year (WY) 2011 volumes from WY 2013 onwards. All other pumpers that are not covered by the Decision, including Cal Water Service and private wells, also pump at WY 2011 volumes from WY 2013 onwards.

Pumping exceptions taken into account in the simulation are:

- Water for SNG, which is an Alternative Producer, is supplied from Cal-Am wells under an agreement with Cal-Am. When the SNG site is developed they will be supplied with water by Cal-Am, who will use SNG's water right of 149.7 acre-feet/year. Currently there is no production from the SNG well. Based on input from the property owner, Ed Ghandour, project construction is planned to start in 2013, and use 25 AFY of water. Water usage thereafter is estimated to be:

- 2014 - 30 AFY
- 2015 – 50 AFY
- 2016 onwards – 70 AFY

No-Project Scenario

Prior to simulating impacts from GWR injection, a No-Project scenario was run to establish baseline conditions. The No-Project scenario included all of the assumptions on future hydrology, future ASR injection, future municipal pumping, and future alternative producer pumping discussed above. No GWR injection was included in the No-Project scenario.

Cal-Am pumping in the No-Project scenario was estimated using the same assumptions detailed above. The only difference is that no GWR water was available for extraction. The total annual amount of water pumped by Cal-Am is shown on Figure 7. The monthly pumping by well for the No-Project scenario is shown in Figure 8.

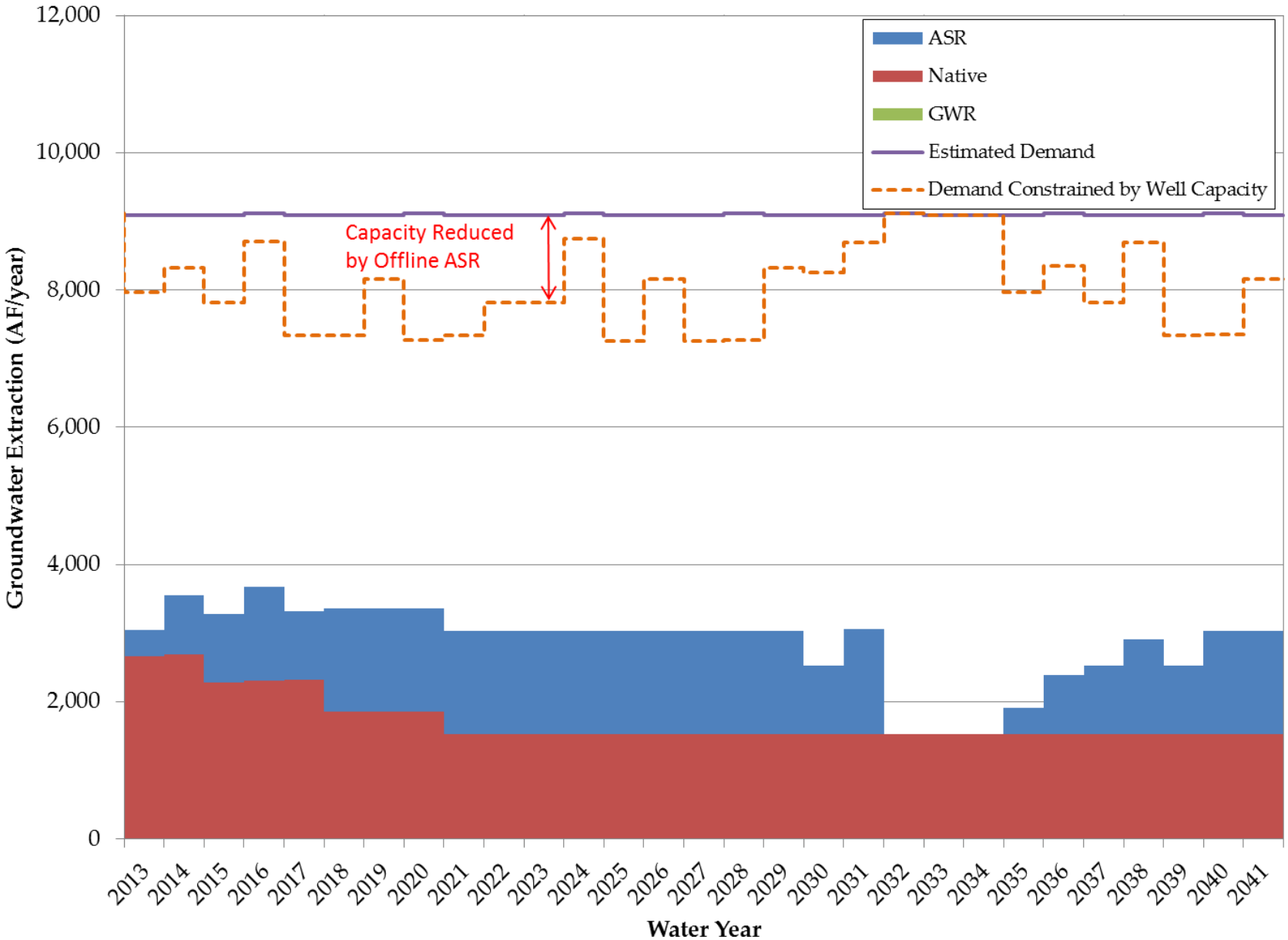


Figure 7: Annual Cal-Am Water Allocation by Water Right Source for No-Project Scenario

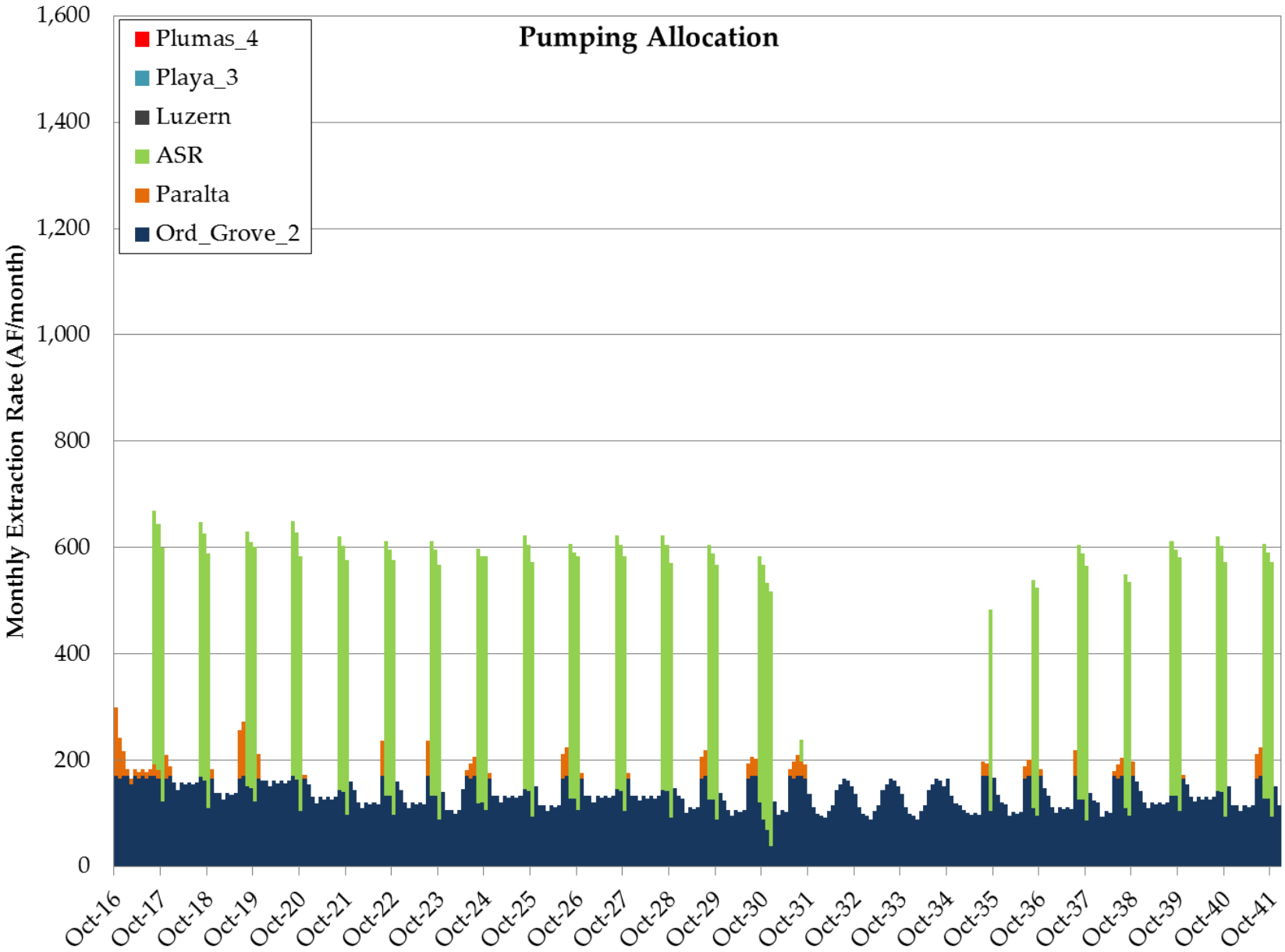


Figure 8: Monthly Pumping Totals by Well for No-Project Scenario

Particle Tracking Approach

Particle tracking was conducted to estimate the fate and transport of GWR water under the Project Scenario. Particles were first introduced around all eight GWR Project injection wells on the simulated period corresponding to October 1, 2016. A new set of particles was released into the model at the beginning of every month until the end of the simulation in 2042. Each month, 40 particles were released from each injection well. Every particle was tracked through the model until it terminated at an extraction well, or until the end of the simulation period in 2042. By introducing the particles continuously, we ensured that there were particles introduced and tracked during times when the travel times would be the fastest.

Particles were placed along the edges of each of the model cells that contained the injection and vadose wells. This strategy is necessary to ensure that the particles are carried outward in all directions in the same manner that water would travel radially from a well. Placing many particles at the exact location of the well results in only a single path taken by all particles. While the approach of placing particles around the edge of the model cell gives a more accurate picture of the dispersal pattern of the water from the injection wells, it also places particles closer to the extraction wells, effectively resulting in faster simulated travel times.

Particles are captured by wells not when they reach the exact location of the extraction wells, but when they reach the edge of the cell that contains an extraction well. This also leads to faster simulated travel times. The results shown below should therefore be considered conservative estimates.

Model Results

GROUNDWATER ELEVATION RESULTS

The impact of the GWR project on groundwater elevations was determined by comparing results from the Project scenario with results from the No-Project scenario. The No-Project scenario simulates future groundwater conditions without the GWR project.

Simulated groundwater elevations from the three scenarios were compared at the following seven wells:

- ASR 1&2
- City of Seaside #3
- Ord Grove #2
- Paralta
- Luzern
- PCA-West (Shallow)
- PCA-West (Deep)

Figure 9 shows the location of these wells and the GWR injection wells. These wells span the area between the GWR injection wells and the coast. Several of the major recovery wells for the GWR project water are included in this set of wells.

Hydrographs for simulated groundwater elevations under the No-Project and Project scenarios are shown on Figure 10 through Figure 16. The blue lines represent the simulated static groundwater elevation under the No-Project scenario and the green lines represent the simulated static groundwater elevation under the with-Project scenario. Over the simulation period, the with-Project hydrographs deviate both below and above the No-Project hydrographs for several wells. The long term groundwater elevation trends of the with-Project hydrographs, however, are generally similar to the long-term trends of the No-Project hydrographs.

The largest relative reduction in groundwater levels under the with-Project scenarios are observed in the Ord Grove #2 well during the drought simulated between 2030 and 2035. During this period, the behaviors of the Ord Grove #2 hydrographs differ in several ways from the other deep wells: ASR wells #1 and #2, City of Seaside well #3, the Paralta well, and PCA-West Deep well. In all wells, there are large seasonal fluctuations throughout the simulation period that greatly diminish during the drought years. These drought year fluctuations tend to remain larger for the with-Project

scenarios than for the No-Project scenarios and produce with-Project water levels that rise above No-Project water levels at their peak and fall below at their trough. In the Ord Grove #2 well, seasonal fluctuations under the with-Project scenario diminish during drought years, but not under the No-Project scenario. The with-Project groundwater elevations remain consistently lower than the No-Project groundwater elevations during the drought period.

There are several factors that control the seasonal fluctuations that occur in simulated groundwater elevations and help to explain the behavior of the Ord Grove #2 well hydrographs. First, the extraction and injection cycle of the ASR wells have a large impact on the seasonal cycles of nearby wells. ASR water is injected during the wet season, lifting groundwater elevations, and extracted during the dry season, dropping groundwater elevations. Injection and extraction of ASR water ceases entirely during the drought years leading to diminished fluctuations in groundwater elevations during these years.

For the with-Project scenarios, injection and extraction of GWR water does not cease, therefore with-Project scenarios experience greater groundwater level fluctuations than the no-Project scenario during the drought years. A second important factor controlling seasonal fluctuations are the seasonal pumping cycles of nearby (and coincident) production wells. Pumping tends to be heavier during the dry season, leading to declining water levels, and lighter during the wet season, leading to recovering water levels. This appears to be the most important factor causing the behavior seen in the Ord Grove #2 well. Figure 17 shows the pumping schedule of the Ord Grove #2 well for the No-Project and with-Project scenarios. While pumping fluctuates greatly under the No-Project scenario, the well is operated close to capacity during all months of the with-Project scenario. This general pattern continues during the drought period, with extended periods of light pumping during the winter months. This behavior compares closely to the Ord Grove #2 hydrographs, where the no-Project scenario sees greater fluctuations during the drought years than the with-Project scenarios. This helps to explain why the magnitude of fluctuations is higher in the Ord Grove #2 well, and why it appears to be much less sensitive to the ASR injection and extraction than its own pumping cycle.

The Luzern well and PCA-West Shallow well show relative reductions in groundwater elevations of one to six feet over the medium term of the simulations. At each of these wells the predicted groundwater elevations for the with-Project scenarios fall below the No-Project elevations soon after the GWR project comes online. Groundwater elevations then slowly recover to exceed or match the no-Project groundwater elevations by the end of the simulation. This behavior is likely a result of how the

injection and additional pumping from the GWR project are distributed within the basin. The Luzern and PCA-West Shallow wells pump from the upper aquifers, not the Santa Margarita aquifer which receives most of the GWR injection. In the upper aquifer, the drop in groundwater elevation due to additional pumping from the Luzern and PCA-West Shallow wells is observed immediately. However the groundwater elevation rise due to both injection in the underlying aquifer and percolation of water through the upper aquifer is delayed. Wells screened in the underlying Santa Margarita aquifer do not show this delayed response because the pressure from GWR injection is transmitted quickly through the aquifer.

Comparing with-Project and No-Project Hydrographs of the PCA-West wells allows us to evaluate how the GWR project may impact seawater intrusion in the Seaside Basin. The simulated groundwater elevations at the PCA-West Deep well are very similar for the with-Project and No-Project scenarios, indicating that the GWR Project would not worsen the potential for seawater intrusion at this location. As previously discussed, hydrographs at the PCA-West Shallow well show relative reductions over the medium term for the Project Scenarios. While the initial relative decline is up to two feet, groundwater elevations remain above the predictive groundwater elevation for this location, and steadily rise to above four feet higher than protective elevations. Therefore, it does not appear that the GWR project would cause this location to become vulnerable to seawater intrusion.

Figure 9: Locations of Wells with Groundwater Elevation Comparisons

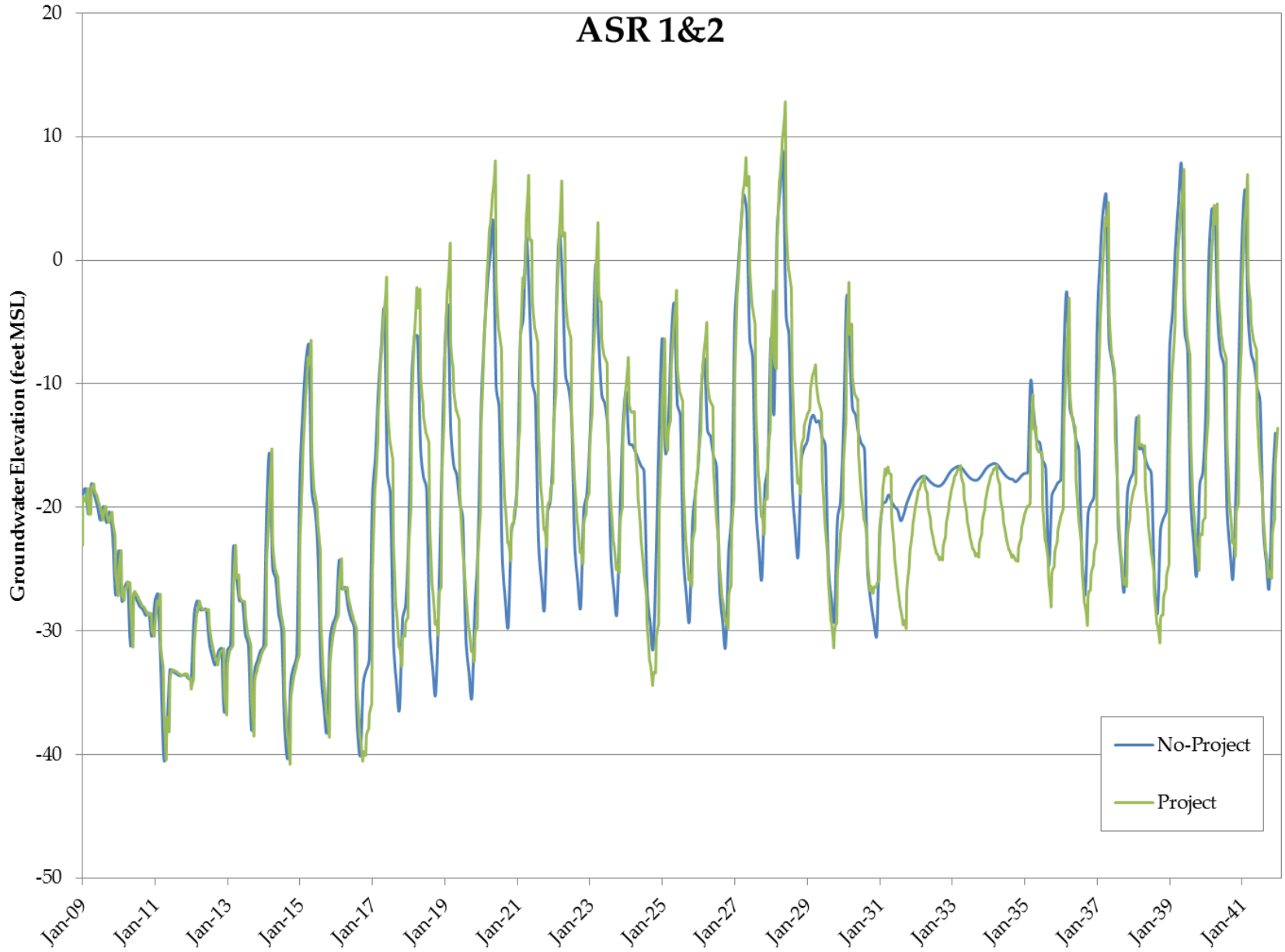


Figure 10: Predicted Static Groundwater Elevations at ASR 1&2 Wells

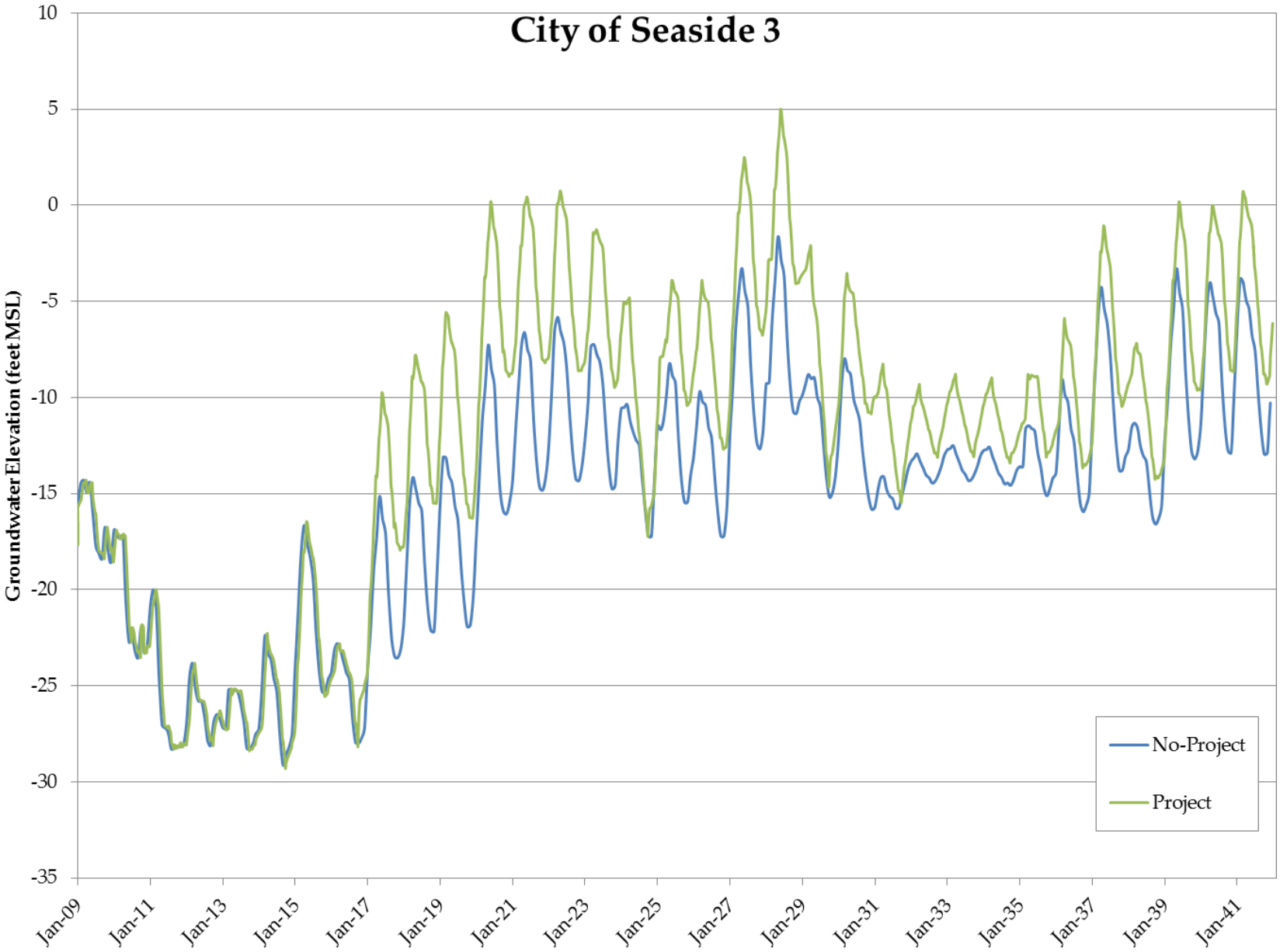


Figure 11: Predicted Static Groundwater Elevations at City of Seaside 3 Well

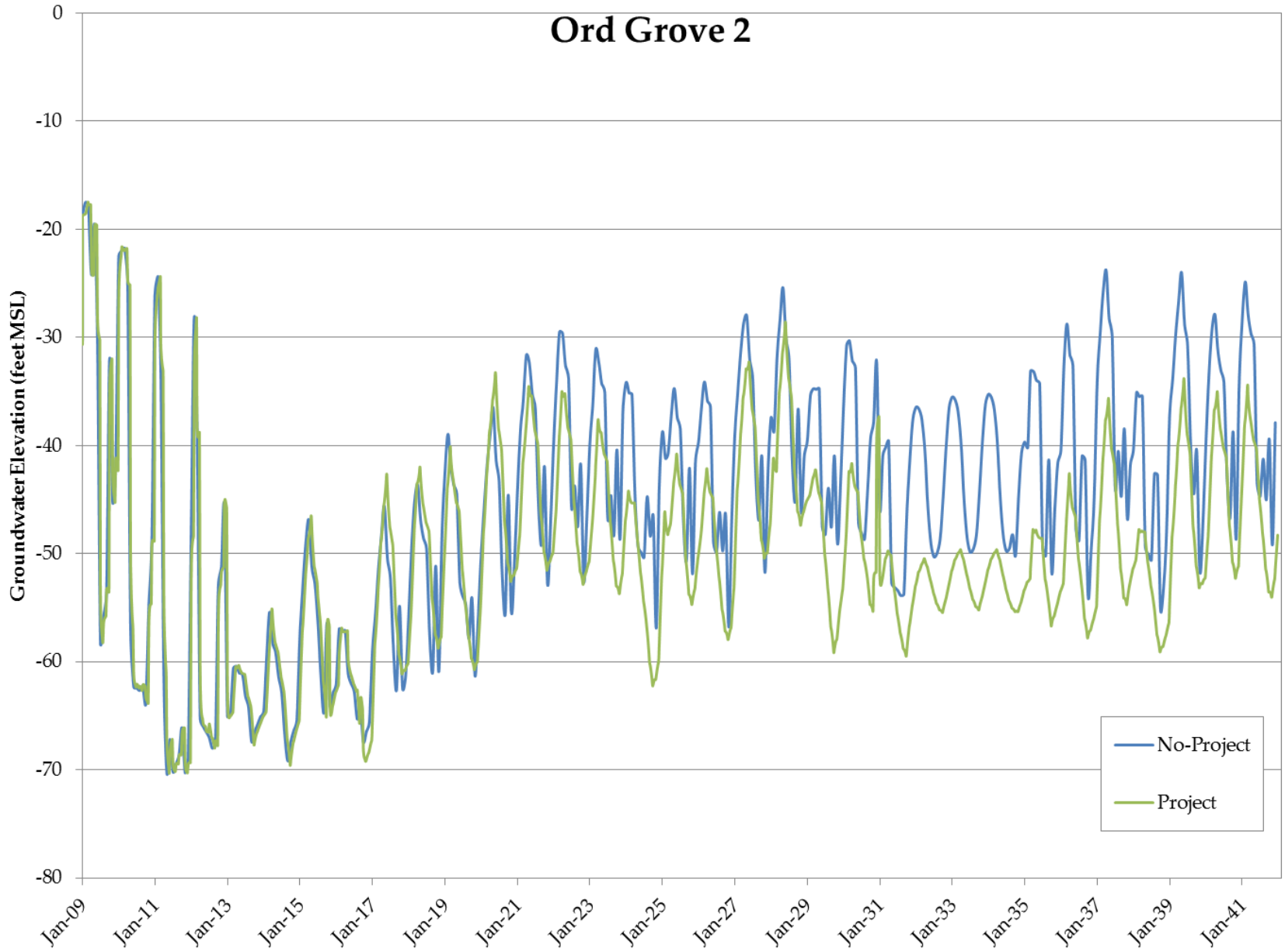


Figure 12: Predicted Static Groundwater Elevations at Ord Grove 2 Well

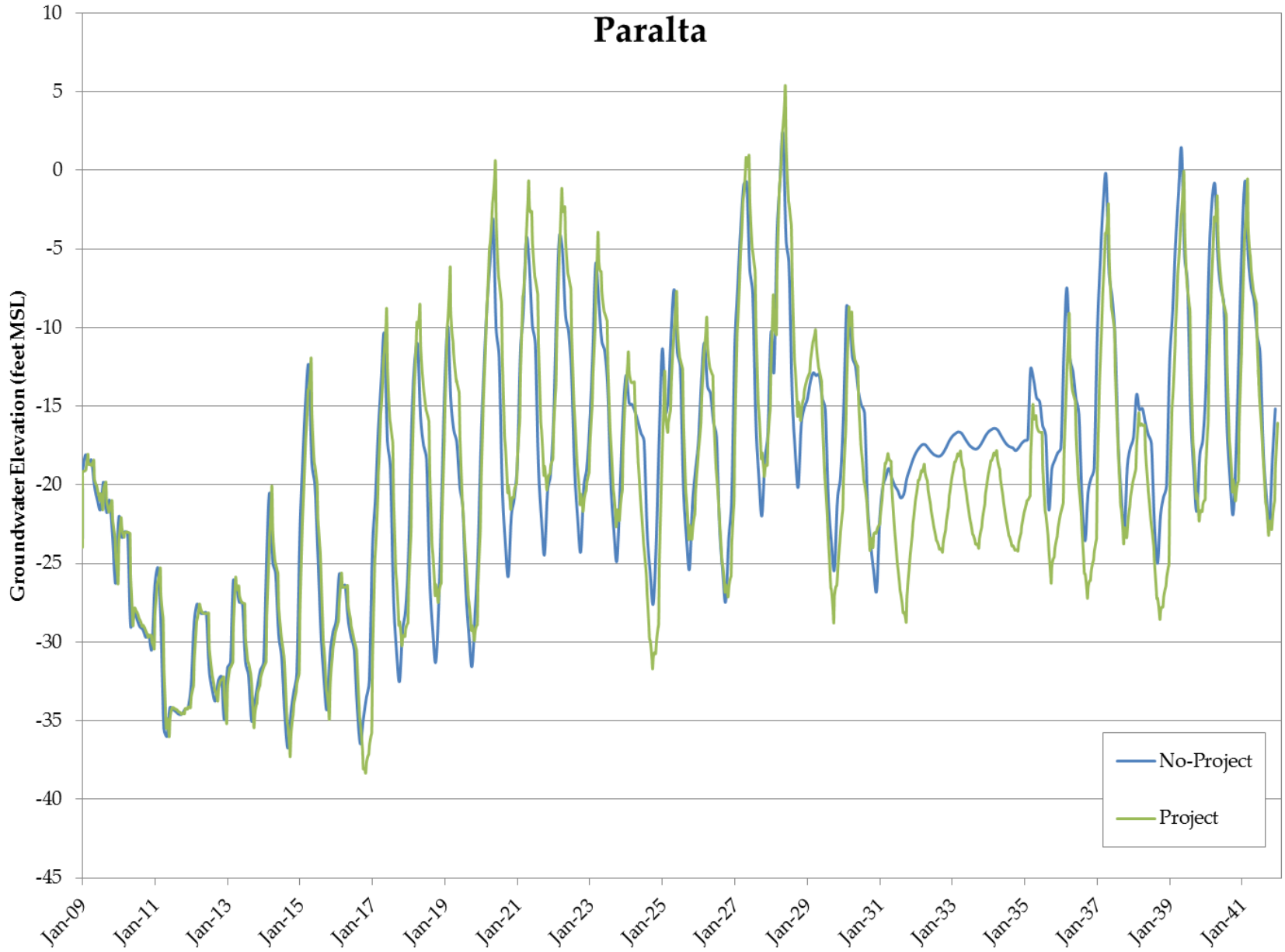


Figure 13: Predicted Static Groundwater Elevations at Paralta Well

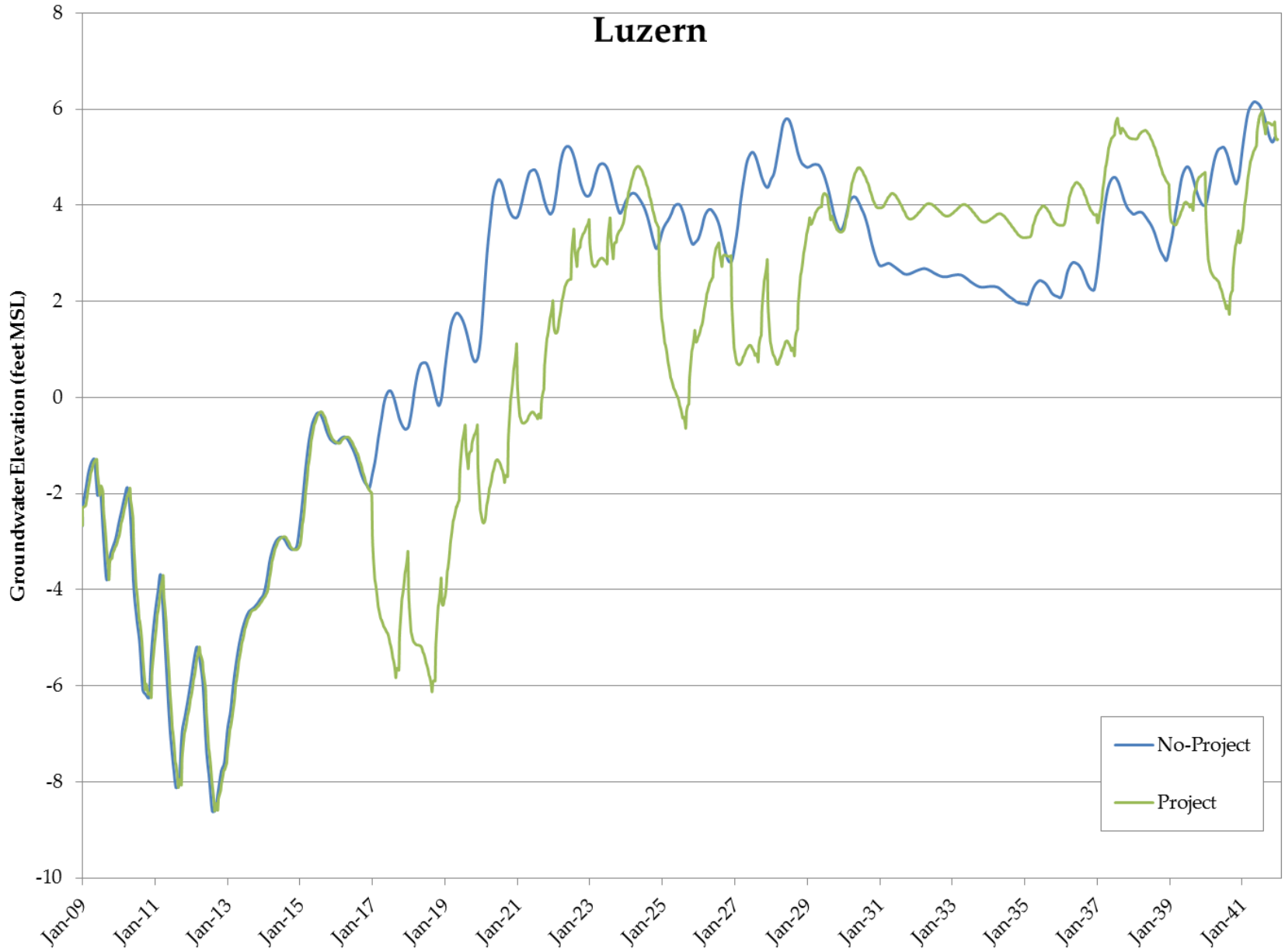


Figure 14: Predicted Static Groundwater Elevations at Luzern Well

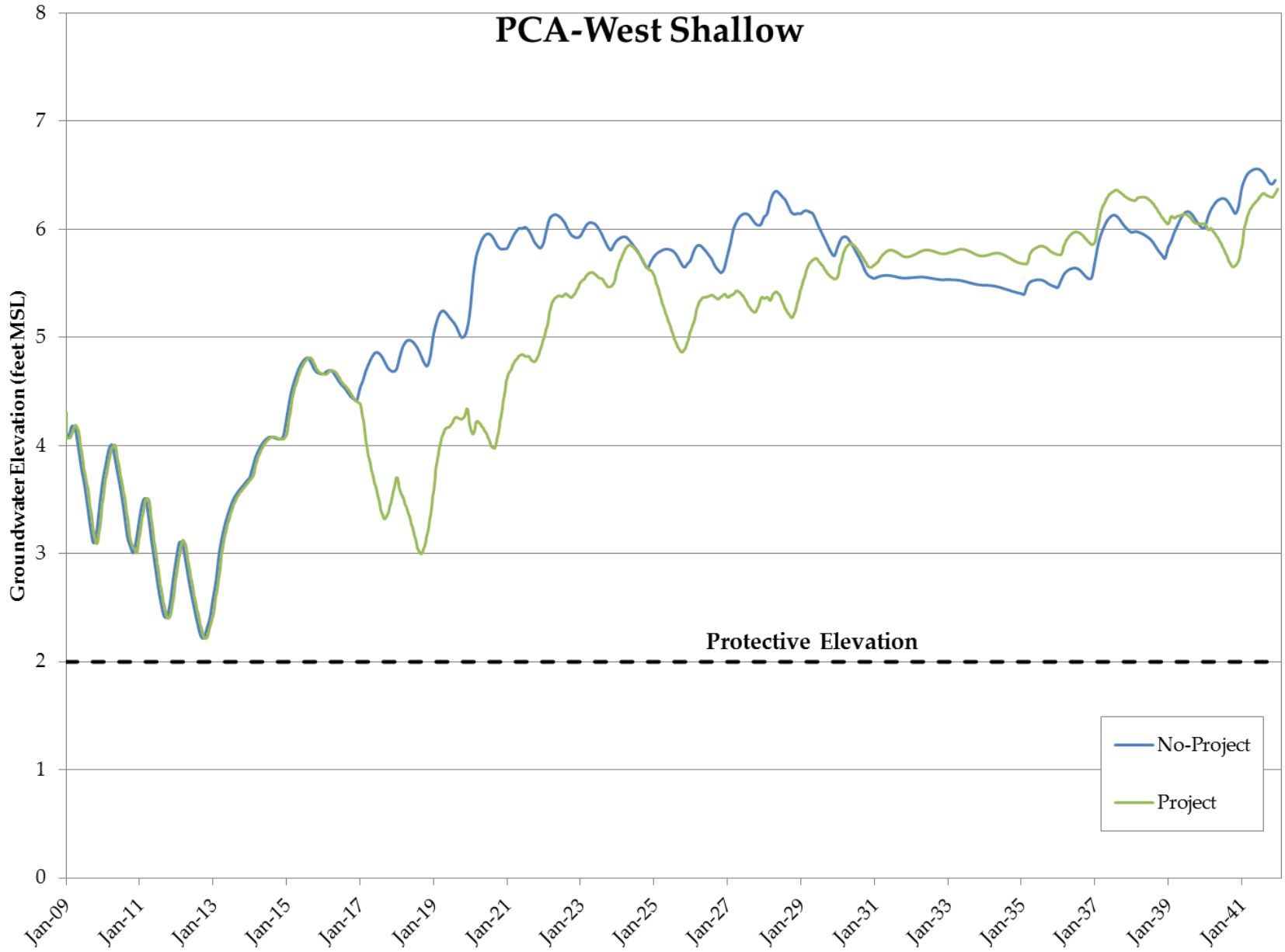


Figure 15: Predicted Static Groundwater Elevations at PCA-West Shallow Well

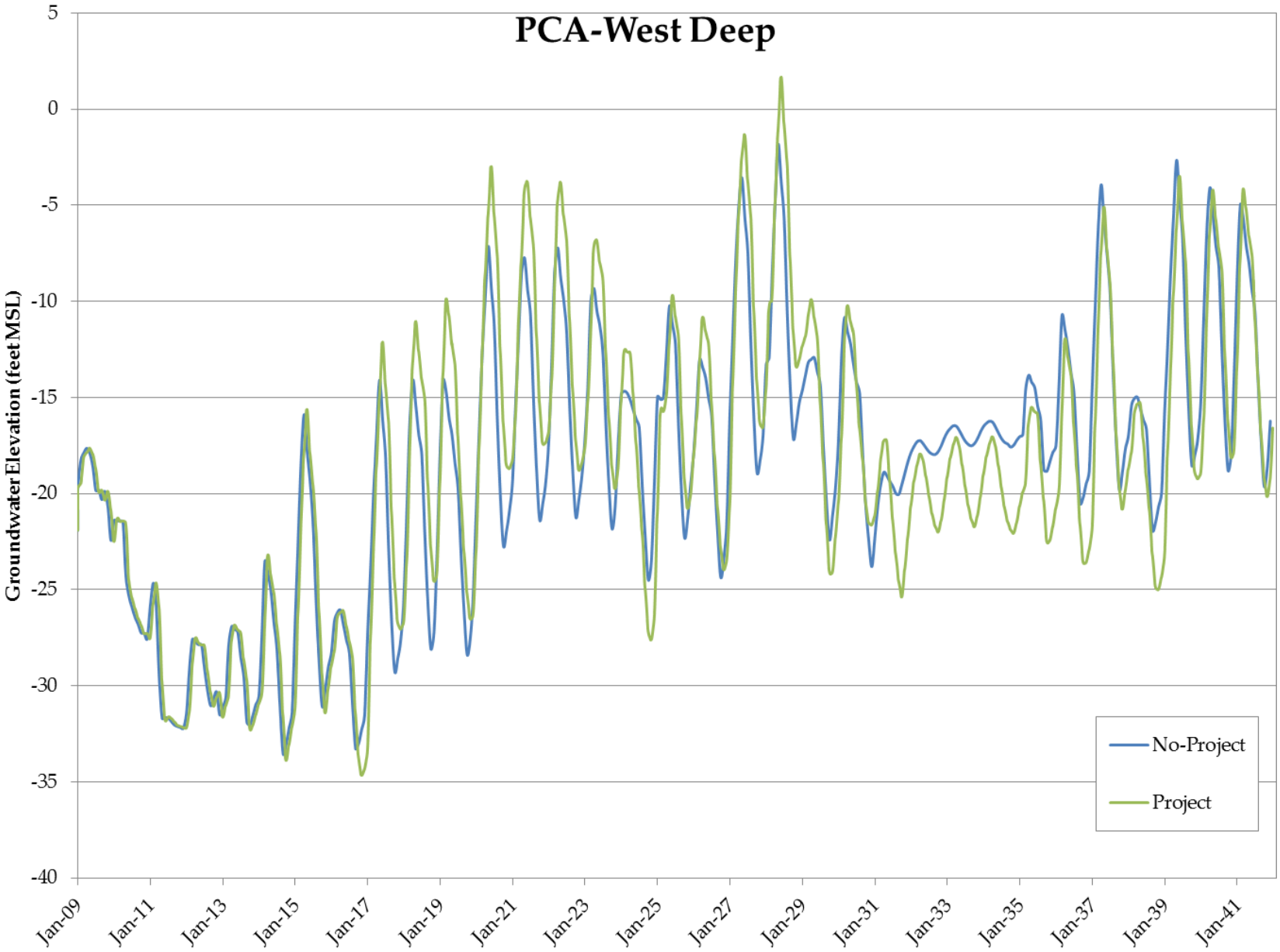
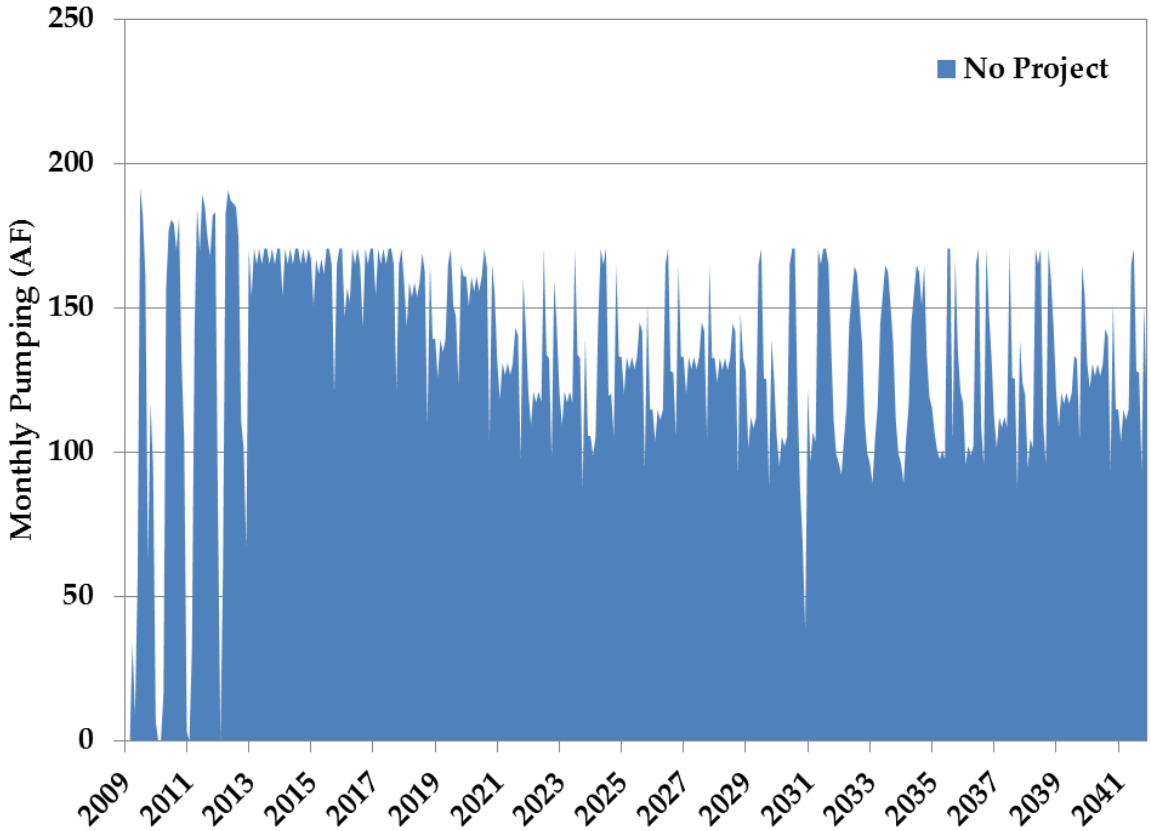


Figure 16: Predicted Static Groundwater Elevations at PCA-West Deep Well



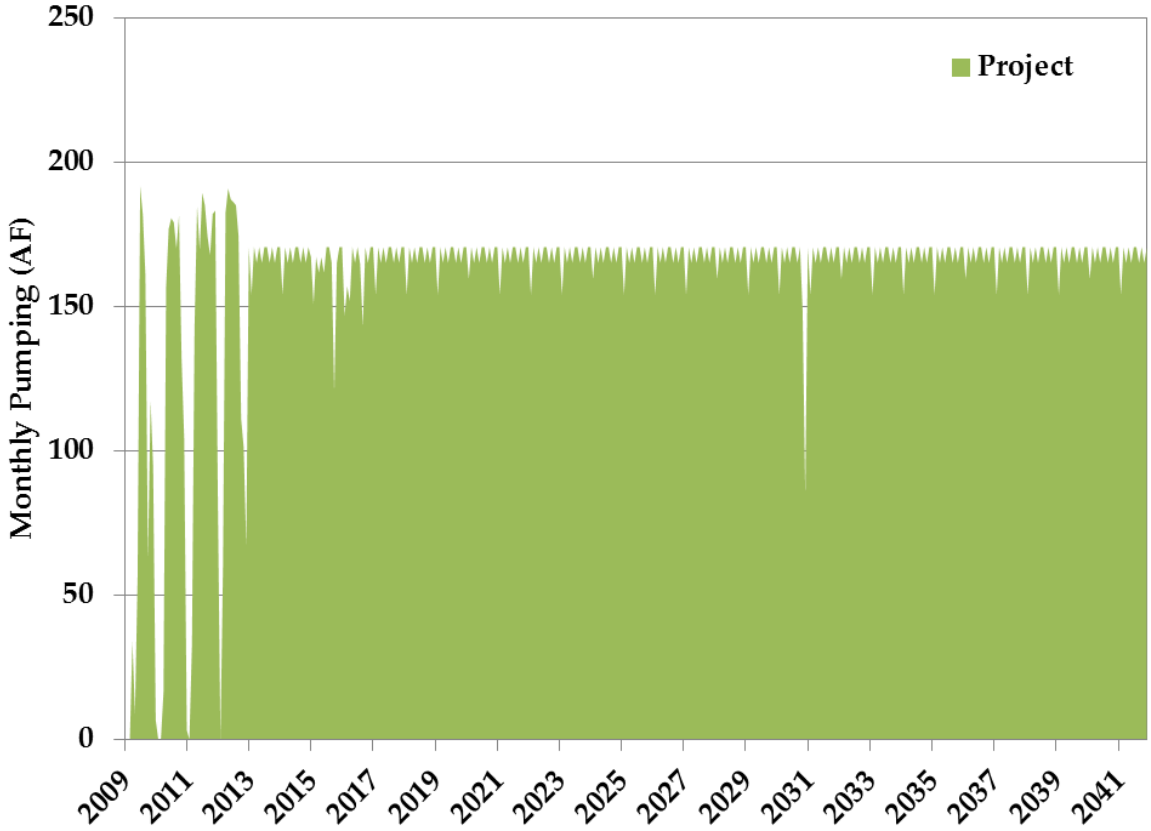


Figure 17: Pumping Rates for Ord Grove #2 Well

PARTICLE TRACKING RESULTS

Figure 18 shows how travel times between the GWR Project injection wells and the nearest extraction wells vary depending upon time of release. The horizontal axis represents the time at which groups of particles were released from the injection wells and the vertical axis represents time in days it took for the fastest particle to reach an extraction well. Each dot represents the time travelled by the fastest particle. The light blue, green, red, and dark blue dots show travel times from the locations of the deep injection wells DIW-1, DIW-2, DIW-3, and DIW-4, respectively. The black, yellow, orange, and magenta dots show travel times from the locations of the vadose zone wells VZW-1, VZW-2, VZW-3, and VZW-4, respectively.

The fastest particles are those released from well DIW-3, and captured at the ASR 1&2 Well Site. The fastest time any particle takes to travel from an injection well to a nearby extraction well is approximately 327 days. Travel times from deep injection well DIW-1 are the next fastest; taking approximately 724 days for the fastest particles to reach the ASR 3&4 Well Site. The fastest particles released at the remaining wells take between 2 and 14 years to reach an extraction well, with particles released from vadose zone well VZW-1 never reaching an extraction well after 24 years of simulation.

For most of the wells, there is a notable variation throughout the simulation in the minimum travel time taken by the released particles. For all four deep injection wells, the variations in travel times are strongly influenced by the ASR wells. These ASR wells both inject and extract water throughout the simulation period, thereby impacting groundwater gradients. These ASR wells sometimes draw particles in and sometimes repel them, creating greatly different trajectories depending on when a particle approaches the ASR wells. For example, particles that are released from well DIW-3 in the early winter and captured by wells ASR 1&2 in the late fall experience the fastest travel times. These particles approach the ASR 1&2 wells during the summer pumping season and are captured before any injection begins in the winter. Particles that approach the ASR wells during the simulated drought of 2030-2034 experience less seasonal variation in travel times. During this period, particles encounter no injection of Carmel River water that would repel them from their path and less pumping that to draw them toward a well.

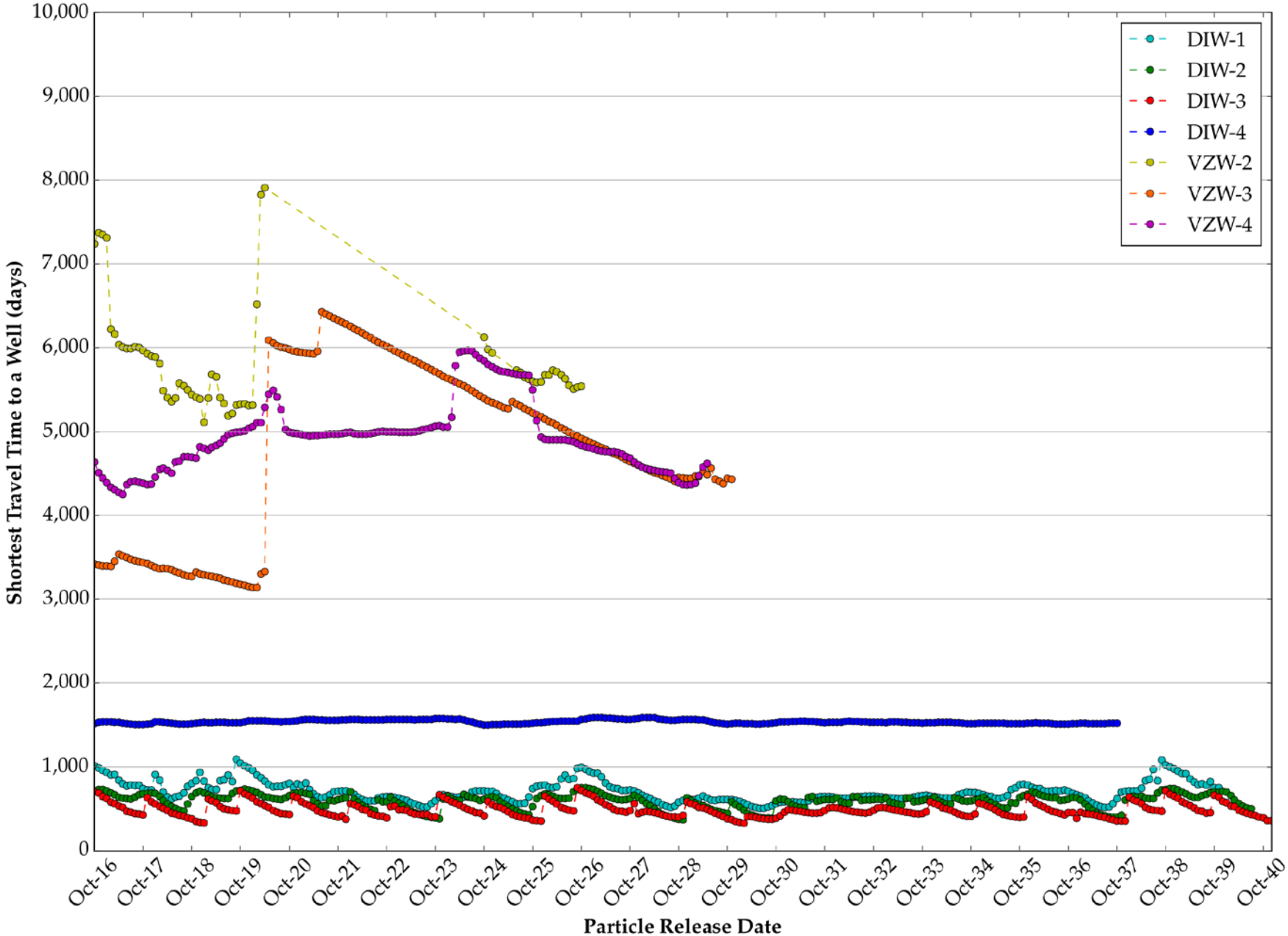


Figure 18: Fastest Travel Times to a Pumping Well

The vadose zone wells also display variations in minimum travel times throughout the simulation. These particles are initially released at shallow depths, above the influence of the large-capacity injection and extraction wells. The dynamics of the shallow layers in the model are mostly influenced by fluctuations in natural recharge and by the vadose zone injection itself. Variations in these factors can lead to saturation or desaturation of shallow model cells which in turn cause rapid changes in vertical and horizontal gradients in these cells. This type of behavior is likely to explain the stepped changes in minimum travel times that are seen in vadose zone wells VZW-2, VZW-3, and VZW-4.

The only production wells that capture particles released from the eight injection locations are the two ASR Well Sites, the Ord Grove #2 well; the Paralta well; and the Luzern well. The following tables summarize how particles from each injection site are captured by nearby wells under the Project scenario.

Table 2 shows the fastest travel times between each injection location and the six groups of extraction wells. A value is not shown if there was no particle travelling between the two wells.

Table 2: Fastest Travel Times between Injection and Extraction Wells, in days

Extraction Well	Well of Origin							
	DIW-1	DIW-2	DIW-3	DIW-4	VZW-1	VZW-2	VZW-3	VZW-4
ASR 1&2	-	371	327	1,780	-	-	-	-
ASR 3&4	724	-	-	3,074	-	-	-	-
Luzern	-	-	-	-	-	-	3,140	-
Ord Grove	3,718	1,952	1,052	1,497	-	-	-	4,250
Paralta	506	521	852	2,076	-	5,114	-	-

Note: — = no particle traveling between wells

Table 3 shows the percent of particles injected at each of the injection locations that were captured by each extraction well. This table only shows the fate of the captured particles – not the fate of all particles. As a result, the columns add to 100% for each scenario, even though most of the particles released from the vadose zone wells were not captured by the end of the simulation. The Paralta and Ord Grove 2 well capture the greatest share of the particles even though it takes considerably longer for particles to travel to these two wells, as shown on Table 2.

Table 3: Percent of Particles Travel between Injection and Extraction Wells

Extraction Well	Well of Origin							
	DIW-1	DIW-2	DIW-3	DIW-4	VZW-1	VZW-2	VZW-3	VZW-4
ASR 1&2	-	16%	44%	3%	-	-	-	-
ASR 3&4	34%	-	-	3%	-	-	-	-
Luzern	-	-	-	-	-	-	100%	-
Ord Grove	3%	2%	44%	55%	-	-	-	100%
Paralta	63%	82%	12%	39%	-	100%	-	-

Note: — = no particle traveling between wells

Figure 19 and Figure 20 show the path each particle takes from its initial injection location to either an extraction well or its final location when the simulation ends. Separate maps for paths originating from deep injection wells and paths originating from vadose zone wells are included. The particle tracks shown on each figure display the fate of particles that were released in the model period corresponding to February, 2030. This date was selected as it is the release period with the fastest travel times.

The particle path figures show that the northwestern-directed groundwater flow field dominates the migration of particles from the vadose zone wells while the local dynamics of the many deep injection and extraction wells dominate the migration of the particles from the deep injection wells. As noted above, there are several particle paths that fluctuate towards and away from the ASR wells before the particles are captured. These fluctuations are the result of the injection and extraction pattern at the ASR wells.

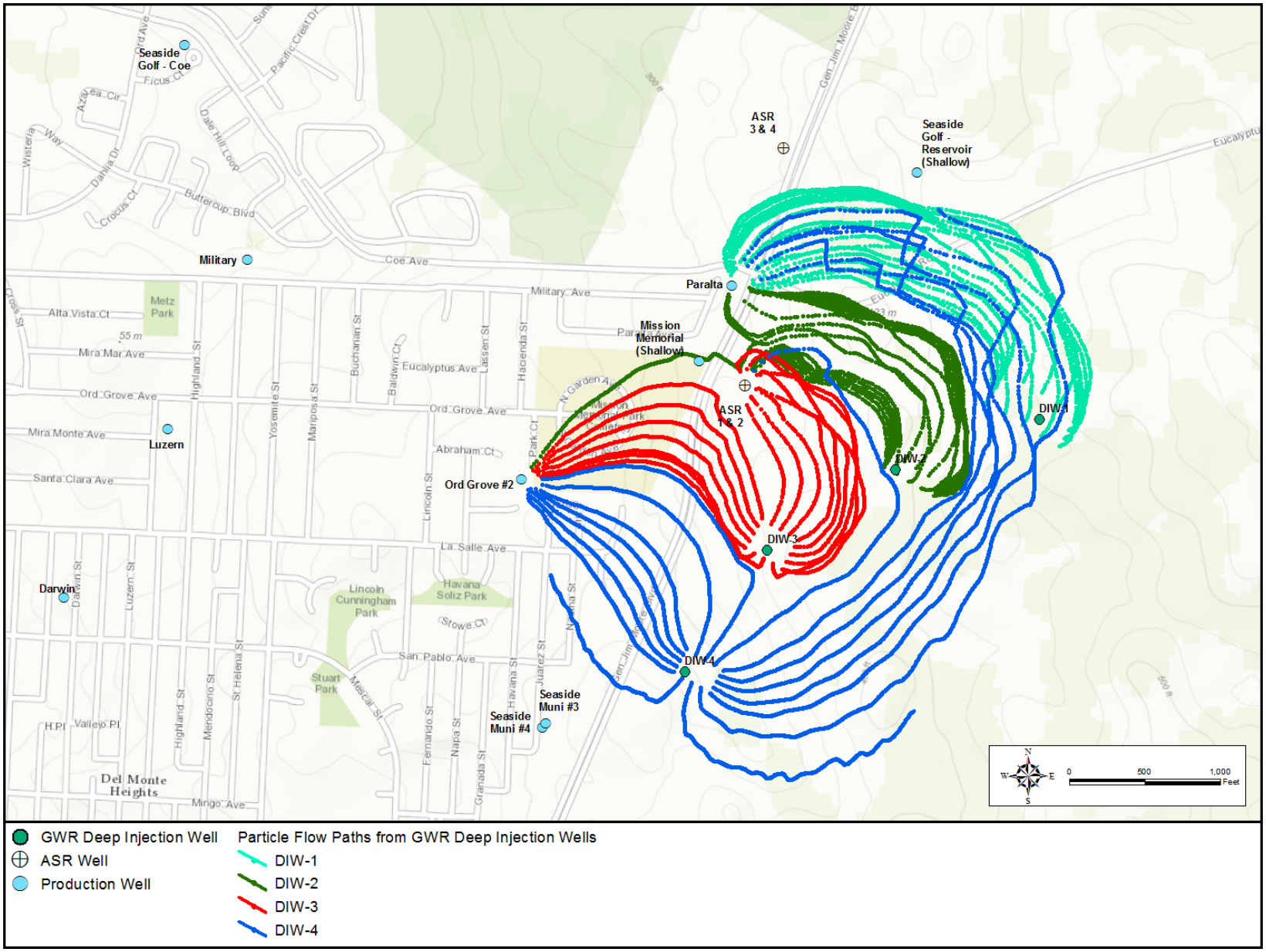


Figure 19: Particle Paths from a Single Release in Deep Injection

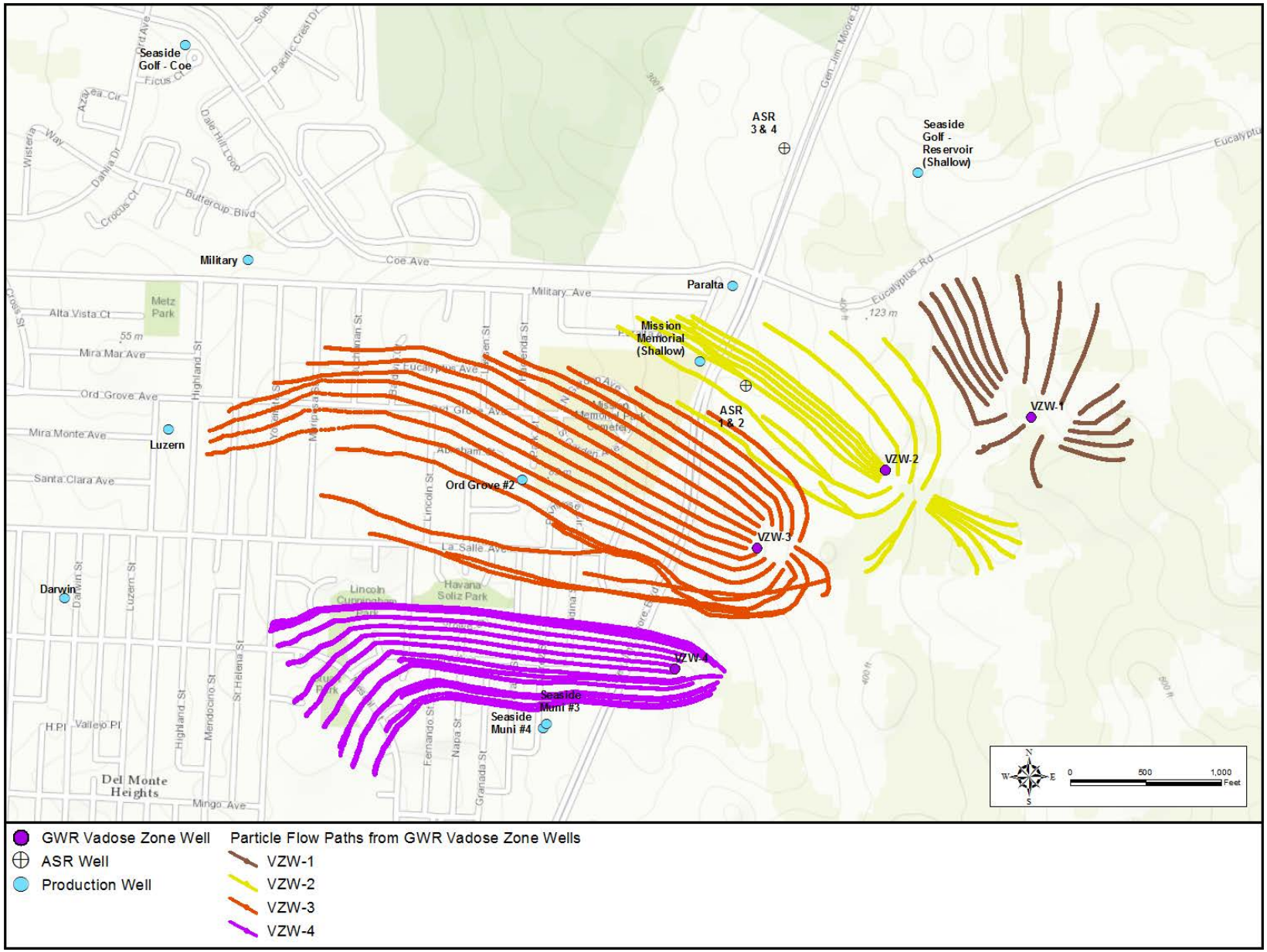


Figure 20: Particle Paths from a Single Release in Vadose Zone

Figure 21 and Figure 22 show the greatest particle extent from each injection location at four separate times. Separate maps for paths originating from deep injection wells and paths originating from vadose zone wells are included. Four times are shown: 90 days (yellow), 180 days (orange), 270 days (red), and 360 days (blue). These contours show the same general spatial pattern as Figure 19 and Figure 20 but represent the extent of all particles at any time rather than individual paths. The fourth (blue) contour, representing 360 days, is 33 days shorter than was taken by the fastest particle to travel from injection well DIW-3 to the ASR 1&2 Well Site.

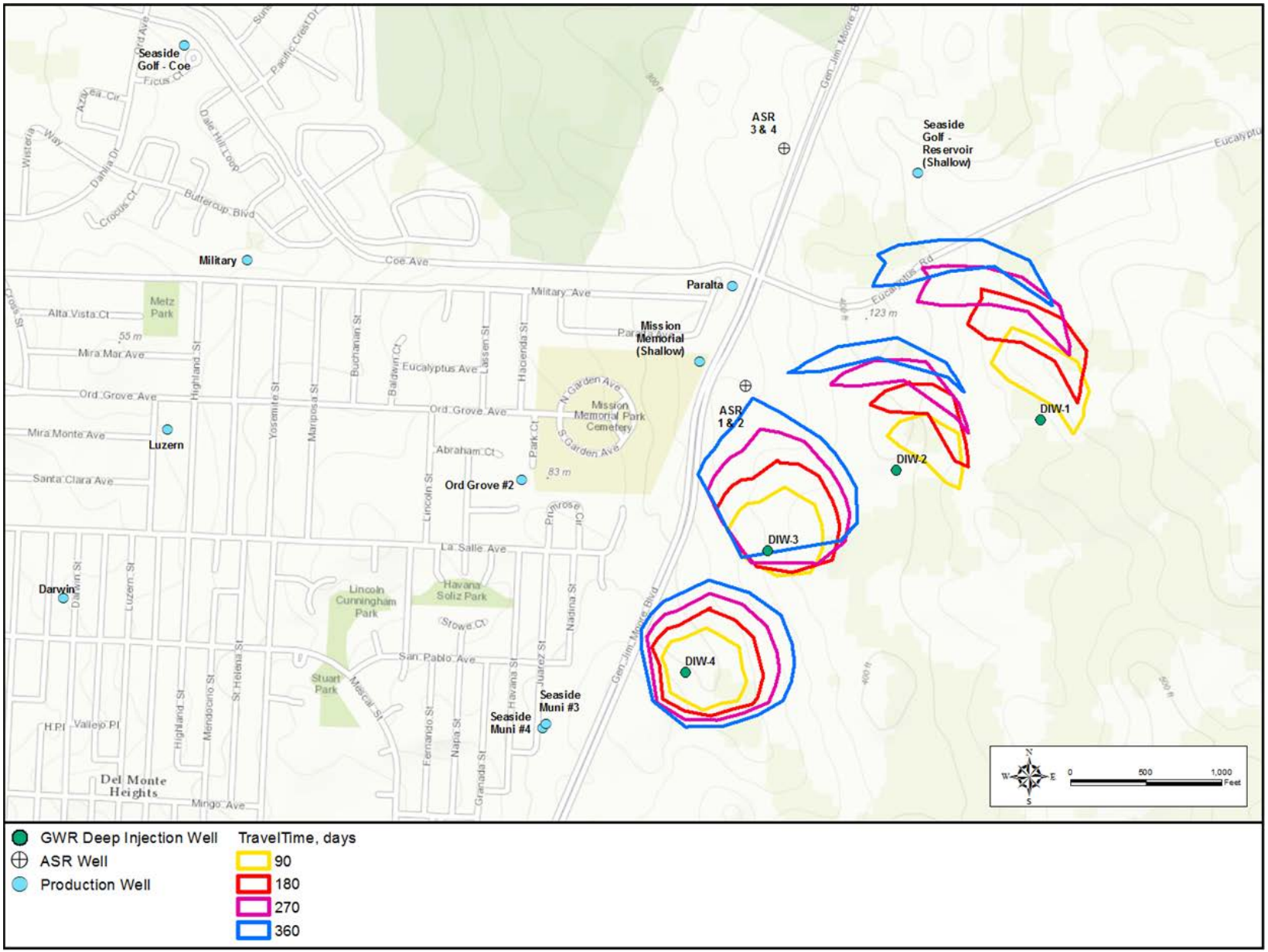


Figure 21: Travel Time Extents from Deep Injection Wells

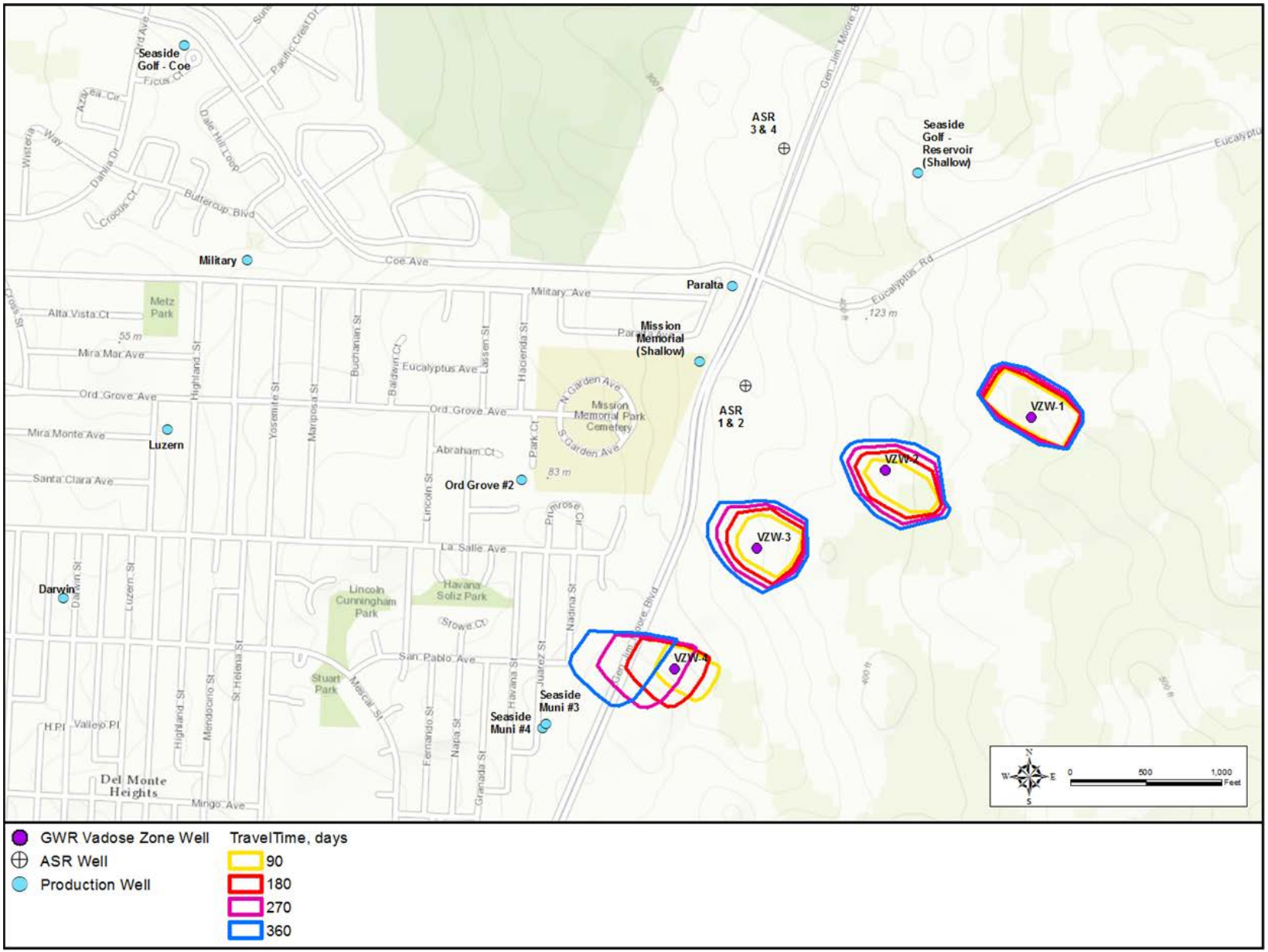


Figure 22: Travel Time Extents from Vadose Zone Wells

References

California American Water v. City of Seaside et al. Monterey County Superior Court, Case Number M66343, filed in Monterey County Superior Court on March 27, 2006, amended on February 9, 2007

HydroMetrics Water Resources Inc. 2009. *Seaside groundwater basin modeling and protective groundwater elevations*, prepared for Seaside basin watermaster, November, 151 p.

Planned Project Water Injection Schedule and CSIP Storage and Delivery Operation

Water Year	Simulated Historical Climate Water Year	Salinas Station Precip (% of Ave.)	Drought Year Criteria (<75% of Average)	Injection Delivery Schedule	Injection Volume (AF)	Annual Recycled Water to CSIP (AF)	Drought Reserve Change (AF)	Cumulative Drought Reserve (AF)	Injection Delivery Schedule (AFM)												
									Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Total
2017	1995	131%		A	3,700	-	200	200	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2018	1996	95%		A	3,700	-	200	400	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2019	1997	123%		A	3,700	-	200	600	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2020	1998	240%		A	3,700	-	200	800	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2021	1999	98%		A	3,700	-	200	1,000	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2022	2000	114%		B	3,500	-	-	1,000	297	288	297	297	268	297	288	297	288	297	297	288	3,500
2023	2001	93%		B	3,500	-	-	1,000	297	288	297	297	268	297	288	297	288	297	297	288	3,500
2024	2002	74%	Drought	G	2,500	1,000	(1,000)	-	297	288	297	297	268	297	124	128	124	128	128	124	2,500
2025	2003	94%		A	3,700	-	200	200	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2026	2004	82%		A	3,700	-	200	400	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2027	2005	148%		A	3,700	-	200	600	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2028	2006	118%		A	3,700	-	200	800	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2029	2007	73%	Drought	D	2,700	1,000	(800)	-	331	321	331	331	299	331	124	128	124	128	128	124	2,700
2030	2008	79%		A	3,700	-	200	200	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2031	1987	60%	Drought	E	3,300	400	(200)	-	331	321	331	331	299	331	222	229	222	229	229	222	3,300
2032	1988	40%	Drought	F	3,500	200	-	-	331	321	331	331	299	331	255	263	255	263	263	255	3,500
2033	1989	63%	Drought	F	3,500	200	-	-	331	321	331	331	299	331	255	263	255	263	263	255	3,500
2034	1990	57%	Drought	F	3,500	200	-	-	331	321	331	331	299	331	255	263	255	263	263	255	3,500
2035	1991	88%		A	3,700	-	200	200	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2036	1992	90%		A	3,700	-	200	400	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2037	1993	140%		A	3,700	-	200	600	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2038	1994	83%		A	3,700	-	200	800	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2039	1995	131%		A	3,700	-	200	1,000	331	321	331	331	299	331	288	297	288	297	297	288	3,700
2040	1996	95%		B	3,500	-	-	1,000	297	288	297	297	268	297	288	297	288	297	297	288	3,500
2041	1997	123%		B	3,500	-	-	1,000	297	288	297	297	268	297	288	297	288	297	297	288	3,500

Injection Delivery Schedule (AF/month)			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Total
before drought reserve complete	wet/normal year	A	331	321	331	331	299	331	288	297	288	297	297	288	3,700
after drought reserve complete	wet/normal year	B	297	288	297	297	268	297	288	297	288	297	297	288	3,500
before drought reserve complete	drought year (min. AWTF delivery)	C	331	321	331	331	299	331	107	111	107	111	111	107	2,601
before drought reserve complete	drought year (1,000 AF to CSIP)	D	331	321	331	331	299	331	124	128	124	128	128	124	2,700
before drought reserve complete	drought year (400 AF to CSIP)	E	331	321	331	331	299	331	222	229	222	229	229	222	3,300
before drought reserve complete	drought year (200 AF to CSIP)	F	331	321	331	331	299	331	255	263	255	263	263	255	3,500
after drought reserve complete	drought year (1,000 AF to CSIP)	G	297	288	297	297	268	297	124	128	124	128	128	124	2,500

APPENDIX A:
MPWMD HISTORIC AND PROJECTED ASR WELL SITE INJECTION

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
Before	Oct-86	1986/10	0	0	0	YES	N	N	Y	Y
Before	Nov-86	1986/11	0	0	0	YES	N	N	Y	Y
Before	Dec-86	1986/12	0	0	0	YES	N	N	Y	Y
Before	Jan-87	1987/1	0	0	0	YES	N	N	Y	Y
Before	Feb-87	1987/2	40	26	14	NO	Y	Y	N	N
Before	Mar-87	1987/3	0	0	0	NO	N	N	N	N
Before	Apr-87	1987/4	0	0	0	NO	N	N	N	N
Before	May-87	1987/5	0	0	0	YES	N	N	Y	Y
Before	Jun-87	1987/6	0	0	0	YES	N	N	Y	Y
Before	Jul-87	1987/7	0	0	0	YES	N	N	Y	Y
Before	Aug-87	1987/8	0	0	0	YES	N	N	Y	Y
Before	Sep-87	1987/9	0	0	0	YES	N	N	Y	Y
Before	Oct-87	1987/10	0	0	0	YES	N	N	Y	Y
Before	Nov-87	1987/11	0	0	0	YES	N	N	Y	Y
Before	Dec-87	1987/12	0	0	0	YES	N	N	Y	Y
Before	Jan-88	1988/1	0	0	0	YES	N	N	Y	Y
Before	Feb-88	1988/2	0	0	0	YES	N	N	Y	Y
Before	Mar-88	1988/3	0	0	0	YES	N	N	Y	Y
Before	Apr-88	1988/4	0	0	0	YES	N	N	Y	Y
Before	May-88	1988/5	0	0	0	YES	N	N	Y	Y
Before	Jun-88	1988/6	0	0	0	YES	N	N	Y	Y
Before	Jul-88	1988/7	0	0	0	YES	N	N	Y	Y
Before	Aug-88	1988/8	0	0	0	YES	N	N	Y	Y
Before	Sep-88	1988/9	0	0	0	YES	N	N	Y	Y
Before	Oct-88	1988/10	0	0	0	YES	N	N	Y	Y
Before	Nov-88	1988/11	0	0	0	YES	N	N	Y	Y
Before	Dec-88	1988/12	0	0	0	YES	N	N	Y	Y
Before	Jan-89	1989/1	0	0	0	YES	N	N	Y	Y
Before	Feb-89	1989/2	0	0	0	YES	N	N	Y	Y
Before	Mar-89	1989/3	0	0	0	YES	N	N	Y	Y
Before	Apr-89	1989/4	0	0	0	YES	N	N	Y	Y
Before	May-89	1989/5	0	0	0	YES	N	N	Y	Y
Before	Jun-89	1989/6	0	0	0	YES	N	N	Y	Y
Before	Jul-89	1989/7	0	0	0	YES	N	N	Y	Y
Before	Aug-89	1989/8	0	0	0	YES	N	N	Y	Y
Before	Sep-89	1989/9	0	0	0	YES	N	N	Y	Y
Before	Oct-89	1989/10	0	0	0	YES	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
Before	Nov-89	1989/11	0	0	0	YES	N	N	Y	Y
Before	Dec-89	1989/12	0	0	0	YES	N	N	Y	Y
Before	Jan-90	1990/1	0	0	0	YES	N	N	Y	Y
Before	Feb-90	1990/2	0	0	0	YES	N	N	Y	Y
Before	Mar-90	1990/3	0	0	0	YES	N	N	Y	Y
Before	Apr-90	1990/4	0	0	0	YES	N	N	Y	Y
Before	May-90	1990/5	0	0	0	YES	N	N	Y	Y
Before	Jun-90	1990/6	0	0	0	YES	N	N	Y	Y
Before	Jul-90	1990/7	0	0	0	YES	N	N	Y	Y
Before	Aug-90	1990/8	0	0	0	YES	N	N	Y	Y
Before	Sep-90	1990/9	0	0	0	YES	N	N	Y	Y
Before	Oct-90	1990/10	0	0	0	YES	N	N	Y	Y
Before	Nov-90	1990/11	0	0	0	YES	N	N	Y	Y
Before	Dec-90	1990/12	0	0	0	YES	N	N	Y	Y
Before	Jan-91	1991/1	0	0	0	YES	N	N	Y	Y
Before	Feb-91	1991/2	0	0	0	YES	N	N	Y	Y
Before	Mar-91	1991/3	280	182	98	NO	Y	Y	N	N
Before	Apr-91	1991/4	100	65	35	NO	Y	Y	N	N
Before	May-91	1991/5	0	0	0	NO	N	N	N	N
Before	Jun-91	1991/6	0	0	0	NO	N	N	N	N
Before	Jul-91	1991/7	0	0	0	YES	N	N	Y	Y
Before	Aug-91	1991/8	0	0	0	YES	N	N	Y	Y
Before	Sep-91	1991/9	0	0	0	NO	N	N	Y	Y
Before	Oct-91	1991/10	0	0	0	YES	N	N	Y	Y
Before	Nov-91	1991/11	0	0	0	YES	N	N	Y	Y
Before	Dec-91	1991/12	0	0	0	YES	N	N	Y	Y
Before	Jan-92	1992/1	0	0	0	YES	N	N	Y	Y
Before	Feb-92	1992/2	380	247	133	NO	Y	Y	N	N
Before	Mar-92	1992/3	480	312	168	NO	Y	Y	N	N
Before	Apr-92	1992/4	0	0	0	NO	N	N	N	N
Before	May-92	1992/5	0	0	0	NO	N	N	N	N
Before	Jun-92	1992/6	0	0	0	YES	N	N	Y	Y
Before	Jul-92	1992/7	0	0	0	YES	N	N	Y	Y
Before	Aug-92	1992/8	0	0	0	NO	N	N	Y	Y
Before	Sep-92	1992/9	0	0	0	NO	N	N	Y	Y
Before	Oct-92	1992/10	0	0	0	YES	N	N	Y	Y
Before	Nov-92	1992/11	0	0	0	YES	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
Before	Dec-92	1992/12	0	0	0	YES	N	N	Y	Y
Before	Jan-93	1993/1	520	338	182	NO	Y	Y	N	N
Before	Feb-93	1993/2	560	364	196	NO	Y	Y	N	N
Before	Mar-93	1993/3	620	403	217	NO	Y	Y	N	N
Before	Apr-93	1993/4	540	351	189	NO	Y	Y	N	N
Before	May-93	1993/5	0	0	0	NO	N	N	N	N
Before	Jun-93	1993/6	0	0	0	NO	N	N	N	N
Before	Jul-93	1993/7	0	0	0	YES	N	N	Y	Y
Before	Aug-93	1993/8	0	0	0	NO	N	N	Y	Y
Before	Sep-93	1993/9	0	0	0	NO	N	N	Y	Y
Before	Oct-93	1993/10	0	0	0	NO	N	N	Y	Y
Before	Nov-93	1993/11	0	0	0	YES	N	N	Y	Y
Before	Dec-93	1993/12	0	0	0	YES	N	N	Y	Y
Before	Jan-94	1994/1	0	0	0	YES	N	N	Y	Y
Before	Feb-94	1994/2	140	91	49	NO	Y	Y	N	N
Before	Mar-94	1994/3	0	0	0	NO	N	N	N	N
Before	Apr-94	1994/4	0	0	0	NO	N	N	N	N
Before	May-94	1994/5	0	0	0	YES	N	N	Y	Y
Before	Jun-94	1994/6	0	0	0	YES	N	N	Y	Y
Before	Jul-94	1994/7	0	0	0	YES	N	N	Y	Y
Before	Aug-94	1994/8	0	0	0	NO	N	N	Y	Y
Before	Sep-94	1994/9	0	0	0	NO	N	N	Y	Y
Before	Oct-94	1994/10	0	0	0	YES	N	N	Y	Y
Before	Nov-94	1994/11	0	0	0	YES	N	N	Y	Y
Before	Dec-94	1994/12	0	0	0	YES	N	N	Y	Y
Before	Jan-95	1995/1	480	312	168	NO	Y	Y	N	N
Before	Feb-95	1995/2	440	286	154	NO	Y	Y	N	N
Before	Mar-95	1995/3	580	377	203	NO	Y	Y	N	N
Before	Apr-95	1995/4	600	390	210	NO	Y	Y	N	N
Before	May-95	1995/5	620	403	217	NO	Y	Y	N	N
Before	Jun-95	1995/6	0	0	0	NO	N	N	N	N
Before	Jul-95	1995/7	0	0	0	NO	N	N	N	N
Before	Aug-95	1995/8	0	0	0	NO	N	N	Y	Y
Before	Sep-95	1995/9	0	0	0	NO	N	N	Y	Y
Before	Oct-95	1995/10	0	0	0	NO	N	N	Y	Y
Before	Nov-95	1995/11	0	0	0	YES	N	N	Y	Y
Before	Dec-95	1995/12	0	0	0	YES	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
Before	Jan-96	1996/1	180	117	63	NO	Y	Y	N	N
Before	Feb-96	1996/2	580	377	203	NO	Y	Y	N	N
Before	Mar-96	1996/3	620	403	217	NO	Y	Y	N	N
Before	Apr-96	1996/4	480	312	168	NO	Y	Y	N	N
Before	May-96	1996/5	60	39	21	NO	Y	Y	N	N
Before	Jun-96	1996/6	0	0	0	NO	N	N	N	N
Before	Jul-96	1996/7	0	0	0	NO	N	N	N	N
Before	Aug-96	1996/8	0	0	0	NO	N	N	Y	Y
Before	Sep-96	1996/9	0	0	0	NO	N	N	Y	Y
Before	Oct-96	1996/10	0	0	0	NO	N	N	Y	Y
Before	Nov-96	1996/11	0	0	0	YES	N	N	Y	Y
Before	Dec-96	1996/12	360	234	126	NO	Y	Y	N	N
Before	Jan-97	1997/1	620	403	217	NO	Y	Y	N	N
Before	Feb-97	1997/2	560	364	196	NO	Y	Y	N	N
Before	Mar-97	1997/3	100	65	35	NO	Y	Y	N	N
Before	Apr-97	1997/4	0	0	0	NO	N	N	N	N
Before	May-97	1997/5	0	0	0	NO	N	N	N	N
Before	Jun-97	1997/6	0	0	0	YES	N	N	Y	Y
Before	Jul-97	1997/7	0	0	0	YES	N	N	Y	Y
Before	Aug-97	1997/8	0	0	0	NO	N	N	Y	Y
Before	Sep-97	1997/9	0	0	0	NO	N	N	Y	Y
Before	Oct-97	1997/10	0	0	0	NO	N	N	Y	Y
Before	Nov-97	1997/11	0	0	0	YES	N	N	Y	Y
Before	Dec-97	1997/12	120	78	42	NO	Y	Y	N	N
Before	Jan-98	1998/1	500	325	175	NO	Y	Y	N	N
Before	Feb-98	1998/2	560	364	196	NO	Y	Y	N	N
Before	Mar-98	1998/3	620	403	217	NO	Y	Y	N	N
Before	Apr-98	1998/4	600	390	210	NO	Y	Y	N	N
Before	May-98	1998/5	620	403	217	NO	Y	Y	N	N
Before	Jun-98	1998/6	0	0	0	NO	N	N	N	N
Before	Jul-98	1998/7	0	0	0	NO	N	N	N	N
Before	Aug-98	1998/8	0	0	0	NO	N	N	Y	Y
Before	Sep-98	1998/9	0	0	0	NO	N	N	Y	Y
Before	Oct-98	1998/10	0	0	0	NO	N	N	Y	Y
Before	Nov-98	1998/11	0	0	0	YES	N	N	Y	Y
Before	Dec-98	1998/12	0	0	0	YES	N	N	Y	Y
Before	Jan-99	1999/1	100	65	35	NO	Y	Y	N	N

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
Before	Feb-99	1999/2	480	312	168	NO	Y	Y	N	N
Before	Mar-99	1999/3	440	286	154	NO	Y	Y	N	N
Before	Apr-99	1999/4	600	390	210	NO	Y	Y	N	N
Before	May-99	1999/5	300	195	105	NO	Y	Y	N	N
Before	Jun-99	1999/6	0	0	0	NO	N	N	N	N
Before	Jul-99	1999/7	0	0	0	NO	N	N	N	N
Before	Aug-99	1999/8	0	0	0	NO	N	N	Y	Y
Before	Sep-99	1999/9	0	0	0	NO	N	N	Y	Y
Before	Oct-99	1999/10	0	0	0	NO	N	N	Y	Y
Before	Nov-99	1999/11	0	0	0	YES	N	N	Y	Y
Before	Dec-99	1999/12	0	0	0	YES	N	N	Y	Y
Before	Jan-00	2000/1	180	117	63	NO	Y	Y	N	N
Before	Feb-00	2000/2	520	338	182	NO	Y	Y	N	N
Before	Mar-00	2000/3	620	403	217	NO	Y	Y	N	N
Before	Apr-00	2000/4	320	208	112	NO	Y	Y	N	N
Before	May-00	2000/5	0	0	0	NO	N	N	N	N
Before	Jun-00	2000/6	0	0	0	NO	N	N	N	N
Before	Jul-00	2000/7	0	0	0	YES	N	N	Y	Y
Before	Aug-00	2000/8	0	0	0	NO	N	N	Y	Y
Before	Sep-00	2000/9	0	0	0	NO	N	N	Y	Y
Before	Oct-00	2000/10	0	0	0	NO	N	N	Y	Y
Before	Nov-00	2000/11	0	0	0	YES	N	N	Y	Y
Before	Dec-00	2000/12	0	0	0	YES	N	N	Y	Y
Before	Jan-01	2001/1	140	91	49	NO	Y	Y	N	N
Before	Feb-01	2001/2	340	221	119	NO	Y	Y	N	N
Before	Mar-01	2001/3	560	364	196	NO	Y	Y	N	N
Before	Apr-01	2001/4	180	117	63	NO	Y	Y	N	N
Before	May-01	2001/5	0	0	0	NO	N	N	N	N
Before	Jun-01	2001/6	0	0	0	NO	N	N	N	N
Before	Jul-01	2001/7	0	0	0	YES	N	N	Y	Y
Before	Aug-01	2001/8	0	0	0	NO	N	N	Y	Y
Before	Sep-01	2001/9	0	0	0	NO	N	N	Y	Y
Before	Oct-01	2001/10	0	0	0	NO	N	N	Y	Y
Before	Nov-01	2001/11	0	0	0	YES	N	N	Y	Y
Before	Dec-01	2001/12	220	143	77	NO	Y	Y	N	N
Before	Jan-02	2002/1	240	156	84	NO	Y	Y	N	N
Before	Feb-02	2002/2	0	0	0	NO	N	N	N	N

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
Before	Mar-02	2002/3	0	0	0	NO	N	N	N	N
Before	Apr-02	2002/4	0	0	0	YES	N	N	Y	Y
Before	May-02	2002/5	0	0	0	YES	N	N	Y	Y
Before	Jun-02	2002/6	0	0	0	YES	N	N	Y	Y
Before	Jul-02	2002/7	0	0	0	YES	N	N	Y	Y
Before	Aug-02	2002/8	0	0	0	NO	N	N	Y	Y
Before	Sep-02	2002/9	0	0	0	NO	N	N	Y	Y
Before	Oct-02	2002/10	0	0	0	NO	N	N	Y	Y
Before	Nov-02	2002/11	0	0	0	YES	N	N	Y	Y
Before	Dec-02	2002/12	340	221	119	NO	Y	Y	N	N
Before	Jan-03	2003/1	500	325	175	NO	Y	Y	N	N
Before	Feb-03	2003/2	0	0	0	NO	N	N	N	N
Before	Mar-03	2003/3	100	65	35	NO	Y	Y	N	N
Before	Apr-03	2003/4	360	234	126	NO	Y	Y	N	N
Before	May-03	2003/5	400	260	140	NO	Y	Y	N	N
Before	Jun-03	2003/6	0	0	0	NO	N	N	N	N
Before	Jul-03	2003/7	0	0	0	NO	N	N	N	N
Before	Aug-03	2003/8	0	0	0	NO	N	N	Y	Y
Before	Sep-03	2003/9	0	0	0	NO	N	N	Y	Y
Before	Oct-03	2003/10	0	0	0	NO	N	N	Y	Y
Before	Nov-03	2003/11	0	0	0	YES	N	N	Y	Y
Before	Dec-03	2003/12	40	26	14	NO	Y	Y	N	N
Before	Jan-04	2004/1	100	65	35	NO	Y	Y	N	N
Before	Feb-04	2004/2	280	182	98	NO	Y	Y	N	N
Before	Mar-04	2004/3	300	195	105	NO	Y	Y	N	N
Before	Apr-04	2004/4	0	0	0	NO	N	N	N	N
Before	May-04	2004/5	0	0	0	NO	N	N	N	N
Before	Jun-04	2004/6	0	0	0	YES	N	N	Y	Y
Before	Jul-04	2004/7	0	0	0	YES	N	N	Y	Y
Before	Aug-04	2004/8	0	0	0	NO	N	N	Y	Y
Before	Sep-04	2004/9	0	0	0	NO	N	N	Y	Y
Before	Oct-04	2004/10	0	0	0	NO	N	N	Y	Y
Before	Nov-04	2004/11	0	0	0	YES	N	N	Y	Y
Before	Dec-04	2004/12	60	39	21	NO	Y	Y	N	N
Before	Jan-05	2005/1	620	403	217	NO	Y	Y	N	N
Before	Feb-05	2005/2	560	364	196	NO	Y	Y	N	N
Before	Mar-05	2005/3	620	403	217	NO	Y	Y	N	N

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
Before	Apr-05	2005/4	600	390	210	NO	Y	Y	N	N
Before	May-05	2005/5	460	299	161	NO	Y	Y	N	N
Before	Jun-05	2005/6	0	0	0	NO	N	N	N	N
Before	Jul-05	2005/7	0	0	0	NO	N	N	N	N
Before	Aug-05	2005/8	0	0	0	NO	N	N	Y	Y
Before	Sep-05	2005/9	0	0	0	NO	N	N	Y	Y
Before	Oct-05	2005/10	0	0	0	NO	N	N	Y	Y
Before	Nov-05	2005/11	0	0	0	YES	N	N	Y	Y
Before	Dec-05	2005/12	20	13	7	NO	Y	Y	N	N
Before	Jan-06	2006/1	400	260	140	NO	Y	Y	N	N
Before	Feb-06	2006/2	40	26	14	NO	Y	Y	N	N
Before	Mar-06	2006/3	620	403	217	NO	Y	Y	N	N
Before	Apr-06	2006/4	600	390	210	NO	Y	Y	N	N
Before	May-06	2006/5	620	403	217	NO	Y	Y	N	N
Before	Jun-06	2006/6	0	0	0	NO	N	N	N	N
Before	Jul-06	2006/7	0	0	0	NO	N	N	N	N
Before	Aug-06	2006/8	0	0	0	NO	N	N	Y	Y
Before	Sep-06	2006/9	0	0	0	NO	N	N	Y	Y
Before	Oct-06	2006/10	0	0	0	NO	N	N	Y	Y
Before	Nov-06	2006/11	0	0	0	YES	N	N	Y	Y
Before	Dec-06	2006/12	0	0	0	YES	N	N	Y	Y
Before	Jan-07	2007/1	0	0	0	YES	N	N	Y	Y
Before	Feb-07	2007/2	40	26	14	NO	Y	Y	N	N
Before	Mar-07	2007/3	40	26	14	NO	Y	Y	N	N
Before	Apr-07	2007/4	0	0	0	NO	N	N	N	N
Before	May-07	2007/5	0	0	0	NO	N	N	N	N
Before	Jun-07	2007/6	0	0	0	YES	N	N	Y	Y
Before	Jul-07	2007/7	0	0	0	YES	N	N	Y	Y
Before	Aug-07	2007/8	0	0	0	NO	N	N	Y	Y
Before	Sep-07	2007/9	0	0	0	NO	N	N	Y	Y
Before	Oct-07	2007/10	0	0	0	NO	N	N	Y	Y
Before	Nov-07	2007/11	0	0	0	YES	N	N	Y	Y
Before	Dec-07	2007/12	0	0	0	YES	N	N	Y	Y
Before	Jan-08	2008/1	200	130	70	NO	Y	Y	N	N
Before	Feb-08	2008/2	500	325	175	NO	Y	Y	N	N
Before	Mar-08	2008/3	260	169	91	NO	Y	Y	N	N
Before	Apr-08	2008/4	0	0	0	NO	N	N	N	N

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
Before	May-08	2008/5	0	0	0	NO	N	N	N	N
Before	Jun-08	2008/6	0	0	0	YES	N	N	Y	Y
Before	Jul-08	2008/7	0	0	0	YES	N	N	Y	Y
Before	Aug-08	2008/8	0	0	0	YES	N	N	Y	Y
Before	Sep-08	2008/9	0	0	0	NO	N	N	Y	Y
Before	Oct-08	2008/10	0	0	0	NO	N	N	Y	Y
Before	Nov-08	2008/11	0	0	0	NO	N	N	Y	Y
Before	Dec-08	2008/12	0	0	0	NO	N	N	Y	Y
1	Jan-09	1987/1	0	0	0	YES	N	N	Y	Y
2	Feb-09	1987/2	40	26	14	NO	Y	Y	N	N
3	Mar-09	1987/3	0	0	0	NO	N	N	N	N
4	Apr-09	1987/4	0	0	0	NO	N	N	N	N
5	May-09	1987/5	0	0	0	YES	N	N	Y	Y
6	Jun-09	1987/6	0	0	0	YES	N	N	Y	Y
7	Jul-09	1987/7	0	0	0	YES	N	N	Y	Y
8	Aug-09	1987/8	0	0	0	YES	N	N	Y	Y
9	Sep-09	1987/9	0	0	0	YES	N	N	Y	Y
10	Oct-09	1987/10	0	0	0	YES	N	N	Y	Y
11	Nov-09	1987/11	0	0	0	YES	N	N	Y	Y
12	Dec-09	1987/12	0	0	0	YES	N	N	Y	Y
13	Jan-10	1988/1	0	0	0	YES	N	N	Y	Y
14	Feb-10	1988/2	0	0	0	YES	N	N	Y	Y
15	Mar-10	1988/3	0	0	0	YES	N	N	Y	Y
16	Apr-10	1988/4	0	0	0	YES	N	N	Y	Y
17	May-10	1988/5	0	0	0	YES	N	N	Y	Y
18	Jun-10	1988/6	0	0	0	YES	N	N	Y	Y
19	Jul-10	1988/7	0	0	0	YES	N	N	Y	Y
20	Aug-10	1988/8	0	0	0	YES	N	N	Y	Y
21	Sep-10	1988/9	0	0	0	YES	N	N	Y	Y
22	Oct-10	1988/10	0	0	0	YES	N	N	Y	Y
23	Nov-10	1988/11	0	0	0	YES	N	N	Y	Y
24	Dec-10	1988/12	0	0	0	YES	N	N	Y	Y
25	Jan-11	1989/1	0	0	0	YES	N	N	Y	Y
26	Feb-11	1989/2	0	0	0	YES	N	N	Y	Y
27	Mar-11	1989/3	0	0	0	YES	N	N	Y	Y
28	Apr-11	1989/4	0	0	0	YES	N	N	Y	Y
29	May-11	1989/5	0	0	0	YES	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
30	Jun-11	1989/6	0	0	0	YES	N	N	Y	Y
31	Jul-11	1989/7	0	0	0	YES	N	N	Y	Y
32	Aug-11	1989/8	0	0	0	YES	N	N	Y	Y
33	Sep-11	1989/9	0	0	0	YES	N	N	Y	Y
34	Oct-11	1989/10	0	0	0	YES	N	N	Y	Y
35	Nov-11	1989/11	0	0	0	YES	N	N	Y	Y
36	Dec-11	1989/12	0	0	0	YES	N	N	Y	Y
37	Jan-12	1990/1	0	0	0	YES	N	N	Y	Y
38	Feb-12	1990/2	0	0	0	YES	N	N	Y	Y
39	Mar-12	1990/3	0	0	0	YES	N	N	Y	Y
40	Apr-12	1990/4	0	0	0	YES	N	N	Y	Y
41	May-12	1990/5	0	0	0	YES	N	N	Y	Y
42	Jun-12	1990/6	0	0	0	YES	N	N	Y	Y
43	Jul-12	1990/7	0	0	0	YES	N	N	Y	Y
44	Aug-12	1990/8	0	0	0	YES	N	N	Y	Y
45	Sep-12	1990/9	0	0	0	YES	N	N	Y	Y
46	Oct-12	1990/10	0	0	0	YES	N	N	Y	Y
47	Nov-12	1990/11	0	0	0	YES	N	N	Y	Y
48	Dec-12	1990/12	0	0	0	YES	N	N	Y	Y
49	Jan-13	1991/1	0	0	0	YES	N	N	Y	Y
50	Feb-13	1991/2	0	0	0	YES	N	N	Y	Y
51	Mar-13	1991/3	280	182	98	NO	Y	Y	N	N
52	Apr-13	1991/4	100	65	35	NO	Y	Y	N	N
53	May-13	1991/5	0	0	0	NO	N	N	N	N
54	Jun-13	1991/6	0	0	0	NO	N	N	N	N
55	Jul-13	1991/7	0	0	0	YES	N	N	Y	Y
56	Aug-13	1991/8	0	0	0	YES	N	N	Y	Y
57	Sep-13	1991/9	0	0	0	NO	N	N	Y	Y
58	Oct-13	1991/10	0	0	0	YES	N	N	Y	Y
59	Nov-13	1991/11	0	0	0	YES	N	N	Y	Y
60	Dec-13	1991/12	0	0	0	YES	N	N	Y	Y
61	Jan-14	1992/1	0	0	0	YES	N	N	Y	Y
62	Feb-14	1992/2	380	247	133	NO	Y	Y	N	N
63	Mar-14	1992/3	480	312	168	NO	Y	Y	N	N
64	Apr-14	1992/4	0	0	0	NO	N	N	N	N
65	May-14	1992/5	0	0	0	NO	N	N	N	N
66	Jun-14	1992/6	0	0	0	YES	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
67	Jul-14	1992/7	0	0	0	YES	N	N	Y	Y
68	Aug-14	1992/8	0	0	0	NO	N	N	Y	Y
69	Sep-14	1992/9	0	0	0	NO	N	N	Y	Y
70	Oct-14	1992/10	0	0	0	YES	N	N	Y	Y
71	Nov-14	1992/11	0	0	0	YES	N	N	Y	Y
72	Dec-14	1992/12	0	0	0	YES	N	N	Y	Y
73	Jan-15	1993/1	520	338	182	NO	Y	Y	N	N
74	Feb-15	1993/2	560	364	196	NO	Y	Y	N	N
75	Mar-15	1993/3	620	403	217	NO	Y	Y	N	N
76	Apr-15	1993/4	540	351	189	NO	Y	Y	N	N
77	May-15	1993/5	0	0	0	NO	N	N	N	N
78	Jun-15	1993/6	0	0	0	NO	N	N	N	N
79	Jul-15	1993/7	0	0	0	YES	N	N	Y	Y
80	Aug-15	1993/8	0	0	0	NO	N	N	Y	Y
81	Sep-15	1993/9	0	0	0	NO	N	N	Y	Y
82	Oct-15	1993/10	0	0	0	NO	N	N	Y	Y
83	Nov-15	1993/11	0	0	0	YES	N	N	Y	Y
84	Dec-15	1993/12	0	0	0	YES	N	N	Y	Y
85	Jan-16	1994/1	0	0	0	YES	N	N	Y	Y
86	Feb-16	1994/2	140	91	49	NO	Y	Y	N	N
87	Mar-16	1994/3	0	0	0	NO	N	N	N	N
88	Apr-16	1994/4	0	0	0	NO	N	N	N	N
89	May-16	1994/5	0	0	0	YES	N	N	Y	Y
90	Jun-16	1994/6	0	0	0	YES	N	N	Y	Y
91	Jul-16	1994/7	0	0	0	YES	N	N	Y	Y
92	Aug-16	1994/8	0	0	0	NO	N	N	Y	Y
93	Sep-16	1994/9	0	0	0	NO	N	N	Y	Y
94	Oct-16	1994/10	0	0	0	YES	N	N	Y	Y
95	Nov-16	1994/11	0	0	0	YES	N	N	Y	Y
96	Dec-16	1994/12	0	0	0	YES	N	N	Y	Y
97	Jan-17	1995/1	480	312	168	NO	Y	Y	N	N
98	Feb-17	1995/2	440	286	154	NO	Y	Y	N	N
99	Mar-17	1995/3	580	377	203	NO	Y	Y	N	N
100	Apr-17	1995/4	600	390	210	NO	Y	Y	N	N
101	May-17	1995/5	620	403	217	NO	Y	Y	N	N
102	Jun-17	1995/6	0	0	0	NO	N	N	N	N
103	Jul-17	1995/7	0	0	0	NO	N	N	N	N

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
104	Aug-17	1995/8	0	0	0	NO	N	N	Y	Y
105	Sep-17	1995/9	0	0	0	NO	N	N	Y	Y
106	Oct-17	1995/10	0	0	0	NO	N	N	Y	Y
107	Nov-17	1995/11	0	0	0	YES	N	N	Y	Y
108	Dec-17	1995/12	0	0	0	YES	N	N	Y	Y
109	Jan-18	1996/1	180	117	63	NO	Y	Y	N	N
110	Feb-18	1996/2	580	377	203	NO	Y	Y	N	N
111	Mar-18	1996/3	620	403	217	NO	Y	Y	N	N
112	Apr-18	1996/4	480	312	168	NO	Y	Y	N	N
113	May-18	1996/5	60	39	21	NO	Y	Y	N	N
114	Jun-18	1996/6	0	0	0	NO	N	N	N	N
115	Jul-18	1996/7	0	0	0	NO	N	N	N	N
116	Aug-18	1996/8	0	0	0	NO	N	N	Y	Y
117	Sep-18	1996/9	0	0	0	NO	N	N	Y	Y
118	Oct-18	1996/10	0	0	0	NO	N	N	Y	Y
119	Nov-18	1996/11	0	0	0	YES	N	N	Y	Y
120	Dec-18	1996/12	360	234	126	NO	Y	Y	N	N
121	Jan-19	1997/1	620	403	217	NO	Y	Y	N	N
122	Feb-19	1997/2	560	364	196	NO	Y	Y	N	N
123	Mar-19	1997/3	100	65	35	NO	Y	Y	N	N
124	Apr-19	1997/4	0	0	0	NO	N	N	N	N
125	May-19	1997/5	0	0	0	NO	N	N	N	N
126	Jun-19	1997/6	0	0	0	YES	N	N	Y	Y
127	Jul-19	1997/7	0	0	0	YES	N	N	Y	Y
128	Aug-19	1997/8	0	0	0	NO	N	N	Y	Y
129	Sep-19	1997/9	0	0	0	NO	N	N	Y	Y
130	Oct-19	1997/10	0	0	0	NO	N	N	Y	Y
131	Nov-19	1997/11	0	0	0	YES	N	N	Y	Y
132	Dec-19	1997/12	120	78	42	NO	Y	Y	N	N
133	Jan-20	1998/1	500	325	175	NO	Y	Y	N	N
134	Feb-20	1998/2	560	364	196	NO	Y	Y	N	N
135	Mar-20	1998/3	620	403	217	NO	Y	Y	N	N
136	Apr-20	1998/4	600	390	210	NO	Y	Y	N	N
137	May-20	1998/5	620	403	217	NO	Y	Y	N	N
138	Jun-20	1998/6	0	0	0	NO	N	N	N	N
139	Jul-20	1998/7	0	0	0	NO	N	N	N	N
140	Aug-20	1998/8	0	0	0	NO	N	N	Y	Y

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Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
141	Sep-20	1998/9	0	0	0	NO	N	N	Y	Y
142	Oct-20	1998/10	0	0	0	NO	N	N	Y	Y
143	Nov-20	1998/11	0	0	0	YES	N	N	Y	Y
144	Dec-20	1998/12	0	0	0	YES	N	N	Y	Y
145	Jan-21	1999/1	100	65	35	NO	Y	Y	N	N
146	Feb-21	1999/2	480	312	168	NO	Y	Y	N	N
147	Mar-21	1999/3	440	286	154	NO	Y	Y	N	N
148	Apr-21	1999/4	600	390	210	NO	Y	Y	N	N
149	May-21	1999/5	300	195	105	NO	Y	Y	N	N
150	Jun-21	1999/6	0	0	0	NO	N	N	N	N
151	Jul-21	1999/7	0	0	0	NO	N	N	N	N
152	Aug-21	1999/8	0	0	0	NO	N	N	Y	Y
153	Sep-21	1999/9	0	0	0	NO	N	N	Y	Y
154	Oct-21	1999/10	0	0	0	NO	N	N	Y	Y
155	Nov-21	1999/11	0	0	0	YES	N	N	Y	Y
156	Dec-21	1999/12	0	0	0	YES	N	N	Y	Y
157	Jan-22	2000/1	180	117	63	NO	Y	Y	N	N
158	Feb-22	2000/2	520	338	182	NO	Y	Y	N	N
159	Mar-22	2000/3	620	403	217	NO	Y	Y	N	N
160	Apr-22	2000/4	320	208	112	NO	Y	Y	N	N
161	May-22	2000/5	0	0	0	NO	N	N	N	N
162	Jun-22	2000/6	0	0	0	NO	N	N	N	N
163	Jul-22	2000/7	0	0	0	YES	N	N	Y	Y
164	Aug-22	2000/8	0	0	0	NO	N	N	Y	Y
165	Sep-22	2000/9	0	0	0	NO	N	N	Y	Y
166	Oct-22	2000/10	0	0	0	NO	N	N	Y	Y
167	Nov-22	2000/11	0	0	0	YES	N	N	Y	Y
168	Dec-22	2000/12	0	0	0	YES	N	N	Y	Y
169	Jan-23	2001/1	140	91	49	NO	Y	Y	N	N
170	Feb-23	2001/2	340	221	119	NO	Y	Y	N	N
171	Mar-23	2001/3	560	364	196	NO	Y	Y	N	N
172	Apr-23	2001/4	180	117	63	NO	Y	Y	N	N
173	May-23	2001/5	0	0	0	NO	N	N	N	N
174	Jun-23	2001/6	0	0	0	NO	N	N	N	N
175	Jul-23	2001/7	0	0	0	YES	N	N	Y	Y
176	Aug-23	2001/8	0	0	0	NO	N	N	Y	Y
177	Sep-23	2001/9	0	0	0	NO	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
178	Oct-23	2001/10	0	0	0	NO	N	N	Y	Y
179	Nov-23	2001/11	0	0	0	YES	N	N	Y	Y
180	Dec-23	2001/12	220	143	77	NO	Y	Y	N	N
181	Jan-24	2002/1	240	156	84	NO	Y	Y	N	N
182	Feb-24	2002/2	0	0	0	NO	N	N	N	N
183	Mar-24	2002/3	0	0	0	NO	N	N	N	N
184	Apr-24	2002/4	0	0	0	YES	N	N	Y	Y
185	May-24	2002/5	0	0	0	YES	N	N	Y	Y
186	Jun-24	2002/6	0	0	0	YES	N	N	Y	Y
187	Jul-24	2002/7	0	0	0	YES	N	N	Y	Y
188	Aug-24	2002/8	0	0	0	NO	N	N	Y	Y
189	Sep-24	2002/9	0	0	0	NO	N	N	Y	Y
190	Oct-24	2002/10	0	0	0	NO	N	N	Y	Y
191	Nov-24	2002/11	0	0	0	YES	N	N	Y	Y
192	Dec-24	2002/12	340	221	119	NO	Y	Y	N	N
193	Jan-25	2003/1	500	325	175	NO	Y	Y	N	N
194	Feb-25	2003/2	0	0	0	NO	N	N	N	N
195	Mar-25	2003/3	100	65	35	NO	Y	Y	N	N
196	Apr-25	2003/4	360	234	126	NO	Y	Y	N	N
197	May-25	2003/5	400	260	140	NO	Y	Y	N	N
198	Jun-25	2003/6	0	0	0	NO	N	N	N	N
199	Jul-25	2003/7	0	0	0	NO	N	N	N	N
200	Aug-25	2003/8	0	0	0	NO	N	N	Y	Y
201	Sep-25	2003/9	0	0	0	NO	N	N	Y	Y
202	Oct-25	2003/10	0	0	0	NO	N	N	Y	Y
203	Nov-25	2003/11	0	0	0	YES	N	N	Y	Y
204	Dec-25	2003/12	40	26	14	NO	Y	Y	N	N
205	Jan-26	2004/1	100	65	35	NO	Y	Y	N	N
206	Feb-26	2004/2	280	182	98	NO	Y	Y	N	N
207	Mar-26	2004/3	300	195	105	NO	Y	Y	N	N
208	Apr-26	2004/4	0	0	0	NO	N	N	N	N
209	May-26	2004/5	0	0	0	NO	N	N	N	N
210	Jun-26	2004/6	0	0	0	YES	N	N	Y	Y
211	Jul-26	2004/7	0	0	0	YES	N	N	Y	Y
212	Aug-26	2004/8	0	0	0	NO	N	N	Y	Y
213	Sep-26	2004/9	0	0	0	NO	N	N	Y	Y
214	Oct-26	2004/10	0	0	0	NO	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
215	Nov-26	2004/11	0	0	0	YES	N	N	Y	Y
216	Dec-26	2004/12	60	39	21	NO	Y	Y	N	N
217	Jan-27	2005/1	620	403	217	NO	Y	Y	N	N
218	Feb-27	2005/2	560	364	196	NO	Y	Y	N	N
219	Mar-27	2005/3	620	403	217	NO	Y	Y	N	N
220	Apr-27	2005/4	600	390	210	NO	Y	Y	N	N
221	May-27	2005/5	460	299	161	NO	Y	Y	N	N
222	Jun-27	2005/6	0	0	0	NO	N	N	N	N
223	Jul-27	2005/7	0	0	0	NO	N	N	N	N
224	Aug-27	2005/8	0	0	0	NO	N	N	Y	Y
225	Sep-27	2005/9	0	0	0	NO	N	N	Y	Y
226	Oct-27	2005/10	0	0	0	NO	N	N	Y	Y
227	Nov-27	2005/11	0	0	0	YES	N	N	Y	Y
228	Dec-27	2005/12	20	13	7	NO	Y	Y	N	N
229	Jan-28	2006/1	400	260	140	NO	Y	Y	N	N
230	Feb-28	2006/2	40	26	14	NO	Y	Y	N	N
231	Mar-28	2006/3	620	403	217	NO	Y	Y	N	N
232	Apr-28	2006/4	600	390	210	NO	Y	Y	N	N
233	May-28	2006/5	620	403	217	NO	Y	Y	N	N
234	Jun-28	2006/6	0	0	0	NO	N	N	N	N
235	Jul-28	2006/7	0	0	0	NO	N	N	N	N
236	Aug-28	2006/8	0	0	0	NO	N	N	Y	Y
237	Sep-28	2006/9	0	0	0	NO	N	N	Y	Y
238	Oct-28	2006/10	0	0	0	NO	N	N	Y	Y
239	Nov-28	2006/11	0	0	0	YES	N	N	Y	Y
240	Dec-28	2006/12	0	0	0	YES	N	N	Y	Y
241	Jan-29	2007/1	0	0	0	YES	N	N	Y	Y
242	Feb-29	2007/2	40	26	14	NO	Y	Y	N	N
243	Mar-29	2007/3	40	26	14	NO	Y	Y	N	N
244	Apr-29	2007/4	0	0	0	NO	N	N	N	N
245	May-29	2007/5	0	0	0	NO	N	N	N	N
246	Jun-29	2007/6	0	0	0	YES	N	N	Y	Y
247	Jul-29	2007/7	0	0	0	YES	N	N	Y	Y
248	Aug-29	2007/8	0	0	0	NO	N	N	Y	Y
249	Sep-29	2007/9	0	0	0	NO	N	N	Y	Y
250	Oct-29	2007/10	0	0	0	NO	N	N	Y	Y
251	Nov-29	2007/11	0	0	0	YES	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
252	Dec-29	2007/12	0	0	0	YES	N	N	Y	Y
253	Jan-30	2008/1	200	130	70	NO	Y	Y	N	N
254	Feb-30	2008/2	500	325	175	NO	Y	Y	N	N
255	Mar-30	2008/3	260	169	91	NO	Y	Y	N	N
256	Apr-30	2008/4	0	0	0	NO	N	N	N	N
257	May-30	2008/5	0	0	0	NO	N	N	N	N
258	Jun-30	2008/6	0	0	0	YES	N	N	Y	Y
259	Jul-30	2008/7	0	0	0	YES	N	N	Y	Y
260	Aug-30	2008/8	0	0	0	YES	N	N	Y	Y
261	Sep-30	2008/9	0	0	0	NO	N	N	Y	Y
262	Oct-30	2008/10	0	0	0	NO	N	N	Y	Y
263	Nov-30	2008/11	0	0	0	NO	N	N	Y	Y
264	Dec-30	2008/12	0	0	0	NO	N	N	Y	Y
265	Jan-31	1987/1	0	0	0	YES	N	N	Y	Y
266	Feb-31	1987/2	40	26	14	NO	Y	Y	N	N
267	Mar-31	1987/3	0	0	0	NO	N	N	N	N
268	Apr-31	1987/4	0	0	0	NO	N	N	N	N
269	May-31	1987/5	0	0	0	YES	N	N	Y	Y
270	Jun-31	1987/6	0	0	0	YES	N	N	Y	Y
271	Jul-31	1987/7	0	0	0	YES	N	N	Y	Y
272	Aug-31	1987/8	0	0	0	YES	N	N	Y	Y
273	Sep-31	1987/9	0	0	0	YES	N	N	Y	Y
274	Oct-31	1987/10	0	0	0	YES	N	N	Y	Y
275	Nov-31	1987/11	0	0	0	YES	N	N	Y	Y
276	Dec-31	1987/12	0	0	0	YES	N	N	Y	Y
277	Jan-32	1988/1	0	0	0	YES	N	N	Y	Y
278	Feb-32	1988/2	0	0	0	YES	N	N	Y	Y
279	Mar-32	1988/3	0	0	0	YES	N	N	Y	Y
280	Apr-32	1988/4	0	0	0	YES	N	N	Y	Y
281	May-32	1988/5	0	0	0	YES	N	N	Y	Y
282	Jun-32	1988/6	0	0	0	YES	N	N	Y	Y
283	Jul-32	1988/7	0	0	0	YES	N	N	Y	Y
284	Aug-32	1988/8	0	0	0	YES	N	N	Y	Y
285	Sep-32	1988/9	0	0	0	YES	N	N	Y	Y
286	Oct-32	1988/10	0	0	0	YES	N	N	Y	Y
287	Nov-32	1988/11	0	0	0	YES	N	N	Y	Y
288	Dec-32	1988/12	0	0	0	YES	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
289	Jan-33	1989/1	0	0	0	YES	N	N	Y	Y
290	Feb-33	1989/2	0	0	0	YES	N	N	Y	Y
291	Mar-33	1989/3	0	0	0	YES	N	N	Y	Y
292	Apr-33	1989/4	0	0	0	YES	N	N	Y	Y
293	May-33	1989/5	0	0	0	YES	N	N	Y	Y
294	Jun-33	1989/6	0	0	0	YES	N	N	Y	Y
295	Jul-33	1989/7	0	0	0	YES	N	N	Y	Y
296	Aug-33	1989/8	0	0	0	YES	N	N	Y	Y
297	Sep-33	1989/9	0	0	0	YES	N	N	Y	Y
298	Oct-33	1989/10	0	0	0	YES	N	N	Y	Y
299	Nov-33	1989/11	0	0	0	YES	N	N	Y	Y
300	Dec-33	1989/12	0	0	0	YES	N	N	Y	Y
301	Jan-34	1990/1	0	0	0	YES	N	N	Y	Y
302	Feb-34	1990/2	0	0	0	YES	N	N	Y	Y
303	Mar-34	1990/3	0	0	0	YES	N	N	Y	Y
304	Apr-34	1990/4	0	0	0	YES	N	N	Y	Y
305	May-34	1990/5	0	0	0	YES	N	N	Y	Y
306	Jun-34	1990/6	0	0	0	YES	N	N	Y	Y
307	Jul-34	1990/7	0	0	0	YES	N	N	Y	Y
308	Aug-34	1990/8	0	0	0	YES	N	N	Y	Y
309	Sep-34	1990/9	0	0	0	YES	N	N	Y	Y
310	Oct-34	1990/10	0	0	0	YES	N	N	Y	Y
311	Nov-34	1990/11	0	0	0	YES	N	N	Y	Y
312	Dec-34	1990/12	0	0	0	YES	N	N	Y	Y
313	Jan-35	1991/1	0	0	0	YES	N	N	Y	Y
314	Feb-35	1991/2	0	0	0	YES	N	N	Y	Y
315	Mar-35	1991/3	280	182	98	NO	Y	Y	N	N
316	Apr-35	1991/4	100	65	35	NO	Y	Y	N	N
317	May-35	1991/5	0	0	0	NO	N	N	N	N
318	Jun-35	1991/6	0	0	0	NO	N	N	N	N
319	Jul-35	1991/7	0	0	0	YES	N	N	Y	Y
320	Aug-35	1991/8	0	0	0	YES	N	N	Y	Y
321	Sep-35	1991/9	0	0	0	NO	N	N	Y	Y
322	Oct-35	1991/10	0	0	0	YES	N	N	Y	Y
323	Nov-35	1991/11	0	0	0	YES	N	N	Y	Y
324	Dec-35	1991/12	0	0	0	YES	N	N	Y	Y
325	Jan-36	1992/1	0	0	0	YES	N	N	Y	Y

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
326	Feb-36	1992/2	380	247	133	NO	Y	Y	N	N
327	Mar-36	1992/3	480	312	168	NO	Y	Y	N	N
328	Apr-36	1992/4	0	0	0	NO	N	N	N	N
329	May-36	1992/5	0	0	0	NO	N	N	N	N
330	Jun-36	1992/6	0	0	0	YES	N	N	Y	Y
331	Jul-36	1992/7	0	0	0	YES	N	N	Y	Y
332	Aug-36	1992/8	0	0	0	NO	N	N	Y	Y
333	Sep-36	1992/9	0	0	0	NO	N	N	Y	Y
334	Oct-36	1992/10	0	0	0	YES	N	N	Y	Y
335	Nov-36	1992/11	0	0	0	YES	N	N	Y	Y
336	Dec-36	1992/12	0	0	0	YES	N	N	Y	Y
337	Jan-37	1993/1	520	338	182	NO	Y	Y	N	N
338	Feb-37	1993/2	560	364	196	NO	Y	Y	N	N
339	Mar-37	1993/3	620	403	217	NO	Y	Y	N	N
340	Apr-37	1993/4	540	351	189	NO	Y	Y	N	N
341	May-37	1993/5	0	0	0	NO	N	N	N	N
342	Jun-37	1993/6	0	0	0	NO	N	N	N	N
343	Jul-37	1993/7	0	0	0	YES	N	N	Y	Y
344	Aug-37	1993/8	0	0	0	NO	N	N	Y	Y
345	Sep-37	1993/9	0	0	0	NO	N	N	Y	Y
346	Oct-37	1993/10	0	0	0	NO	N	N	Y	Y
347	Nov-37	1993/11	0	0	0	YES	N	N	Y	Y
348	Dec-37	1993/12	0	0	0	YES	N	N	Y	Y
349	Jan-38	1994/1	0	0	0	YES	N	N	Y	Y
350	Feb-38	1994/2	140	91	49	NO	Y	Y	N	N
351	Mar-38	1994/3	0	0	0	NO	N	N	N	N
352	Apr-38	1994/4	0	0	0	NO	N	N	N	N
353	May-38	1994/5	0	0	0	YES	N	N	Y	Y
354	Jun-38	1994/6	0	0	0	YES	N	N	Y	Y
355	Jul-38	1994/7	0	0	0	YES	N	N	Y	Y
356	Aug-38	1994/8	0	0	0	NO	N	N	Y	Y
357	Sep-38	1994/9	0	0	0	NO	N	N	Y	Y
358	Oct-38	1994/10	0	0	0	YES	N	N	Y	Y
359	Nov-38	1994/11	0	0	0	YES	N	N	Y	Y
360	Dec-38	1994/12	0	0	0	YES	N	N	Y	Y
361	Jan-39	1995/1	480	312	168	NO	Y	Y	N	N
362	Feb-39	1995/2	440	286	154	NO	Y	Y	N	N

							Carmel River Water Injection		ASR sites available for extraction	
Model Stress Period	Model Date	Historic Date	Monthly Injection	Santa Margarita Site Injection	Seaside Middle School Site Injection	ASR Wells Available for GWR extraction	Active Injection Santa Margarita	Active Injection Seaside Middle School	Santa Margarita Available for Extraction	Santa Margarita Available for Extraction
			(AF)	(AF)	(AF)	(Yes/NO)	(Y/N)	(Y/N)	(Y/N)	(Y/N)
363	Mar-39	1995/3	580	377	203	NO	Y	Y	N	N
364	Apr-39	1995/4	600	390	210	NO	Y	Y	N	N
365	May-39	1995/5	620	403	217	NO	Y	Y	N	N
366	Jun-39	1995/6	0	0	0	NO	N	N	N	N
367	Jul-39	1995/7	0	0	0	NO	N	N	N	N
368	Aug-39	1995/8	0	0	0	NO	N	N	Y	Y
369	Sep-39	1995/9	0	0	0	NO	N	N	Y	Y
370	Oct-39	1995/10	0	0	0	NO	N	N	Y	Y
371	Nov-39	1995/11	0	0	0	YES	N	N	Y	Y
372	Dec-39	1995/12	0	0	0	YES	N	N	Y	Y
373	Jan-40	1996/1	180	117	63	NO	Y	Y	N	N
374	Feb-40	1996/2	580	377	203	NO	Y	Y	N	N
375	Mar-40	1996/3	620	403	217	NO	Y	Y	N	N
376	Apr-40	1996/4	480	312	168	NO	Y	Y	N	N
377	May-40	1996/5	60	39	21	NO	Y	Y	N	N
378	Jun-40	1996/6	0	0	0	NO	N	N	N	N
379	Jul-40	1996/7	0	0	0	NO	N	N	N	N
380	Aug-40	1996/8	0	0	0	NO	N	N	Y	Y
381	Sep-40	1996/9	0	0	0	NO	N	N	Y	Y
382	Oct-40	1996/10	0	0	0	NO	N	N	Y	Y
383	Nov-40	1996/11	0	0	0	YES	N	N	Y	Y
384	Dec-40	1996/12	360	234	126	NO	Y	Y	N	N
385	Jan-41	1997/1	620	403	217	NO	Y	Y	N	N
386	Feb-41	1997/2	560	364	196	NO	Y	Y	N	N
387	Mar-41	1997/3	100	65	35	NO	Y	Y	N	N
388	Apr-41	1997/4	0	0	0	NO	N	N	N	N
389	May-41	1997/5	0	0	0	NO	N	N	N	N
390	Jun-41	1997/6	0	0	0	YES	N	N	Y	Y
391	Jul-41	1997/7	0	0	0	YES	N	N	Y	Y
392	Aug-41	1997/8	0	0	0	NO	N	N	Y	Y
393	Sep-41	1997/9	0	0	0	NO	N	N	Y	Y
394	Oct-41	1997/10	0	0	0	NO	N	N	Y	Y
395	Nov-41	1997/11	0	0	0	YES	N	N	Y	Y
396	Dec-41	1997/12	120	78	42	NO	Y	Y	N	N

APPENDIX D

Todd Groundwater

Groundwater Quality Analytical Program – Laboratory Summary
Tables D-1 and D-1A through D-1P

Table D-1: Groundwater Quality Analytical Program - Laboratory Summary

Laboratory	Analytes	Tables
Alpha Analytical Laboratory	Anions	D-1A
Alpha Analytical Laboratory/McCampbell Analytical	Metals (Including Major Cations) and Cr(VI)	D-1B
Alpha Analytical Laboratory	Conventional Chemistry and Other Parameters	D-1C
Alpha Analytical Laboratory	Chlorinated Pesticides and PCBs	D-1D
Alpha Analytical Laboratory	Nitrogen and Phosphorus Pesticides	D-1E
Alpha Analytical Laboratory	Organic Analytes	D-1F
Alpha Analytical Laboratory	Chlorinated Acids	D-1G
Alpha Analytical Laboratory	Carbamates	D-1H
Alpha Analytical Laboratory	Other Organic Compounds	D-1I
Alpha Analytical Laboratory	Volatile Organic Compounds (VOCs)	D-1J
Alpha Analytical Laboratory UL Laboratory and Pace Analytical	Semivolatile Organic Compounds (VOCs)+Dioxin	D-1K
Alpha Analytical Laboratory	Haloacetic Acids	D-1L
ALS Environmental	Nitroaromatics and Nitramines (Explosives)	D-1M
Weck Laboratories, Inc.	Pharmaceuticals and Personal Care Products (PPCPs)	D-1N
UL Laboratory and GEL Laboratories	Radiogenic: Gross Alpha, Beta; Radium 226 and 228, Strontium 90	D-1O
ZyMax Forensics	Stable Isotopes of oxygen and hydrogen in water, nitrogen and oxygen in nitrate	D-1P
Asbestos TEM Laboratories, Inc.	Asbestos	D-1C
Isotech	Tritium (enriched)	D-1O

Notes:
For abbreviation explanations see notes at end of Table D-1P.

Table D-1A: Anions

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		mg/L								Type
Bicarbonate (HCO_3^-)	SM2320B	0.060	66	210	68	70	130	270	–	–
Bromate (BrO_3^-)	EPA 300.1	0.005	ND	ND	ND	ND	ND	ND	0.010	CSMCL-ESMCL
Chloride (Cl^-)	EPA 300.0	0.30	59	100	44	79	86	120	250	CSMCL-ESMCL
Chlorite (ClO_2^-)	EPA 300.0	0.020	ND	ND	ND	ND	ND	ND	1.0	CSMCL-ESMCL
Fluoride (F^-)	EPA 300.0	0.070	ND	ND	ND	ND	ND	0.15	2.0/4.0	CPMCL/EPMCL
Nitrite as N	EPA 300.0	0.02	ND	ND	ND	ND	ND	ND	1.0	CPMCL/EPMCL
Nitrate as NO_3^-	EPA 300.0	0.20	13	0.60	2.4	2.7	11	0.42	45	CPMCL/EPMCL
Sulfate (SO_4^{2-})	EPA 300.0	0.090	14	24	13	9.9	89	73	250	CPMCL/EPMCL

Table D-1B: Metals (Including Major Cations)

Analyte	Method	Units	MDL	City of Seaside 4	FO-7**** Deep	FO-7**** Shallow	MRWPCA MW-1****	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
Aluminum (Al)	EPA 200.8	µg/L	8.0	ND	170****	3,700****	2,700****	4.3	4.8	1,000/200	CPMCL/CMCL
Antimony (Sb)	EPA 200.8	µg/L	0.080	ND	0.75	3.7	0.51	0.033	0.34	6	CPMCL-EPMCL
Arsenic (As)	EPA 200.8	µg/L	0.28	1.2	7.6****	210****	2.8****	1.6	1.6	10	CPMCL-EPMCL
Barium (Ba)	EPA 200.8	µg/L	0.12	26	72****	1,200****	40****	59	66	1,000/2000	CPMCL/EPMCL
Beryllium (Be) (Total)	EPA 200.8	µg/L	0.080	ND	ND	0.68	0.044	ND	ND	4	CPMCL-EPMCL
Boron (B)	EPA 200.8	µg/L	24	42***	140***	25***	36***	32***	90***	–	–
Cadmium (Cd) Total	EPA 200.8	µg/L	0.080	ND	ND	3.3	0.15	0.10	0.51	5	CPMCL-EPMCL
Calcium (Ca) Total	EPA 200.7	mg/L	0.010	14	53	29	17	37	76	–	–
Chromium (Cr) Total	EPA 200.8	µg/L	0.32	3.6	1.7	790****	13****	3.4	ND	50/100	CPMCL/CMCL
Cr(VI)	EPA 218.6	µg/L	0.050*	3.4	ND	1.7	1.1	1.6	ND	10	CPMCL**
Copper (Cu) Total	EPA 200.8	µg/L	0.16	1.1	1.6	14****	3.7	1.9	4.3	1,300/1,000	CPMCL-EPMCL/ CSMCL-ESMCL
Iron (Fe) Total	EPA 200.8	µg/L	7.2	ND	1100****	80,000****	4,000****	67	21	300	CSMCL-ESMCL
Lead (Pb) Total	EPA 200.8	µg/L	0.080	ND	1.3****	42****	1.3****	0.061	0.78	15	CPMCL-EPMCL
Magnesium (Mg) Total	EPA 200.7	mg/L	0.0080	6.5	6.8	3.8	6.5	10	22	–	CPMCL-EPMCL
Manganese (Mn) Total	EPA 200.8	µg/L	0.12	0.25	83****	20,000****	150****	1.1	23	50	CSMCL-ESMCL
Mercury (Hg) Total	EPA 245.1	µg/L	0.060	ND	ND	0.11	ND	ND	0.85	2	CPMCL-EPMCL
Nickel (Ni) Total	EPA 200.8	µg/L	0.24	0.54	2.8****	26****	8.1****	1.3	4.0	100	CPMCLC
Potassium (Total)	EPA 200.7	mg/L	0.0080	2.0	3.7	3.6	3.4	3.1	5.1	–	–
Selenium (Se) Total	EPA 200.8	µg/L	0.28	0.66***	1.8	1.3***	1.5***	2.2	1.8***	50	CPMCL-EPMCL
Silver (Ag) Total	EPA 200.8	µg/L	0.080	ND	ND	0.11	0.028	ND	ND	2	CPMCL-EPMCL
Sodium (Na) Total	EPA 200.7	mg/L	0.020	43	86	38	50	64	91	–	–
Thallium (Tl)	EPA 200.8	µg/L	0.080	ND	ND	0.19	0.027	0.045	ND	2	CPMCL-EPMCL
Uranium (U)	EPA 200.8	pCi/l	0.080	ND	1.6	0.62	0.33	0.20	1.3	20	CPMCL
Vanadium (V)	EPA 200.8	µg/L	1.2	2.5	5.8****	34****	9.5****	1.6	0.76	–	–
Zinc (Zn)	EPA 200.8	µg/L	2.0	2.9	52***	300***	69***	75***	25***	5,000	CPMCL-EPMCL

Notes: * Reporting Level or RL. ** Proposed April 15, 2014. *** Reported in laboratory blank. ****Analysis questionable due to high turbidity (see Table D-1C)

Table D-1C: Conventional Chemistry and Other Parameters

Analyte	Method	Units	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
			Concentration								Type
Asbestos by TEM (chrysotile/amphibole)*	EPA 100.2	MFL	0.1-1.1	ND	ND	ND	ND	ND	ND	7.0	CSMCL-ESMCL
Bicarbonate ($HCO3^-$)	SM2320B	mg/L	0.060	66	210	68	70	130	270	–	–
Color	SM2120B	Color Units	3.0	ND	4.0	4.0	28	6.0	3.0	15	CSMCL
MBAS, calculated as LAS, mw 340	SM5540C	mg/L	0.030	ND	ND	ND	ND	ND	ND	5.0	CSMCL-ESMCL
Odor	EPA 140.1	T.O.N.		ND	ND	ND	1.4	ND	ND	3	CSMCL-ESMCL
Perchlorate (ClO_4^-)	EPA 314.0	µg/L	0.90	ND**	1.9**	ND**	ND**	1.1**	ND**	6.0	CPMCL
Specific Conductance (EC)	SM2510B	µmhos/cm or µS/cm	1.0	340	660	280	270	440	900	900	CSMCL
Total Dissolved Solids (TDS)	SM2540C	mg/L	5.0	250	460	190	220	350	560	500	CSMCL-ESMCL
Turbidity	SM2130B	NTU	0.040	0.32	10	550	71	0.98	0.37	1/5	CPMCL-EPMCL/ CSMCL-ESMCL
Nitrate + Nitrite as N	EPA 300.0	mg/L	0.0086	3.0	0.13	0.55	0.61	2.4	0.094	10	CSMCL-ESMCL
Total Organic Carbon (TOC)	SM5310C	mg/L	0.100	0.274	0.190	0.768	0.898**	0.519**	0.627	–	–
Cyanide (CN^-)	10-204-00-1X	mg/L	0.0020	0.0028	0.0023	ND	ND	ND	ND	0.15/0.20	CPMCL/EPMCL

Note:
* Calculated asbestos structures >10 micrometers (µm)
** Detected in Laboratory Blank

Table D-1D: Chlorinated Pesticides and PCBs

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Aldrin	EPA 508	0.10	ND	ND	ND	ND	ND	ND	–	–
Chloroneb	EPA 508	0.20	ND	ND	ND	ND	ND	ND	–	–
Chlorbenzilate	EPA 508	2.0	ND	ND	ND	ND	ND	ND	–	–
Chlorothalonil	EPA 508	0.030	ND	ND	ND	ND	ND	ND	–	–
DCPA	EPA 508	0.020	ND	ND	ND	ND	ND	ND		
4,4'-DDD	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
4,4'-DDE	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
4,4'-DDT	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
Dieldrin	EPA 508	0.010	ND	ND	ND	ND	ND	ND	–	–
Endosulfan I	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
Endosulfan II	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
Endosulfan sulfate	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
Endrin	EPA 508	0.030	ND	ND	ND	ND	ND	ND	2.0	CPMCL-EPMCL
Endrin aldehyde	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
HCH-alpha (α-BHC)	EPA 508	0.010	ND	ND	ND	ND	ND	ND	–	–
HCH-beta (β-BHC)	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
HCH-delta (δ-BHC)	EPA 508	0.030	ND	ND	ND	ND	ND	ND	–	–
HCH-gamma (γ-BHC) (Lindane)	EPA 508	0.010	ND	ND	ND	ND	ND	ND	0.2	CPMCL-EPMCL
Heptachlor	EPA 508	0.010	ND	ND	ND	ND	ND	ND	0.01/0.4	CPMCL/EPMCL
Heptachlor epoxide	EPA 508	0.010	ND	ND	ND	ND	ND	ND	0.01/0.2	CPMCL/EPMCL

Table 1D: Chlorinated Pesticides and PCBs (continued)

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Hexachlorobenzene	EPA 508	0.010	ND	ND	ND	ND	ND	ND	1.0	CPMCL-EPMCL
Hexachlorocyclo-pentadiene	EPA 508	0.040	ND	ND	ND	ND	ND	ND	50	CPMCL-EPMCL
Methoxychlor	EPA 508	0.020	ND	ND	ND	ND	ND	ND	30/40	CPMCL/EPMCL
cis-Permethrin	EPA 508	0.070	ND	ND	ND	ND	ND	ND	–	–
trans-Permethrin	EPA 508	0.090	ND	ND	ND	ND	ND	ND	–	–
Propachlor	EPA 508	0.070	ND	ND	ND	ND	ND	ND	–	–
Trifluralin	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
PCB (Aroclor)-1016	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1221	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1232	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1242	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1248	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1254	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB -(Aroclor)1260	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
Total PCBs	EPA 508	0.30	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
Toxaphene	EPA 508	0.40	ND	ND	ND	ND	ND	ND	3	CPMCL-EPMCL
Chlordane (tech)	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.1/2	CPMCL/EPMCL

Table D-1E: Nitrogen and Phosphorus Pesticides

Analyte	Method	MDL	City of Seaside 4	FO-07 Deep	FO-07 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Alachlor	EPA 507	0.50	ND	ND	ND	ND	ND	ND	2.0	CPMCL-EPMCL
Atrazine	EPA 507	0.30	ND	ND	ND	ND	ND	ND	–	–
Bromacil	EPA 507	0.50	ND	ND	ND	ND	ND	ND	–	–
Butachlor	EPA 507	0.40	ND	ND	ND	ND	ND	ND	–	–
Dimethoate	EPA 507	0.20	ND	ND	ND	ND	ND	ND	–	–
Metolachlor	EPA 507	0.30	ND	ND	ND	ND	ND	ND	–	–
Metribuzin	EPA 507	0.40	ND	ND	ND	ND	ND	ND	–	–
Molinate	EPA 507	0.20	ND	ND	ND	ND	ND	ND	20	CPMCL
Prometryn	EPA 507	0.50	ND	ND	ND	ND	ND	ND	–	–
Propachlor	EPA 507	0.30	ND	ND	ND	ND	ND	ND	–	–
Simazine	EPA 507	0.30	ND	ND	ND	ND	ND	ND	4.0	CPMCL-EPMCL
Thiobencarb	EPA 507	0.20	ND	ND	ND	ND	ND	ND	70/1	CPMCL/CSMCL

Table D-1F: Organic Analytes

Analyte	Method	MDL	City of Seaside 4	FO-07 Deep	FO-07 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
1,2-Dibromo-3-chloropropane	EPA 504.1	0.0040	ND	ND	ND	ND	ND	ND	0.2	CPMCL-EPMCL
1,2-Dibromoethane (EDB)	EPA 504.1	0.0050	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL

Table D-1G: Chlorinated Acids

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
2,4,5-T	EPA 515.1	0.40	ND	ND	ND	ND	ND	ND	–	–
2,4,5-TP (Silvex)	EPA 515.1	0.50	ND	ND	ND	ND	ND	ND		
2,4-D	EPA 515.1	0.80	ND	ND	ND	ND	ND	ND	–	–
2,4-DB	EPA 515.1	4.0	ND	ND	ND	ND	ND	ND	–	–
4-Nitrophenol	EPA 515.1	0.70	ND	ND	ND	ND	ND	ND	–	–
Acifluorfen	EPA 515.1	0.50	ND	ND	ND	ND	ND	ND	–	–
Bentazon	EPA 515.1	0.40	ND	ND	ND	ND	ND	ND	18	CPMCL
Dicamba	EPA 515.1	0.40	ND	ND	ND	ND	ND	ND	–	–
Dichlorprop	EPA 515.1	1.0	ND	ND	ND	ND	ND	ND	–	–
Dinoseb	EPA 515.1	0.80	ND	ND	ND	ND	ND	ND	7	CPMCL-EPMCL
Pentachlorophenol	EPA 515.1	0.20	ND	ND	ND	ND	ND	ND	1	CPMCL-EPMCL
Picloram	EPA 515.1	0.50	ND	ND	ND	ND	ND	ND	500	CPMCL-EPMCL

Table D-1H: Carbamates

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
3-Hydroxycarbofuran	EPA 531.1	0.90	ND	ND	ND	ND	ND	ND	–	–
Aldicarb	EPA 531.1	0.70	ND	ND	ND	ND	ND	ND	3	EPMCL
Aldicarb sulfone	EPA 531.1	0.70	ND	ND	ND	ND	ND	ND	3	EPMCL
Aldicarb sulfoxide	EPA 531.1	0.80	ND	ND	ND	ND	ND	ND	4	EPMCL
Carbaryl	EPA 531.1	0.70	ND	ND	ND	ND	ND	ND	–	–
Carbofuran	EPA 531.1	2.0	ND	ND	ND	ND	ND	ND	18/40	CPMCL/EPMCL
Methiocarb	EPA 531.1	2.0	ND	ND	ND	ND	ND	ND	–	–
Methomyl	EPA 531.1	2.0	ND	ND	ND	ND	ND	ND	–	–
Oxamyl	EPA 531.1	0.80	ND	ND	ND	ND	ND	ND	50/200	CPMCL/EPMCL
Propoxur (Baygon)	EPA 531.1	2.0	ND	ND	ND	ND	ND	ND	–	–

Table D-1I: Other Organic Compounds

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Diquat	EPA 549.2	2.0	ND	ND	ND	ND	ND	ND	20	CPMCL-EPMCL
Endothall	EPA 548.1	2.0	ND	ND	ND	ND	ND	ND	100	CPMCL-EPMCL
Glyphosate	EPA 547	3.0	ND	ND	ND	ND	ND	ND	700	CPMCL-EPMCL

Table D-1J: Volatile Organic Compounds (VOCs)

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Acetone	EPA 524.2	0.80	ND	ND	2.0	ND	ND	ND	–	–
Acrylonitrile	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Benzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	1/5	CPMCL/EPMCL
Bromobenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Bromochloromethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Bromodichloromethane	EPA 524.2	0.50	ND	ND	ND	ND	ND	ND	80	CPMCL-EPMCL
Bromoform	EPA 524.2	0.50	ND	ND	ND	ND	ND	ND	80	CPMCL-EPMCL
Bromomethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
n-Butylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Sec-Butylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	100/10	CPMCL-EPMCL
Tert-Butylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Carbon disulfide	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Carbon tetrachloride	EPA 524.2	0.30	ND	ND	ND	ND	ND	ND	0.5/5	CPMCL/EPMCL
Chlorobenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	70/100	CPMCL/EPMCL
Chloroethane	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Chloroform	EPA 524.2	0.50	ND	ND	ND	ND	1.2	0.87	80	CPMCL-EPMCL
Chloromethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
2-Chlorotoluene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
4-Chlorotoluene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Dibromochloromethane	EPA 524.2	0.50	ND	ND	ND	ND	ND	ND	80	CPMCL-EPMCL
1,2-Dibromo-3-chloropropane	EPA 524.2	0.36	ND	ND	ND	ND	ND	ND	0.2	CPMCL-EPMCL
1,2-Dibromethane (EDB)	EPA 524.2	0.14	ND	ND	ND	ND	ND	ND	0.05	CPMCL-EPMCL
1,2-Dichlorobenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	600	CPMCL-EPMCL
1,3-Dichlorobenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,4-Dichlorobenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	5/75	CPMCL/EPMCL
Trans-1,4-Dichloro-2-butene	EPA 524.2	0.095	ND	ND	ND	ND	ND	ND	–	–

Table D-1J: Volatile Organic Compounds (VOCs) (continued)

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Dichlorodifluoromethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,1-Dichloroethane	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	5	CPMCL
1,2-Dichloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	0.5/5	CPMCL/EPMCL
1,1-Dichloroethene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	5	CPMCL
Cis-1,2,-Dichloroethene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	6/70	CPMCL/EPMCL
Trans-1,2-Dichloroethene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	10/100	CPMCL/EPMCL
1,2-Dichloropropane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	10/100	CPMCL/EPMCL
1,3-Dichloropropane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
2,2-Dichloropropane	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
1,1-Dichloropropene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Cis-1,3-Dichloropropene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	0.5	CPMCL
Trans-1,3,Dichloropropene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,3-Dichloropropene(total)	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
2-Hexanone	EPA 524.2	0.097	ND	ND	ND	ND	ND	ND	–	–
Ethylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND		
Hexachlorobuteadiene	EPA 524.2	0.30	ND	ND	ND	ND	ND	ND	1,200	CPMCL
Isopropylbenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
p-Isopropyltoluene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Methyl ethyl ketone	EPA 524.2	0.40	ND	ND	ND	ND	ND	ND	–	–
Methyl iodide	EPA 524.2	0.12	ND	ND	ND	ND	ND	ND	–	–
Methyl isobutyl ketone	EPA 524.2	0.30	ND	ND	ND	ND	ND	ND	–	–
Methylene chloride	EPA 524.2	0.40	ND	ND	ND	ND	ND	ND	5/5	CPMCL/EPMCL
Naphthalene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
n-Propylbenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Styrene	EPA 524.2	0.10	ND	ND	ND	0.18	ND	ND	100/100	CPMCL/EPMCL
1,1,1,2-Tetrachloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,1,2,2-Tetrachloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	1	CPMCL
Tetrachloroethane	EPA 524.2	0.20	ND	ND	ND	ND	0.20	ND	5/5	CPMCL/EPMCL

Table D-1J: Volatile Organic Compounds (VOCs) (continued)

Analyte	Method	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Toluene	EPA 524.2	0.10	ND	ND	ND	2.0	ND	ND	150/1000	CPMCL/EPMCL
1,2,3-Trichlorobenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
1,2,4-Trichlorobenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	5/70	CPMCL/EPMCL
1,1,1-Trichloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	200/200	CPMCL/EPMCL
1,1,2-Trichloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	5/5	CPMCL/EPMCL
Trichloroethene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Trichlorofluoromethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	150	CPMCL
Trichlorotrifluoroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,2,3-Trichloropropane	EPA 524.2	0.13	ND	ND	ND	ND	ND	ND	–	–
1,2,4-Trimethylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
1,3,5-Trimethylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Vinyl chloride	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	0.5/2	CPMCL/EPMCL
m,p-Xylene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
o-Xylene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Xylenes (total)	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	1,750/10,000	CPMCL/EPMCL
Trihalomethanes (total)	EPA 524.2	0.50	ND	ND	ND	ND	1.2	0.87	–	–
Methyl tert-butyl ether	EPA 524.2	0.50	ND	ND	ND	ND	ND	ND	–	–
Ethyl tert-butyl ether	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Tert-amyl methyl ether	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–

Table D-1K: Semivolatile Organic Compounds (SVOCs)

Analyte	Method	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
			µg/L							Type
Benzo (a) pyrene	EPA 525.2	0.080	ND	ND	ND	ND	ND	ND	–	–
Di(2-ethylhexyl)adipate	EPA 525.2	0.40	ND	ND	ND	ND	ND	ND	400/400	CPMCL/EPMCL
Di(2-ethylhexyl)phthalate	EPA 525.2	0.20	ND	ND	ND	0.29	ND	ND	4/6	CPMCL/EPMCL
2,3,7,8-Tetrachlorodibenzo-p-Dioxin*	EPA 1613	0.000005	ND	ND	ND	ND	ND	ND	0.00003	CPMCL-EPMCL

Note:
* Dioxin reported in pg/L; converted to µg/L

Table D-1L: Haloacetic Acids

Analyte	Methods	MRL	City of Seaside 4	FO-07 Deep	FO-07 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
		µg/L								Type
Monobromoacetic Acid	EPA 552.2	0.8	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Monochloroacetic Acid	EPA 552.2	1.1	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Dibromoacetic Acid	EPA 552.2	0.8	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Dichloroacetic Acid	EPA 552.2	1.0	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Trichloroacetic Acid	EPA 552.2	1.0	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Total Haloacetic Acids (HAA5)	EPA 552.2	1.0	ND	ND	ND	ND	ND	ND	*	*

Note:
* See individual analytes for regulatory requirements.

Table D-1M: Nitroaromatics and Nitramines (Explosives)

Analyte	Methods	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
		µg/L								Type
HMX	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
RDX	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
1,3,5-Trinitrobenzene	8330B	0.20	ND	ND	ND	ND	ND	ND	–	–
1,3-Dinitrobenzene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
3,5-Dinitroaniline	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
Tetryl	8330B	0.10	ND	ND	ND	ND	ND	ND	–	–
Nitrobenzene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
4-Amino-2,6-dinitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
2-Amino-4,6-dinitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
2,4,6-Trinitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
2,6-Dinitrotoluene	8330B	0.20	ND	0.064*	0.070*	ND	ND	0.037*	–	–
2,4-Dinitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
2-Nitrotoluene	8330B	0.10	ND	ND	ND	ND	ND	ND	–	–
4-Nitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
3-Nitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
Nitroglycerin	8330B	0.98	ND	ND	ND	ND	ND	ND	–	–
Pentaerythritol Tetranitrate	8330B	0.49	ND	ND	ND	ND	ND	ND	–	–

Note:
***** Detected in laboratory blank sample; estimated J value.

Table D-1N: Pharmaceutical and Personal Care Products (PPCPs)

Analyte	Method	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission	ASR MW-1	Regulatory Requirements	
		µg/L								Type
N-nitrosodiethylamine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-nitrosodimethylamine	EPA 1625M	0.002	ND*	ND*	NA	ND	0.0054	ND	0.01	NL
N-nitrosodi-n-butylamine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-nitrosodimethylethylene	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-Nitrosomorpholine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-nitrosopiperdine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-Nitrosopyrrolidine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
17-α-ethynlestradiol	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	–	–
17-β-estradiol	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	–	–
Esdtrone	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	0.0009-1.8	DWEL
Progesterone	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	–	–
Testosterone	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	–	–
Bisphenol A	EPA 1694M-ESI−	0.001	0.009*	0.062*	ND*	0.390*	ND*	1.400*	–	–
Gemfibrozil	EPA 1694M-ESI−	0.001	ND	ND	ND	ND	ND	ND	–	–
Ibuprofen	EPA 1694M-ESI−	0.001	ND	ND	ND	ND	ND	ND	–	–
Iopromide	EPA 1694M-ESI−	0.005	ND	ND	ND	ND	ND	ND	–	–
Naproxen	EPA 1694M-ESI−	0.001	ND	ND	ND	ND	ND	ND	–	–
Salicylic acid	EPA 1694M-ESI−	0.050	52	ND	ND	ND	ND	ND	–	–
Triclosan	EPA 1694M-ESI−	0.002	ND	ND	ND	ND	ND	ND	0.35-2,600	DWEL
Aceltaminophen	EPA 1694M/ESI+	0.020	ND	ND	ND	ND	ND	ND	–	–
Amoxicillin	EPA 1694M=ESI+	0.001	ND	ND	ND	0.014	ND	ND	–	–
Atenolol	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Atorvastatin	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Azithromycin	EPA 1694M-ESI+	0.010	ND	ND	ND	ND	ND	ND	–	–
Caffeine	EPA 1694M-ESI+	0.001	ND	0.0027	ND	0.0068	ND	ND	0.35	DWEL
Carbamazepine	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Ciprofloxacin	EPA 1694M-ESI+	0.005	ND	ND	ND	0.0059	ND	ND	–	–
Cotinine	EPA 1694M-ESI+	0.002	ND	ND	ND	ND	ND	ND	–	–

Table D-1N: Pharmaceutical and Personal Care Products (PPCPs) (continued)

Analyte	Method	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
		µg/L								Type
DEET	EPA 1694M-ESI+	0.001	ND	0.0023	ND	0.006	ND	ND	2.5-6,300	DWEL
Diazepam	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Fluoxetine	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Methadone	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Oxybenzone	EPA 1694M-ESI+	0.001	ND	ND	0.0012	0.087	ND	ND	–	–
Phenyloin	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Primidone	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Sucralose	EPA 1694M-ESI+	0.005	ND	ND	ND	ND	ND	ND	175,000	DWEL
Sulfamethoxazolke	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
TCEP	EPA 1694M-ESI+	0.001	0.0067	ND	ND	0.0064	ND	ND	–	–
TCPP	EPA 1694M-ESI+	0.001	0.0052*	0.0025*	0.0026*	0.011*	0.0032*	0.0016*	–	–
TDCPP	EPA 1694M-ESI+	0.001	0.0011	0.0031	ND	0.0038	ND	ND	–	–
Trimethoprim	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–

Notes:
Laboratory analytical data sheets reported detected values in ng/L; converted to µg/L.
* Detected in laboratory blank sample
NA = Not analyzed for FO-7 Shallow because laboratory instrumental problems resulted in unsuccessful runs; insufficient sample volume remaining for re-analysis.

Table D-1O: Radiogenic

Analyte	Method	DL	City of Seaside 4	FO-7 Deep**	FO-7 Shallow**	MRWPCA MW-1**	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
		pCi/L								Type
Gross Alpha	7110B	3.00	0.29±0.39	3.0±0.5	125±5	6.3±1.2	8.7±1.2	2.8±1.1	15	CPMCL-EPMCL
Gross Beta	7110B	4.0	1.4±0.5	4.5±0.5	114±2	7.5±1.1	8.8±0.9	5.6±1.0	50	CPMCL-EPMCL
Radium 226	7500-RaB	1.00	0.48±0.46	0.47±0.43	22±2.2	0.62±0.31	1.9±0.9	0.73±0.42	††	–
Radium 228	7500-Ra D	1.00	0.11±0.38	0.44±0.38	16.3±1.2	-0.08±0.51	2.2±07	0.45±0.45	††	–
Combined Radium	calculated	1.00	0.59±	0.91±0.57	38.3±2.4	0.54±0.60	4.1±0.7	1.18±0.62	5 ††	CPMCL-EPMCL
Strontium 90	905.0	2.00*	0.339±0.692	-0.439±0.720	0.748±1.140	0.090±1.070	-1.27±0.850	-0.883±0.948	8	CPMCL-EPMCL
Tritium***	Enriched	–	0.07±0.1 (0.2233)	<1.0 (<3.19)	<1.00 (<3.19)	<1.0 (<3.19)	0.75±0.16 (2.39)	<1.00 (<2.19)	(20,000)	CPMCL
Uranium	200.8	0.080	ND	1.6	0.62	0.33	0.20	1.3	20/30†	CPMCL/EPMCL†

Notes:
* MRL for strontium 90
** Turbid sample
*** Tritium (enriched) reported in tritium units (TU) where 1.0 TU = 3.19 pCi/L. Values in parenthesis are in pCi/L.
† In micrograms per liter (µg/L)
†† MCL for combined concentrations of Radium 226 and Radium 228

Table D-1P: Stable Isotopes in Water and Nitrate

Sample	Water (H_2O)				Nitrate (NO_3^-)			
	$\delta^{18}O$		δD		$\delta^{15}N$		$\delta^{18}O$	
	‰	1σ	‰	1σ	‰	1σ	‰	1σ
Monitoring Wells:								
City of Seaside 4	-6.62	0.06	-44.27	0.32	1.4	0.2	0.7	0.4
FO-7 Deep	-7.18	0.06	-48.55	0.32	*	0.2	*	0.4
FO-7 Shallow	-6.36	0.06	-45.44	0.32	8.7	0.2	4.2	0.4
MRWPCA MW-1	-6.56	.0.06	-43.87	0.32	8.9	0.2	4.4	0.4
PRTIW Mission Memorial	-6.14	0.06	-40.68	0.32	2.5	0.2	1.3	0.4
ASR MW-1	-6.4	0.06	-45.90	0.32	*	0.2	*	0.4

Notes:
* Analysis did not produce a reliable compound specific isotope analysis (CSIA) value.
δD = ratio of deuterium to hydrogen (D/H) against Vienna Standard Mean Ocean Water (VSMOW) standard
$\delta^{18}O$ = ratio of $1^8O/^{16}O$ against VSMOW standard
$\delta^{15}N$ = ratio of $^{15}N/^{14}N$ against standard of nitrogen in air
‰ = per mil or parts per thousand
1σ = analytical precision of one sigma

General Notes for Tables D-1A to D-1P:

Samples collected from January 29-30, 2014 and February 3, 2014; received and analyzed, unless otherwise noted, by Alpha Analytical Laboratory, Inc., Ukiah, CA
– (dash) = no data reported
EPA = U.S. Environmental Protection Agency
CPMCL = California Department of Public Health (CDPH) Primary Maximum Contaminant Level
CSMCL = California Department of Public Health (CDPH) Secondary Maximum Contaminant Level
DWEL = U.S. EPA Drinking Water Equivalent Level; advisory only and not to be construed as legally enforceable Federal standards.
EPMCL = U.S. Environmental Protection Agency Primary Maximum Contaminant Level
ESMCL = U.S. Environmental Protection Agency Secondary Maximum Contaminant Level
NL = CDPH Notification Level – advisory in nature and not an enforceable standard
California MCL for Gross Beta = 50 pCi/L; U.S. EPA Primary MCL (EPMCL) = 4 millirems per year (mrem/yr)
CU = Color Units
MFL = Millions of fibers per liter
µg/L = micrograms per liter or parts per billion (ppb)
µS/cm = microSiemans per centimeter (formerly µmohs/cm)
mg/L = milligrams per liter or parts per million (ppm)
pg/L = picograms per liter or parts per quadtrillion (ppq)
pCi/L = picoCuries per liter
TU = tritium units
NTU = Nephelometric Turbidity Units
SM = Standard Method
MFL = Millions of fibers per liter
MRL = Minimum Reporting Limit
ND = Not detected or below MRL
TEM = Transmission Electron Microscope

APPENDIX E

Source Water Sampling Program Water Quality Data Summary

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
General Water Quality Parameters													
Aggressiveness index	--	SM2330	-	--	12.4 (12-12.4)	4 / 4	11.6 (11.3-12)	3 / 3	13.3 (13.2-14)	4 / 4	13.0 (12.8-13.1)	2 / 2	13.3
Alkalinity (in CaCO3 units)	--	SM 2330B	mg/L	--	316 (277-344)	12 / 12	168 (157-260)	3 / 3	356 (327-373)	4 / 4	185 (157-212)	2 / 2	363
-Bicarbonate alkalinity as HCO3	--	SM 2330B	mg/L	--	384 (338-420)	9 / 9	205 (192-310)	3 / 3	427 (399-455)	4 / 4	226 (192-259)	2 / 2	443
Ammonia as N	--	SM 4500NH3F,G	mg/L	--	32.6 (31.3-39.7)	11 / 11	5.0 (2.4-7.5)	2 / 2	*(<0.05-<0.5)*	1 / 3	*<0.05*	0 / 1	*<0.5*
Anion sum	--	SM 1030E	meq/L	--	14.49 (14.05-15.91)	9 / 9	16 (13.51-16.1)	3 / 3	30.36 (17.46-30.89)	4 / 4	15.18	1 / 1	
BOD, 5-day @ 20°C	--	SM 5210B	mg/L	-	84 (10-160)	12 / 12	483 (56-656)	10 / 10	*<2 (<2-5)*	4 / 11	14	1 / 1	*<2*
Bromide	--	EPA 300.0	mg/L	--	*<0.2 (<0.1-0.5)*	10 / 11	*<0.2 (<0.1-4.6)*	6 / 9	1.9 (1.2-2.9)	10 / 10	0.6	1 / 1	2.5
Calcium	--	EPA 200.7	mg/L	--	58 (54-62)	12 / 12	81 (76-100)	10 / 10	155 (128-169)	11 / 11	100 (77-122)	2 / 2	166
Cation sum	--	SM 1030E	meq/L	--	14.19 (13-15.28)	9 / 9	18 (15.25-18.01)	3 / 3	28.87 (19.32-30.18)	4 / 4	14.2	1 / 1	
Chemical Oxygen Demand (COD)	--	EPA 410.4/Hach 8000	mg/L	--	110 (33-158)	12 / 12	1004 (250-1152)	10 / 10	48 (*<5*-163)	9 / 11	92	1 / 1	23
Chloride	sMCL	EPA 300.0	mg/L	250	217 (183-235)	12 / 12	237 (154-292)	9 / 9	274 (241-307)	10 / 10	423 (332-514)	2 / 2	394
Color	sMCL	SM 2120B	units	15	60 (45-75)	4 / 4	170 (150-175)	3 / 3	73 (45-85)	4 / 4	75	1 / 1	175
Conductivity (Specific Conductance)	sMCL	SM 2510B	µS/cm	900	1578 (1508-1623)	12 / 12	1625 (1279-1830)	10 / 10	2861 (2647-2929)	11 / 11	2083 (1607-2559)	2 / 2	2939
Copper	sMCL, EPA PP	EPA 200.8	mg/L	1.3/1.0	*<0.0095 (0.009-<0.01)*	2 / 4	0.012 (*<0.01*-0.073)	2 / 3	*<0.01 (<0.01*-0.013)	2 / 4	*<0.009 (0.008-<0.01)*	1 / 2	*<0.01*
Dissolved organic carbon (DOC)		SM 5310C	mg/L	--	14 (12-14)	10 / 10	280 (100-320)	9 / 9	3.2 (2.6-8.2)	10 / 10	11	1 / 1	7.9
Dissolved oxygen (DO)	--	Field/SM4500-O	mg/L	--	7.6 (5.8-10.5)	11 / 11	7.9 (3.9-8.5)	9 / 9	9.5 (6.9-13.3)	10 / 10	10.9	1 / 1	6.8
Foaming Agents (MBAS)	sMCL	SM 5540C	mg/L	0.5	0.17 (0.16-0.18)	2 / 2	0.066 (0.05-0.082)	2 / 3	0.11 (0.07-0.14)	2 / 2		0 / 1	
Iron	sMCL	EPA 200.7	mg/L	0.3	0.339 (0.175-0.537)	12 / 12	0.43 (0.3-0.875)	3 / 3	1.563 (0.639-3.891)	4 / 4	0.355 (0.202-0.508)	2 / 2	2.962
Langelier index (15C)	--	SM 2330B	-	--	0.44 (0.41-0.48)	4 / 4	0.34	1 / 1	1.22 (1.07-1.9)	4 / 4	1.22 (1.06-1.37)	2 / 2	
Magnesium	--	EPA 200.7	mg/L	--	22 (20-24)	12 / 12	34 (28-39)	4 / 4	146 (140-177)	5 / 5	42 (32-52)	2 / 2	159
Manganese	sMCL, NL	EPA 200.8	mg/L	0.5/0.5	0.045 (0.034-0.051)	12 / 12	0.049 (0.039-0.051)	3 / 3	0.243 (0.06-0.449)	4 / 4	0.281 (0.219-0.342)	2 / 2	0.108
Nitrate (as NO3)	pMCL	EPA 300.0	mg/L	45	21.5 (*<1*-42)	11 / 12	22.5 (*<1.1*-28)	9 / 10	292 (70.3-352)	11 / 11	*<1*	0 / 2	255
Nitrite (as N)	pMCL	EPA 300.0	mg-N/L	1	1.4 (0.4-2.2)	12 / 12	0.6 (*<0.1*-1.5)	3 / 5	0.3 (0.2-0.8)	6 / 6	*<0.1*	0 / 2	0.5
Nitrate+Nitrite (sum as N)	pMCL	EPA 300.0	mg-N/L	10	6.5 (2.3-11)	11 / 11	6.2 (*<0.1*-7.7)	4 / 5	69.6 (63-77.3)	6 / 6	*<0.1 (<0.1*-0.1)	1 / 2	58
Odor-Threshold	sMCL	SM 2150B	units	3	19 (8-200)	4 / 4	300 (200-350)	3 / 3	7 (2-40)	4 / 4	2	1 / 1	2
Oil and Grease	--	EPA 1664	mg/L	--	*<5*	0 / 4	*<5 (<5*-7)	1 / 3	*<5*	0 / 4	*<5*	0 / 1	
pH	--	SM 2330B/SM4500H +B	pH	--	7.75 (7.34-8)	12 / 12	6.95 (6.46-7.3)	10 / 10	8.1 (7.7-8.6)	11 / 11	8.3	2 / 2	8
Phosphate (Orthophosphate as P)	--	EPA 300.0	mg/L	--	3.1 (2.2-13)	11 / 11	15.8 (3.1-47.2)	9 / 9	*<0.1 (<0.1*-0.2)	2 / 10	*<0.1*	0 / 2	*<0.1*
Potassium	--	EPA 200.7	mg/L	--	21 (19-23)	12 / 12	36 (32-42)	5 / 5	2.3 (1-2.7)	6 / 6	7.8 (6.2-9.3)	2 / 2	4.9

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Settleable Solids	--	SM 2540F	mL/L	--	<0.1 (<0.1-0.2)	2 / 4	0.7 (<0.1-1.75)	2 / 3	<0.1 (<0.1-0.2)	1 / 4	<0.1	0 / 1	<0.1
Silica	--	EPA 200.7	mg/L	--	40.5 (39-44)	12 / 12	44 (41-48)	10 / 10	29 (26-63)	11 / 11	<0.5	0 / 1	30
Silver	sMCL, EPA PP	EPA 200.8	mg/L	0.1	<0.01	0 / 4	<0.01	0 / 3	<0.01	0 / 4	<0.01	0 / 2	<0.01
Sodium	--	EPA 200.7	mg/L	--	161 (144-173)	12 / 12	177 (133-201)	9 / 9	241 (196-266)	10 / 10	235 (174-296)	2 / 2	333
Sulfate	sMCL	EPA 300.0	mg/L	250	89 (83-151)	12 / 12	170 (153-172)	3 / 3	523 (498-530)	4 / 4	157 (127-186)	2 / 2	412
Temperature	--	Field/SM 2550B	°C	--	12.3 (6.1-25.8)	10 / 11	12.9 (7.7-16)	9 / 9	15.5 (9.7-25)	10 / 10	19	1 / 1	18
Total Dissolved Solids (TDS)	sMCL	EPA 160.1/SM 2540C	mg/L	500	793 (771-803)	12 / 12	1282 (797-1591)	10 / 10	2003 (1822-2066)	11 / 11	1226 (946-1506)	2 / 2	1968
Total hardness as CaCO3	--	SM 2340B	mg/L	--	233 (220-250)	10 / 10	358 (318-420)	4 / 4	981 (908-1118)	5 / 5	422 (324-519)	2 / 2	1069
Total Kjehldahl Nitrogen (TKN)	--	EPA 351.2/SM 4500B,C	mg/L	--	37.2 (23.8-42.7)	12 / 12	19.5 (12.5-43.6)	10 / 10	<0.5 (<0.2-8.8)	4 / 11	1.2	1 / 1	<1
Total Nitrogen	--	calculation	mg/L	--	44.2 (26.6-50.5)	12 / 12	25.3 (19-51.1)	5 / 5	70.1 (63-77.3)	6 / 6	1.3	1 / 1	58
Total Organic Carbon (TOC)	--	SM 5310C	mg/L	--	15 (12-17)	12 / 12	295 (66-340)	10 / 10	3 (2.5-11)	11 / 11	14	1 / 1	8.8
Total Phosphorus as P	--	SM 4500-PE/EPA 365.1	mg/L	--	3.9 (3.4-4.3)	4 / 4	45 (6.9-45)	3 / 3	0.36 (0.3-0.66)	4 / 4	0.39	1 / 1	0.82
Dissolved Phosphorus	--	SM 4500-PE/EPA 365.1	mg/L	--	4.1 (3.4-8.6)	4 / 4	17 (6.4-27)	2 / 2	0.27 (0.26-0.47)	3 / 3	0.26	1 / 1	0.65
Total Suspended Solids (TSS)	--	SM 2540D	mg/L	--	<6 (9-<10)	11 / 12	98 (54-140)	10 / 10	48 (16-335)	11 / 11	18	1 / 1	62
Turbidity	sMCL	EPA 180.1	NTU	5	3.2 (1.5-4.8)	12 / 12	51 (28-72)	10 / 10	28 (7.1-150)	11 / 11	15 (12-18)	2 / 2	50
UV-254 Absorbance	--	SM 5910	cm^{-1}	--	0.208 (0.189-0.226)	12 / 12	0.278 (0.207-0.488)	3 / 3	0.225 (0.198-0.253)	4 / 4	0.279	1 / 1	0.318
UV Transmittance	--	calculation	%	--	62% (59%-65%)	12 / 12	53% (33%-62%)	3 / 3	60% (56%-63%)	4 / 4	0.526	1 / 1	48.10%
Zinc	sMCL, EPA PP	EPA 200.8	mg/L	5	<0.018 (0.016-<0.05)	1 / 4	0.112 (0.062-0.135)	3 / 3	(<0.01-<0.05)	1 / 4	0.032 (0.022-0.042)	2 / 2	
Microbiological Quality													
Cryptosporidium	--	EPA 1623	oocysts/L	TT	0.39 (<0.10-0.9)	3 / 4	<0.38	0 / 3	<0.19 (<0.18-0.2)	1 / 4	<0.3	0 / 1	<0.09
Giardia	--	EPA 1623	cysts/L	-	<0.1 (<0.1-0.2)	1 / 4	<0.38	0 / 3	<0.18	0 / 4	<0.3	0 / 1	<0.09
Total coliform[1]	pMCL	SM 9223B	MPN/100mL	TT	$7.3x10^6$ ($1.9x10^5$-$1.6x10^6$)	9 / 11	$7.7x10^6$ ($6.2x10^5$-$9.6x10^7$)	2 / 3	$7.3x10^4$ ($8.4x10^3$-$2.0x10^6$)	4 / 4	$3.5x10^3$	1 / 1	$1.7x10^5$
E. coli[1]	pMCL	SM 9223B	MPN/100mL	TT	$1.8x10^5$ ($2.9x10^4$-$5.8x10^5$)	11 / 11	$<2x10^1$ ($1.8x10^1$-$<1.0x10^2$)	1 / 3	$2.7x10^2$ ($7.5x10^1$-$2.0x10^3$)	4 / 4	$<1.0x10^2$	0 / 1	$7.5x10^2$
Enterococcus[1]	--	SM 9230B	MPN/100 mL	-	$1.95x10^4$ ($3.7x10^3$-$8.2x10^4$)	4 / 4	$<2x10^1$ ($2.0x10^1$-$<1.0x10^2$)	2 / 3	$1.6x10^2$ ($1.0x10^1$-$2.2x10^2$)	4 / 4	$2.0x10^2$	1 / 1	$8.4x10^1$
DDW Drinking Water Maximum Contaminant Levels (MCLs) - primary MCLs (pMCLs) and secondary MCLs (sMCLs)													
MCLs -- Inorganics													
Aluminum	pMCL, sMCL, EPA CCL	EPA 200.8	mg/L	1/0.2	0.048 (0.021-0.256)	10 / 11	0.237 (0.14-0.598)	3 / 3	0.77 (0.26-2.04)	4 / 4	0.296 (0.189-0.402)	2 / 2	1.54
Antimony	pMCL, EPA PP	EPA 200.8	mg/L	0.006	<0.001	0 / 4	<0.001	0 / 3	<0.001	0 / 4	<0.001 (<0.001-0.001)	1 / 2	0.001
Arsenic	pMCL, EPA PP	EPA 200.8	mg/L	0.01	0.0025 (0.002-0.0041)	4 / 4	0.0039 (0.003-0.004)	3 / 3	0.0075 (0.007-0.0085)	4 / 4	0.004	2 / 2	0.011
Asbestos	pMCL, EPA PP	EPA 100.2	MFL	7	<6.4 (<4.02-<6.8)	0 / 4	<6.4 (<4.02-<6.8)	0 / 3	<6.4 (<4.02-<6.8)	0 / 4	1	1 / 1	<6.7
Barium	pMCL	EPA 200.8	mg/L	1	0.012 (0.011-0.026)	4 / 4	0.096 (0.082-0.109)	3 / 3	0.068 (0.054-0.079)	4 / 4	0.086 (0.065-0.107)	2 / 2	0.119
Beryllium	pMCL, EPA PP	EPA 200.8	mg/L	0.004	<0.001	0 / 4	<0.001	0 / 3	<0.001	0 / 4	<0.001	0 / 2	<0.001

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Cadmium	pMCL, EPA PP	EPA 200.8	mg/L	0.005	*<0.0005*	**0 / 4**	*<0.0005* (*<0.0005*-**0.002**)	**1 / 3**	*<0.0005*	**0 / 4**	*<0.0005* (*<0.0005*-**0.0005**)	**1 / 2**	*<0.0005*
Chromium	pMCL, EPA PP, UCMR 3	EPA 200.8	mg/L	0.05	**0.0016** (**0.00092-0.003**)	**4 / 4**	**0.009** (**0.0049-0.01**)	**3 / 3**	**0.0046** (**0.0017-0.019**)	**4 / 4**	**0.0025** (**0.002-0.003**)	**2 / 2**	**0.019**
Cyanide	pMCL, EPA PP	SM 4500CN-F	mg/L	0.15	**0.049** (**0.006-0.13**)	**4 / 4**	**0.075** (**0.011-0.089**)	**3 / 3**	*<0.005* (*<0.005*-**0.127**)	**1 / 4**	*<0.005*	**0 / 1**	*<0.005*
Fluoride	pMCL	SM 4500F-C/EPA 300.0	mg/L	2	**0.6** (**0.4-0.8**)	**4 / 4**	**0.3** (*<0.1*-**31.9**)	**2 / 3**	**0.7** (**0.66-0.9**)	**4 / 4**	**0.3**	**2 / 2**	**0.7**
Mercury	pMCL, EPA PP	EPA 245.1	mg/L	0.002	*<0.0002*	**0 / 4**	*<0.0002*	**0 / 3**	*<0.0002*	**0 / 4**	*<0.0002*	**0 / 2**	*<0.0002*
Nickel	pMCL, EPA PP	EPA 200.8	mg/L	0.1	*<0.01*	**0 / 4**	*<0.01* (*<0.01*-**0.01**)	**1 / 3**	**0.025** (**0.02-0.038**)	**4 / 4**	*<0.0085* (**0.007**-*<0.01*)	**1 / 2**	**0.034**
Perchlorate	pMCL, UCMR 1	EPA 314	mg/L	0.006	*<0.002*	**0 / 4**	*<0.002*	**0 / 3**	*<0.002*	**0 / 4**	*<0.002*	**0 / 1**	*<0.002*
Selenium	pMCL, EPA PP	EPA 200.8	mg/L	0.05	**0.0025** (**0.002**-*<0.005*)	**3 / 4**	*<0.005* (*<0.005*-**0.005**)	**2 / 3**	**0.013** (**0.0092-0.018**)	**4 / 4**	**0.0055** (**0.005-0.006**)	**2 / 2**	**0.015**
Thallium	pMCL, EPA PP	EPA 200.8	mg/L	0.002	*<0.001*	**0 / 4**	*<0.001*	**0 / 3**	*<0.001* (*<0.001*-**0.001**)	**1 / 4**	*<0.001*	**0 / 2**	*<0.001*
MCLs - Volative Organic Chemicals (VOCs)													
1,1-Dichloroethane	pMCL, EPA PP, UCMR 3	EPA 524.2	µg/L	5	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,1-Dichloroethylene	pMCL, EPA PP	EPA 524.2	µg/L	6	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,1,1-Trichloroethane	pMCL, EPA PP	EPA 524.2	µg/L	200	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	pMCL	EPA 524.2	µg/L	1,200	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,1,2-Trichloroethane	pMCL, EPA PP	EPA 524.2	µg/L	5	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,1,2,2-Tetrachloroethane	pMCL, EPA PP	EPA 524.2	µg/L	1	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,2-Dichlorobenzene	pMCL, EPA PP	EPA 524.2	µg/L	600	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,2-Dichloroethane	pMCL, EPA PP	EPA 524.2	µg/L	0.5	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,2-Dichloropropane	pMCL, EPA PP	EPA 524.2	µg/L	5	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,2,4-Trichlorobenzene	pMCL, EPA PP	EPA 524.2	µg/L	5	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,3-Dichloropropene	pMCL, PoLI, EPA PP	EPA 524.2	µg/L	0.5	*<0.5*	**0 / 4**	*<0.5* (*<0.5*-**0.7**)	**1 / 3**	*<0.5* (*<0.5*-**0.62**)	**1 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,4-Dichlorobenzene	pMCL, EPA PP	EPA 524.2	µg/L	5	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Benzene	pMCL, EPA PP	EPA 524.2	µg/L	1	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Carbon Tetrachloride	pMCL, EPA PP	EPA 524.2	µg/L	0.5	*<0.5*	**0 / 4**	*<0.5* (*<0.5*-**0.52**)	**1 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
cis-1,2-Dichloroethylene	pMCL	EPA 524.2	µg/L	6	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Dichloromethane	pMCL, EPA PP	EPA 524.2	µg/L	5	*<0.5*	**0 / 4**	*<0.5* (*<0.5*-**0.94**)	**1 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Ethylbenzene	pMCL, EPA PP	EPA 524.2	µg/L	300	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Methyl-tert-butyl ether (MTBE)	pMCL, sMCL, UCMR 1	EPA 524.2	µg/L	13	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Monochlorobenzene	pMCL	EPA 524.2	µg/L	70	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Styrene	pMCL	EPA 524.2	µg/L	100	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Tetrachloroethylene	pMCL, EPA PP	EPA 524.2	µg/L	5	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Toluene	pMCL, EPA PP	EPA 524.2	µg/L	150	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
trans-1,2-Dichloroethylene	pMCL	EPA 524.2	µg/L	10	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Trichloroethylene	pMCL, EPA PP	EPA 524.2	µg/L	5	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Trichlorofluoromethane	pMCL	EPA 524.2	µg/L	150	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Vinyl Chloride	pMCL, EPA PP	EPA 524.2	µg/L	0.5	*<0.3*	**0 / 4**	*<0.3*	**0 / 3**	*<0.3*	**0 / 4**	*<0.3*	**0 / 1**	*<0.3*
Xylenes	pMCL	EPA 524.2	µg/L	1,750	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
MCLs - Non-Volatile Synthetic Organic Chemicals (SOCs)													
2,4-D	pMCL	EPA 515.4	µg/L	70	**0.29** (*<0.1*-**0.78**)	**2 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Alachlor	pMCL, UCMR 2	EPA 505	µg/L	2	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 9**	*<0.1*	**0 / 1**	*<0.05*

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Atrazine	pMCL	EPA 525.2	µg/L	1	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Bentazon	pMCL	EPA 515.4	µg/L	18	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Benzo(a)pyrene	pMCL, EPA PP	EPA 525.2	µg/L	0.2	*<0.02*	**0 / 4**	*<0.02*	**0 / 3**	*<0.02*	**0 / 4**	*<0.02*	**0 / 1**	*<0.02*
Carbofuran	pMCL	EPA 531.2	µg/L	18	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chlordane	pMCL, EPA PP	EPA 505	µg/L	0.1	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 9**	*<0.1*	**0 / 1**	*<0.1*
Chlordane	pMCL, EPA PP	EPA 608	µg/L	0.1			*<0.05*	**0 / 1**	*<0.05*	**0 / 1**	*<0.05*	**0 / 1**	*<0.05*
Dalapon	pMCL	EPA 515.4	µg/L	200	*<1*	**0 / 4**	*<1*	**0 / 3**	*<1*	**0 / 4**	*<1*	**0 / 1**	*<1*
Di(2-ethylhexyl)adipate	pMCL	EPA 525.2	µg/L	400	*<0.6*	**0 / 4**	*<0.6* *(<0.6-***0.95***)*	**1 / 3**	*<0.6*	**0 / 4**	*<0.6*	**0 / 1**	*<0.6*
Di(2-ethylhexyl)phthalate	pMCL, EPA PP	EPA 525.2	µg/L	4	**1.5 (1-78)**	**4 / 4**	**3.2** *(<0.6-***5.9***)*	**2 / 3**	*<0.6*	**0 / 4**	*<0.6*	**0 / 1**	**78**
Di(2-ethylhexyl)phthalate	pMCL, EPA PP	EPA 8720C	µg/L	4	*<4*	**0 / 4**	**10** *(<4-***16***)*	**2 / 3**	*<4*	**0 / 4**	*<4*	**0 / 1**	*<4*
Dibromochloropropane	pMCL	EPA 551.1	µg/L	0.2	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 4**	*<0.01*	**0 / 1**	*<0.01*
Dinoseb	pMCL	EPA 515.4	µg/L	7	*<0.2*	**0 / 4**	*<0.2*	**0 / 3**	*<0.2*	**0 / 4**	*<0.2*	**0 / 1**	*<0.2*
Diquat	pMCL, PoLI	EPA 549.2	µg/L	20	*<0.4*	**0 / 4**	*<0.4*	**0 / 3**	*<0.4*	**0 / 4**	*<0.4*	**0 / 1**	*<0.4*
Endothall	pMCL	EPA 548.1	µg/L	100	*<20*	**0 / 4**	*<20*	**0 / 3**	*<20*	**0 / 4**	*<20*	**0 / 1**	*<20*
Endrin	pMCL	EPA 505	µg/L	2	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 9**	*<0.01*	**0 / 1**	*<0.01*
Ethylene Dibromide	pMCL	EPA 551.1	µg/L	0.05	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 4**	*<0.01*	**0 / 1**	*<0.01*
Glyphosate	pMCL, PoLI	EPA 547	µg/L	700	*<6*	**0 / 4**	*<6*	**0 / 3**	**7.5** *(<6-***9.2***)*	**2 / 4**	*<6*	**0 / 1**	*<6*
Heptachlor	pMCL, EPA PP	EPA 505	µg/L	0.01	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 9**	*<0.01*	**0 / 1**	*<0.01*
Heptachlor Epoxide	pMCL, EPA PP	EPA 505	µg/L	0.01	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 9**	*<0.01*	**0 / 1**	*<0.01*
Hexachlorobenzene	pMCL	EPA 525.2	µg/L	1	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Hexachlorocyclopentadiene	pMCL	EPA 525.2	µg/L	50	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Lindane	pMCL, PoLI	EPA 505	µg/L	0.2	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 9**	*<0.01*	**0 / 1**	*<0.01*
Methoxychlor	pMCL	EPA 505	µg/L	30	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 9**	*<0.05*	**0 / 1**	*<0.05*
Methoxychlor	pMCL	EPA 608	µg/L	30			*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*
Molinate	pMCL, UCMR 1	EPA 525.2	µg/L	20	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Oxamyl	pMCL, PoLI	EPA 531.2	µg/L	50	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5* *(<0.5-***2.4***)*	**1 / 4**	*<0.5*	**0 / 1**	*<0.5*
Pentachlorophenol	pMCL, EPA PP	EPA 515.4	µg/L	1	*<0.04*	**0 / 4**	*<0.04*	**0 / 3**	*<0.04* *(<0.04-***0.06***)*	**1 / 4**	**0.06**	**1 / 1**	*<0.04*
Picloram	pMCL	EPA 515.4	µg/L	500	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Polychlorinated Biphenyls	pMCL	EPA 505	µg/L	0.5	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 7**	*<0.1*	**0 / 1**	*<0.1*
Simazine	pMCL, PoLI	EPA 525.2	µg/L	4	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Thiobencarb	pMCL, sMCL, PoLI	EPA 525.2	µg/L	70	*<0.2*	**0 / 4**	*<0.2*	**0 / 3**	*<0.2*	**0 / 4**	*<0.2*	**0 / 1**	*<0.2*
Toxaphene	pMCL, EPA PP	EPA 505	µg/L	3	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 8**	*<0.5*	**0 / 1**	*<0.5*
2,3,7,8-TCDD (Dioxin)	pMCL, EPA PP	EPA 1613	µg/L	3.00E-05	*<2.1E-06*	**0 / 4**	*<1.90E-06*	**0 / 3**	*<1.9E-06*	**0 / 4**	*<1.9E-06*	**0 / 1**	*<1.9E-06*
2,4,5-TP (Silvex)	pMCL	EPA 515.4	µg/L	50	*<0.2*	**0 / 4**	*<0.2*	**0 / 3**	*<0.2*	**0 / 4**	*<0.2*	**0 / 1**	*<0.2*
MCLs - Radionuclides													
Gross Alpha Particle (excluding radon and uranium)	pMCL	EPA 900.0	pCi/L	15	*<2.02±0.95 (<1.35±0.828-***4.55±2.07***)*	**1 / 4**	**2.4±1.3** *(<2.07±1.27-***6.32±2.64***)*	**2 / 3**	**8.9±2.21 (4.47±2.21-9.62±2.47)**	**4 / 4**	**2.15±1.33**	**1 / 1**	**1.81±5.89**
Gross Beta			pCi/L	4 mrem/yr	**15±4.5 (14.9±1.59-16±2.45)**	**4 / 4**	**21±2.3 (17.6±2.09-25±2.41)**	**2 / 2**	**3.8±3.0** *(<3±3.7-***4.68±2.29***)*	**1 / 2**	**15.2±2.05**	**1 / 1**	*<6.110±3.66*
Radium-226	pMCL	EPA 903.1	pCi/L	5 (Combined)	*<0.906±0.364 (***0.318±0.38-***<0.94±0.552)*	**1 / 4**	(<0.764±0.479-<0.827±0.487)	**0 / 3**	*(<0.51±0.374-<0.923±0.398)*	**0 / 4**	*<0.784±0.549*	**0 / 1**	*<0.602±0.311*
Radium-228	pMCL	EPA 904.0	pCi/L		*(<0.82±0.388-<0.971±0.484)*	**0 / 4**	*<0.95±0.403 (<0.671±0.333-***0.95±0.504***)*	**1 / 3**	*(<0.609±0.266-<0.976±0.439)*	**0 / 4**	*<0.814±0.394*	**0 / 1**	*<0.991±0.452*
Strontium-90	pMCL	EPA 905.0	pCi/L	8	*(<0.38±0.204-<1.44±0.569)*	**0 / 4**	*(<0.545±0.29-<1.26±0.584)*	**0 / 3**	*(<0.756±0348-<1.7±0.872)*	**0 / 4**	*<0.571±0.225*	**0 / 1**	*<0.738±0.409*

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Tritium	pMCL	EPA 906.0	pCi/L	20,000	*(<193±112-<222±127)*	**0 / 4**	*(<204±107-<215±118)*	**0 / 3**	*(<213±115-<217±129)*	**0 / 4**	*<230±126*	**0 / 1**	*<225±124*
Uranium	pMCL	EPA 900.0	pCi/L	20	**2.15 (1.9-2.4)**	**4 / 4**	**5.7 (3.2-6.7)**	**3 / 3**	**12.5 (11-13)**	**4 / 4**	**1.4**	**1 / 1**	**10**
MCLs - Disinfection By-Products (DBPs)													
Bromate	pMCL	EPA 317	µg/L	10	*<1*	**0 / 4**	*<1*	**0 / 3**	*<1*	**0 / 4**	*<1*	**0 / 1**	*<1*
Chlorite	pMCL	EPA 300.1	µg/L	1,000	*<10*	**0 / 4**	*<10*	**0 / 3**	*<10*	**0 / 4**	*<10*	**0 / 1**	*<10*
Total Haloacetic acids (HAAs)	pMCL	SM6251B	µg/L	60	**3.7 (2.4-4.4)**	**4 / 4**	**200 (62-390)**	**3 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	**2.6**
Total trihalomethanes (TTHM)	pMCL	EPA 551.1	µg/L	80	*<0.5 (<0.5-***0.82***)*	**1 / 4**	**63 (2.6-160)**	**3 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
DDW Drinking Water Notification Levels													
Boron	NL	EPA 200.7	µg/L	1,000	**300 (290-350)**	**4 / 4**	**210 (190-290)**	**3 / 3**	**670 (590-700)**	**4 / 4**	**180 (110-240)**	**2 / 2**	**510**
n-Butylbenzene	NL	EPA 524.2	µg/L	260	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
sec-Butylbenzene	NL, EPA CCL	EPA 524.2	µg/L	260	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
tert-Butylbenzene	NL	EPA 524.2	µg/L	260	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Carbon disulfide	NL	EPA 524.2	µg/L	160	*<0.5*	**0 / 4**	*<0.5 (<0.5-***0.67***)*	**1 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chlorate	NL, UCMR 3	EPA 300.1	µg/L	800	*<20*	**0 / 4**	*<20 (<20-***420***)*	**1 / 3**	*<20*	**0 / 4**	**3.9**	**1 / 1**	*<20*
2-Chlorotoluene	NL	EPA 524.2	µg/L	140	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.4*	**0 / 1**	*<0.5*
4-Chlorotoluene	NL	EPA 524.2	µg/L	140	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Diazinon	NL, UCMR 1, PoLI	EPA 525.2	µg/L	1.2	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 11**	*<0.1*	**0 / 1**	*<0.1*
Dichlorodifluoromethane (Freon 12)	NL	EPA 524.2	µg/L	1,000	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,4-Dioxane	NL, UCMR 3	EPA 522	µg/L	1	*<1 (<1-***1.2***)*	**4 / 11**	*<1*	**0 / 10**	*<1*	**0 / 11**	*<1*	**0 / 1**	*<1*
Ethylene glycol	NL	EPA 8270C	µg/L	14,000	*<40*	**0 / 4**	*<40*	**0 / 3**	*<40*	**0 / 4**	*<40*	**0 / 1**	*<40*
Formaldehyde	NL, EPA CCL	EPA 556	µg/L	100	**11 (9.7-13)**	**4 / 4**	**70 (6.9-120)**	**3 / 3**	*<5 (<5-***6.3***)*	**1 / 4**	**5.3**	**1 / 1**	*<5*
HMX (or Octogen)	NL	LC-MS-MS	µg/L	350	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Isopropylbenzene	NL	EPA 524.2	µg/L	770	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Methyl isobutyl ketone (MIBK)	NL	EPA 524.2	µg/L	120	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<5*	**0 / 1**	*<5*
Naphthalene	NL	EPA 524.2	µg/L	17	*<0.3*	**0 / 4**	*<0.3*	**0 / 3**	*<0.3*	**0 / 4**	*<0.3*	**0 / 1**	*<0.3*
N-Nitrosodiethyamine (NDEA)	NL, UCMR 2	EPA 521	ng/L	10	**2.1 (<2-3.7)**	**2 / 4**	*<2 (<2-***3.2***)*	**1 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	*<2*
N-Nitrosodimethylamine (NDMA)	NL, EPA PP, UCMR 2	EPA 521	ng/L	10	**5.1 (2.0-16)**	**11 / 11**	**10 (<2-340)**	**7 / 10**	*<2 (<2-***2.4***)*	**1 / 11**	*<2*	**0 / 1**	*<2*
N-Nitrosodi-n-propylamine (NDPA)	NL, EPA PP, UCMR 2	EPA 521	ng/L	10	*<2 (<2-***6.9***)*	**1 / 4**	*<2*	**0 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	*<2*
Propachlor	NL	EPA 525.2	µg/L	90	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
n-Propylbenzene	NL	EPA 524.2	µg/L	260	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	NL, UCMR 1&2	LC-MS-MS	µg/L	0.3	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Tertiary butyl alcohol (TBA)	NL	EPA 524.2m	µg/L	12	**2.9 (2.6-3.3)**	**4 / 4**	*<2 (<2-***3***)*	**1 / 3**	*<2 (<2-***2***)*	**1 / 4**	*<2*	**0 / 1**	*<2*
1,2,3-Trichloropropane (1,2,3-TCP)	NL	EPA 524.2m	µg/L	0.005	*<0.005*	**0 / 4**	*<0.005*	**0 / 3**	*<0.005*	**0 / 4**	*<0.005*	**0 / 1**	*<0.005*
1,2,4-Trimethylbenzene	NL, EPA PP	EPA 524.2	µg/L	330	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
1,3,5-Trimethylbenzene	NL	EPA 524.2	µg/L	330	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
2,4,6-Trinitrotoluene (TNT)	NL, UCMR 2	LC-MS-MS	µg/L	1	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Vanadium	NL, UCMR 3	EPA 200.8	µg/L	50	**4 (3.4-9.8)**	**4 / 4**	**16 (13-18)**	**3 / 3**	**16 (13-30)**	**4 / 4**	**3.3**	**1 / 1**	**21**
DDW Drinking Water Archived Advisory Levels													
3-Hydroxycarbofuran	EPA CCL 3	EPA 531.2	µg/L	--	**1.5 (1.4-2.1)**	**4 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Aldicarb	aNL	EPA 531.2	µg/L	7	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Aldrin	aNL	EPA 505	µg/L	0.002	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 8**	*<0.01*	**0 / 1**	*<0.01*
Baygon	aNL	EPA 531.2	µg/L	30	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 5**	*<0.5*	**0 / 1**	*<0.5*
alpha-BHC	aNL	EPA 8081A	µg/L	0.015	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
alpha-BHC	aNL	EPA 608	µg/L	0.015			*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*
beta-BHC	aNL	EPA 8081A	µg/L	0.025	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
beta-BHC	aNL	EPA 608	µg/L	0.025			*<0.005*	**0 / 1**	*<0.005*	**0 / 1**	*<0.005*	**0 / 1**	*<0.005*
Captan	aNL, EPA CCL, PoLI	EPA 8081/8082	µg/L	15	*<0.05*	**0 / 3**	*<0.05*	**0 / 2**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Carbaryl	aNL, PoLI	EPA 531.2	µg/L	700	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chloropicrin	aNL, PoLI	EPA 551.1	µg/L	50	*<0.5*	**0 / 4**	*<0.5* (*<0.5*-**0.51**)	**1 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chloropropham (CIPC)	aNL	EPA 8321	µg/L	1,200	*<2*	**0 / 4**	*<2*	**0 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	*<2*
1,3-Dichlorobenzene	aNL	EPA 8270C	µg/L	600	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<5*	**0 / 1**	*<5*
Dieldrin	aNL, EPA PP	EPA 525.2	ng/L	2	*<200*	**0 / 4**	*<200*	**0 / 3**	*<200*	**0 / 11**	*<200*	**0 / 1**	*<200*
Dieldrin	EPA PP, aNL	EPA 505	ng/L	2	*<10*	**0 / 4**	*<10*	**0 / 3**	**17** (*<10*-**28**)	**8 / 9**	*<10*	**0 / 1**	*<10*
Dieldrin	aNL, EPA PP	EPA 8081/8082	ng/L	2	*<50*	**0 / 4**	*<50*	**0 / 3**	*<50*	**0 / 4**	*<50*	**0 / 1**	*<50*
Dieldrin	aNL, EPA PP	EPA 608	ng/L	2			*<10*	**0 / 1**	**31**	**1 / 1**	*<10*	**0 / 1**	*<10*
Dimethoate	aNL, UCMR 2, PoLI	EPA 525.2	µg/L	1	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
2,4-Dimethylphenol	aNL, EPA PP	EPA 8270C	µg/L	100	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<5*	**0 / 1**	*<5*
Diphenamide	aNL	EPA 8141	µg/L	200	*<0.1*	**0 / 3**	*<0.1*	**0 / 2**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Ethion	aNL	EPA 8141	µg/L	4	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Malathion	aNL, PoLI	EPA 525.2	µg/L	160	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1* (*<0.1*-**0.14**)	**1 / 4**	*<0.1*	**0 / 1**	*<0.1*
Methylisothiocyanate	aNL	EPA 131	µg/L	190	*<1* (*<1*-**7.4**)	**1 / 4**	*<1*	**0 / 3**	*<1*	**0 / 4**	*<1*	**0 / 1**	*<1*
Methyl parathion	aNL	EPA 8141	µg/L	2	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Parathion	aNL	EPA 525.2	µg/L	40	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Pentachloronitrobenzene	aNL	EPA 8270C	µg/L	20	*<10*	**0 / 4**	*<10*	**0 / 3**	*<10*	**0 / 4**	*<10*	**0 / 1**	*<10*
Phenol	aNL, EPA PP	EPA 8270C	µg/L	4,200	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<1*	**0 / 1**	*<5*
2,3,5,6-Tetrachloroterephthalate (DCPA)	aNL	EPA 515.4	µg/L	3,500	**0.56** (**0.52-0.66**)	**4 / 4**	*<0.1* (*<0.1*-**0.16**)	**1 / 3**	**38** (**36-40**)	**4 / 4**	*<0.1*	**0 / 1**	**17**
Trithion	aNL	EPA 8081/8082	µg/L	7	*<0.05*	**0 / 2**	*<0.05*	**0 / 2**	*<0.05*	**0 / 3**	*<0.05*	**0 / 1**	
EPA Unregulated Contaminant Monitoring Rule (UCMR) Lists 1 through 3													
1,1-Dichloroethane	UCMR 3	EPA 524.3	µg/L	--	*<0.03*	**0 / 4**	*<0.03*	**0 / 3**	*<0.03*	**0 / 4**	*<0.03*	**0 / 1**	*<0.03*
1,2,3-Trichloropropane (1,2,3-TCP)	UCMR 3	EPA 524.3	µg/L	--	*<0.03*	**0 / 4**	*<0.03*	**0 / 3**	*<0.03*	**0 / 4**	*<0.03*	**0 / 1**	*<0.03*
1,3-Butadiene	UCMR 3	EPA 524.3	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
1,3-Dinitrobenzene	UCMR 2	EPA 8270C	µg/L	--	*<10*	**0 / 4**	*<10*	**0 / 3**	*<10*	**0 / 4**	*<10*	**0 / 1**	*<10*
2,2',4,4'-tetrabromodiphenyl ether (BDE-47)	UCMR 2	EPA 527	µg/L	--	*<0.3*	**0 / 4**	*<0.3*	**0 / 3**	*<0.3*	**0 / 4**	*<0.3*	**0 / 1**	*<0.3*
2,2',4,4',5-pentabromodiphenyl ether (BDE-99)	UCMR 2	EPA 527	µg/L	--	*<0.9*	**0 / 4**	*<0.9*	**0 / 3**	*<0.9*	**0 / 4**	*<0.9*	**0 / 1**	*<0.9*
2,2',4,4',5,5'-hexabromobiphenyl (HBB)	UCMR 2	EPA 527	µg/L	--	*<0.7*	**0 / 4**	*<0.7*	**0 / 3**	*<0.7*	**0 / 4**	*<0.7*	**0 / 1**	*<0.7*
2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153)	UCMR 2	EPA 527	µg/L	--	*<0.8*	**0 / 4**	*<0.8*	**0 / 3**	*<0.8*	**0 / 4**	*<0.8*	**0 / 1**	*<0.8*
2,2',4,4',6-pentabromodiphenyl ether (BDE-100)	UCMR 2	EPA 527	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
2-methyl-Phenol (o-cresol)	UCMR 1	EPA 8270C	µg/L	--	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<1*	**0 / 1**	*<5*
4-androstene-3,17-dione	CECs	EPA 539	µg/L	--	**0.0040** (**0.002-0.0047**)	**4 / 4**	**0.00062** (*<0.0003*-**0.0011**)	**2 / 3**	*<0.0003* (*<0.0003*-**0.00044**)	**1 / 4**	*<0.0003*	**0 / 1**	*<0.0003*
Acetochlor	UCMR 1&2	EPA 525.2	µg/L	--	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Acetochlor ethanesulfonic acid (ESA)	UCMR 2	EPA 535	µg/L	--	*<1*	**0 / 4**	*<1*	**0 / 3**	*<1*	**0 / 4**	*<1*	**0 / 1**	*<1*
Acetochlor oxanilic acid (OA)	UCMR 2	EPA 535	µg/L	--	*<2*	**0 / 4**	*<2*	**0 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	*<2*

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Alachlor ethanesulfonic acid (ESA)	UCMR 1&2	EPA 535	µg/L	--	*<1*	**0 / 4**	*<1*	**0 / 3**	*<1*	**0 / 4**	*<1*	**0 / 1**	*<1*
Alachlor oxanilic acid (OA)	UCMR 2	EPA 535	µg/L	--	*<2*	**0 / 4**	*<2*	**0 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	*<2*
Chromium-6	UCMR 3	EPA 218.6	µg/L	--	*<0.02*	**0 / 4**	**3.8 (*<0.02*-4.9)**	**2 / 3**	**0.53 (0.36-1.1)**	**4 / 4**	**0.082**	**1 / 1**	**0.72**
Cobalt	UCMR 3	EPA 200.8	µg/L	--	*<1*	**0 / 4**	*<1* **(*<1*-2.1)**	**1 / 3**	**1.6 (1.3-3.8)**	**4 / 4**	*<1*	**0 / 1**	*<1*
DCPA mono and di-acid degradate	UCMR 1	EPA 515.4	µg/L	--	**0.56 (0.52-0.66)**	**4 / 4**	*<0.1* **(*<0.1*-0.16)**	**1 / 3**	**38 (36-40)**	**4 / 4**	*<0.1*	**0 / 1**	**17**
Disulfoton	UCMR 1	EPA 8270C	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<10*	**0 / 1**	*<0.1*
Diuron	UCMR 2	EPA 8321	µg/L	--	*<1*	**0 / 4**	*<1*	**0 / 3**	*<1*	**0 / 4**	*<1*	**0 / 1**	**1**
EPTC	UCMR 1, PoLI	EPA 525.2	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Equilin	UCMR 3	EPA 539	µg/L	--	*<0.004*	**0 / 4**	*<0.004*	**0 / 3**	*<0.004*	**0 / 4**	*<0.004*	**0 / 1**	*<0.004*
Estradiol (17-beta estradiol)	UCMR 3	EPA 539	µg/L	--	**0.0044 (0.0026-0.0091)**	**4 / 4**	*<0.0004*	**0 / 3**	*<0.0004*	**0 / 4**	*<0.0004*	**0 / 1**	*<0.0004*
Estriol	UCMR 3	EPA 539	µg/L	--	*<0.0022* **(*<0.0008*-0.0042)**	**3 / 4**	*<0.0008*	**0 / 3**	*<0.0008*	**0 / 4**	*<0.0008*	**0 / 1**	*<0.0008*
Estrone	UCMR 3	EPA 539	µg/L	--	**0.21 (0.084-0.35)**	**4 / 4**	*<0.002* **(*<0.002*-0.0037)**	**1 / 3**	*<0.002* **(*<0.002*-0.0022)**	**1 / 4**	*<0.002*	**0 / 1**	*<0.005*
Ethinyl Estradiol (17-alpha ethynyl estradiol)	UCMR 3	EPA 539	µg/L	--	*<0.0009* **(*<0.0009*-0.011)**	**1 / 4**	*<0.0009*	**0 / 3**	*<0.0009*	**0 / 4**	*<0.0009*	**0 / 1**	*<0.0009*
Fonofos	UCMR 1	EPA 526	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Halon 1011 (bromochloromethane)	UCMR 3	EPA 524.3	µg/L	--	*<0.06*	**0 / 4**	**0.075 (*<0.06*-0.26)**	**2 / 3**	*<0.06*	**0 / 4**	*<0.06*	**0 / 1**	*<0.06*
Halon 1011 (bromochloromethane)	UCMR 3	EPA 524.2	µg/L	--	*<0.5*	**0 / 3**	*<0.5*	**0 / 2**	*<0.5*	**0 / 3**	*<0.5*	**0 / 1**	*<0.5*
HCFC-22 (Chlorodifluoromethane)	UCMR 3	EPA 524.3	µg/L	--	*<0.08*	**0 / 4**	*<0.08*	**0 / 3**	*<0.08*	**0 / 4**	*<0.08*	**0 / 1**	*<0.08*
Linuron	UCMR 1	EPA 8321	µg/L	--	*<1*	**0 / 4**	*<1*	**0 / 3**	*<1*	**0 / 4**	*<1*	**0 / 1**	*<1*
Metolachlor	UCMR 2	EPA 525.2	µg/L	--	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Metolachlor ethanesulfonic acid (ESA)	UCMR 2	EPA 535	µg/L	--	*<1*	**0 / 4**	*<1*	**0 / 3**	*<1*	**0 / 4**	*<1*	**0 / 1**	*<1*
Metolachlor oxanilic acid (OC)	UCMR 2	EPA 535	µg/L	--	*<2*	**0 / 4**	*<2*	**0 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	*<2*
Molybdenum	UCMR 3	EPA 200.8	µg/L	--	**6.8 (4-13)**	**4 / 4**	**43 (23-78)**	**3 / 3**	**105 (92-220)**	**4 / 4**	**12**	**1 / 1**	**62**
N-nitroso-di-n-butylamine (NDBA)	UCMR 2	EPA 521	ng/L	--	**4.3 (*<2*-6.7)**	**3 / 4**	*<2*	**0 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	*<2*
N-nitroso-methylethylamine (NMEA)	UCMR 2	EPA 521	ng/L	--	*<2*	**0 / 4**	*<2*	**0 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	*<2*
N-Nitrosopyrrolidine (NPYR)	UCMR 2	EPA 521	ng/L	--	**2.05 (*<2*-2.5)**	**2 / 4**	*<2* **(*<2*-4.7)**	**1 / 3**	*<2*	**0 / 4**	*<2*	**0 / 1**	*<2*
N-Nitrosomorpholine	--	EPA 8270C	µg/L	--	*<10*	**0 / 4**	*<10*	**0 / 3**	*<10*	**0 / 4**	*<10*	**0 / 1**	*<10*
N-Nitrosopiperidine (NPIP)	--	EPA 8270C	µg/L	--	*<10*	**0 / 4**	*<10*	**0 / 3**	*<10*	**0 / 4**	*<10*	**0 / 1**	*<10*
Perfluorooctane sulfonic acid (PFOS)	UCMR 3	EPA 537	µg/L	--	*<0.04*	**0 / 4**	**0.073 (*<0.04*-0.3)**	**2 / 3**	*<0.04*	**0 / 4**	*<0.04*	**0 / 1**	*<0.04*
Perfluorooctanoic acid (PFOA)	UCMR 3	EPA 537	µg/L	--	*<0.02*	**0 / 4**	*<0.02*	**0 / 3**	*<0.02*	**0 / 4**	**0.021**	**1 / 1**	*<0.02*
Perfluorononanoic acid (PFNA)	UCMR 3	EPA 537	µg/L	--	*<0.02*	**0 / 4**	*<0.02*	**0 / 3**	*<0.02*	**0 / 4**	*<0.02*	**0 / 1**	*<0.02*
Perfluorohexanesulfonic acid (PFHxS)	UCMR 3	EPA 537	µg/L	--	*<0.03*	**0 / 4**	*<0.03*	**0 / 3**	*<0.03*	**0 / 4**	*<0.03*	**0 / 1**	*<0.03*
Perfluoroheptanoic acid (PFHpA)	UCMR 3	EPA 537	µg/L	--	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 4**	*<0.01*	**0 / 1**	*<0.01*
Perfluorobutanesulfonic acid (PFBS)	UCMR 3	EPA 537	µg/L	--	*<0.09*	**0 / 4**	*<0.09*	**0 / 3**	*<0.09*	**0 / 4**	*<0.09*	**0 / 1**	*<0.09*
Prometon	UCMR 1	EPA 526	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Strontium	UCMR 3	EPA 200.8	µg/L	--	**365 (290-740)**	**4 / 4**	**580 (510-1300)**	**3 / 3**	**1250 (990-2200)**	**4 / 4**	**500**	**1 / 1**	**1800**
Terbacil	UCMR 1	EPA 525.2	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Terbufos	UCMR 1	EPA 526	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Terbufos sulfone	UCMR 2	EPA 527	µg/L	--	*<0.4*	**0 / 4**	*<0.4*	**0 / 3**	*<0.4*	**0 / 4**	*<0.4*	**0 / 1**	*<0.4*
EPA Clean Water Act Priority Pollutants (PPs)													
1,2-diphenylhydrazine	EPA PP, UCMR 1	EPA 8270C	µg/L	--	*<10*	**0 / 4**	*<10*	**0 / 3**	*<10*	**0 / 4**	*<1*	**0 / 1**	*<10*
1,2-trans-dichloroethylene	EPA PP	EPA 524.2	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
1,3-dichlorobenzene	EPA PP	EPA 524.2	µg/L	--	<0.5	**0 / 4**	<0.5	**0 / 3**	<0.5	**0 / 4**	<0.5	**0 / 1**	<0.5
2-chloroethyl vinyl ethers	EPA PP	EPA 524.2	µg/L	--	<0.5	**0 / 6**	<0.5	**0 / 5**	<0.5	**0 / 8**	<0.5	**0 / 1**	<0.5
2-chloronaphthalene	EPA PP	EPA 8270C	µg/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<1	**0 / 1**	<5
2-chlorophenol	EPA PP	EPA 8270C	µg/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<1	**0 / 1**	<5
2-nitrophenol	EPA PP	EPA 8270C	µg/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5.1	**0 / 1**	<5
2,4-dichlorophenol	EPA PP, UCMR 1	EPA 8270C	µg/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<1	**0 / 1**	<5
2,4-dinitrophenol	EPA PP, UCMR 1	EPA 8270C	µg/L	--	<50	**0 / 4**	<50	**0 / 3**	<50	**0 / 4**	<5.1	**0 / 1**	<50
2,4-dinitrotoluene	EPA PP, UCMR 1	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 3**	<0.1	**0 / 4**	<1	**0 / 1**	<0.1
2,4,6-trichlorophenol	EPA PP, UCMR 1	EPA 8270C	µg/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<1	**0 / 1**	<5
2,6-dinitrotoluene	EPA PP, UCMR 1	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 3**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
3,3-dichlorobenzidine	EPA PP	EPA 8270C	µg/L	--	<50	**0 / 4**	<50	**0 / 3**	<50	**0 / 4**	<2	**0 / 1**	<50
4-bromophenyl phenyl ether	EPA PP	EPA 8270C	µg/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5.1	**0 / 1**	<5
4-chlorophenyl phenyl ether	EPA PP	EPA 8270C	µg/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<1	**0 / 1**	<5
4-nitrophenol	EPA PP	EPA 8270C	µg/L	--	<10	**0 / 4**	<10	**0 / 3**	<10	**0 / 4**	<5.1	**0 / 1**	<10
4,4-DDD	EPA PP	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 4**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
4,4-DDD	EPA PP	EPA 8081A/8082	µg/L	--	<0.05	**0 / 4**	<0.05	**0 / 4**	<0.05	**0 / 4**	<0.05	**0 / 1**	<0.05
4,4-DDD	EPA PP	EPA 608	µg/L	--			<0.01	**0 / 1**	<0.01	**0 / 1**	<0.01	**0 / 1**	<0.01
4,4-DDE	EPA PP, UCMR 1	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 4**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
4,4-DDE	EPA PP, UCMR 1	EPA 8081A/8082	µg/L	--	<0.05	**0 / 4**	<0.05	**0 / 4**	<0.05	**0 / 4**	<0.05	**0 / 1**	<0.05
4,4-DDE	EPA PP, UCMR 1	EPA 608	µg/L	--			<0.01	**0 / 1**	**0.021**	**1 / 1**	<0.01	**0 / 1**	**0.012**
4,4-DDT	EPA PP	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 4**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
4,4-DDT	EPA PP	EPA 8081A/8082	µg/L	--	<0.05	**0 / 4**	<0.05	**0 / 4**	<0.05	**0 / 4**	<0.05	**0 / 1**	<0.05
4,4-DDT	EPA PP	EPA 608	µg/L	--			<0.01	**0 / 1**	<0.01	**0 / 1**	<0.01	**0 / 1**	<0.01
4,6-dinitro-o-cresol	EPA PP	EPA 8270C	µg/L	--	<50	**0 / 4**	<50	**0 / 3**	<50	**0 / 4**	<5.1	**0 / 1**	<50
Acenaphthene	EPA PP	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 3**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
Acenaphthylene	EPA PP	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 3**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
Acrolein	EPA PP, EPA CCL	EPA 624	µg/L	--	<2	**0 / 4**	**4.8** (<2-**22**)	**2 / 3**	<2	**0 / 4**	<2	**0 / 1**	<2
Acrylonitrile	EPA PP	EPA 624	µg/L	--	<2	**0 / 4**	**3.6** (<2-**4.2**)	**2 / 3**	<2	**0 / 4**	<2	**0 / 1**	<2
Aldrin	EPA PP	EPA 505	µg/L	--	<0.01	**0 / 4**	<0.01	**0 / 3**	<0.01	**0 / 4**	<0.01	**0 / 1**	<0.01
Alpha-BHC	EPA PP	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 3**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
Alpha-endosulfan	EPA PP	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 3**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
Alpha-endosulfan	EPA PP	EPA 608	µg/L	--			<0.01	**0 / 1**	<0.01	**0 / 1**	<0.01	**0 / 1**	<0.01
Anthracene	EPA PP	EPA 525.2	µg/L	--	<0.02	**0 / 4**	<0.02	**0 / 3**	<0.02	**0 / 4**	<0.02	**0 / 1**	<0.02
Benzidine	EPA PP	EPA 8270C	µg/L	--	<50	**0 / 4**	<50	**0 / 3**	<50	**0 / 4**	<5.1	**0 / 1**	<50
benzo(a) anthracene	EPA PP	EPA 525.2	µg/L	--	<0.05	**0 / 4**	<0.05	**0 / 3**	<0.05	**0 / 4**	<0.05	**0 / 1**	<5
Benzo(b) fluoranthene	EPA PP	EPA 525.2	µg/L	--	<0.02	**0 / 4**	<0.02	**0 / 3**	<0.02	**0 / 4**	<0.02	**0 / 1**	<0.02
Benzo(ghi) perylene	EPA PP	EPA 525.2	µg/L	--	<0.05	**0 / 4**	<0.05	**0 / 3**	<0.05	**0 / 4**	<0.05	**0 / 1**	<0.05
Benzo(k) fluoranthene	EPA PP	EPA 525.2	µg/L	--	<0.02	**0 / 4**	<0.02	**0 / 3**	<0.02	**0 / 4**	<0.02	**0 / 1**	<0.02
Beta-BHC	EPA PP	EPA 525.2	µg/L	--	<0.1 (<0.1-**0.15**)	**1 / 4**	<0.1	**0 / 3**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
Beta-endosulfan	EPA PP	EPA 525.2	µg/L	--	<0.1	**0 / 4**	<0.1	**0 / 3**	<0.1	**0 / 4**	<0.1	**0 / 1**	<0.1
Beta-endosulfan	EPA PP	EPA 608	µg/L	--			<0.01	**0 / 1**	<0.01	**0 / 1**	<0.01	**0 / 1**	<0.01
Bis(2-chloroethoxy) methane	EPA PP	EPA 8270C	µg/L	--	<10	**0 / 4**	<10	**0 / 3**	<10	**0 / 4**	<1	**0 / 1**	<10
Bis(2-chloroethyl) ether	EPA PP	EPA 8270C	µg/L	--	<10	**0 / 4**	<10	**0 / 3**	<10	**0 / 4**	<1	**0 / 1**	<10
Bis(2-chloroisopropyl) ether	EPA PP	EPA 8270C	µg/L	--	<10	**0 / 4**	<10	**0 / 3**	<10	**0 / 4**	<1	**0 / 1**	<10
Bromoform	EPA PP	EPA 524.2	µg/L	--	<0.5	**0 / 4**	**0.95** (<0.5-**2.4**)	**2 / 3**	<0.5	**0 / 4**	<0.5	**0 / 1**	<0.5
Bromoform	EPA PP	EPA 551.1	µg/L	--	<0.5	**0 / 4**	**1.2** (<0.5-**1.8**)	**2 / 3**	<0.5	**0 / 4**	<0.5	**0 / 1**	<0.5

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Butyl benzyl phthalate	EPA PP	EPA 525.2	µg/L	--	*<0.5*	**0 / 4**	**1.2 (*<0.5*-1.9)**	**2 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chlorobenzene	EPA PP	EPA 524.2	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chlorodibromomethane	EPA PP	EPA 524.2	µg/L	--	*<0.5*	**0 / 4**	**2.2 (*<0.5*-11)**	**2 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chlorodibromomethane	EPA PP	EPA 551.1	µg/L	--	*<0.5*	**0 / 4**	**3.6 (*<0.5*-8.3)**	**2 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chloroethane	EPA PP	EPA 524.2	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chloroform	EPA PP	EPA 524.2	µg/L	--	*<0.5 (<0.5*-**0.76)**	**1 / 4**	**36 (2.5-96)**	**3 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chloroform	EPA PP	EPA 551.1	µg/L	--	*<0.5 (<0.5*-**0.82)**	**1 / 4**	**49 (2.6-150)**	**3 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Chrysene	EPA PP	EPA 525.2	µg/L	--	*<0.02*	**0 / 4**	*<0.02*	**0 / 3**	*<0.02*	**0 / 4**	*<0.02*	**0 / 1**	*<0.02*
Delta-BHC	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Delta-BHC	EPA PP	EPA 608	µg/L	--			*<0.005*	**0 / 1**	*<0.005*	**0 / 1**	*<0.005*	**0 / 1**	*<0.005*
Di-N-Butyl Phthalate	EPA PP	EPA 8270C	µg/L	--	*<10*	**0 / 4**	*<10*	**0 / 3**	*<10*	**0 / 4**	*<1*	**0 / 1**	*<10*
Di-n-octyl phthalate	EPA PP	EPA 8270C	µg/L	--	*<10*	**0 / 4**	*<10*	**0 / 3**	*<10*	**0 / 4**	*<2*	**0 / 1**	*<10*
Dibenz(a,h) anthracene	EPA PP	EPA 525.2	µg/L	--	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Dichlorobromomethane	EPA PP	EPA 524.2	µg/L	--	*<0.5*	**0 / 4**	**5.8 (0.52-26)**	**3 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Dichlorobromomethane	EPA PP	EPA 551.1	µg/L	--	*<0.5*	**0 / 4**	*<0.5 (<0.5*-**9)**	**1 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Diethyl Phthalate	EPA PP	EPA 525.2	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Dimethyl phthalate	EPA PP	EPA 525.2	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Endosulfan sulfate	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Endosulfan sulfate	EPA PP	EPA 608	µg/L	--			*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*
Endrin	EPA PP	EPA 525.2	µg/L	--	*<0.2*	**0 / 4**	*<0.2*	**0 / 3**	*<0.2*	**0 / 5**	*<0.2*	**0 / 1**	*<0.2*
Endrin	EPA PP	EPA 608	µg/L	--			*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*
Endrin aldehyde	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Endrin aldehyde	EPA PP	EPA 608	µg/L	--			*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*	**0 / 1**	*<0.01*
Fluoranthene	EPA PP	EPA 525.2	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 4**	*<0.1*	**0 / 1**	*<0.1*
Fluorene	EPA PP	EPA 525.2	µg/L	--	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Gamma-BHC	EPA PP	EPA 505	µg/L	--	*<0.01*	**0 / 4**	*<0.01*	**0 / 3**	*<0.01*	**0 / 4**	*<0.01*	**0 / 1**	*<0.01*
Hexachlorobenzene	EPA PP	EPA 8270C	µg/L	--	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<1*	**0 / 1**	*<5*
Hexachlorobutadiene	EPA PP	EPA 524.2	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Hexachloroethane	EPA PP	EPA 8270C	µg/L	--	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<1*	**0 / 1**	*<5*
Hexachlorocyclopentadiene	EPA PP	EPA 525.2	µg/L	--	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Indeno (1,2,3-cd) pyrene	EPA PP	EPA 525.2	µg/L	--	*<0.05*	**0 / 4**	*<0.05*	**0 / 3**	*<0.05*	**0 / 4**	*<0.05*	**0 / 1**	*<0.05*
Isophorone	EPA PP	EPA 525.2	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Lead	EPA PP	EPA 200.8	µg/L	--	*<0.5*	**0 / 4**	**0.93 (0.6-1.3)**	**3 / 3**	**0.7 (*<0.5*-0.98)**	**2 / 4**	**3**	**1 / 1**	**1.8**
Methyl bromide	EPA PP, UCMR 3, PoLI	EPA 524.2	µg/L	--	*<0.5*	**0 / 4**	*<0.5*	**0 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Methyl chloride	EPA PP, UCMR 3	EPA 524.2	µg/L	--	**0.51 (*<0.5*-0.54)**	**2 / 4**	*<0.5 (<0.5*-**1.7)**	**2 / 3**	*<0.5*	**0 / 4**	*<0.5*	**0 / 1**	*<0.5*
Methyl chloride	EPA PP, UCMR 3	EPA 524.3	µg/L	--	*<0.2*	**0 / 4**	**0.37 (*<0.2*-0.404)**	**2 / 3**	*<0.2*	**0 / 4**	*<0.2*	**0 / 1**	*<0.2*
Nitrobenzene	EPA PP, UCMR 1	EPA 8270C	µg/L	--	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<1*	**0 / 1**	*<5*
N-nitrosodiphenylamine	EPA PP, EPA CCL	EPA 8270C	µg/L	--	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<1*	**0 / 1**	*<5*
Naphthalene	EPA PP	EPA 525.2	µg/L	--	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<0.3*	**0 / 1**	*<0.3*
Parachlorometa cresol (p-Chloro-m-cresol)	EPA PP	EPA 8270C	µg/L	--	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<5*	**0 / 1**	*<5*
PCB–1016 (Arochlor 1016)	EPA PP	EPA 505	µg/L	--	*<0.08*	**0 / 4**	*<0.08*	**0 / 3**	*<0.08*	**0 / 9**	*<0.08*	**0 / 1**	*<0.08*
PCB–1221 (Arochlor 1221)	EPA PP	EPA 505	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 9**	*<0.1*	**0 / 1**	*<0.1*
PCB–1232 (Arochlor 1232)	EPA PP	EPA 505	µg/L	--	*<0.1*	**0 / 4**	*<0.1*	**0 / 3**	*<0.1*	**0 / 9**	*<0.1*	**0 / 1**	*<0.1*

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
PCB–1242 (Arochlor 1242)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 4	<0.1	0 / 3	<0.1	0 / 9	<0.1	0 / 1	<0.1
PCB–1248 (Arochlor 1248)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 4	<0.1	0 / 3	<0.1	0 / 9	<0.1	0 / 1	<0.1
PCB–1254 (Arochlor 1254)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 4	<0.1	0 / 3	<0.1	0 / 9	<0.1	0 / 1	<0.1
PCB–1260 (Arochlor 1260)	EPA PP	EPA 505	µg/L	--	<0.1	0 / 4	<0.1	0 / 3	<0.1	0 / 9	<0.1	0 / 1	<0.1
Phenanthrene	EPA PP	EPA 525.2	µg/L	--	<0.04	0 / 4	<0.04	0 / 3	<0.04	0 / 4	<0.04	0 / 1	<0.04
Pyrene	EPA PP	EPA 525.2	µg/L	--	<0.05	0 / 4	<0.05	0 / 3	<0.05	0 / 4	<0.05	0 / 1	<0.05
Pesticides of Local Interest (PoLI)													
Chlorothalonil (Draconil, Bravo)	PoLI	EPA 525.2	µg/L	--	<0.1	0 / 4	<0.1 (<0.1-0.1)	1 / 3	<0.1	0 / 4	<0.1	0 / 1	<0.1
Chlorpyrifos	PoLI	EPA 525.2	µg/L	--	<0.05	0 / 4	<0.05	0 / 3	<0.05	0 / 11	<0.05	0 / 1	<0.05
Chlorthal-Dimethyl (DCPA)	PoLI	EPA 515.4	µg/L	--	0.56 (0.52-0.66)	4 / 4	<0.1 (<0.1-0.16)	1 / 3	38 (36-40)	4 / 4	<0.1	0 / 1	17
Glyphosate, Isopropylamine Salt	PoLI	EPA 547	µg/L	--	<6	0 / 4	<6	0 / 3	7.5 (<6-9.2)	2 / 4	<6	0 / 1	8.1
Methidathion	PoLI	EPA 8141	µg/L	--	<0.1	0 / 3	<0.1	0 / 2	<0.1	0 / 4	<0.1	0 / 1	<0.5
Methomyl	PoLI	EPA 531.2	µg/L	--	<0.5 (<0.5-0.53)	1 / 4	<0.5	0 / 3	<0.5	0 / 4	<0.5	0 / 1	<0.5
Naled	PoLI	EPA 8141	µg/L	--	<0.5	0 / 4	<0.5	0 / 3	<0.5	0 / 4	<0.5	0 / 1	<0.5
Oxydemeton-Methyl (Demeton)	PoLI	EPA 8141A	µg/L	--	<0.2	0 / 4	<0.2	0 / 3	<0.2	0 / 4	<0.2	0 / 1	<0.2
Sulfur	PoLI	EPA 200.7	mg/L	--	38 (36-41)	4 / 4	68 (62-80)	3 / 3	200 (200-210)	4 / 4	50	1 / 1	140
Contaminants of Emerging Concern (CECs)													
1,7-Dimethylxanthine	CECs	LC-MS-MS	ng/L	--	125 (<10-1100)	2 / 4	<10	0 / 3	<10	0 / 4	<10	0 / 1	<10
2,4-D	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5 (<5-17)	1 / 3	<5	0 / 4	<5	0 / 1	<5
4-nonylphenol - semi quantitative	CECs	LC-MS-MS	ng/L	--	<100 (<100-860)	1 / 4	<100	0 / 3	<100	0 / 4	<100	0 / 1	<100
4-tert-octylphenol	CECs	LC-MS-MS	ng/L	--	95 (<50-790)	2 / 4	<50 (<50-53)	1 / 3	<50	0 / 4	<50	0 / 1	<50
Acesulfame-K	CECs	LC-MS-MS	ng/L	--	33000 (22000-85000)	4 / 4	38 (22-44)	3 / 3	1490 (580-3000)	4 / 4	140	1 / 1	3100
Acetaminophen	CECs	LC-MS-MS	ng/L	--	<5 (<5-350)	1 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Albuterol	CECs	LC-MS-MS	ng/L	--	14 (<5-33)	2 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Amoxicillin (semi-quantitative)	CECs	LC-MS-MS	ng/L	--	2450 (2000-3700)	4 / 4	<20	0 / 3	<20	0 / 4	<20	0 / 1	<20
Andorostenedione	CECs, UCMR 3	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Atenolol	CECs	LC-MS-MS	ng/L	--	330 (<5-540)	3 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Atrazine	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Azithromycin	CECs	LC-MS-MS	ng/L	--	1160 (<20-20000)	2 / 4	<20	0 / 3	<20	0 / 4	48	1 / 1	<20
Bendroflumethiazide	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Bezafibrate	CECs	LC-MS-MS	ng/L	--	33 (<5-120)	2 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
BPA	CECs	LC-MS-MS	ng/L	--	<10 (<10-71)	1 / 4	31 (<10-59)	2 / 3	<10	0 / 4	<10	0 / 1	<10
Bromacil	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Butalbital	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5 (<5-100)	1 / 4	<5	0 / 1	<5
Butylparben	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Caffeine	CECs	LC-MS-MS	ng/L	--	1065 (820-2800)	4 / 4	150 (39-200)	3 / 3	6.3 (<5-8.3)	2 / 4	110	1 / 1	63
Carbadox	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Carbamazepine	CECs	LC-MS-MS	ng/L	--	225 (120-360)	4 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Carisoprodol	CECs	LC-MS-MS	ng/L	--	106 (<5-770)	3 / 4	<5	0 / 3	<5 (<5-5.1)	1 / 4	<5	0 / 1	<5
Chloramphenicol	CECs	LC-MS-MS	ng/L	--	<10	0 / 4	<10	0 / 3	<10	0 / 4	<10	0 / 1	<10
Chloridazon	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5 (<5-59)	1 / 4	<5	0 / 1	<5
Chlorotoluron	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Cimetidine	CECs	LC-MS-MS	ng/L	--	98 (<5-430)	2 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Clofibric Acid	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Cotinine	CECs	LC-MS-MS	ng/L	--	115 (25-240)	4 / 4	16 (<10-24)	2 / 3	<10	0 / 4	86	1 / 1	<10
Cyanazine	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
DACT	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5 (<5-370)	1 / 3	<5	0 / 4	<5	0 / 1	58
DEA	CECs	LC-MS-MS	ng/L	--	<5 (<5-16)	1 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
DEET	CECs	LC-MS-MS	ng/L	--	325 (120-1400)	4 / 4	<10 (<10-11)	1 / 3	<10 (<10-14)	1 / 4	15	1 / 1	15
Dehydronifedipine	CECs	LC-MS-MS	ng/L	--	67 (62-150)	4 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
DIA	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Diazepam	CECs	LC-MS-MS	ng/L	--	<5 (<5-12)	1 / 4	<5	0 / 3	<5 (<5-5)	1 / 4	<5	0 / 1	<5
Diclofenac	CECs	LC-MS-MS	ng/L	--	37 (<5-81)	2 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Dilantin	CECs	LC-MS-MS	ng/L	--	140 (120-180)	4 / 4	<20	0 / 3	<20	0 / 4	<20	0 / 1	<20
Diuron	CECs	LC-MS-MS	ng/L	--	45 (<5-96)	3 / 4	<5	0 / 3	<5	0 / 4	38	1 / 1	450
Erythromycin	CECs, EPA CCL	LC-MS-MS	ng/L	--	30 (<10-120)	2 / 4	<10	0 / 3	<10	0 / 4	<10	0 / 1	<10
Estradiol	CECs, UCMR 3	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Estrone	CECs, UCMR 3	LC-MS-MS	ng/L	--	90 (12-300)	4 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Ethinyl Estradiol - 17 alpha	CECs, UCMR 3	LC-MS-MS	ng/L	--	<5	0 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Ethylparaben	CECs	LC-MS-MS	ng/L	--	<20	0 / 4	<20	0 / 3	<20	0 / 4	<20	0 / 1	<20
Flumeqine	CECs	LC-MS-MS	ng/L	--	<10	0 / 4	<10	0 / 3	<10	0 / 4	<10	0 / 1	<10
Fluoxetine	CECs	LC-MS-MS	ng/L	--	30 (<10-57)	3 / 4	<10	0 / 3	<10	0 / 4	<10	0 / 1	<10
Gemfibrozil	CECs	LC-MS-MS	ng/L	--	1150 (<5-1500)	3 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	11
Ibuprofen	CECs	LC-MS-MS	ng/L	--	<10	0 / 4	<10	0 / 3	<10	0 / 4	<10	0 / 1	<10
Iohexal	CECs	LC-MS-MS	ng/L	--	11700 (7800-40000)	4 / 4	<10	0 / 3	105 (<10-370)	2 / 4	<10	0 / 1	190
Iopromide	CECs	LC-MS-MS	ng/L	--	1400 (<5-1600)	3 / 4	<5	0 / 3	<5 (<5-16)	1 / 4	<5	0 / 1	<5
Isobutylparaben	CECs	LC-MS-MS	ng/L	--	<5	0 / 4	7 (<5-74)	2 / 3	<5	0 / 4	<5	0 / 1	<5
Isoproturon	CECs	LC-MS-MS	ng/L	--	<100	0 / 4	<100	0 / 3	<100	0 / 4	<100	0 / 1	<100
Ketoprofen	CECs	LC-MS-MS	ng/L	--	68 (<5-170)	2 / 4	<5	0 / 3	<5	0 / 4	6.9	1 / 1	<5
Ketorolac	CECs	LC-MS-MS	ng/L	--	<5 (<5-17)	1 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Lidocaine	CECs	LC-MS-MS	ng/L	--	485 (260-800)	4 / 4	<5	0 / 3	<5	0 / 4	<5	0 / 1	<5
Lincomycin	CECs	LC-MS-MS	ng/L	--	26 (<10-51)	2 / 4	<10	0 / 3	<10	0 / 4	<10	0 / 1	<10
Linuron	CECs, PoLI	LC-MS-MS	ng/L	--	<5	0 / 4	<5 (<5-5.3)	1 / 3	<5	0 / 4	<5	0 / 1	9.2

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Lopressor	CECs	LC-MS-MS	ng/L	--	**610 (<20-1200)**	**3 / 4**	<20	**0 / 3**	<20	**0 / 4**	<20	**0 / 1**	<20
Meclofenamic Acid	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Meprobamate	CECs	LC-MS-MS	ng/L	--	**395 (220-730)**	**4 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Metazachlor	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Methylparaben	CECs	LC-MS-MS	ng/L	--	<20	**0 / 4**	<20	**0 / 3**	<20	**0 / 4**	<20	**0 / 1**	<20
Metolachlor	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Naproxen	CECs	LC-MS-MS	ng/L	--	<10 (<10-**41**)	**1 / 4**	<10	**0 / 3**	<10	**0 / 4**	<10	**0 / 1**	<10
Nifedipine	CECs	LC-MS-MS	ng/L	--	<20	**0 / 4**	<20	**0 / 3**	<20	**0 / 4**	<20	**0 / 1**	<20
Norethisterone	CECs	LC-MS-MS	ng/L	--	<5 (<5-**25**)	**1 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Oxolinic Acid	CECs	LC-MS-MS	ng/L	--	<10	**0 / 4**	<10	**0 / 3**	<10	**0 / 4**	<10	**0 / 1**	<10
Pentoxifylline	CECs	LC-MS-MS	ng/L	--	**14 (<5-80)**	**3 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Phenazone	CECs	LC-MS-MS	ng/L	--	<5 (<5-**37**)	**1 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Primidone	CECs	LC-MS-MS	ng/L	--	**49 (31-94)**	**4 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Progesterone	CECs	LC-MS-MS	ng/L	--	**5 (<5-59)**	**2 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Propazine	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Propylparaben	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Quinoline	CECs, EPA CCL	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5 (<5-**12**)	**1 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Simazine	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Sucralose	CECs	LC-MS-MS	ng/L	--	**37500 (35000-44000)**	**4 / 4**	**280 (<100-1100)**	**2 / 3**	**765 (110-2700)**	**4 / 4**	**130**	**1 / 1**	**1600**
Sulfachloropyridazine	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Sulfadiazine	CECs	LC-MS-MS	ng/L	--	<5 (<5-**9.4**)	**1 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Sulfadimethoxine	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Sulfamerazine	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Sulfamethazine	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Sulfamethizole	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Sulfamethoxazole	CECs	LC-MS-MS	ng/L	--	**860 (470-1500)**	**4 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Sulfathiazole	CECs	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5	**0 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
TCEP	CECs	LC-MS-MS	ng/L	--	**120 (<10-320)**	**3 / 4**	<10 (<10-**15**)	**1 / 3**	<10 (<10-**13**)	**1 / 4**	**33**	**1 / 1**	<10
TCPP	CECs	LC-MS-MS	ng/L	--	**570 (440-720)**	**4 / 4**	<100	**0 / 3**	<100	**0 / 4**	<100	**0 / 1**	<100
TDCPP	CECs	LC-MS-MS	ng/L	--	**635 (510-880)**	**4 / 4**	<100	**0 / 3**	<100	**0 / 4**	<100	**0 / 1**	<100
Testosterone	CECs, UCMR 3	LC-MS-MS	ng/L	--	<5	**0 / 4**	<5 (<5-**18**)	**1 / 3**	<5	**0 / 4**	<5	**0 / 1**	<5
Theobromine	CECs	LC-MS-MS	ng/L	--	<10 (<10-**700**)	**1 / 4**	<10	**0 / 3**	<10	**0 / 4**	<10	**0 / 1**	<10

Sampling Constituent	Contaminant List	Analytical Method	Units	DDW MCL/NL	RTP Effluent		Ag Wash Water		Blanco Drain		Lake El Estero		Tembladero Slough
					Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	Median (Range)	Detected / Measured	
Theophylline	CECs	LC-MS-MS	ng/L	--	**225 (*<20*-2200)**	**2 / 4**	*<20*	**0 / 3**	*<20*	**0 / 4**	*<20*	**0 / 1**	*<20*
Triclosan	CECs	LC-MS-MS	ng/L	--	**325 (180-1600)**	**4 / 4**	*<10*	**0 / 3**	*<15 (<10-67)*	**1 / 4**	*<10*	**0 / 1**	*<10*
Trimethoprim	CECs	LC-MS-MS	ng/L	--	**505 (48-1700)**	**4 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<5*	**0 / 1**	*<5*
Warfarin	CECs	LC-MS-MS	ng/L	--	*<5*	**0 / 4**	*<5*	**0 / 3**	*<5*	**0 / 4**	*<5*	**0 / 1**	*<5*

[1] Values for total coliform, *E. coli*, and enterococcus are in the format geometric mean (range)

List of Acronyms:
cm: centimeter
EPA: Environmental Protection Agency
SM: Standard Methods for the Examination of Water and Wastewater
LC-MS-MS: Liquid Chromatography, tandem Mass Spectrometry
L: Liter
MFL: Million Fibers per Liter
mg: milligram
mL: milliliter
MPN: Most Probably Number
ng: nanogram
NTU: Nephelometric Turbidity Units
pCi: picocuries
TT: Treatment Technique
UV: ultraviolet
µg: microgram

APPENDIX F

Central Coast Regional Water Quality Control Board Order No. R3-2014-0013, NPDES No. CA0048551, for the MRWPCA Regional Treatment Plant

CALIFORNIA Water Boards

EDMUND G. BROWN JR. GOVERNOR

MATTHEW RODRIQUEZ SECRETARY FOR ENVIRONMENTAL PROTECTION

Central Coast Regional Water Quality Control Board

ORDER NO. R3-2014-0013
NPDES NO. CA0048551

WASTE DISCHARGE REQUIREMENTS FOR THE MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY REGIONAL TREATMENT PLANT

The following Discharger is subject to waste discharge requirements as set forth in this Order.

Table 1. Discharger Information

Discharger	**Monterey Regional Water Pollution Control Agency**
Name of Facility	**Regional Wastewater Treatment Plant**
Facility Address	**14811 Del Monte Boulevard**
	Marina, CA 93933
	Monterey County

Table 2. Discharge Location

Discharge Point	Effluent Description	Discharge Point Latitude	Discharge Point Longitude	Receiving Water
001	Secondary Treated Wastewater and Brine Wastes	36 º 43 ' 40 " N	121 º 50 ' 15 " W	Pacific Ocean (Monterey Bay National Marine Sanctuary)[1]

[1] The termination of the outfall is outside the National Marine Sanctuary Zone of Prohibition.

Table 3. Administrative Information

This Order was adopted by the Central Coast Region Water Quality Control Board on:	**May 22, 2014**
This Order shall become effective on:	**August 1, 2014**
This Order shall expire on:	**July 31, 2019**
The Discharger shall file a Report of Waste Discharge as an application for reissuance of waste discharge requirements in accordance with title 23, California Code of Regulations, and an application for reissuance of a National Pollutant Discharge Elimination System (NPDES) permit no later than:	**February 1, 2019**
The U.S. Environmental Protection Agency (U.S. EPA) and the California Regional Water Quality Control Board, Central Coast Region have classified this discharge as follows:	**Major discharge**

I, Kenneth A. Harris Jr., Executive Officer, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Coast Region on the date indicated above.

Kenneth A. Harris Jr., Executive Officer

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I. FINDINGS

The California Regional Water Quality Control Board, Central Coast Region (hereinafter the Central Coast Water Board) finds:

A. Legal Authorities. This Order serves as Waste Discharge Requirements (WDR's) pursuant to article 4, chapter 4, division 7 of the California Water Code (commencing with section 13260). This Order is also issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. Environmental Protection Agency (USEPA) and chapter 5.5, division 7 of the Water Code (commencing with section 13370). It shall serve as a National Pollutant Discharge Elimination System (NPDES) permit for point source discharges from this facility to surface waters.

B. Background and Rationale for Requirements. The Central Coast Water Board developed this Order's requirements based on information submitted in the application, through monitoring and reporting programs, and other available information. The Fact Sheet (Attachment F), which contains background information and rationale for the Order's waste discharge requirements, is hereby incorporated into this Order and constitutes part of the Findings for this Order. Attachments A through E are also incorporated into this Order.

C. Provisions and Requirements Implementing State Law. The provisions/requirements in subsections III.B, III.C, and IV.B of this Order are included to implement state law only. These provisions/requirements are not required or authorized under the federal CWA; consequently, violations of these provisions/requirements are not subject to the enforcement remedies that are available for NPDES violations.

D. Notification of Interested Parties. The Central Coast Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe WDRs for the discharge and has provided them with an opportunity to submit their written comments and recommendations. Details of the notification are provided in the Fact Sheet accompanying this Order.

E. Consideration of Public Comment. The Central Coast Water Board, in a public meeting, heard and considered all comments pertaining to the discharge. Details of the Public Hearing are provided in the Fact Sheet of this Order.

THEREFORE, IT IS HEREBY ORDERED, that this Order supersedes Order R3-2008-0008 except for enforcement purposes, and, in order to meet the provisions contained in division 7 of the Water Code (commencing with section 13000) and regulations adopted thereunder and the provisions of the CWA and regulations and guidelines adopted thereunder, the Discharger shall comply with the requirements in this Order. This action in no way prevents the Central Coast Water Board from taking enforcement action for past violations of the previous Order.

II. DISCHARGE PROHIBITIONS

A. Discharge to the Pacific Ocean at a location other than those described by this Order at 36° 43' 40" N. Latitude, 121° 50' 15" W. Longitude are prohibited.

B. The rate of discharge to Monterey Bay shall not exceed 81.2 million gallons per day (MGD).

C. The influent flow to the secondary treatment system shall not exceed 29.6 MG average dry weather flow and 75.6 MGD peak wet weather flow.

D. The overflow or bypass of wastewater from the Discharger's collection, treatment, or disposal facilities and the subsequent discharge of untreated or partially treated wastewater, except as provided for in Attachment D, Standard Provision I.A.7 (Bypass), is prohibited.

E. Discharge of any waste in any manner other than as described by this Order, excluding storm water regulated by General Permit No. CAS000001 (Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities) is prohibited.

F. The discharge of any radiological, chemical, or biological warfare agent or high-level radioactive waste into the ocean is prohibited.

G. Federal law prohibits the discharge of sludge by pipeline to the Ocean. The discharge of municipal or industrial waste sludge directly to the Ocean or into a waste stream that discharges to the Ocean is prohibited. The discharge of sludge digester supernatant, without further treatment, directly to the Ocean or to a waste stream that discharges to the Ocean, is prohibited.

III. EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

A. Effluent Limitations – Discharge Point 001

1. Final Effluent Limitations – Discharge Point 001

a. The Discharger shall maintain compliance with the following effluent limitations at Discharge Point 001, with compliance measured at Monitoring Location EFF-001 as described in the attached MRP.

Table 4. Effluent Limitations

Parameter	Units	Effluent Limitations			
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Maximum
$CBOD_5$	mg/L	25	40	85	--
	lbs/day [1]	6,200	10,000	21,000	--
TSS	mg/L	30	45	90	--
	lbs/day [1]	7,400	11,000	22,000	--
Oil & Grease	mg/L	25	40	75	--
	lbs/day [1]	6,200	10,000	19,000	--

Parameter	Units	Effluent Limitations			
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Maximum
Settleable Solids	mL/L/hr	1.0	1.5	--	3.0
Turbidity	NTUs	75	100	--	230
pH [2]	pH units	6.0 – 9.0 at all times			

[1] The mass-based (lbs/day) effluent limitations in this table are based on the average dry weather flow design capacity of 29.6 MGD for the treatment facility and are therefore only good up to this flow. For flows above 29.6 MGD, mass-based effluent limitations shall be calculated individually using the concentration-based effluent limitations and the observed flow at the time of sampling per the following equation:

lbs/day = 0.00834 x Ce x Q
where:
Ce = the effluent concentration limit in ug/L
Q = observed flow rate in MGD

[2] Excursions from the effluent limit range are permitted subject to the following limitations (40 CFR 401.17):

a. The total time during which the pH values are outside the required range of pH values shall not exceed 7 hours and 26 minutes in any calendar month; and

b. No individual excursion from the range of pH values shall exceed 60 minutes.

Note: 40 CFR 401.17(2)(c) notes that, for the purposes of 40 CFR 401.17, "excursion" is defined as "an unintentional and temporary incident in which the pH value of discharge wastewater exceeds the range set forth in the applicable effluent limitations guidelines." The State Board may adjust the requirements set forth in paragraph 40 CFR 401.17 (a) with respect to the length of individual excursions from the range of pH values, if a different period of time is appropriate based upon the treatment system, plant configuration, or other technical factors.

b. Toxic Pollutants. The Discharger shall maintain compliance with the following effluent limitations for toxic pollutants at Discharge Point 001, with compliance measured at Monitoring Location EFF-001, as described in the attached MRP.

Table 5. Effluent Limitations for the Protection of Marine Aquatic Life

Pollutant	Unit	6-Month Median	Daily Maximum	Instantaneous Maximum
Cadmium	µg/L	150	580	1,500
	lb/day[1]	36	140	360
Chromium (Hexavalent) [2]	µg/L	290	1,200	2,900
	lb/day[1]	72	290	720
Lead	µg/L	290	1,200	2,900
	lb/day[1]	72	290	720
Selenium	µg/L	2,200	8,800	22,000
	lb/day[1]	540	2,200	5,400
Silver	µg/L	79	390	1,000
	lb/day[1]	20	95	250
Cyanide [3]	µg/L	150	580	1,500
	lb/day[1]	36	140	360
Total Residual Chlorine [4] [5]	µg/L	290	1,200	8,800
	lb/day[1]	72	290	2,200
Acute Toxicity [6]	TUa	---	4.7	---
Chronic Toxicity [6]	TUc	---	150	---
Phenolic Compounds (non-chlorinated)	µg/L	4,400	18,000	44,000
	lb/day[1]	1,100	4,300	11,000
Endosulfan	µg/L	1.3	2.6	3.9

Pollutant	Unit	6-Month Median	Daily Maximum	Instantaneous Maximum
	lb/day[1]	0.32	0.65	0.97
Endrin	µg/L	0.29	0.58	0.88
	lb/day[1]	0.072	0.14	0.22
HCH	µg/L	0.58	1.2	1.8
	lb/day[1]	0.14	0.29	0.43
Radioactivity	--	Not to exceed limits specified in California Code of Regulations, Title 22, Division 4, Chapter 15, Article 5, Section 64443		

[1] The mass-based (lbs/day) effluent limitations in this table are based on the average dry weather flow design capacity of 29.6 MGD for the treatment facility and are therefore only good up to this flow. For flows above 29.6 MGD, mass-based effluent limitations shall be calculated individually using the concentration-based effluent limitations and the observed flow at the time of sampling per the following equation:

lbs/day = 0.00834 x Ce x Q
where:
Ce = the effluent concentration limit in ug/L
Q = observed flow rate in MGD

[2] The Discharger may at their option meet this objective as a total chromium objective.

[3] If a discharger can demonstrate to the satisfaction of the Regional Board (subject to EPA approval) that an analytical method is available to reliably distinguish between strongly and weakly complexed cyanide, effluent limitations for cyanide may be met by the combined measurement of free cyanide, simple alkali metal cyanides, and weakly complexed organometallic cyanide complexes. In order for the analytical method to be acceptable, the recovery of free cyanide from metal complexes must be comparable to that achieved by the approved method in 40 CFR PART 136, as revised May 14, 1999.

[4] Water quality objectives for total chlorine residual applying to intermittent discharges not exceeding two hours shall be determined using the following equation:
$\log_y=-0.43(\log_x)+1.8$ where: y = the water quality objective (in µg/L) to apply when chlorine is being discharged; and
x = the duration of uninterrupted chlorine discharge in minutes.
The applicable effluent limitation must then be determined using Equation No. 1 from the Ocean Plan.

[5] The Discharger is not required to disinfect secondary effluent due to treatment system performance and outfall configuration and placement. The total chlorine residual effluent limitations are retained in this Order in the event the Discharger implements chlorine-based disinfection in the future and to verify compliance with semiannual Table 1 Pollutant monitoring requirements which include total chlorine residual.

[6] See Attachment A for applicable definitions.

Table 6. Effluent Limitations for the Protection of Human Health (Non-Carcinogens)

Pollutant	Unit	30-day Average
Acrolein	µg/L	32,000
	lb/day[1]	7,900
Antimony	µg/L	180,000
	lb/day[1]	43,000
Bis(2-Chloroethoxy)Methane	µg/L	640
	lb/day[1]	160
Bis(2-Chloroisopropyl)Ether	µg/L	180,000
	lb/day[1]	43,000
Chlorobenzene	µg/L	83,000
	lb/day[1]	21,000
Di-n-Butyl Phthalate	µg/L	510,000
	lb/day[1]	130,000
Dichlorobenzenes	µg/L	740,000
	lb/day[1]	180,000

Pollutant	Unit	30-day Average
Diethyl Phthalate	µg/L	4,800,000
	lb/day[1]	1,200,000
Dimethyl Phthalate	µg/L	120,000,000
	lb/day[1]	30,000,000
2-Methyl-4,6-Dinitrophenol	µg/L	32,000
	lb/day[1]	7,900
2,4-Dinitrophenol	µg/L	580
	lb/day[1]	140
Ethylbenzene	µg/L	600,000
	lb/day[1]	150,000
Fluoranthene	µg/L	2,200
	lb/day[1]	540
Hexachlorocyclopentadiene	µg/L	8,500
	lb/day[1]	2,100
Nitrobenzene	µg/L	720
	lb/day[1]	180
Thallium	µg/L	290
	lb/day[1]	72
Toluene	µg/L	12,000,000
	lb/day[1]	3,100,000
Tributylin	µg/L	0.20
	lb/day[1]	0.050
1,1,1-Trichloroethane	µg/L	79,000,000
	lb/day[1]	19,000,000

[1] The mass-based (lbs/day) effluent limitations in this table are based on the average dry weather flow design capacity of 29.6 MGD for the treatment facility and are therefore only good up to this flow. For flows above 29.6 MGD, mass-based effluent limitations shall be calculated individually using the concentration-based effluent limitations and the observed flow at the time of sampling per the following equation:

lbs/day = 0.00834 x Ce x Q
where:
Ce = the effluent concentration limit in ug/L
Q = observed flow rate in MGD

Table 7. Effluent Limitations for the Protection of Human Health (Carcinogens)

Pollutant	Unit	30-day Average
Acrylonitrile	µg/L	15
	lb/day[1]	3.6
Aldrin	µg/L	0.0032
	lb/day[1]	0.00079
Benzene	µg/L	860
	lb/day[1]	210
Benzidine	µg/L	0.010
	lb/day[1]	0.0025
Beryllium	µg/L	4.8
	lb/day[1]	1.2
Bis(2-Chloroethyl)Ether	µg/L	6.6
	lb/day[1]	1.6

Pollutant	Unit	30-day Average
Bis(2-Ethylhexyl)Phthalate	µg/L	510
	lb/day[1]	130
Carbon Tetrachloride	µg/L	130
	lb/day[1]	32
Chlordane	µg/L	0.0034
	lb/day[1]	0.00083
Chlorodibromomethane	µg/L	1,300
	lb/day[1]	310
Chloroform	µg/L	19,000
	lb/day[1]	4,700
1,4 Dichlorobenzene	µg/L	2,600
	lb/day[1]	650
3,3'-Dichlorobenzidine	µg/L	1.2
	lb/day[1]	0.29
1,2-Dichloroethane	µg/L	4,100
	lb/day[1]	1,000
1,1-Dichloroethylene	µg/L	130
	lb/day[1]	32
Dichlorobromomethane	µg/L	910
	lb/day[1]	220
Dichloromethane (Methylene Chloride)	µg/L	66,000
	lb/day[1]	16,000
1,3-Dichloropropene	µg/L	1,300
	lb/day[1]	320
Dieldrin	µg/L	0.0058
	lb/day[1]	0.0014
2,4-Dinitrotoluene	µg/L	380
	lb/day[1]	94
1,2-Diphenylhydrazine	µg/L	23
	lb/day[1]	5.8
Halomethanes	µg/L	19,000
	lb/day[1]	4,700
Heptachlor	µg/L	0.0073
	lb/day[1]	0.0018
Heptachlor Epoxide	µg/L	0.0029
	lb/day[1]	0.00072
Hexachlorobenzene	µg/L	0.031
	lb/day[1]	0.0076
Hexachlorobutadiene	µg/L	2,000
	lb/day[1]	500
Hexachloroethane	µg/L	370
	lb/day[1]	90
Isophorone	µg/L	110,000
	lb/day[1]	26,000
N-Nitrosodimethylamine	µg/L	1,100
	lb/day[1]	260

Pollutant	Unit	30-day Average
N-Nitrosodi-n-Propylamine	µg/L	55
	lb/day[1]	14
N-Nitrosodiphenylamine	µg/L	370
	lb/day[1]	90
PAHs (total)	µg/L	1.3
	lb/day[1]	0.32
PCBs	µg/L	0.0028
	lb/day[1]	0.00068
TCDD Equivalents	µg/L	5.7E-07
	lb/day[1]	1.4E-07
1,1,2,2-Tetrachloroethane	µg/L	340
	lb/day[1]	83
Tetrachloroethylene	µg/L	290
	lb/day[1]	72
Toxaphene	µg/L	0.031
	lb/day[1]	0.0076
Trichloroethylene	µg/L	3,900
	lb/day[1]	970
1,1,2-Trichloroethane	µg/L	1,400
	lb/day[1]	340
2,4,6-Trichlorophenol	µg/L	42
	lb/day[1]	10
Vinyl Chloride	µg/L	5,300
	lb/day[1]	1,300

[1] The mass-based (lbs/day) effluent limitations in this table are based on the average dry weather flow design capacity of 29.6 MGD for the treatment facility and are therefore only good up to this flow. For flows above 29.6 MGD, mass-based effluent limitations shall be calculated individually using the concentration-based effluent limitations and the observed flow at the time of sampling per the following equation:

lbs/day = 0.00834 x Ce x Q
where:
Ce = the effluent concentration limit in µg/L
Q = observed flow rate in MGD

c. **Percent Removal:** The average monthly percent removal of $CBOD_5$ and TSS shall not be less than 85 percent.

d. **Initial Dilution:** The minimum initial dilution of treated effluent at the point of discharge to Monterey Bay shall not be less than 145 to 1 (seawater to effluent) at any time.

2. Interim Effluent Limitations – Not Applicable

B. Land Discharge Specifications – Not Applicable

C. Recycling Specifications

The Discharger shall comply with applicable state and local requirements regarding the production and use of recycled wastewater, including requirements of California

Water Code (CWC) sections 13500 – 13577 (Water Reclamation) and Department of Public Health regulations at title 22, sections 60301 – 60357 of the California Code of Regulations (Water Recycling Criteria).

IV. RECEIVING WATER LIMITATIONS

A. Surface Water Limitations

The discharge shall not cause a violation of the following receiving water limitations which are based on water quality objectives (Water-Contact Standards) contained in the Ocean Plan and are a required part of this Order. Compliance with these limitations shall be determined from samples collected at stations representative of the area within the waste field where initial dilution is completed except where other stations are defined.

1. Within a zone bounded by the shoreline and a distance of 1,000 feet from the shoreline or the 30-foot depth contour, whichever is farther from the shoreline, and in areas outside this zone designated for water contact recreation use by the Central Coast Water Board, but including all kelp beds, the following bacteriological objectives shall be maintained throughout the water column.

   30-Day Geometric Mean – The following standards are based on the geometric mean of the five most recent samples from each receiving water monitoring location.

   a. Total coliform density shall not exceed 1,000 per 100 mL;
   b. Fecal coliform density shall not exceed 200 per 100 mL; and
   c. Enterococcus density shall not exceed 35 per 100 mL.

   Single Sample maximum;

   a. Total coliform density shall not exceed 10,000 per 100 mL;
   b. Fecal coliform density shall not exceed 400 per 100 mL; and
   c. Enterococcus density shall not exceed 104 per 100 mL.
   d. Total coliform density shall not exceed 1,000 per 100 mL when the fecal coliform to total coliform ratio exceeds 0.1

2. At all areas where shellfish may be harvested for human consumption, as determined by the Central Coast Water Board, the following bacteriological objectives shall be maintained throughout the water column:

   a. The median total coliform density shall not exceed 70 organisms per 100 mL, and in not more than 10 percent of samples shall coliform density exceed 230 organisms per 100 mL.

3. Floating particulates and grease and oil shall not be visible.

4. The discharge of waste shall not cause aesthetically undesirable discoloration of the ocean surface.

5. Natural light shall not be significantly reduced at any point outside the initial dilution zone as the result of the discharge of waste.

6. The rate of deposition of inert solids and the characteristics of inert solids in ocean sediments shall not be changed such that benthic communities are degraded.

7. The dissolved oxygen concentration shall not at any time be depressed more than 10 percent from that which occurs naturally as a result of the discharge of oxygen-demanding waste.

8. The pH shall not be changed at any time more than 0.2 units from that which occurs naturally.

9. The dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that present under natural conditions.

10. The concentration of substances set forth in Chapter II, Table 1 of the Ocean Plan in marine sediments shall not be increased to levels that would degrade indigenous biota.

11. The concentration of organic materials in marine sediments shall not be increased to levels that would degrade marine life.

12. Nutrient levels shall not cause objectionable aquatic growths or degrade indigenous biota.

13. Discharges shall not cause exceedances of water quality objectives for ocean waters of the State established in Table 1 of the Ocean Plan.

14. Marine communities, including vertebrate, invertebrate and plant species, shall not be degraded.

15. The natural taste, odor, and color of fish, shellfish, or other marine resources used for human consumption shall not be altered.

16. The concentration of organic materials in fish, shellfish, or other marine resources used for human consumption shall not bioaccumulate to levels that are harmful to human health.

17. Discharge of radioactive waste shall not degrade marine life.

B. Groundwater Limitations

Activities at the facility shall not cause exceedance/deviation from the following water quality objectives for groundwater established by the Basin Plan.

1. Groundwater shall not contain taste or odor producing substances in concentrations that adversely affect beneficial uses.

2. Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life; or result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.

V. PROVISIONS

A. Standard Provisions

1. The Discharger shall comply with all Standard Provisions included in Attachment D of this Order.

2. The Discharger shall comply with the following provisions:

   Before changing the point of discharge, place of use, or purpose of use of treated wastewater that results in a decrease of flow in any portion of an inland watercourse, in any way, the Discharger shall file a petition with the State Water Board, Division of Water Rights, and receive approval for such a change. (Water Code section 1211.)

B. Monitoring and Reporting Program (MRP) Requirements

Pursuant to CWC sections 13267 and 13383, the Discharger shall comply with the Monitoring and Reporting Program (MRP), and future revisions thereto, in Attachment E of this Order, and all notification and general reporting requirements throughout this Order and Attachment D. Where notification or general reporting requirements conflict with those stated in the MRP (e.g., annual report due date), the Discharger shall comply with the MRP requirements. All monitoring shall be conducted according to 40 C.F.R. part 136, *Guidelines Establishing Test Procedures for Analysis of Pollutants*.

The Discharger is required to provide these technical or monitoring reports because it is the owner and operator responsible for the waste discharge and compliance with this Order. The Central Coast Water Board needs the information to determine the Discharger's compliance with this Order, assess the need for further investigation and/or enforcement action, and to protect public health and safety and the environment.

C. Special Provisions

1. Reopener Provisions

This permit may be reopened and modified in accordance with NPDES regulations at 40 C.F.R. §§ 122 and 124, as necessary, to include additional conditions or limitations based on newly available information or to implement any USEPA-approved, new State water quality objective.

This Order may be reopened for modification to include an effluent limitation if monitoring establishes that the discharge causes, has the reasonable potential to cause, or contributes to an excursion above a California Ocean Plan (Ocean Plan) Table 1 water quality objective.

2. Special Studies, Technical Reports and Additional Monitoring Requirements

a. Toxicity Reduction Requirements

If the discharge consistently exceeds an effluent limitation for toxicity specified by Section III of this Order, the Discharger shall conduct a Toxicity Reduction Evaluation (TRE) in accordance with the Discharger's TRE Workplan.

A TRE is a study conducted in a step-wise process designed to identify the causes of effluent or ambient toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. The first steps of the TRE consist of the collection of data relevant to the toxicity, including additional toxicity testing, and an evaluation of facility operations and maintenance practices, and best management practices. A Toxicity Identification Evaluation (TIE) may be required as part of the TRE, if appropriate. A TIE is a set of procedures to identify the specific chemical(s) responsible for toxicity. These procedures are performed in three phases - characterization, identification, and confirmation using aquatic organism toxicity tests. The TRE shall include all reasonable steps to identify the source of toxicity. The Discharger shall take all reasonable steps to reduce toxicity to the required level once the source of toxicity is identified.

The Discharger shall maintain a TRE Workplan, which describes steps that the Discharger intends to follow if a toxicity effluent limitation in this Order is exceeded. The workplan shall be prepared in accordance with current technical guidance and reference material, including EPA/600/2-88-070 (for industrial discharges) or EPA/600/2-88/062 (for municipal discharges), and shall describe, at least:

i. Actions proposed to investigate/identify the causes/sources of toxicity,

ii. Actions proposed to mitigate the discharge's adverse effects, to correct the non-compliance, and/or to prevent the recurrence of acute or chronic toxicity (this list of action steps may be expanded, if a TRE is undertaken), and

iii. A schedule to implement these actions.

When monitoring detects effluent toxicity greater than a limitation in this Order, the Discharger shall resample as soon as practicable, if the discharge is continuing, and retest for whole effluent toxicity. Results of an initial failed test and results of subsequent monitoring shall be reported to the Executive Officer (EO) as soon as possible after receiving monitoring results. If subsequent monitoring indicates that the discharge consistently exceeds a toxicity effluent limit, the Discharger, upon notification of the EO, shall conduct a TRE considering guidance provided by the USEPA's Toxicity Reduction Evaluation Procedures, Phases 1, 2, and 3 (EPA document nos. EPA 600/3-88/034, 600/3-88/035, and 600/3-88/036, respectively). A TRE, if necessary, shall be conducted in accordance with the following schedule.

Table 8. Toxicity Reduction Evaluation—Schedule

Action Step	When Required
Take all reasonable measures necessary to immediately reduce toxicity, where the source is known.	Within 24 hours of identification of noncompliance.
Initiate the TRE in accordance to the Workplan.	Within 7 days of notification by the EO
Conduct the TRE following the procedures in the Workplan.	Within the period specified in the Workplan (not to exceed one year, without an approved Workplan)
Submit the results of the TRE, including summary of findings, required corrective action, and all results and data.	Within 60 days of completion of the TRE
Implement corrective actions to meet Permit limits and conditions.	To be determined by the EO

b. Water Contact Monitoring (Bacterial Characteristics)

In accordance with Ocean Plan section III.D.1.b, if a single sample exceeds any of the bacteriological single sample maximum (SSM) standards contained within section V.A.1 of this Order, repeat sampling at that location shall be conducted to determine the extent and persistence of the exceedance. The EO shall be notified within 24 hours of receiving analytical results and repeat sampling shall be conducted within 24 hours of receiving analytical results and continued based per a sampling frequency as directed by the EO until the sample result is less than the SSM standard or until a sanitary survey is conducted to determine the source of the high bacterial densities.

When repeat sampling is required because of an exceedance of any one single sample density, values from all samples collected during that 30-day period will be used to calculate the geometric mean.

(This requirement is also footnoted in Table E-8 of Section VIII.A of Attachment E Monitoring and Reporting Program.)

c. Brine Waste Disposal Study

Prior to increasing the volume of brine waste discharged through the ocean outfall beyond 375,000 gallons average daily flow, the Discharger shall submit a brine waste disposal study to the Executive Officer for approval. The study shall include, at a minimum, the following elements: (1) a projection of the brine volume and characteristics, (2) an assessment of the impact of the increased brine volume on permit compliance, (3) an assessment of the impact of the increased brine volume on the minimum probable initial dilution at the point of discharge, (4) a detailed description of the brine waste disposal facilities which are proposed to accommodate the increased brine volume and facilitate blended secondary effluent and brine wastes flow metering and sampling, and (5) a schedule for the design and construction of the new brine disposal facilities. The Order includes a requirement to send a copy of the study to the MBNMS.

3. Best Management Practices and Pollution Prevention

a. Pollutant Minimization Program

The 2012 California Ocean Plan establishes guidelines for the Pollutant Minimization Program (PMP). At the time of the proposed adoption of this Order, no known evidence was available that would require the Discharger to immediately develop and conduct a PMP. The Central Coast Water Board will notify the Discharger in writing if such a program becomes necessary. The 2012 Ocean Plan PMP language is included herein to provide guidance in the event that a PMP must be developed and implemented by the Discharger.

PMP Goal: The PMP goal is to reduce all potential pollutant sources through pollutant minimization (control) strategies, including pollution prevention measures, to maintain pollutant effluent concentrations at or below the effluent limitation.

Pollution prevention measures may be particularly appropriate for persistent bioaccumulative priority pollutants where there is evidence of impairment of beneficial uses. The completion and implementation of a Pollution Prevention Plan, required in accordance with California Water Code §13263.3 (d), will fulfill the PMP requirements.

Determining the Need for a PMP:

1. The Discharger must develop and conduct a PMP if all of the following conditions are true:

(a) The calculated effluent limitation is less than the reported Minimum Level.

(b) The concentration of the pollutant is reported as DNQ.

(c) There is evidence showing that the pollutant is present in the effluent above the calculated effluent limitation.

2. Alternatively, the Discharger must develop and conduct a PMP if all of the following conditions are true:

(a) The calculated effluent limitation is less than the Method Detection Limit (MDL).

(b) The concentration of the pollutant is reported as ND.

(c) There is evidence showing that the pollutant is present in the effluent above the calculated effluent limitation.

Special Provision for Evidence of Pollutant Presence

Central Coast Water Boards may include special provisions in the discharge requirements to require the gathering of evidence to determine whether the pollutant is present in the effluent at levels above the calculated effluent limitation. Examples of evidence may include:

1. Health advisories for fish consumption;
2. Presence of whole effluent toxicity;
3. Results of benthic or aquatic organism tissue sampling;
4. Sample results from analytical methods more sensitive than methods included in the permit (in accordance with the 2012 Ocean Plan, Chapter III, Section C.5.b, *Deviations from Minimum Levels in Appendix II*; or
5. The concentration of the pollutant is reported as DNQ and the effluent limitation is less than the MDL.

Elements of a PMP

The Central Coast Water Board may consider cost-effectiveness when establishing the requirements of a PMP. The program shall include actions and submittals acceptable to the Central Coast Water Board including, but not limited to, the following:

1. An annual review and semiannual monitoring of potential sources of the reportable pollutant, which may include fish tissue monitoring and other bio-uptake sampling;
2. Quarterly monitoring for the reportable pollutant in the influent to the wastewater treatment system;
3. Submittal of a control strategy designed to proceed toward the goal of maintaining concentrations of the reportable pollutant in the effluent at or below the calculated effluent limitation;
4. Implementation of appropriate cost-effective control measures for the pollutant, consistent with the control strategy; and,
5. An annual status report that shall be sent to the Central Coast Water Board including:
   (a) All PMP monitoring results for the previous year;
   (b) A list of potential sources of the reportable pollutant;
   (c) A summary of all action taken in accordance with the control strategy; and,
   (d) A description of actions to be taken in the following year.

4. Construction, Operation and Maintenance Specifications – Not Applicable

The Facility shall be operated as specified under Standard Provision D of Attachment D.

5. Special Provisions for Municipal Facilities (POTWs Only)

a. Biosolids Management.

i. Sludge and wastewater solids must be disposed of in a municipal solid waste landfill, reused by land application, or disposed of in a sludge-only

landfill in accordance with 40 C.F.R. parts 258 and 503 and Title 23, Chapter 15 of the CCR. If the Discharger desires to dispose of solids and/or sludge in a different manner, a request for permit modification must be submitted to the U.S. EPA and to the Regional Water Board at least 180 days prior to beginning the alternative means of disposal.

ii. Sludge that is disposed of in a municipal solid waste landfill must meet the requirements of 40 C.F.R. part 258 pertaining to providing information to the public. In the annual self-monitoring report, the Discharger shall include the amount of sludge placed in the landfill as well as the landfill to which it was sent.

iii. All requirements of 40 C.F.R. part 503 and 23 CCR Chapter 15 are enforceable whether or not the requirements of those regulations are stated in an NPDES permit or any other permit issued to the Discharger.

iv. The Discharger shall take all reasonable steps to prevent and minimize any sludge use or disposal in violation of this Order that has a likelihood of adversely affecting human health or the environment.

v. Solids and sludge treatment, storage, and disposal or reuse shall not create a nuisance, such as objectionable odors or flies, and shall not result in groundwater contamination.

vi. The solids and sludge treatment and storage site shall have adequate facilities to divert surface water runoff from adjacent areas to protect the boundaries of the site from erosion, and to prevent drainage from the treatment and storage site. Adequate protection is defined as protection, at the minimum, from a 100-year storm and protection from the highest possible tidal stage that may occur.

vii. The discharge of sewage sludge and solids shall not cause waste material to be in position where it is, or can be, conveyed from the treatment and storage sites and deposited in waters of the State. The Discharger shall submit an annual report to the U.S. EPA and the Regional Board.

viii. Water Board containing monitoring results and pathogen and vector attraction reduction requirements, as specified by 40 C.F.R. part 503. The Discharger shall also report the quantity of sludge removed from the Facility and the disposal method. This self-monitoring report shall be postmarked by February 19th of each year and report for the period of the previous calendar year.

b. Pretreatment

The Discharger shall be responsible for the performance of all pretreatment requirements contained in 40 C.F.R. part 403 and shall be subject to enforcement actions, penalties, fines, and other remedies by the U.S. EPA, or other appropriate parties, as provided in the CWA, as amended (33 USA 1351 et seq.).

The Discharger shall implement and enforce its Approved Publicly Owned Treatment Works (POTW) Pretreatment Program. Implementation of the Discharger's Approved POTW Pretreatment Program is hereby made an enforceable condition of this permit. U.S. EPA may initiate enforcement action against an industrial user for non-compliance with applicable standards and requirements as provided in the CWA.

The Discharger shall enforce the requirements promulgated under Sections 307(b), (c), and (d) and 402(b) of the CWA. The Discharger shall cause industrial users subject to Federal Categorical Standards to achieve compliance no later than the date specified in those requirements or, in the case of a new industrial user, upon commencement of the discharge.

The Discharger shall perform the pretreatment functions as required in 40 C.F.R. part 403, including, but not limited to:

i. Implement necessary legal authorities as provided in 40 C.F.R. § 403.8(f)(1);

ii. Enforce the pretreatment requirements under 40 C.F.R. §§ 403.5 and 403.6;

iii. Implement the programmatic functions as provided in 40 C.F.R. § 403.8(f)(2); and,

iv. Provide the requisite funding and personnel to implement the pretreatment program as provided in 40 C.F.R. § 403.8(f)(3).

The Discharger shall submit annually a report to the U.S. EPA – Region 9, the Central Coast Water Board, and the State Water Resources Control Board describing the Discharger's pretreatment activities over the previous twelve months. In the event that the Discharger is not in compliance with conditions or requirements of this permit affected by the pretreatment program, it shall also include reasons for non-compliance and a statement how and when it shall comply. This annual report is due by February 1st of each year and shall contain, but not be limited to, the contents described in the "Pretreatment Reporting Requirements" contained in the Attachment E Monitoring and Reporting Program.

The Discharger shall comply, and ensure affected "indirect dischargers" comply, with Paragraph No. II.D.1 of the "Standard Provisions and Reporting Requirements."

6. Other Special Provisions

a. Discharges of Storm Water. For the control of storm water discharged from the site of the wastewater treatment and disposal facilities, if applicable, the Discharger shall seek authorization to discharge under and meet the requirements of the State Water Resources Control Board's Water Quality Order 97-03-DWQ, NPDES General Permit No. CAS000001, Waste Discharge

Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities.

b. **Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (State Water Board Order No. 2006-0003-DWQ)**. This General Order, adopted on May 2, 2006, is applicable to all "federal and state agencies, municipalities, counties, districts, and other public entities that own or operate sanitary sewer systems greater than one mile in length that collect and/or convey untreated or partially treated wastewater to a publicly owned treatment facility in the State of California." The purpose of the General Order is to promote the proper and efficient management, operation, and maintenance of sanitary sewer systems and to minimize the occurrences and adverse effects of sanitary sewer overflows. The Discharger has enrolled in this General Order.

7. Compliance Schedules – Not Applicable

VI. COMPLIANCE DETERMINATION

Compliance with the effluent limitations contained in Section IV of this Order will be determined as specified below:

A. General.

Compliance with effluent limitations for reportable pollutants shall be determined using sample reporting protocols defined in the MRP and Attachment A of this Order. For purposes of reporting and administrative enforcement by the Regional and State Water Boards, the Discharger shall be deemed out of compliance with effluent limitations if the concentration of the reportable pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the reported Minimum Level (ML).

B. Multiple Sample Data.

When determining compliance with a measure of central tendency (arithmetic mean, geometric mean, median, etc.) of multiple sample analyses and the data set contains one or more reported determinations of "Detected, but Not Quantified" (DNQ) or "Not Detected" (ND), the Discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:

1. The data set shall be ranked from low to high, ranking the reported ND determinations lowest, DNQ -determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

2. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

ATTACHMENT A – DEFINITIONS

Acute Toxicity:

a. Acute Toxicity (TUa)

Expressed in Toxic Units Acute (TUa)

$$TUa = \frac{100}{96\text{-hr LC } 50\%}$$

b. Lethal Concentration 50% (LC 50)

LC 50 (percent waste giving 50% survival of test organisms) shall be determined by static or continuous flow bioassay techniques using standard marine test species as specified in Ocean Plan Appendix III. If specific identifiable substances in wastewater can be demonstrated by the discharger as being rapidly rendered harmless upon discharge to the marine environment, but not as a result of dilution, the LC 50 may be determined after the test samples are adjusted to remove the influence of those substances.

When it is not possible to measure the 96-hour LC 50 due to greater than 50 percent survival of the test species in 100 percent waste, the toxicity concentration shall be calculated by the expression:

$$TUa = \frac{\log (100 - S)}{1.7}$$

where: S = percentage survival in 100% waste. If S > 99, TUa shall be reported as zero.

Areas of Special Biological Significance (ASBS): are those areas designated by the State Water Board as ocean areas requiring protection of species or biological communities to the extent that alteration of natural water quality is undesirable. All Areas of Special Biological Significance are also classified as a subset of STATE WATER QUALITY PROTECTION AREAS.

Average Monthly Effluent Limitation (AMEL): the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Effluent Limitation (AWEL): the highest allowable average of daily discharges over a calendar week (Sunday through Saturday), calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges **measured during that week.**

Chlordane shall mean the sum of chlordane-alpha, chlordane-gamma, chlordene-alpha, chlordene-gamma, nonachlor-alpha, nonachlor-gamma, and oxychlordane.

Chronic Toxicity: This parameter shall be used to measure the acceptability of waters for supporting a healthy marine biota until improved methods are developed to evaluate biological response.

a. Chronic Toxicity (TUc)

   Expressed as Toxic Units Chronic (TUc)

   $$TUc = \frac{100}{NOEL}$$

b. No Observed Effect Level (NOEL)

   The NOEL is expressed as the maximum percent effluent or receiving water that causes no observable effect on a test organism, as determined by the result of a critical life stage toxicity test listed in Ocean Plan Appendix II.

Daily Discharge: Daily Discharge is defined as either: (1) the total mass of the constituent discharged over the calendar day (12:00 am through 11:59 pm) or any 24-hour period that reasonably represents a calendar day for purposes of sampling (as specified in the permit), for a constituent with limitations expressed in units of mass or; (2) the unweighted arithmetic mean measurement of the constituent over the day for a constituent with limitations expressed in other units of measurement (e.g., concentration).

The daily discharge may be determined by the analytical results of a composite sample taken over the course of one day (a calendar day or other 24-hour period defined as a day) or by the arithmetic mean of analytical results from one or more grab samples taken over the course of the day.

For composite sampling, if 1 day is defined as a 24-hour period other than a calendar day, the analytical result for the 24-hour period will be considered as the result for the calendar day in which the 24-hour period ends.

DDT shall mean the sum of 4,4'DDT, 2,4'DDT, 4,4'DDE, 2,4'DDE, 4,4'DDD, and 2,4'DDD.

Degrade: Degradation shall be determined by comparison of the waste field and reference site(s) for characteristic species diversity, population density, contamination, growth anomalies, debility, or supplanting of normal species by undesirable plant and animal species. Degradation occurs if there are significant differences in any of three major biotic groups, namely, demersal fish, benthic invertebrates, or attached algae. Other groups may be evaluated where benthic species are not affected, or are not the only ones affected.

Detected, but Not Quantified (DNQ) are those sample results less than the reported Minimum Level, but greater than or equal to the laboratory's MDL. Sample results reported as DNQ are estimated concentrations.

Dichlorobenzenes shall mean the sum of 1,2- and 1,3-dichlorobenzene.

Downstream Ocean Waters shall mean waters downstream with respect to ocean currents.

Dredged Material: Any material excavated or dredged from the navigable waters of the United States, including material otherwise referred to as "spoil".

Enclosed Bays are indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. This definition includes but is not limited to: Humboldt Bay, Bodega Harbor, Tomales Bay, Drakes Estero, San Francisco Bay, Morro Bay, Los Angeles Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay.

Endosulfan shall mean the sum of endosulfan-alpha and -beta and endosulfan sulfate.

Estuaries and Coastal Lagoons are waters at the mouths of streams that serve as mixing zones for fresh and ocean waters during a major portion of the year. Mouths of streams that are temporarily separated from the ocean by sandbars shall be considered as estuaries. Estuarine waters will generally be considered to extend from a bay or the open ocean to the upstream limit of tidal action but may be considered to extend seaward if significant mixing of fresh and salt water occurs in the open coastal waters. The waters described by this definition include but are not limited to the Sacramento-San Joaquin Delta as defined by Section 12220 of the California Water Code, Suisun Bay, Carquinez Strait downstream to Carquinez Bridge, and appropriate areas of the Smith, Klamath, Mad, Eel, Noyo, and Russian Rivers.

Halomethanes shall mean the sum of bromoform, bromomethane (methyl bromide) and chloromethane (methyl chloride).

HCH shall mean the sum of the alpha, beta, gamma (lindane) and delta isomers of hexachlorocyclohexane.

Initial Dilution is the process that results in the rapid and irreversible turbulent mixing of wastewater with ocean water around the point of discharge.

For a submerged buoyant discharge, characteristic of most municipal and industrial wastes that are released from the submarine outfalls, the momentum of the discharge and its initial buoyancy act together to produce turbulent mixing. Initial dilution in this case is completed when the diluting wastewater ceases to rise in the water column and first begins to spread horizontally.

For shallow water submerged discharges, surface discharges, and non-buoyant discharges, characteristic of cooling water wastes and some individual discharges, turbulent mixing results primarily from the momentum of discharge. Initial dilution, in these cases, is considered to be completed when the momentum induced velocity of the discharge ceases to produce significant mixing of the waste, or the diluting plume reaches a fixed distance from the discharge to be specified by the Regional Board, whichever results in the lower estimate for initial dilution.

Instantaneous Maximum Effluent Limitation: the highest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous maximum limitation).

Instantaneous Minimum Effluent Limitation: the lowest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous minimum limitation).

Kelp Beds, for purposes of the bacteriological standards of the Ocean Plan, are significant aggregations of marine algae of the genera Macrocystis and Nereocystis. Kelp beds include the total foliage canopy of Macrocystis and Nereocystis plants throughout the water column.

Mariculture is the culture of plants and animals in marine waters independent of any pollution source.

Material: (a) In common usage: (1) the substance or substances of which a thing is made or composed (2) substantial; (b) For purposes of the Ocean Plan relating to waste disposal, dredging and the disposal of dredged material and fill, MATERIAL means matter of any kind or description which is subject to regulation as waste, or any material dredged from the navigable waters of the United States. See also, DREDGED MATERIAL.

Maximum Daily Effluent Limitation (MDEL): the highest allowable daily discharge of a pollutant.

MDL (Method Detection Limit) is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, as defined in 40 C.F.R. 136, part 136, Appendix B.

Minimum Level (ML) is the concentrations at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method-specified sample weights, volumes and processing steps have been followed.

Natural Light: Reduction of natural light may be determined by the Central Coast Water Board by measurement of light transmissivity or total irradiance, or both, according to the monitoring needs of the Central Coast Water Board.

Not Detected (ND) are those sample results less than the laboratory's MDL.

Ocean Waters are the territorial marine waters of the state as defined by California law to the extent these waters are outside of enclosed bays, estuaries, and coastal lagoons. If a discharge outside the territorial waters of the state could affect the quality of the waters of the state, the discharge may be regulated to assure no violation of the Ocean Plan will occur in ocean waters.

PAHs (polynuclear aromatic hydrocarbons) shall mean the sum of acenaphthylene, anthracene, 1,2-benzanthracene, 3,4-benzofluoranthene, benzo[k]fluoranthene, 1,12-benzoperylene, benzo[a]pyrene, chrysene, dibenzo[ah]anthracene, fluorene, indeno[1,2,3-cd]pyrene, phenanthrene and pyrene.

PCBs (polychlorinated biphenyls) shall mean the sum of chlorinated biphenyls whose analytical characteristics resemble those of Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254 and Aroclor-1260.

Pollutant Minimization Program (PMP) means waste minimization and pollution prevention actions that include, but are not limited to, product substitution, waste stream recycling, alternative waste management methods, and education of the public and businesses. The goal of the PMP shall be to reduce all potential sources of Ocean Plan Table 1 pollutants through pollutant minimization (control) strategies, including pollution prevention measures as appropriate, to maintain the effluent concentration at or below the water quality-based effluent limitation. Pollution prevention measures may be particularly appropriate for persistent bioaccumulative priority pollutants where there is evidence that beneficial uses are being impacted. The Central Coast Water Board may consider cost effectiveness when establishing the requirements of a PMP. The completion and implementation of a Pollution Prevention Plan, if required pursuant to Water Code section 13263.3(d), shall be considered to fulfill the PMP requirements.

Reported Minimum Level is the ML, also known as the Reporting Level, or RL (and its associated analytical method) chosen by the Discharger for reporting and compliance determination from the MLs included in this Order, including an additional factor if applicable as discussed herein. The MLs included in this Order correspond to approved analytical methods for reporting a sample result that are selected by the Central Coast Water Board either from Appendix II of the Ocean Plan in accordance with section III.C.5.a. of the Ocean Plan or established in accordance with section III.C.5.b. of the Ocean Plan. The ML is based on the proper application of method-based analytical procedures for sample preparation and the absence of any matrix interferences. Other factors may be applied to the ML depending on the specific sample preparation steps employed. For example, the treatment typically applied in cases where there are matrix-effects is to dilute the sample or sample aliquot by a factor of ten. In such cases, this additional factor must be applied to the ML in the computation of the reported ML.

Satellite Collection System is the portion, if any, of a sanitary sewer system owned or operated by a different public agency than the agency that owns and operates the wastewater treatment facility that a sanitary sewer system is tributary to.

Shellfish are organisms identified by the California Department of Health Services as shellfish for public health purposes (i.e., mussels, clams and oysters).

Significant Difference is defined as a statistically significant difference in the means of two distributions of sampling results at the 95 percent confidence level.

Six-month Median Effluent Limitation: the highest allowable moving median of all daily discharges for any 180-day period.

State Water Quality Protection Areas (SWQPAs) are non-terrestrial marine or estuarine areas designated to protect marine species or biological communities from an undesirable alteration in natural water quality. All AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE (ASBS) that were previously designated by the State Water Board in Resolution No.s 74-28, 74-32, and 75-61 are now also classified as a subset of State Water Quality Protection Areas and require special protections afforded by the Ocean Plan.

TCDD Equivalents shall mean the sum of the concentrations of chlorinated dibenzodioxins (2,3,7,8-CDDs) and chlorinated dibenzofurans (2,3,7,8-CDFs) multiplied by their respective toxicity factors, as shown in the table below.

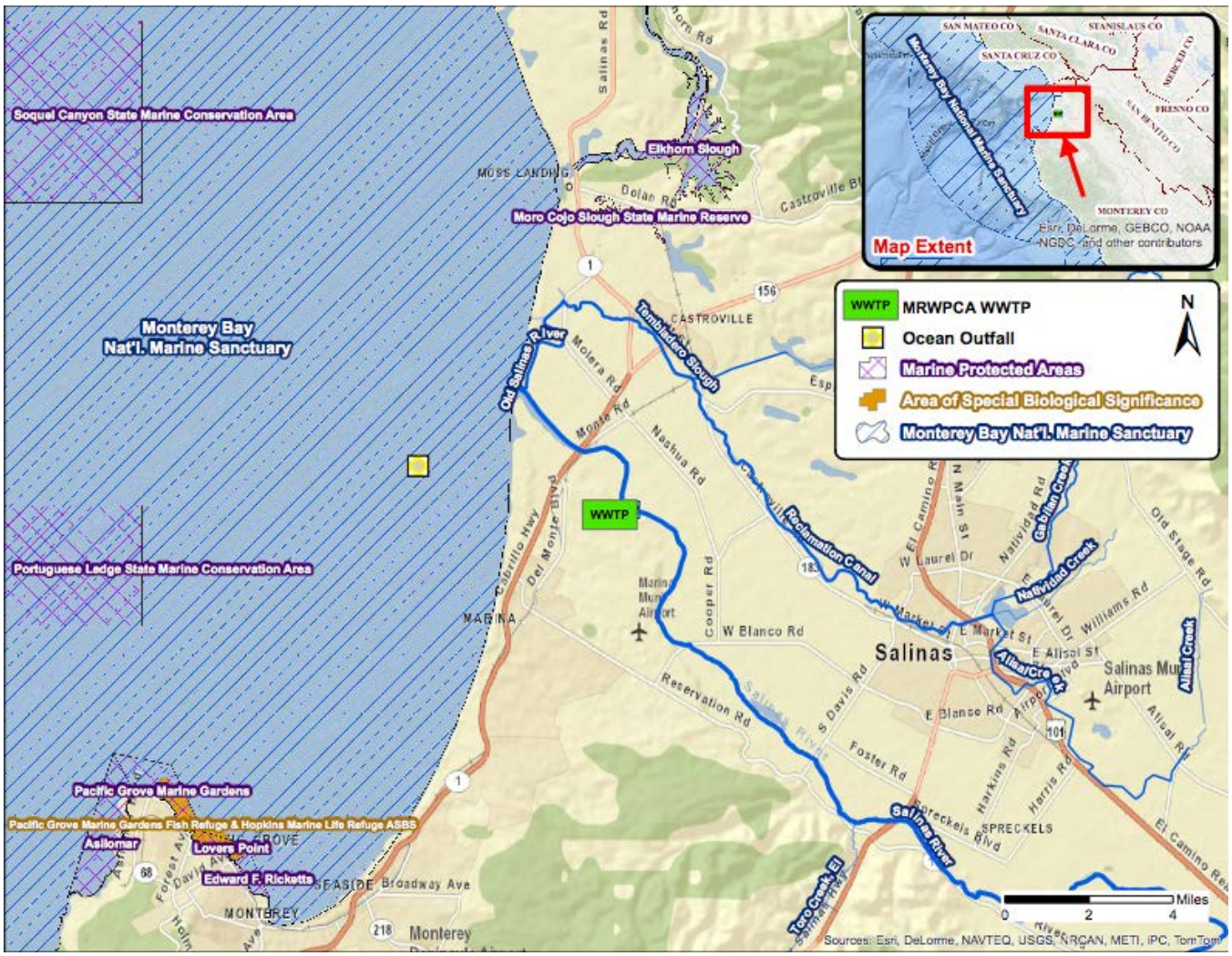
Isomer Group	Toxicity Equivalence Factor
2,3,7,8-tetra CDD	1.0
2,3,7,8-penta CDD	0.5
2,3,7,8-hexa CDDs	0.1
2,3,7,8-hepta CDD	0.01
octa CDD	0.001
2,3,7,8 tetra CDF	0.1
1,2,3,7,8 penta CDF	0.05
2,3,4,7,8 penta CDF	0.5
2,3,7,8 hexa CDFs	0.1
2,3,7,8 hepta CDFs	0.01
octa CDF	0.001

Toxicity Reduction Evaluation (TRE) is a study conducted in a step-wise process designed to identify the causative agents of effluent or ambient toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. The first steps of the TRE consist of the collection of data relevant to the toxicity, including additional toxicity testing, and an evaluation of facility operations and maintenance practices, and best management practices. A TOXICITY IDENTIFICATION EVALUATION (TIE) may be required as part of the TRE, if appropriate. (A TIE is a set of procedures to identify the specific chemical(s) responsible for toxicity. These procedures are performed in three phases (characterization, identification, and confirmation) using aquatic organism toxicity tests.)

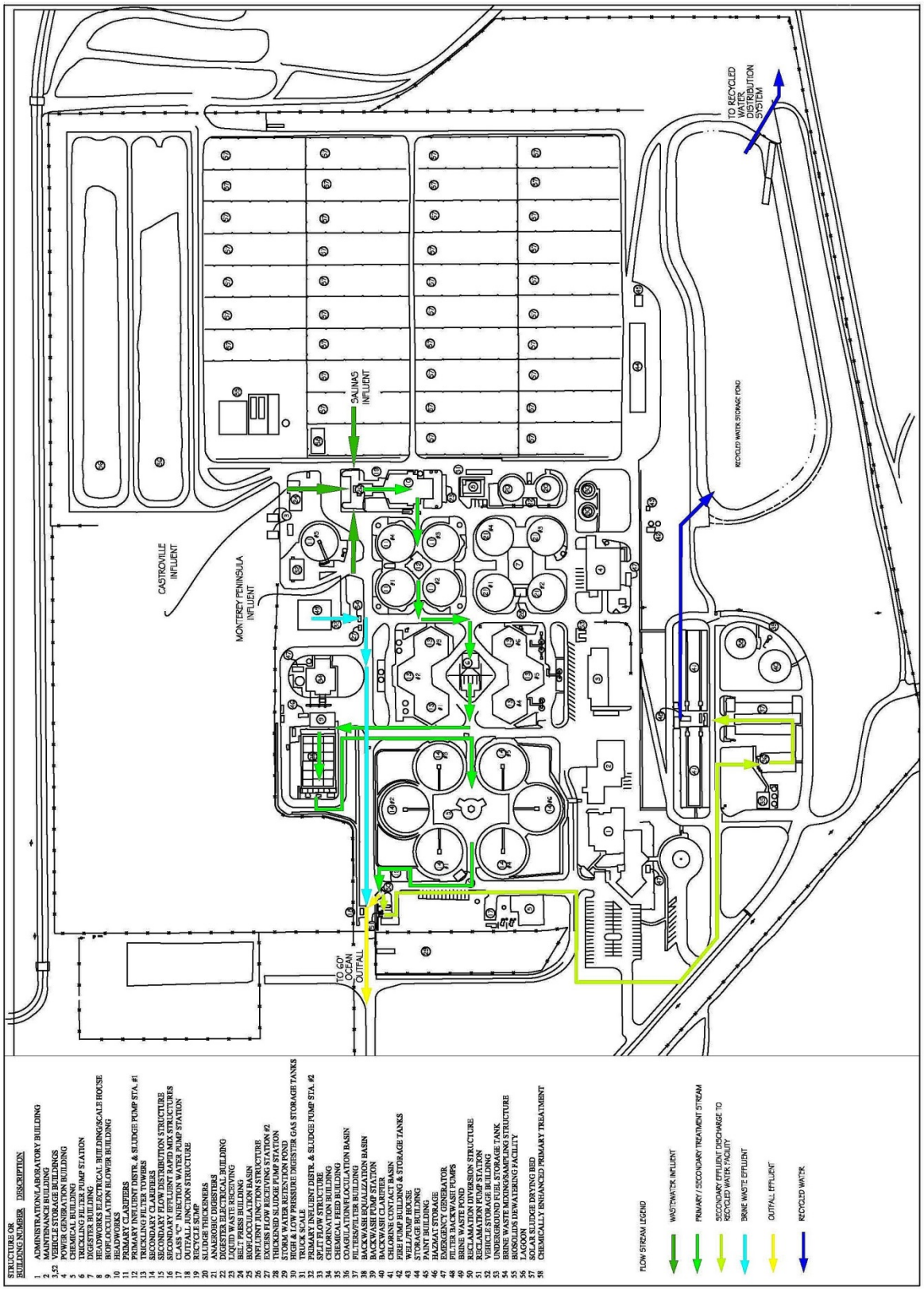
Waste: As used in the Ocean Plan, waste includes a Discharger's total discharge, of whatever origin, i.e., gross, not net, discharge.

Water Recycling: The treatment of wastewater to render it suitable for reuse, the transportation of treated wastewater to the place of use, and the actual use of treated wastewater for a direct beneficial use or controlled use that would not otherwise occur.

ATTACHMENT B – MAP



ATTACHMENT C – FLOW SCHEMATIC



ATTACHMENT D –STANDARD PROVISIONS

I. STANDARD PROVISIONS – PERMIT COMPLIANCE

A. Duty to Comply

1. The Discharger must comply with all of the conditions of this Order. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code and is grounds for enforcement action, for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. (40 CFR § 122.41(a).)

2. The Discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants and with standards for sewage sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if this Order has not yet been modified to incorporate the requirement. (40 CFR § 122.41(a)(1).)

B. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for the Discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Order. (40 CFR § 122.41(c).)

C. Duty to Mitigate

The Discharger shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this Order that has a reasonable likelihood of adversely affecting human health or the environment. (40 CFR § 122.41(d).)

D. Proper Operation and Maintenance

The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Discharger to achieve compliance with the conditions of this Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by the Discharger only when necessary to achieve compliance with the conditions of this Order (40 CFR § 122.41(e)).

E. Property Rights

1. This Order does not convey any property rights of any sort or any exclusive privileges. (40 CFR § 122.41(g).)

2. The issuance of this Order does not authorize any injury to persons or property or invasion of other private rights, or any infringement of state or local law or regulations. (40 CFR § 122.5(c).)

F. Inspection and Entry

The Discharger shall allow the Central Coast Water Board, State Water Board, United States Environmental Protection Agency (USEPA), and/or their authorized representatives (including an authorized contractor acting as their representative), upon the presentation of credentials and other documents, as may be required by law, to (40 CFR § 122.41(i); Water Code, § 13383):

1. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this Order (40 CFR § 122.41(i)(1));

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order (40 CFR § 122.41(i)(2));

3. Inspect and photograph, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order (40 CFR § 122.41(i)(3)); and

4. Sample or monitor, at reasonable times, for the purposes of assuring Order compliance or as otherwise authorized by the CWA or the Water Code, any substances or parameters at any location. (40 CFR § 122.41(i)(4).)

G. Bypass

1. Definitions

   a. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility. (40 CFR § 122.41(m)(1)(i).)

   b. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities, which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. (40 CFR § 122.41(m)(1)(ii).)

2. Bypass not exceeding limitations. The Discharger may allow any bypass to occur which does not cause exceedances of effluent limitations, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions listed in Standard Provisions – Permit Compliance I.G.3, I.G.4, and I.G.5 below. (40 CFR § 122.41(m)(2).)

3. Prohibition of bypass. Bypass is prohibited, and the Central Coast Water Board may take enforcement action against the Discharger for bypass, unless (40 CFR § 122.41(m)(4)(i)):

   a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage (40 CFR § 122.41(m)(4)(i)(A));

b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance (40 CFR § 122.41(m)(4)(i)(B)); and

c. The Discharger submitted notice to the Central Coast Water Board as required under Standard Provisions – Permit Compliance I.G.5 below. (40 CFR § 122.41(m)(4)(i)(C).)

4. The Central Coast Water Board may approve an anticipated bypass, after considering its adverse effects, if the Central Coast Water Board determines that it will meet the three conditions listed in Standard Provisions – Permit Compliance I.G.3 above. (40 CFR § 122.41(m)(4)(ii).)

5. Notice

a. Anticipated bypass. If the Discharger knows in advance of the need for a bypass, it shall submit a notice, if possible at least 10 days before the date of the bypass. (40 CFR § 122.41(m)(3)(i).)

b. Unanticipated bypass. The Discharger shall submit notice of an unanticipated bypass as required in Standard Provisions - Reporting V.E below (24-hour notice). (40 CFR § 122.41(m)(3)(ii).)

H. Upset

Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. (40 CFR § 122.41(n)(1).)

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of Standard Provisions – Permit Compliance I.H.2 below are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review. (40 CFR § 122.41(n)(2).).

2. Conditions necessary for a demonstration of upset. A Discharger who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that (40 CFR § 122.41(n)(3)):

a. An upset occurred and that the Discharger can identify the cause(s) of the upset (40 CFR § 122.41(n)(3)(i));

b. The permitted facility was, at the time, being properly operated (40 CFR § 122.41(n)(3)(ii));

c. The Discharger submitted notice of the upset as required in Standard Provisions – Reporting V.E.2.b below (24-hour notice) (40 CFR § 122.41(n)(3)(iii)); and

d. The Discharger complied with any remedial measures required under Standard Provisions – Permit Compliance I.C above. (40 CFR § 122.41(n)(3)(iv).)

3. Burden of proof. In any enforcement proceeding, the Discharger seeking to establish the occurrence of an upset has the burden of proof. (40 CFR § 122.41(n)(4).)

II. STANDARD PROVISIONS – PERMIT ACTION

A. General

This Order may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Discharger for modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any Order condition. (40 CFR § 122.41(f).)

B. Duty to Reapply

If the Discharger wishes to continue an activity regulated by this Order after the expiration date of this Order, the Discharger must apply for and obtain a new permit. (40 CFR § 122.41(b).)

C. Transfers

This Order is not transferable to any person except after notice to the Central Coast Water Board. The Central Coast Water Board may require modification or revocation and reissuance of this Order to change the name of the Discharger and incorporate such other requirements as may be necessary under the CWA and the Water Code. (40 CFR § 122.41(l)(3); § 122.61.)

III. STANDARD PROVISIONS – MONITORING

A. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. (40 CFR § 122.41(j)(1).)

B. Monitoring results must be conducted according to test procedures under Part 136 or, in the case of sludge use or disposal, approved under Part 136 unless otherwise specified in Part 503 unless other test procedures have been specified in this Order. (40 CFR § 122.41(j)(4); § 122.44(i)(1)(iv).)

IV. STANDARD PROVISIONS – RECORDS

A. Except for records of monitoring information required by this Order related to the Discharger's sewage sludge use and disposal activities, which shall be retained for a

period of at least five years (or longer as required by Part 503), the Discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the application for this Order, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Central Coast Water Board Executive Officer at any time. (40 CFR § 122.41(j)(2).)

B. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements (40 CFR § 122.41(j)(3)(i));
2. The individual(s) who performed the sampling or measurements (40 CFR § 122.41(j)(3)(ii));
3. The date(s) analyses were performed (40 CFR § 122.41(j)(3)(iii));
4. The individual(s) who performed the analyses (40 CFR § 122.41(j)(3)(iv));
5. The analytical techniques or methods used (40 CFR § 122.41(j)(3)(v)); and
6. The results of such analyses. (40 CFR § 122.41(j)(3)(vi).)

C. Claims of confidentiality for the following information will be denied (40 CFR § 122.7(b)):

1. The name and address of any permit applicant or Discharger (40 CFR § 122.7(b)(1)); and
2. Permit applications and attachments, permits and effluent data. (40 CFR § 122.7(b)(2).)

V. STANDARD PROVISIONS – REPORTING

A. Duty to Provide Information

The Discharger shall furnish to the Central Coast Water Board, State Water Board, or USEPA within a reasonable time, any information which the Central Coast Water Board, State Water Board, or USEPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order or to determine compliance with this Order. Upon request, the Discharger shall also furnish to the Central Coast Water Board, State Water Board, or USEPA copies of records required to be kept by this Order. (40 CFR § 122.41(h); Wat. Code, § 13267.)

B. Signatory and Certification Requirements

1. All applications, reports, or information submitted to the Central Coast Water Board, State Water Board, and/or USEPA shall be signed and certified in accordance with Standard Provisions – Reporting V.B.2, V.B.3, V.B.4, and V.B.5 below. (40 CFR § 122.41(k).)

2. All permit applications shall be signed by either a principal executive officer or ranking elected official. For purposes of this provision, a principal executive officer of a federal agency includes: (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of USEPA). (40 CFR § 122.22(a)(3).).

3. All reports required by this Order and other information requested by the Central Coast Water Board, State Water Board, or USEPA shall be signed by a person described in Standard Provisions – Reporting V.B.2 above, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described in Standard Provisions – Reporting V.B.2 above (40 CFR § 122.22(b)(1));

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) (40 CFR § 122.22(b)(2)); and

   c. The written authorization is submitted to the Central Coast Water Board and State Water Board. (40 CFR § 122.22(b)(3).)

4. If an authorization under Standard Provisions – Reporting V.B.3 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Standard Provisions – Reporting V.B.3 above must be submitted to the Central Coast Water Board and State Water Board prior to or together with any reports, information, or applications, to be signed by an authorized representative. (40 CFR § 122.22(c).)

5. Any person signing a document under Standard Provisions – Reporting V.B.2 or V.B.3 above shall make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations." (40 CFR § 122.22(d).)

C. Monitoring Reports

1. Monitoring results shall be reported at the intervals specified in the Monitoring and Reporting Program (Attachment E) in this Order. (40 CFR § 122.22(l)(4).)

2. Monitoring results must be reported on a Discharge Monitoring Report (DMR) form or forms provided or specified by the Central Coast Water Board or State Water Board for reporting results of monitoring of sludge use or disposal practices. (40 CFR § 122.41(l)(4)(i).)

3. If the Discharger monitors any pollutant more frequently than required by this Order using test procedures approved under Part 136 or, in the case of sludge use or disposal, approved under Part 136 unless otherwise specified in Part 503, or as specified in this Order, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Central Coast Water Board. (40 CFR § 122.41(l)(4)(ii).)

4. Calculations for all limitations, which require averaging of measurements, shall utilize an arithmetic mean unless otherwise specified in this Order. (40 CFR § 122.41(l)(4)(iii).)

D. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this Order, shall be submitted no later than 14 days following each schedule date. (40 CFR § 122.41(l)(5).)

E. Twenty-Four Hour Reporting

1. The Discharger shall report any noncompliance that may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the Discharger become aware of the circumstances. A written submission shall also be provided within five (5) days of the time the Discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. (40 CFR § 122.41(l)(6)(i).)

2. The following shall be included as information that must be reported within 24 hours under this paragraph (40 CFR § 122.41(l)(6)(ii)):

   a. Any unanticipated bypass that exceeds any effluent limitation in this Order. (40 CFR § 122.41(l)(6)(ii)(A).)

   b. Any upset that exceeds any effluent limitation in this Order. (40 CFR § 122.41(l)(6)(ii)(B).)

3. The Central Coast Water Board may waive the above-required written report under this provision on a case-by-case basis if an oral report has been received within 24 hours. (40 CFR § 122.41(l)(6)(iii).)

F. Planned Changes

The Discharger shall give notice to the Central Coast Water Board as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required under this provision only when (40 CFR § 122.41(l)(1)):

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in section 122.29(b) (40 CFR § 122.41(l)(1)(i)); or

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this Order. (40 CFR § 122.41(l)(1)(ii).)

3. The alteration or addition results in a significant change in the Discharger's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan. (40 CFR§ 122.41(l)(1)(iii).)

G. Anticipated Noncompliance

The Discharger shall give advance notice to the Central Coast Water Board or State Water Board of any planned changes in the permitted facility or activity that may result in noncompliance with General Order requirements. (40 CFR § 122.41(l)(2).)

H. Other Noncompliance

The Discharger shall report all instances of noncompliance not reported under Standard Provisions – Reporting V.C, V.D, and V.E above at the time monitoring reports are submitted. The reports shall contain the information listed in Standard Provision – Reporting V.E above. (40 CFR § 122.41(l)(7).)

I. Other Information

When the Discharger becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Central Coast Water Board, State Water Board, or USEPA, the Discharger shall promptly submit such facts or information. (40 CFR § 122.41(l)(8).)

VI. STANDARD PROVISIONS – ENFORCEMENT

A. The Central Coast Water Board is authorized to enforce the terms of this Order under several provisions of the Water Code, including, but not limited to, sections 13385, 13386, and 13387.

VII. ADDITIONAL PROVISIONS – NOTIFICATION LEVELS

A. Publicly Owned Treatment Works (POTWs)

All POTWs shall provide adequate notice to the Central Coast Water Board of the following (40 CFR § 122.42(b)):

1. Any new introduction of pollutants into the POTW from an indirect discharger that would be subject to sections 301 or 306 of the CWA if it were directly discharging those pollutants (40 CFR § 122.42(b)(1)); and

2. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of adoption of this Order. (40 CFR § 122.42(b)(2).)

3. Adequate notice shall include information on the quality and quantity of effluent introduced into the POTW as well as any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW. (40 CFR § 122.42(b)(3).)

VIII. CENTRAL COAST WATER BOARD STANDARD PROVISIONS

A. Prohibitions

1. Introduction of "incompatible wastes" to the treatment system is prohibited.

2. Discharge of high-level radiological waste and of radiological, chemical, and biological warfare agents is prohibited.

3. Discharge of "toxic pollutants" in violation of effluent standards and prohibitions established under §307(a) of the Clean Water Act (CWA) is prohibited.

4. Discharge of sludge, sludge digester or thickener supernatant, and sludge drying bed leachate to drainageways, surface waters, or the ocean is prohibited.

5. Introduction of pollutants into the collection, treatment, or disposal system by an "indirect discharger" that:
   a. Inhibit or disrupt the treatment process, system operation, or the eventual use or disposal of sludge; or
   b. Flow through the system to the receiving water untreated; and
   c. Cause or "significantly contribute" to a violation of any requirement of this Order, is prohibited.

6. Introduction of "pollutant free" wastewater to the collection, treatment, and disposal system in amounts that threaten compliance with this order is prohibited.

B. Provisions

1. Collection, treatment, and discharge of waste shall not create nuisance or pollution, as defined by California Water Code (CWC) §13050.

2. All facilities used for transport or treatment of wastes shall be adequately protected from inundation and washout as the result of a 100-year frequency flood.

3. Operation of collection, treatment, and disposal systems shall be in a manner that precludes public contact with wastewater.

4. Collected screenings, sludges, and other solids removed from liquid wastes shall be disposed of in a manner approved by the Executive Officer.

5. Wastewater treatment plants shall be supervised and operated by persons possessing certificates of appropriate grade pursuant to Title 23 of the California Code of Regulations.

6. After notice and opportunity for a hearing, this order may be terminated for cause, including, but not limited to:

    a. violation of any term or condition contained in this order.
    b. obtaining this order by misrepresentation, or by failure to disclose fully all relevant facts.
    c. a change in any condition or endangerment to human health or environment that requires a temporary or permanent reduction or elimination of the authorized discharge.
    d. a substantial change in character, location, or volume of the discharge.

7. Provisions of this permit are severable. If any provision of the permit is found invalid, the remainder of the permit shall not be affected.

8. After notice and opportunity for hearing, this order may be modified or revoked and reissued for cause, including:

    a. Promulgation of a new or revised effluent standard or limitation.
    b. A material change in character, location, or volume of the discharge.
    c. Access to new information that affects the terms of the permit, including applicable schedules.
    d. Correction of technical mistakes or mistaken interpretations of law.
    e. Other causes set forth under Sub-part D of 40 CFR Part 122.

9. Safeguards shall be provided to ensure maximal compliance with all terms and conditions of this permit. Safeguards shall include preventative and contingency plans and may also include alternative power sources, stand-by generators, retention capacity, operating procedures, or other precautions. Preventative and contingency plans for controlling and minimizing the effect of accidental discharges shall:

a. identify possible situations that could cause "upset," "overflow," "bypass," or other noncompliance. (Loading and storage areas, power outage, waste treatment unit outage, and failure of process equipment, tanks and pipes should be considered.)
b. evaluate the effectiveness of present facilities and procedures and describe procedures and steps to minimize or correct any adverse environmental impact resulting from noncompliance with the permit.

10. Physical facilities shall be designed and constructed according to accepted engineering practice and shall be capable of full compliance with this order when properly operated and maintained. Proper operation and maintenance shall be described in an Operation and Maintenance Manual. Facilities shall be accessible during the wet-weather season.

11. The discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the discharger to achieve compliance with the conditions of this order. Electrical and mechanical equipment shall be maintained in accordance with appropriate practices and standards, such as NFPA 70B, *Recommended Practice for Electrical Equipment Maintenance*; NFPA 70E, *Standard for Electrical Safety in the Workplace*; ANSI/NETA MTS *Standard for Maintenance: Testing Specifications for Electrical Power Equipment and Systems*, or procedures established by insurance companies or other industry resources.

12. If the discharger's facilities are equipped with SCADA or other systems that implement wireless, remote operation, the discharger should implement appropriate safeguards against unauthorized access to the wireless systems. Standards such as NIST SP 800-53, Recommended Security Controls for Federal Information Systems, can provide guidance.

13. Production and use of recycled water is subject to the approval of the Central Coast Water Board. Production and use of recycled water shall be in conformance with reclamation criteria established in Chapter 3, Title 22, of the California Code of Regulations and Chapter 7, Division 7, of the California Water Code. An engineering report pursuant to section 60323, Title 22, of the California Code of Regulations is required and a waiver or water reclamation requirements from the Central Coast Water Board is required before recycled water is supplied for any use, or to any user, not specifically identified and approved either in this Order or another order issued by this Board.

C. General Monitoring Requirements

1. If results of monitoring a pollutant appear to violate effluent limitations based on a weekly, monthly, 30-day, or six-month period, but compliance or non-compliance cannot be validated because sampling is too infrequent, the frequency of sampling shall be increased to validate the test within the next monitoring period. The

increased frequency shall be maintained until the Executive Officer agrees the original monitoring frequency may be resumed.

For example, if copper is monitored annually and results exceed the six-month median numerical effluent limitation in the permit, monitoring of copper must be increased to a frequency of at least once every two months (Central Coast Standard Provisions – Definitions I.G.13.). If suspended solids are monitored weekly and results exceed the weekly average numerical limit in the permit, monitoring of suspended solids must be increased to at least four (4) samples every week (Central Coast Standard Provisions – Definitions I.G.14.).

2. Water quality analyses performed in order to monitor compliance with this permit shall be by a laboratory certified by the State Department of Public Health (DPH) for the constituents being analyzed. Bioassays performed to monitor compliance with this permit shall be in accord with guidelines approved by the State Water Resources Control Board (State Water Board) and the State Department of Fish and Game.

3. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. Samples shall be taken during periods of peak loading conditions. Influent samples shall be samples collected from the combined flows of all incoming wastes, excluding recycled wastes. Effluent samples shall be samples collected downstream of the last treatment unit and tributary flow and upstream of any mixing with receiving waters.

4. All monitoring instruments and devices used by the discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy.

D. General Reporting Requirements

1. Reports of marine monitoring surveys conducted to meet receiving water monitoring requirements of the Monitoring and Reporting Program shall include at least the following information:

   a. A description of climatic and receiving water characteristics at the time of sampling (weather observations, floating debris, discoloration, wind speed and direction, swell or wave action, time of sampling, tide height, etc.).
   b. A description of sampling stations, including differences unique to each station (e.g., station location, grain size, rocks, shell litter, calcareous worm tubes, evident life, etc.).
   c. A description of the sampling procedures and preservation sequence used in the survey.
   d. A description of the exact method used for laboratory analysis. In general, analysis shall be conducted according to Central Coast Standard Provisions – C.1 above, and Federal Standard Provision – Monitoring III.B. However, variations in procedure are acceptable to accommodate the special requirements of sediment analysis. All such variations must be reported with the test results.

e. A brief discussion of the results of the survey. The discussion shall compare data from the control station with data from the outfall stations. All tabulations and computations shall be explained.

2. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule shall be submitted within 14 days following each scheduled date unless otherwise specified within the permit. If reporting noncompliance, the report shall include a description of the reason, a description and schedule of tasks necessary to achieve compliance, and an estimated date for achieving full compliance. A second report shall be submitted within 14 days of full compliance.

3. The "Discharger" shall file a report of waste discharge at least 180 days before making any material change or proposed change in the character, location, or plume of the discharge.

4. Within 120 days after the discharger discovers, or is notified by the Central Coast Water Board, that monthly average daily flow will or may reach design capacity of waste treatment and/or disposal facilities within four years, the discharger shall file a written report with the Central Coast Water Board. The report shall include:
   a. the best estimate of when the monthly average daily dry weather flow rate will equal or exceed design capacity.
   b. a schedule for studies, design, and other steps needed to provide additional capacity for waste treatment and/or disposal facilities before the waste flow rate equals the capacity of present units.

   In addition to complying with Federal Standard Provision – Reporting V.B., the required technical report shall be prepared with public participation and reviewed, approved and jointly submitted by all planning and building departments having jurisdiction in the area served by the waste collection, treatment, or disposal facilities.

5. All "Dischargers" shall submit reports electronically to the:

   California Regional Water Quality Control Board
   Central Coast Region
   centralcoast@waterboards.ca.gov
   895 Aerovista Place, Suite 101
   San Luis Obispo, CA 93401-7906

   In addition, "Dischargers" with designated major discharges shall submit a copy of each document to:

   Regional Administrator
   USEPA, Region 9
   Attention: CWA Standards and Permits Office (WTR-5)
   75 Hawthorne Street
   San Francisco, California 94105

6. Transfer of control or ownership of a waste discharge facility must be preceded by a notice to the Central Coast Water Board at least 30 days in advance of the proposed transfer date. The notice must include a written agreement between the existing "Discharger" and proposed "Discharger" containing a specific date for transfer of responsibility, coverage, and liability between them. Whether a permit may be transferred without modification or revocation and reissuance is at the discretion of the Board. If permit modification or revocation and reissuance is necessary, transfer may be delayed 180 days after the Central Coast Water Board's receipt of a complete permit application. Please also see Federal Standard Provision – Permit Action II.C.

7. Except for data determined to be confidential under CWA §308 (excludes effluent data and permit applications), all reports prepared in accordance with this permit shall be available for public inspection at the office of the Central Coast Water Board or Regional Administrator of USEPA. Please also see Federal Standard Provision – Records IV.C.

8. By February 1st of each year, the discharger shall submit an annual report to the Central Coast Water Board and MBNMS. The report shall contain the following:

    a) Both tabular and graphical summaries of the monitoring data obtained during the previous year.
    b) A discussion of the previous year's compliance record and corrective actions taken, or which may be needed, to bring the discharger into full compliance.
    c) An evaluation of wastewater flows with projected flow rate increases over time and the estimated date when flows will reach facility capacity.
    d) A discussion of operator certification and a list of current operating personnel and their grades of certification.
    e) The date of the facility's Operation and Maintenance Manual (including contingency plans as described in Provision B.9), the date the manual was last reviewed, and whether the manual is complete and valid for the current facility.
    f) A discussion of the laboratories used by the discharger to monitor compliance with effluent limits and a summary of performance relative to Section C, General Monitoring Requirements.
    g) If the facility treats industrial or domestic wastewater and there is no provision for periodic sludge monitoring in the Monitoring and Reporting Program, the report shall include a summary of sludge quantities, analyses of its chemical and moisture content, and its ultimate destination.
    h) If appropriate, the report shall also evaluate the effectiveness of the local source control or pretreatment program using the State Water Resources Control Board's "Guidelines for Determining the Effectiveness of Local Pretreatment Program."

E. General Pretreatment Provisions

1. Discharge of pollutants by "indirect dischargers" in specific industrial sub-categories (appendix C, 40 CFR Part 403), where categorical pretreatment standards have been established, or are to be established, (according to 40 CFR Chapter 1, Subchapter N), shall comply with the appropriate pretreatment standards by the date specified therein or, if a new indirect discharger, upon commencement of discharge.

F. Enforcement

1. Any person failing to file a report of waste discharge or other report as required by this permit shall be subject to a civil penalty not to exceed $5,000 per day.

2. Upon reduction, loss, or failure of the treatment facility, the "Discharger" shall, to the extent necessary to maintain compliance with this permit, control production or all discharges, or both, until the facility is restored or an alternative method of treatment is provided.

G. Definitions
(Not otherwise included in Attachment A to this Order)

1. A “composite sample" is a combination of no fewer than eight individual samples obtained at equal time intervals (usually hourly) over the specified sampling (composite) period. The volume of each individual sample is proportional to the flow rate at the time of sampling. The period shall be specified in the Monitoring and Reporting Program ordered by the Executive Officer.

2. “Daily Maximum” limit means the maximum acceptable concentration or mass emission rate of a pollutant measured during a calendar day or during any 24-hour period reasonably representative of the calendar day for purposes of sampling. It is normally compared with results based on "composite samples” except for ammonia, total chlorine, phenolic compounds, and toxicity concentration. For all exceptions, comparisons will be made with results from a “grab sample.”

3. “Discharger," as used herein, means, as appropriate: (1) the Discharger, (2) the local sewering entity (when the collection system is not owned and operated by the Discharger), or (3) "indirect discharger" (where "Discharger" appears in the same paragraph as "indirect discharger,” it refers to the discharger.)

4. “Duly Authorized Representative" is one where:

   a. the authorization is made in writing by a person described in the signatory paragraph of Standard Provision V.B.;
   b. the authorization specifies either an individual or the occupant of a position having either responsibility for the overall operation of the regulated facility, such as the plant manager, or overall responsibility for environmental matters of the company; and,
   c. the written authorization was submitted to the Central Coast Water Board.

5. A "grab sample" is defined as any individual sample collected in less than 15 minutes. "Grab samples" shall be collected during peak loading conditions, which may or may not be during hydraulic peaks. It is used primarily in determining compliance with the daily maximum limits identified in Central Coast Standard Provision – Provision G.2. and instantaneous maximum limits.

6. "Hazardous substance" means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the Clean Water Act.

7. "Incompatible wastes" are:

   a. Wastes that create a fire or explosion hazard in the treatment works.
   b. Wastes that will cause corrosive structural damage to treatment works, or wastes with a pH lower than 5.0 unless the works is specifically designed to accommodate such wastes.
   c. Solid or viscous wastes in amounts that cause obstruction to flow in sewers or that cause other interference with proper operation of treatment works.
   d. Any waste, including oxygen-demanding pollutants (BOD, etc), released in such volume or strength as to cause inhibition or disruption in the treatment works and subsequent treatment process upset and loss of treatment efficiency.
   e. Heat in amounts that inhibit or disrupt biological activity in the treatment works or that raise influent temperatures above 40°C (104°F) unless the treatment works is designed to accommodate such heat.

8. "Indirect Discharger" means a non-domestic discharger introducing pollutants into a publicly owned treatment and disposal system.

9. "Log Mean" is the geometric mean. Used for determining compliance of fecal or total coliform populations, it is calculated with the following equation:

   Log Mean = (C1 x C2 x...x Cn)1/n

   in which "n" is the number of days samples were analyzed during the period and any "C" is the concentration of bacteria (MPN/100 ml) found on each day of sampling. "n" should be five or more.

10. "Mass emission rate" is a daily rate defined by the following equations:

    mass emission rate (lbs/day) = 8.34 x Q x C; and
    mass emission rate (kg/day) = 3.79 x Q x C

    where "C" (in mg/L) is the measured daily constituent concentration or the average of measured daily constituent concentrations and "Q" (in MGD) is the measured daily flowrate or the average of measured daily flowrates over the period of interest.

11. "Maximum Allowable Mass Emission Rate," whether for a month, week, day, or six-month period, is a daily rate determined with the formulas in paragraph G.10, above,

using the effluent concentration limit specified in the permit for the period and the average of measured daily flows (up to the allowable flow) over the period.

12. “Maximum Allowable Six-Month Median Mass Emission Rate" is a daily rate determined with the formulas in Central Coast Standard Provision – Provision G.10, above, using the "six-month median" effluent limit specified in the permit, and the average of measured daily flows (up to the allowable flow) over a 180-day period.

13. "Median" is the value below which half the samples (ranked progressively by increasing value) fall. It may be considered the middle value, or the average of two middle values.

14. "Monthly Average" (or "Weekly Average,” as the case may be) is the arithmetic mean of daily concentrations or of daily mass emission rates over the specified 30-day (or 7-day) period.

    Average = (X1 + X2 + ... + Xn) / n

    in which “n" is the number of days that samples were analyzed during the period and “X" is either the constituent concentration (mg/L) or mass emission rate (kg/day or lbs/day) for each sampled day. “n" should be four or greater.

15. "Municipality" means a city, town, borough, county, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial waste, or other waste.

16. "Overflow" means the intentional or unintentional diversion of flow from the collection and transport systems, including pumping facilities.

17. "Pollutant-free wastewater" means inflow and infiltration, stormwaters, and cooling waters and condensates which are essentially free of pollutants.

18. "Primary Industry Category" means any industry category listed in 40 CFR Part 122, Appendix A.

19. "Removal Efficiency" is the ratio of pollutants removed by the treatment unit to pollutants entering the treatment unit. Removal efficiencies of a treatment plant shall be determined using “Monthly averages" of pollutant concentrations (C, in mg/L) of influent and effluent samples collected about the same time and the following equation (or its equivalent):

    $C_{Effluent}$ Removal Efficiency (%) = 100 x (1 – $C_{effluent}$ / $C_{influent}$)

20. "Severe property damage" means substantial physical damage to property, damage to treatment facilities that causes them to become inoperable, or substantial and permanent loss to natural resources that can reasonably be expected to occur in the absence of a "bypass.” It does not mean economic loss caused by delays in production.

21. "Sludge" means the solids, residues, and precipitates separated from, or created in, wastewater by the unit processes of a treatment system.

22. To "significantly contribute" to a permit violation means an "indirect discharger" must:

    a. Discharge a daily pollutant loading in excess of that allowed by contract with the "Discharger" or by federal, state, or local law;
    b. Discharge wastewater which substantially differs in nature or constituents from its average discharge;
    c. Discharge pollutants, either alone or in conjunction with discharges from other sources, that results in a permit violation or prevents sewage sludge use or disposal; or
    d. Discharge pollutants, either alone or in conjunction with pollutants from other sources, that increase the magnitude or duration of permit violations.

23. "Toxic Pollutant" means any pollutant listed as toxic under Section 307 (a) (1) of the Clean Water Act or under 40 CFR Part 122, Appendix D. Violation of maximum daily discharge limitations are subject to 24-hour reporting (Standard Provisions V.E.).

24. “Zone of Initial Dilution" means the region surrounding or adjacent to the end of an outfall pipe or diffuser ports whose boundaries are defined through calculation of a plume model verified by the State Water Board.

ATTACHMENT E – MONITORING AND REPORTING PROGRAM

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ATTACHMENT E – MONITORING AND REPORTING PROGRAM (MRP)

The Code of Federal Regulations (40 C.F.R. §122.48) requires that all NPDES permits specify monitoring and reporting requirements. Water Code sections 13267 and 13383 also authorize the Central Coast Water Board to require technical and monitoring reports. This MRP establishes monitoring and reporting requirements, which implement the federal and California regulations.

I. GENERAL MONITORING PROVISIONS

A. Laboratories analyzing monitoring samples shall be certified by the Department of Public Health (DPH), in accordance with Water Code §13176, and must include quality assurance/quality control data with their reports.

B. Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring locations specified below and, unless otherwise specified, before the monitored flow joins or is diluted by any other waste stream, body of water, or substance. Monitoring locations shall not be changed without notification to and approval of the Central Coast Water Board.

C. Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated, and maintained to ensure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ±10 percent from true discharge rates throughout the range of expected discharge volumes. Guidance in selection, installation, calibration, and operation of acceptable flow measurement devices can be obtained from the following references.

1. *A Guide to Methods and Standards for the Measurement of Water Flow, U.S. Department of Commerce, National Bureau of Standards*, NBS Special Publication 421, May 1975, 96 pp. (Available from the U.S. Government Printing Office, Washington, D.C. 20402. Order by SD Catalog No. C13.10:421.)

2. *Water Measurement Manual, U.S. Department of Interior, Bureau of Reclamation, Second Edition, Revised Reprint*, 1974, 327 pp. (Available from the U.S. Government Printing Office, Washington D.C. 20402. Order by Catalog No. 172.19/2:W29/2, Stock No. S/N 24003-0027.)

3. *Flow Measurement in Open Channels and Closed Conduits, U.S. Department of Commerce, National Bureau of Standards*, NBS Special Publication 484, October 1977, 982 pp. (Available in paper copy or microfiche from National Technical Information Services (NTIS) Springfield, VA 22151. Order by NTIS No. PB-273 535/5ST.)

4. *NPDES Compliance Sampling Manual, U.S. Environmental Protection Agency, Office of Water Enforcement*, Publication MCD-51, 1977, 140 pp. (Available from the

General Services Administration (8FFS), Centralized Mailing Lists Services, Building 41, Denver Federal Center, CO 80225.)

D. All monitoring instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy. All flow measurement devices shall be calibrated at least once per year to ensure continued accuracy of the devices.

E. Monitoring results, including noncompliance, shall be reported at intervals and in a manner specified in this MRP.

F. Unless otherwise specified by this MRP, all monitoring shall be conducted according to test procedures established at 40 C.F.R. part 136, *Guidelines Establishing Test Procedures for Analysis of Pollutants*. All analyses shall be conducted using the lowest practical quantitation limit achievable using the specified methodology. Where effluent limitations are set below the lowest achievable quantitation limits, pollutants not detected at the lowest practical quantitation limits will be considered in compliance with effluent limitations. Analysis for toxics listed by the California Toxics Rule shall also adhere to guidance and requirements contained in the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (2005). Analyses for toxics listed in Table 1 of the California Ocean Plan (2012) shall adhere to guidance and requirements contained in that document.

II. MONITORING LOCATIONS

The Discharger shall establish the following monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this Order:

Table E-1. Monitoring Station Locations

Discharge Point	Monitoring Location Name	Monitoring Location Description
---	INF-001	Influent wastewater with a domestic component (this excludes brine wastes but includes hauled septage), prior to treatment and following all significant inputs to the collection system or to the headworks of untreated wastewater and inflow and infiltration where representative samples of wastewater influent can be obtained.
---	INF-002 (Brine)	Influent brine waste via haulers to the brine waste storage facility prior to blending with secondary effluent as applicable.
001	EFF-001 [1]	Location where representative effluent sample, which includes any component of brine waste, discharged through the ocean outfall can be collected, after treatment and before contact with receiving water.
---	RSW-A	Shoreline monitoring station – 900 feet north of the outfall, 1000 feet offshore
---	RSW-B	Shoreline monitoring station – adjacent to the outfall, 1000 feet offshore
---	RSW-C	Shoreline monitoring station – 900 feet south of the outfall, 1000 feet offshore
---	RSW-D	Shoreline monitoring station – 1800 feet south of the outfall, 1000 feet offshore

[1] The Discharger's outfall and brine discharge facilities currently do not allow for aggregate flow metering or sampling of as-discharged combined secondary effluent and brine wastes at high secondary effluent flows (during wet season when recycling is not being implemented) above what is required for blending to safely meet the prescribed effluent limitations.

During the dry season, when the Discharger is recycling essentially 100% the wastewater flow less what is needed for blending with brine wastes, the facility is capable of aggregate flow metering and sampling downstream of a static mixer prior to entering the outfall. During the dry season, brine waste discharge flows (with minimum required secondary effluent blending) and high volume secondary effluent flows are currently metered separately and are sampled separately via grab samples that are manually composited based on the as-discharged flow proportions entering the outfall. Effluent monitoring per the Discharger's current facility configuration and effluent monitoring protocol is acceptable until the brine waste disposal facility is upgraded to handle anticipated increases in brine flows and facilitate year-round blended secondary effluent and brine waste flow metering and sampling (see Special Provision c. within section V.C.2 of the Order).

III. INFLUENT MONITORING REQUIREMENTS

A. Monitoring Location INF - 001

1. The Discharger shall monitor the untreated wastewater at Monitoring Location INF – 001 as follows:

Table E-2. Influent Monitoring at INF-001

Parameter	Units	Sample Type	Minimum Sampling Frequency
Daily Flow	MGD	Metered or Calculated [1]	Daily
Instantaneous Maximum Flow	MGD	Metered or Calculated [1]	Daily
Maximum Daily Flow	MGD	Metered or Calculated [1]	Monthly
Mean Daily Flow	MGD	Calculated	Monthly
$CBOD_5$	mg/L	24-hr Composite	Weekly
TSS	mg/L	24-hr Composite	Weekly

[1] Metered at the treatment facility headworks or calculated based on the summation of collection system pump station flow metering which is more accurate at low flow rates.

B. Monitoring Location INF – 002 (Brine)

1. The Discharger shall monitor brine waste delivered to the facility at Monitoring Location INF – 002 (Brine) as follows:

Table E-3. Influent Brine Monitoring at INF-002

Parameter	Units	Sample Type	Minimum Sampling Frequency
Weekly Volume Received	G	Metered or Calculated	Weekly
Monthly Volume Received	G	Calculated	Monthly
Annual Volume Received	MG	Calculated	Annually
Volume Routed to Emergency Storage [1]	G	Metered or Calculated	Weekly/Monthly/Annually
Other	The Discharger shall report all brine sampling data collected as part of the brine facility operation (i.e., analytical data used to characterize brine waste and determine appropriate blending ratios for discharge).		

[1] Sludge holding lagoons and drying beds, or other storage as noted on the monitoring reports.

IV. EFFLUENT MONITORING REQUIREMENTS

A. Monitoring Location EFF - 001

1. The Discharger shall monitor effluent discharged at Discharge Point 001 at Monitoring Location EFF – 001 as follows:

Table E-4. Effluent Monitoring at EFF – 001[1]

Parameter	Units	Sample Type	Minimum Sampling Frequency
Daily Flow [2]	MGD	Metered or Calculated	Daily
Instantaneous Max Flow [2]	MGD	Metered or Calculated	Daily
Maximum Daily Flow [2]	MGD	Metered or Calculated	Monthly
Mean Daily Flow [2]	MGD	Calculated	Monthly
Brine Waste Dilution Ratio	---	Calculated	Daily
pH	pH units	Metered	Weekly [3]
Temperature	° F	Measured [4]	Weekly [3]
$CBOD_5$	mg/L	24-hr Composite [4]	Weekly [3]
TSS	mg/L	24-hr Composite [4]	Weekly [3]
Settleable Solids	mL/L/hr	Grab	Weekly [3]
Chlorine Residual [5]	mg/L	Continuous [4]	Daily [3]
Chlorine Used [5]	lbs/day	Recorded	Daily [3]
Turbidity	NTUs	Grab	Weekly [3]
Oil and Grease	mg/L	Grab	Weekly [3]
Ammonia	mg/L	Grab	Monthly
Nitrate	mg/L	Grab	Monthly
Urea	mg/L	Grab	Monthly
Silicate	mg/L	Grab	Monthly
Total Dissolved Solids	mg/L	Grab	Quarterly
Sodium	mg/L	Grab	Quarterly
Chloride	mg/L	Grab	Quarterly
Iron	mg/L	Grab	Quarterly
Magnesium	mg/L	Grab	Quarterly
Hardness	mg/L	Grab	Quarterly
$Chromium^{+6}$	µg/L	24-hr composite	Quarterly
Cyanide	µg/L	24-hr composite	Quarterly
Selenium	µg/L	24-hr composite	Quarterly
Acute Toxicity [6] [7]	TUa	Grab	Semiannually
Chronic Toxicity [6] [7]	TUc	Grab	Semiannually
Ocean Plan Table 1 Metals [7] [8] [9]	µg/L	HVWS [10] [11]	Semiannually
Ocean Plan Table 1 pollutants [7] [9] [12]	µg/L	HVWS [10] [11]	Semiannually
Remaining Priority Pollutants [7] [9] [13]	µg/L	HVWS [10] [11]	3x / permit term [14]

[1] Effluent sampling per the Discharger's current brine waste and outfall facility configuration and sampling protocols is acceptable until the brine waste disposal facility is upgraded to handle anticipated increases in brine flows and facilitate year-round blended secondary effluent and brine waste monitoring (see Table E-1 and Special Provision c. within section V.C.2 of the Order).

[2] Individual reporting for secondary effluent and brine waste effluent flows are required along with as-discharged combined flow for blended secondary effluent and brine waste. The calculation of combined effluent flow per the Discharger's current brine waste and outfall facility configuration is acceptable until the brine waste disposal facility is upgraded to handle anticipated increases in brine flows and facilitate year-round blended secondary effluent and brine waste flow metering (see Table E-1 and Special Provision c. within section V.C.2 of the Order).

[3] Brine waste samples shall be collected per a minimum monthly sampling frequency and be manually composited per the Discharger's current brine waste and outfall facility configuration and sampling protocols until the brine waste disposal facility is upgraded to handle anticipated increases in brine flows and facilitate year-round blended secondary effluent and brine waste monitoring (see Table E-1 and Special Provision c. within section V.C.2 of the Order).

[4] Brine waste samples shall be collected as grab samples and manually composited per the Discharger's current brine waste and outfall facility configuration and sampling protocols until the brine waste disposal facility is upgraded to handle anticipated increases in brine flows and facilitate year-round blended secondary effluent and brine waste monitoring (see Table E-1 and Special Provision c. within section V.C.2 of the Order).

[5] When applicable – the Discharger is not required to disinfect whole effluent prior to discharge and currently does not do so. However, the Discharger is required to monitor for chlorine residual semiannually per the Ocean Plan Table 1 Pollutants monitoring.

[6] Whole effluent, acute and chronic toxicity monitoring shall be conducted according to the requirements established in section V. of this Monitoring and Reporting Program.

[7] Monitoring for the Ocean Plan (2012) Table 1 pollutants and whole effluent acute and chronic toxicity shall occur one time in a dry season and one time in a wet season each year so that characterization of effluent occurs one time per year when the discharge is primarily secondary treated wastewater (wet season) and one time per year when the discharge is primarily brine waste (dry season). Toxicity and Ocean Plan Table 1 pollutant sampling/monitoring shall be conducted concurrently as practicable.

[8] Those twelve metals (Sb, As, Cd, Cr^{+3}, Cr^{+6}, Cu, Pg, Hg, Ni, Se, Ag, and Zn) with applicable water quality objectives established by Table 1 of the Ocean Plan. Analysis shall be for total recoverable metals.

[9] Procedures, calibration techniques, and instrument/reagent specifications shall conform to 40 C.F.R. part 136 and applicable provisions of the Ocean Plan, including the Standard Monitoring Procedures presented in Appendix III of the Ocean Plan. The Discharger shall instruct its analytical laboratory to establish calibration standards so that the Minimum Levels (MLs) presented in Appendix II of the Ocean Plan are the lowest calibration standards. The Discharger and its analytical laboratory shall select MLs, which are below applicable water quality criteria of Table 1; and when applicable water quality criteria are below all MLs, the Discharger and its analytical laboratory shall select the lowest ML. In addition, data must comply with QA/QC requirements of 40 C.F.R. part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 C.F.R. part 136.

[10] HVWS = High-volume water sampling

[11] The Discharger shall utilize high volume water sampling (HVWS) methods employed by the CCLEAN program for compliance determination of the Table 1 pollutants and the implementation of all other pollutant monitoring requirements contained within this Order, when appropriate, given the subsequent analytical methods are in accordance with 40 C.F.R. part 136 or as allowable per the Implementation Provisions for Table 1 contained in section III.C.5.b of the Ocean Plan.

[12] Those pollutants in 2012 Ocean Plan Table 1. Analyses, compliance determination, and reporting shall adhere to applicable provisions of the Ocean Plan, including the Standard Monitoring Procedures presented in Appendix III. The Discharger shall ensure its analytical laboratory uses the Minimum Levels (MLs) presented in Ocean Plan Appendix II as the lowest calibration standards. The Discharger shall select the lowest ML necessary to demonstrate compliance with effluent limitations. If effluent limitations are less than the lowest ML, then the Discharger shall use the lowest ML.

[13] The "Remaining Priority Pollutants" (see Table E-5 below) consist of the priority pollutants listed in Part D of EPA Form 3510-2A (Rev. 1-99) that currently do not have ocean criteria (water quality objectives) per Table 1 of the Ocean Plan. A complete EPA Form 3510-2A is required for all new and renewal NPDES permit applications pursuant to 40 C.F.R. § 122.21. Expanded Effluent Testing Data per Part D of EPA Form 3510-2A is required for all treatment works with design flows greater than or equal to 1.0 MGD or with a pretreatment program (or required to have a pretreatment program), or otherwise required by the permitting authority to provide the data.

[14] At a minimum, effluent testing data must be based on at least three pollutant scans and must be no more than four and one-half years old. Remaining priority pollutant monitoring shall occur at least one time in a dry season and one time in a wet season so that characterization of effluent occurs one time per year when the discharge is primarily secondary treated wastewater (wet season) and one time per year when the discharge is primarily brine waste (dry season).

Table E-5. Remaining Priority Pollutants

Volatile Organic Compounds
Bromoform
Chloroethane
2-Chloroethyl Vinyl Ether
1,1-Dichloroethane
Trans-1,2-Dichloro-Ethylene
1,2-Dichloropropane
1,3-Dichloro-Propylene
Methyl Bromide
Methyl Chloride
Methylene Chloride
Acid Extractable Compounds
P-Chloro-M-Cresol
2-Chlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
4,6-Dinitro-O-Cresol
2-Nitrophenol
4-Nitrophenol
Pentachlorophenol
Phenol
Base-Neutral Compounds
Acenaphthene
Acenaphthylene
Anthracene
Benzo(A)Anthracene
Benzo(A)Pyrene
3,4-Benzo-Fluoranthene
Benzo(ghi)Perylene
Benzo(K)Fluoranthene
4-Bromophenyl Phenyl Ether
Butyl Benzyl Phthalate
2-Chloronapthalene
4-Chlorophenyl Phenyl Ether
Chrysene
Di-N-Octyl Phthalate
Dibenzo(A,H)Anthracene
1,4-Dichlorobenzene
2,6-Dinitrotoluene
Fluorene
Indeno(1,2,3-CD)Pyrene
Naphthalene
Phenanthrene
Pyrene
1,2,4-Trichlorobenzene

V. WHOLE EFFLUENT TOXICITY TESTING REQUIREMENTS

A. Acute Toxicity

Compliance with acute toxicity objective shall be determined using a U.S. EPA approved protocol as provided in 40 C.F.R. part 136 (*Methods for Measuring the Acute Toxicity of*

Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition, October 2002, U.S. EPA Office of Water, EPA-821-R-02-012 or the latest edition).

Acute Toxicity (TUa) = 100/96-hr LC 50.

LC 50 (percent waste giving 50% survival of test organisms) shall be determined by 96-hour static or continuous flow bioassay techniques using standard marine test species as specified in EPA-821-R-02-012 and as noted in the following table.

Table E-6. Approved Test - Acute Toxicity (TUa)

Species	Scientific Name	Effect	Test Duration
shrimp	*Holmesimysis costata*	survival	48 or 96 hours
shrimp	*Mysidopsis bahia*	survival	48 or 96 hours
silversides	*Menidia beryllina*	survival	48 or 96 hours
sheepshead minnow	*Cyprinodon variegatus*	survival	48 or 96 hours

If the effluent is to be discharged to a marine or estuarine system (e.g., salinity values in excess of 1,000 mg/L) and originates from a freshwater supply, salinity of the effluent must be increased with dry ocean salts (e.g., FORTY FATHOMS®) to match salinity of the receiving water. This modified effluent shall then be tested using marine species.

Reference toxicant test results shall be submitted with the effluent sample test results. Both tests must satisfy the test acceptability criteria specified in EPA-821-R-02-012. If the test acceptability criteria are not achieved or if toxicity is detected, the sample shall be retaken and retested within 5 days of the failed sampling event. The retest results shall be reported in accordance with EPA-821-R-02-012 (chapter on report preparation) and the results shall be attached to the next monitoring report.

When it is not possible to measure the 96-hour LC 50 due to greater than 50 percent survival of the test species in 100 percent waste, the toxicity concentration shall be calculated by the expression:

$$TUa = [\log(100 - S)]/1.7$$

where S = percentage survival in 100% waste. If S > 99, TUa shall be reported as zero.

When toxicity monitoring finds acute toxicity in the effluent above the effluent limitation established by the Order, the Discharger shall immediately resample the effluent, if the discharge is continuing, and retest for acute toxicity. Results of the initial failed test and any toxicity monitoring results subsequent to the failed test shall be reported as soon as reasonable to the Executive Officer (EO). The EO will determine whether to initiate enforcement action, whether to require the Discharger to implement toxicity reduction evaluation (TRE) requirements (section V.C.2.a of the Order), or to implement other measures.

B. Chronic Toxicity

The presence of chronic toxicity shall be estimated as specified in *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms*, EPA-821/600/R-95/136; *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms*, EPA-600-4-91-003; *Procedures Manual for Conducting Toxicity Tests developed by the Marine Bioassay Project*, SWRCB 1996, 96-1WQ; and/or *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms*, EPA/600/4-87-028 or subsequent editions.

Chronic toxicity measures a sublethal effect (e.g., reduced growth or reproduction) to experimental test organisms exposed to an effluent compared to that of the control organisms.

Chronic Toxicity (TUc) = 100/NOEL.

The no observed effect level (NOEL) is the maximum tested concentration in a medium which does not cause known adverse effects upon chronic exposure in the species in question (i.e., the highest effluent concentration to which organisms are exposed in a chronic test that causes no observable adverse effects on the test organisms; e.g., the highest concentration of a toxicant to which the values for the observed responses are not statistically significantly different from the controls). Examples of chronic toxicity include but are not limited to measurements of toxicant effects on reproduction, growth, and sublethal effects that can include behavioral, physiological, and biochemical effects.

In accordance with the 2012 Ocean Plan, Appendix III, *Standard Monitoring Procedures*, the Discharger shall use the critical life stage toxicity tests specified in the table below to measure TUc. Other species or protocols will be added to the list after State Water Resources Control Board review and approval.

A minimum of three test species with approved test protocols shall be used to measure compliance with the toxicity limitation. If possible, the test species shall include a fish, an invertebrate, and an aquatic plant. After a screening period of no fewer than three sampling events, monitoring can be reduced to the most sensitive species. The sensitivity of the test organisms to a reference toxicant shall be determined concurrently with each bioassay test and reported with the test results.

Table E-7. Approved Tests—Chronic Toxicity

Species	Test	Tier [1]	Reference [2]
Giant kelp, *Macrocystis pyrifera*	percent germination; germ tube length	1	a, c
Red abalone, *Haliotis rufescens*	abnormal shell development	1	a, c
Oyster, *Crassostrea gigas*; mussels, *Mytilus spp*.	abnormal shell development; percent survival	1	a, c
Urchin, *Strongylocentrotus purpuratus*; sand dollar, *Dendraster excentricus*	percent normal development	1	a, c
Urchin, *Strongylocentrotus purpuratus*;	percent fertilization	1	a, c

sand dollar, *Dendraster excentricus*			
Shrimp, *Homesimysis costata*	percent survival; growth	1	a, c
Shrimp, *Mysidopsis bahia*	percent survival; fecundity	2	b, d
Topsmelt, *Atherinops affinis*	larval growth rate; percent survival	1	a, c
Silverside, *Menidia beryllina*	larval growth rate; percent survival	2	b, d

[1] First tier methods are preferred for compliance monitoring. If first tier organisms are not available, the Discharger can use a second tier test method following approval by the Central Coast Water Board.

[2] Protocol References:

a. Chapman, G.A., D.L. Denton, and J.M. Lazorchak. 1995. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms. U.S. EPA Report No. EPA/600/R-95/136.

b. Klemm, D.J., G.E. Morrison, T.J. Norberg-King, W.J. Peltier, and M.A. Heber. 1994. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Marine and Estuarine Organisms. U.S. EPA Report No. EPA-600-4-91-003.

c. SWRCB 1996. Procedures Manual for Conducting Toxicity Tests Developed by the Marine Bioassay Project. 96-1WQ.

d. Weber, C.I., W.B. Horning, I.I., D.J. Klemm, T.W. Nieheisel, P.A. Lewis, E.L. Robinson, J. Menkedick and F. Kessler (eds). 1998. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms. EPA/600/4-87/028. National Information Service, Springfield, VA.

Dilution and control waters shall be obtained from an area of the receiving waters, typically upstream, which is unaffected by the discharge. Standard dilution water can be used, if the receiving water itself exhibits toxicity or if approved by the Central Coast Water Board. If the dilution water used in testing is different from the water in which the test organisms were cultured, a second control sample using culture water shall be tested.

If the effluent is to be discharged to a marine or estuarine system (e.g., salinity values in excess of 1,000 mg/L) originates from a freshwater supply, salinity of the effluent must be increased with dry ocean salts (e.g., FORTY FATHOMS®) to match salinity of the receiving water. This modified effluent shall then be tested using marine species.

If chronic toxicity is measured in the effluent above 150 TUc, the Discharger shall re-sample and submit the results to the Central Coast Water Board as described in section V.C.2.a of this Order.

C. Toxicity Reporting

1. The Discharger shall include a full report of toxicity test results with the regular monthly monitoring report and include the following information.

   a. Toxicity test results,

   b. Dates of sample collection and initiation of each toxicity test, and

   c. Acute and/or chronic toxicity discharge limitations (or value).

2. Toxicity test results shall be reported according to the appropriate guidance - *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, Fifth Edition, U.S. EPA Office of Water, EPA-

821-R-02-012 (2002) or the latest edition, or *Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, EPA-821-R-02-012 (2002) or subsequent editions.

3. If the initial investigation TRE workplan is used to determine that additional (accelerated) toxicity testing is unnecessary, these results shall be submitted with the monitoring report for the month in which investigations conducted under the TRE workplan occurred.

4. Within 30 days of receipt of test results exceeding an acute or chronic toxicity discharge limitation, the Discharger shall provide written notification to the Executive Officer of:

   a. Findings of the TRE or other investigation to identify the cause(s) of toxicity, and

   b. Actions the Discharger has taken/will take, to mitigate the impact of the discharge and to prevent the recurrence of toxicity.

   When corrective actions, including a TRE, have not been completed, a schedule under which corrective actions will be implemented, or the reason for not taking corrective action, if no action has been taken.

VI. LAND DISCHARGE MONITORING REQUIREMENTS – NOT APPLICABLE

VII. RECYCLED WATER MONITORING REQUIREMENTS

The Discharger shall comply with applicable state and local requirements regarding the production and use of recycled wastewater, including requirements of California Water Code (CWC) sections 13500 – 13577 (Water Reclamation) and Department of Public Health regulations at title 22, sections 60301 – 60357 of the California Code of Regulations (Water Recycling Criteria). Recycled Water from this Facility is regulated under Order No. 94-82.

VIII. RECEIVING WATER MONITORING REQUIREMENTS – SURFACE WATER AND GROUNDWATER

A. Bacteria Monitoring – Monitoring Locations RSW-A, RSW-B, RSW-C, and RSW-D

Bacteria monitoring shall be conducted to assess bacteriological conditions in areas used for body contact recreation (e.g., swimming) and to assess conditions of aesthetics for general recreation use (e.g., picnicking, boating). Bacteria monitoring shall be conducted along the 30-foot contour at Monitoring Locations RSW-A, RSW-B, RSW-C, and RSW-D. Bacteria monitoring shall be conducted in accordance with the following table. Latitude and Longitude shall be provided for all stations when reporting.

Table E-8. Triggered Shoreline Bacteria Monitoring Schedule

Parameter	Units	Sampling Station	Sampling Frequency
Total and Fecal Coliform Bacteria [1], [2], [4]	MPN/100ml	RSW-A, B, C, D	Monthly
Enterococcus Bacteria [1], [3], [4]	MPN/100ml	RSW-A, B, C, D	Monthly

Visual Monitoring [5]	Narrative	RSW-A, B, C, D	Monthly

[1] For all bacterial analyses, sample dilutions shall be performed so the range of values extends from 2 to 16,000 MPN/100ml. The detection methods used for each analysis shall be reported with the results of the analysis.

[2] Detection methods used for coliforms (total and fecal) shall be those presented in Table 1A of 40 CFR PART 136, unless alternate methods have been approved in advance by US EPA pursuant to 40 CFR PART 136.

[3] Detection methods used for enterococcus shall be those presented in EPA publication EPA 600/4-85/076, Test Methods for Escherichia coli and Enterococci in Water by Membrane Filter Procedure, or any improved method determined by the Central Coast Regional Board (and approved by EPA) to be appropriate.

[4] If a single sample exceeds any of the bacteriological single sample maximum (SSM) standards contained within section V.A.1 of the Order, repeat sampling at that location shall be conducted to determine the extent and persistence of the exceedance. Repeat sampling shall be conducted within 24 hours of receiving analytical results and continued daily until the sample result is less than the SSM standard or until a sanitary survey is conducted to determine the source of the high bacterial densities. When repeat sampling is required because of an exceedance of any one single sample density, values from all samples collected during that 30-day period will be used to calculate the geometric mean. Shore stations (immediately inshore of 30-foot contour sites) shall be sampled concurrent with 30-foot contour repeat sampling.

[5] Visual monitoring shall include observations of wind (direction and speed), weather (e.g., cloudy, sunny, rainy), antecedent rainfall (7-day), sea state, and tidal conditions (e.g., high, slack, or low tide). Observations of water discoloration, floating oil and grease, turbidity, odor, material of sewage origin in the water or on the beach, and temperature (°C) shall be recorded and reported.

These requirements also satisfy the CCLEAN 30-foot contour bacteriological monitoring requirements noted in Table E-9, below.

IX. OTHER MONITORING REQUIREMENTS

A. Central Coast Long-Term Environmental Assessment Network (CCLEAN)

1. The Discharger shall participate in the implementation of the CCLEAN Regional Monitoring Program in order to fulfill receiving water compliance monitoring requirements and support the following CCLEAN Program objectives.

    a. Obtain high-quality data describing the status and long-term trends in the quality of nearshore waters, sediments, and associated beneficial uses.

    b. Determine whether nearshore waters and sediments are in compliance with the Ocean Plan.

    c. Determine sources of contaminants to nearshore waters.

    d. Provide legally defensible data on the effects of wastewater discharges in nearshore waters.

    e. Develop a long-term database on trends in the quality of nearshore waters, sediments, and associated beneficial uses.

    f. Ensure that the nearshore component database is compatible with other regional monitoring efforts and regulatory requirements.

g. Ensure that nearshore component data are presented in ways that are understandable and relevant to the needs of stakeholders.

2. General discharger components of the first phase of the CCLEAN Program are outlined in the following table. The CCLEAN Quality Assurance Project Plan (QAPP) will be revised as necessary each year to reflect any program adjustments and submitted to the Central Coast Water Board Quality Assurance Officer for approval prior to initiation of CCLEAN sampling. A detailed technical study design description, including specific location of sampling sites and a description of the specific contents of the CCLEAN Annual Report, shall be provided as a component of the CCLEAN QAPP. Any year-to-year modifications to the program (including implementation of subsequent program phases) shall be identified in this document. The QAPP will also include program components funded by other participant agencies and organizations.

Table E-9. CCLEAN Monitoring Requirements

Sampling Sites	Parameters Sampled at Each Site	Frequency of Sampling	Applicable Water-quality Stressors and Program Objectives
Water Sampling Four wastewater discharges (Santa Cruz, Watsonville, MRWPCA, CAWD) in effluent and two rivers (Pajaro and San Lorenzo)	30-day flow proportioned samples using automated pumping equipment, solid-phase-extraction techniques for POPs (PAHs, chlorinated pesticides, PCBs, dioxins/furans, PBDEs).	Twice per year (wet season and dry season)	Sources, loads, trends, effects and permit compliance for: POPs
	Grabs of effluent for ammonia and nitrate, turbidity, temperature, conductivity, pH, urea, orthophosphate, dissolved silica and total suspended solids	Monthly	Sources, loads, trends and permit compliance for: Nutrients
	Evaluate satellite imagery for algal blooms	Periodically	Effects of: Nutrients
30-ft contour sites for Santa Cruz, Watsonville and MRWPCA	Grabs for total and fecal coliform, *enterococcus*	At least monthly	Sources, trends, effects and permit compliance for: Pathogen indicators
Two nearshore background sites	30-day time-integrated samples using automated pumping equipment and solid-phase-extraction techniques for: POPs (same as for wastewater, except no dioxins/furans), nitrate, ammonia, urea, orthophosphate and dissolved silica, total suspended solids, temperature, conductivity, pH, total and fecal coliform, *enterococcus*	Twice per year (wet season and dry season)	California Ocean Plan compliance for: POPs Nutrients Pathogen indicators
Mussel Sampling Five rocky intertidal sites	One composite of 30-40 mussels for POPs (same as nearshore background ocean sites), total and fecal coliform,	Annually in the wet season	Status, trends, effects and alert level comparisons

	and *enterococcus*		for: POPs Pathogen indicators
Sediment Sampling Six sites along the 80-meter contour	POPs (same as for mussels, except including pyrethroids), sediment grain size and total organic carbon, benthic infauna	Every 5 years in the fall	Status, effects and alert level comparisons for POPs

B. Solids/Biosolids Monitoring, Notification, and Reporting

1. Biosolids Monitoring

a. Biosolids shall be tested for the metals required in 40 C.F.R. § 503.16 (for land application) or 40 C.F.R. § 503.26 (for surface disposal), using the methods in Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), as required in 40 C.F.R. § 503.8(b)(4), at the following minimum frequencies:

Volume (dry metric tons) [1]	Sampling and Analysis Frequency [2]
0-290	Once per year
290-1500	Once per quarter
1500-15000	Once per 60 days
> 15000	Once per month

[1] For accumulated, previously untested biosolids, the Permittee shall develop a representative sampling plan, including number and location of sampling points, and collect representative samples.

[2] Test results shall be expressed in mg pollutant per kg biosolids on a 100% dry weight basis. Biosolids to be land applied shall be tested for organic-N, ammonium-N, and nitrate-N at the frequencies required above.

b. Prior to land application, the Permittee shall demonstrate that the biosolids meet Class A or Class B pathogen reduction levels by one of the methods listed in 40 C.F.R. § 503.32. Prior to disposal in a surface disposal site, the Permittee shall demonstrate that the biosolids meet Class B levels or shall ensure that the site is covered at the end of each operating day. If pathogen reduction is demonstrated using a “Process to Significantly/Further Reduce Pathogens”, the Permittee shall maintain daily records of the operating parameters used to achieve this reduction. If pathogen reduction is demonstrated by testing for fecal coliforms and/or pathogens, samples must be drawn at the frequency in 11(a) above. For fecal coliform, at least seven grab samples must be drawn during each monitoring event and a geometric mean calculated from these seven samples.

c. For biosolids that are land applied or placed in a surface disposal site, the Permittee shall track and keep records of the operational parameters used to achieve Vector Attraction Reduction requirements in 40 C.F.R. § 503.33(b).

d. Class 1 facilities (facilities with pretreatment programs or others designated as Class 1 by the Regional Administrator) and Federal facilities with greater than five million gallons per day (MGD) influent flow shall sample biosolids for

pollutants listed under Section 307(a) of the Clean Water Act (as required in the pretreatment section of the permit for POTW's with pretreatment programs). Class 1 facilities and Federal facilities greater than five MGD shall test dioxins/dibenzofurans using a detection limit of less than one pg/g at the time of their next priority pollutant scan if they have not done so within the past five years, and once per five years thereafter.

e. The biosolids shall be tested annually, or more frequently if necessary, to determine hazardousness in accordance 40 C.F.R. part 261.

f. If biosolids are placed in a surface disposal site (dedicated land disposal site or monofill), a qualified groundwater scientist shall develop a groundwater monitoring program for the site, or shall certify that the placement of biosolids on the site will not contaminate an aquifer.

g. Biosolids placed in a municipal landfill shall be tested by the Paint Filter Liquids Test (EPA Method 9095) at the frequency in 11 (a) above or more often if necessary to demonstrate that there are no free liquids.

2. Solids/Biosolids Monitoring

The Permittee, either directly or through contractual arrangements with their biosolids management contractors, shall comply with the following notification requirements:

a. Notification of non-compliance: The Permittee shall notify U.S. EPA Region 9, the Central Coast Regional Board, and the Regional Board located in the region where the biosolids are used or disposed, of any non-compliance within 24 hours if the non-compliance may seriously endanger health or the environment. For other instances of non-compliance, the Permittee shall notify U.S. EPA Region 9 and the affected Regional Boards of the non-compliance in writing within five working days of becoming aware of the non-compliance. The Permittee shall require their biosolids management contractors to notify U.S. EPA Region 9 and the affected Regional Boards of any non-compliance within the same timeframes. See Attachment C for Regional Board contact information.

b. If biosolids are shipped to another State or to Indian Lands, the Permittee must send 60 days prior notice of the shipment to the permitting authorities in the receiving State or Indian Land (the U.S. EPA Regional Office for that area and the State/Indian authorities).

c. For land application: Prior to reuse of any biosolids from this facility to a new or previously unreported site, the Permittee shall notify U.S. EPA and Regional Board. The notification shall include a description and topographic map of the proposed site(s), names and addresses of the applier, and site owner and a listing of any state or local permits which must be obtained. The plan shall include a description of the crops or vegetation to be grown, proposed loading rates and determination of agronomic rates. If any biosolids within a given

monitoring period do not meet 40 C.F.R. § 503.13 metals concentration limits, the Permittee (or its contractor) must pre-notify U.S. EPA, and determine the cumulative metals loading at that site to date, as required in 40 C.F.R. § 503.12.

d. The Permittee shall notify the applier of all the applier's requirements under 440 C.F.R. part 503, including the requirement that the applier certify that the management practices, site restrictions, and any applicable vector attraction reduction requirements have been met. The Permittee shall require the applier to certify at the end of 38 months following application of Class B biosolids that the harvesting restrictions in effect for up to 38 months have been met.

e. For surface disposal: Prior to disposal to a new or previously unreported site, the Permittee shall notify U.S. EPA and the Regional Board. The notice shall include description and topographic map of the proposed site, depth to groundwater, whether the site is lined or unlined, site operator, site owner, and any state or local permits. The notice shall describe procedures for ensuring public access and grazing restrictions for three years following site closure. The notice shall include a groundwater monitoring plan or description of why groundwater monitoring is not required.

3. Biosolids Reporting

The Permittee shall submit an annual biosolids report to the U.S. EPA Region 9 Biosolids Coordinator and Regional Board by February 19 of each year for the period covering the previous calendar year. The report shall include:

a. The amount of biosolids generated during the reporting period, in dry metric tons, and the amount accumulated from previous years;

b. Results of all pollutant and pathogen monitoring required in Item 12 above and the Monitoring and Reporting Program of this Order. Results must be reported on a 100% dry weight basis for comparison with 40 C.F.R. part 503 limits;

c. Descriptions of pathogen reduction methods and vector attraction reduction methods, including supporting time and temperature data, and certifications, as required in 40 C.F.R. §§ 503.17 and 503.27;

d. Names, mailing addresses, and street addresses of persons who received biosolids for storage, further treatment, disposal in a municipal waste landfill, or for other use or disposal methods not covered above, and volumes delivered to each.

e. For land application sites, the following information must be submitted by the Permittee, unless the Permittee requires its biosolids management contractors to report this information directly to the U.S. EPA Region 9 Biosolids Coordinator:

1) Locations of land application sites (with field names and numbers) used that calendar year, size of each field applied to, applier, and site owner.

2) Volumes applied to each field (in wet tons and dry metric tons), nitrogen applied, calculated plant available nitrogen;
3) Crop planted, dates of planting and harvesting;
4) For any biosolids exceeding 40 C.F.R. § 503.13 Table 3 metals concentrations: the locations of sites where applied and cumulative metals loading at that site to date;
5) Certifications of management practices in 40 C.F.R. § 503.14; and
6) Certifications of site restrictions in 40 C.F.R. § 503(b)(5).

f. For surface disposal sites:
1) Locations of sites, site operator, site owner, size of parcel on which disposed;
2) Results of any required groundwater monitoring;
3) Certifications of management practices in 40 C.F.R. § 503.24; and
4) For closed sites, date of site closure and certifications of management practices for the three years following site closure.

g. For all biosolids used or disposed at the Permittee's facilities, the site and management practice information and certification required in 40 C.F.R. §§ 503.17 and 503.27; and

h. For all biosolids temporarily stored, the information required in 40 C.F.R. § 503.20 required to demonstrate temporary storage.

Reports shall be submitted to:

Regional Biosolids Coordinator
USEPA (WTR-7)
75 Hawthorne Street
San Francisco, CA 94105-3901

Executive Officer
Central Coast Regional Water Quality Control Board
centralcoast@waterboards.ca.gov

i. All the requirements of 40 C.F.R. part 503 and 23 CCR 15 are enforceable by the U.S. EPA and this Regional Board whether or not the requirements are stated in an NPDES permit or any other permit issued to the discharger.

C. Pretreatment Monitoring

At least once per year, influent, effluent, and biosolids shall be sampled and analyzed for the priority pollutants identified under Section 307(a) of the Clean Water Act. A summary of analytical results from representative, flow-proportioned, 24-hour composite

sampling of the plant's influent and effluent for those pollutants U.S. EPA has identified under Section 307(a) of the Act which are known or suspected to be discharged by industrial users. The Discharger is not required to sample and analyze for asbestos until U.S. EPA promulgates an applicable analytical technique under 40 C.F.R. part 136. Biosolids shall be sampled during the same 24-hour period and analyzed for the same pollutants as the influent and effluent sampling and analysis. The biosolids analyzed shall be a composite sample of a minimum of twelve discrete samples taken at equal time intervals over the 24-hour period. Wastewater and biosolids sampling and analysis shall be performed a minimum of annually and not less than the frequency specified in the required monitoring program for the plant. The Discharger shall also provide any influent, effluent, or biosolids monitoring data for nonpriority pollutants which the Discharger believes may be causing or contributing to interference, pass-through, or adversely impacting biosolids quality. Sampling and analysis shall be performed in accordance with the techniques prescribed in 40 C.F.R. part 136 and amendments thereto. Biosolids samples shall be collected from the last point in solids handling before disposal. If biosolids are dried on-site, samples shall be composited from at least twelve discrete samples from twelve representative locations.

D. Outfall Inspection

At least one time per year, the Discharger shall visually inspect the outfall structure and report in the Annual Report, regarding its physical integrity. The inspection shall note leaks and potential leaks using dye studies, if necessary.

E. MBNMS Spill Reporting

The Discharger shall report all sewage spills under its control that are likely to enter ocean waters, directly to the Monterey Bay National Marine Sanctuary (MBNMS) office at 831-236-6797.

X. REPORTING REQUIREMENTS

A. General Monitoring and Reporting Requirements

1. The Discharger shall comply with all Standard Provisions (Attachment D) related to monitoring, reporting, and recordkeeping.

B. Self Monitoring Reports (SMRs)

1. The Discharger shall submit electronic SMRs using the State Water Board's California Integrated Water Quality System (CIWQS) Program website (http://www.waterboards.ca.gov/water_issues/programs/ciwqs/). The CIWQS website will provide additional directions for SMR submittal in the event of a service interruption for electronic submittal. The Discharger shall use the current version of the Permittee Entry Template (PET) tool to configure data into the applicable CIWQS Data Format, and shall update that template according to this Order (e.g., add/delete parameters, revise limits, update monitoring locations, etc). Blank versions of the latest PET tool are available at http://www.waterboards.ca.gov/water_issues/programs/ciwqs/chc_npdes.shtml.

2. The Discharger shall report in the SMR the results for all monitoring specified in this MRP under sections III through IX. The Discharger shall submit SMRs including the results of all required monitoring using USEPA approved test methods or other test methods specified in this Order. If the Discharger monitors any pollutant more frequently than required by this Order, the results of this monitoring shall be included in the calculations and reporting of the data submitted in the SMR.

3. Sampling and monitoring as required by this MRP shall begin on the effective date of this Order. The Discharger shall complete all required monitoring and reporting according to the following schedule unless otherwise directed by the Executive Officer:

Table E-10. Monitoring Periods and Reporting Schedule

SMR Name	Permit Section for Monitoring & Sampling Data Included in Report	SMR Submittal Frequencies	SMR Due Date
NPDES Monitoring Report - Monthly	MRP Sections III (Influent) and IV (Effluent)	Monthly	First day of second calendar month following period of sampling
NPDES Monitoring Report – Quarterly	MRP Section IV Table E.4 (Effluent)	Quarterly	1st Quarter: May 1st 2nd Quarter: Aug 1st 3rd Quarter: Nov 1st 4th Quarter: Feb 1st
NPDES Monitoring Report - Semi-Annual	MRP Section IV (Effluent) – Toxicity and Ocean Plan Table 1	Semi-annually	February 1st and August 1st
NPDES Monitoring Report – Remaining Priority Pollutants	MRP Section IV Table E.4 (Effluent) Remaining Priority Pollutants	3x per permit	February 1, 2016, 2017 and 2018 (following sampling as described in footnote 14 table E-4)
Pretreatment Annual Report	MRP Section IX.C and Order Section V.C.5.b	Annually	February 1st following calendar year of sampling and inspections
Ocean Outfall Inspection Report	MRP Section IX.D	Annually	February 1st following calendar year of inspection
Biosolids Annual Report	MRP Section IX.B.3 and Order Section V.C.5.a	Annually	February 19th following calendar year of sampling
Annual Summary Report	Attachment D, Standard Provision VIII.D.8	Annually	February 1st following calendar year of sampling

4. Reporting Protocols. The Discharger shall report with each sample result the applicable reported Minimum Level (reported ML, also known as the Reporting

Level, or RL) and the current Method Detection Limit (MDL), as determined by the procedure in 40 C.F.R. part 136. For each parameter identified in Table 1 of the Ocean Plan, the Discharger shall use a ML no greater than specified in Appendix II of the Ocean Plan.

The Discharger shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

a. Sample results greater than or equal to the reported ML shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).

b. Sample results less than the reported ML, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified," or DNQ. The estimated chemical concentration of the sample shall also be reported.

   For the purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ. The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (± a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.

c. Sample results less than the laboratory's MDL shall be reported as "Not Detected," or ND.

d. Dischargers are to instruct laboratories to establish calibration standards so that the ML value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the Discharger to use analytical data derived from extrapolation beyond the lowest point of the calibration curve.

5. The Discharger shall submit SMRs in accordance with the following requirements:

   a. The Discharger shall arrange all reported data in a tabular format. The data shall be summarized to clearly illustrate whether the facility is operating in compliance with interim and/or final effluent limitations. The Discharger is not required to duplicate the submittal of data that is already entered within CIWQS in a tabular format. When electronic submittal of data is required and CIWQS does not provide for entry into a tabular format within the system, the Discharger shall electronically submit the data in a tabular format as an attachment.

   b. The Discharger shall include in their CIWQS upload a cover letter to the SMR. The information contained in the cover letter shall clearly identify violations of the WDRs; discuss corrective actions taken or planned; and the proposed time schedule for corrective actions. Identified violations must include a description of the requirement that was violated and a description of the violation. Uploaded reports must also include laboratory data sheets for the analytical results being presented.

c. Discharger shall maintain and update, as necessary, a Permitee Entry Tool (PET) to facilitate data entry into the CIWQS system.

C. Discharge Monitoring Reports (DMRs)

1. At any time during the term of this permit, the State or Central Coast Water Board may notify the Discharger to electronically submit DMR's. Until such notification is given specifically for the submittal of DMR's, the Discharger shall submit DMR's in accordance with the requirements described below.

2. DMRs must be signed and certified as required by the standard provisions (Attachment D). The Discharge shall submit the original DMR and one copy of the DMR to the address listed below.

Standard Mail	Fedex/UPS/Other Private Carriers
State Water Resources Control Board Division of Water Quality c/o DMR Processing Center PO Box 100 Sacramento, CA 95812-1000	State Water Resources Control Board Division of Water Quality c/o DMR Processing Center 1001 I Street, 15th Floor Sacramento, CA 95814

3. All discharge monitoring results must be reported on the official USEPA pre-printed DMR forms (EPA Form 3320-1) or on self-generated forms that follow the exact same format of EPA Form 3320-1.

D. Other Reports

1. Unless otherwise noted, with the next SMR, the Discharger shall report the results of any special monitoring, TREs, or other data or information that results from the Special Provisions, section VI. C, of the Order.

ATTACHMENT F – FACT SHEET

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ATTACHMENT F – FACT SHEET

As described in section I of this Order, the Central Coast Water Board incorporates this Fact Sheet as findings of the Central Coast Water Board supporting the issuance of this Order. This Fact Sheet includes the legal requirements and technical rationale that serve as the basis for the requirements of this Order.

This Order has been prepared under a standardized format to accommodate a broad range of discharge requirements for dischargers in California. Only those sections or subsections of this Order that are specifically identified as "not applicable" have been determined not to apply to this Discharger. Sections or subsections of this Order not specifically identified as "not applicable" are fully applicable to this Discharger.

I. PERMIT INFORMATION

The following table summarizes administrative information related to the facility.

Table F-1. Facility Information

WDID	3 270118002
Discharger	Monterey Regional Water Pollution Control Agency
Name of Facility	Regional Treatment Plant
Facility Address	14811 Del Monte Boulevard
	Marina, California 93933
	Monterey County
Administrative Office	5 Harris Court, Building D
	Monterey, California 93940
	Monterey County
Facility Contact, Title and Phone	James Dix, Operations Manager (831) 883-6183
Authorized Person to Sign and Submit Reports	James Dix, Operations Manager (831) 883-6183
Environmental Contact	Garrett Haertel, Compliance Engineer, (831) 883-6176
Mailing Address	5 Harris Court, Building D, Monterey, California 93940
Billing Address	5 Harris Court, Building D, Monterey, California 93940
Type of Facility	POTW
Major or Minor Facility	Major
Threat to Water Quality	2
Complexity	A
Pretreatment Program	Yes
Recycling Requirements	Producer
Facility Permitted Flow	29.6 million gallons per day (MGD)
Facility Design Flow	29.6 MGD (Average Dry Weather Flow)
Watershed	Lower Salinas Valley HA (309.10)
Receiving Waters	Pacific Ocean (Monterey Bay National Marine Sanctuary, outside the Zone of Prohibition)
Receiving Water Type	Ocean Water

A. The Monterey Regional Water Pollution Control Agency (MRWPCA) (hereinafter, the Discharger) is the owner and operator of a wastewater treatment plant (hereinafter, Facility), which treats domestic, commercial, and industrial wastewaters collected from the cities of Monterey, Pacific Grove, Del Rey Oaks, Sand City, Marina, and Salinas; the Seaside County Sanitation District; the Castroville, Moss Landing and Boronda Community Service Districts; and Fort Ord. The wastewater treatment facility is located at 14811 Del Monte Boulevard, Marina, Monterey County.

For the purposes of this Order, references to the "discharger" or "Permittee" in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

B. The Facility discharges wastewater to the Pacific Ocean (via Monterey Bay), a water of the United States, and is currently regulated by Order No. R3-2008-0008, which was adopted on March 20, 2008, expired on April 30, 2013, and administratively extended until the Board adopts this new permit. The terms and conditions of the current Order will be automatically continued and remain in effect until new Waste Discharge Requirements and a National Pollutant Discharge Elimination System (NPDES) permit are adopted pursuant to this Order.

C. The Discharger filed a Report of Waste Discharge and submitted an application for reissuance of its Waste Discharge Requirements (WDRs) and NPDES permit on November 21, 2012. The application was deemed complete on March 15, 2013.

II. FACILITY DESCRIPTION

A. Wastewater and Biosolids Treatment

The MRWPCA, which currently serves a population of approximately 252,000, was created in 1972. MRWPCA consists of and provides regional wastewater treatment, disposal, and reclamation facilities for the cities of Monterey, Pacific Grove, Del Rey Oaks, Sand City, Marina, and Salinas; the Seaside County Sanitation District; the Castroville, Moss Landing and Boronda Community Services Districts; and Fort Ord. Each member entity retains ownership and operating/maintenance responsibility for wastewater collection and transport systems up to the point of connection with interceptors owned and operated by the Discharger. Residential, commercial, and industrial wastewater is conveyed to the MRWPCA Regional Treatment Plant, which has a design treatment capacity of 29.6 MGD (average dry weather flow) and currently treats approximately 18 MGD. The Facility began operation in 1990, replacing six local wastewater treatment facilities.

The MRWPCA currently accepts 30,000 – 50,000 gallons per day (gpd) of brine wastes by truck from business entities which would otherwise be discharging to the sanitary sewer system. Such wastewaters include softener regenerant wastes and reverse osmosis brines, which are now trucked to the Regional Treatment Plant instead of being discharged to the collection system. Because irrigation uses of recycled wastewater are sensitive to elevated levels of total dissolved solids (TDS), the MRWPCA has sought to keep such elevated TDS wastewaters segregated from the influent flow of the Regional

Treatment Plant. Brine wastes are held in a 375,000 gallon (approximate) lined holding pond at the Regional Treatment Plant and ultimately discharged directly to or blended with secondary treated wastewater before being discharged through Discharge Point 001.

Wastewater treatment at the Regional Treatment Plant includes aerated grit removal, primary clarifiers, trickling filters, solids contact, secondary clarifiers, and filtration. Undisinfected secondary clarifier effluent is discharged through Discharge Point 001. Sludge/biosolids are anaerobically digested and sent to two screw presses constructed in 2007. The presses have replaced the sludge drying beds and belt filter press. The holding lagoons and some of the drying beds may still be utilized in emergency situations. Dried solids are then hauled to the Monterey Regional Waste Management District's landfill in Marina, California, adjacent to the Regional Treatment Plant, where it is mixed with wood products and used for slope cover.

In winter months, secondary treated wastewater from the Regional Treatment Plant is discharged through a diffuser, positioned 11,260 feet offshore at a depth of approximately 100 feet, to Monterey Bay. In summer months, treated wastewater is recycled for irrigation of 12,000 acres of farmland in the northern Salinas Valley. Tertiary treatment of recycled wastewater is provided for design flows of up to 29.6 MGD by the Salinas Valley Reclamation Project (SVRP), which holds tertiary treated wastewater in an 80 acre-foot storage pond before it is distributed to farmland by the Castroville Seawater Intrusion Project (CSIP). The irrigation use of recycled wastewater reduces regional dependence on and use of local groundwater, thereby minimizing seawater intrusion. The SVRP portion of the MRWPCA facility and use of recycled water is regulated via separate water recycling requirements.

B. Discharge Points and Receiving Waters

Discharge from the Regional Treatment Plant at Discharge Point 001 occurs through an 11,260-foot outfall/diffuser system that terminates at a depth of approximately 100 feet in the Pacific Ocean (Monterey Bay) at 36°, 43', 40" N. latitude and 121°, 50', 15" W longitude. The receiving water is part of the Monterey Bay National Marine Sanctuary, designated as such on September 15, 1992. The purpose of the National Marine Sanctuaries Program is to protect areas of the marine environment which possess conservation, recreational, ecological, historical, research, educational, or aesthetic qualities of special national significance. The first priority of the Program is the long-term protection of resources within designated sanctuaries. The Monterey Bay Sanctuary has been recognized for its unique and diverse biological and physical characteristics. The MRWPCA outfall/diffuser system is located outside the Monterey Bay National Marine Sanctuary Zone of Prohibition.

Discharges through Discharge Point 001 consist of secondary treated wastewater and/or brine wastes, as described above. The minimum probable dilution for Discharge Point 001 is 145 to 1, a figure that has been used by Central Coast Water Board staff to determine the need for water quality-based effluent limitations and, if necessary, to calculate those limitations.

C. Summary of Existing Requirements and Effluent Characterization

Effluent limitations contained in the previous Order for discharges from Discharge Point 001 and representative monitoring data for Monitoring Location EFF-001, for the last five years of the permit term (i.e., 2008 through 2012), are presented in the following tables. Wastewater monitored at Monitoring Location EFF-001 is essentially a combination of brine wastes and secondary effluent. Effluent monitoring data that are reported for compliance purposes represent flow-weighted concentrations based on each flow stream contribution, which ensures a representative sample of effluent discharged from the Regional Treatment Plant.

Table F-2. Historic Effluent Limitations and Monitoring Data, Conventional Pollutants, Discharge Point 001

Parameter	Units	Effluent Limitations				Monitoring Data (7/08 – 11/12)
		Average Monthly	Average Weekly	Daily Maximum	Instantaneous Maximum	Maximum Reported Value
$CBOD_5$	mg/L	25	40	85	--	26 [1]
	lb/day	6,200	10,000	21,000	--	--
TSS	mg/L	30	45	90	--	47 [2]
	lb/day	7,400	11,000	22,000	--	--
$CBOD_5$, and TSS	%	Removal by treatment shall not be less than 85 percent				--
Settleable Solids	mL/L/hr	1.0	1.5	3.0	--	0.3
Turbidity	NTU	75	100	230	--	18
Oil & Grease	mg/L	25	40	75	--	16
	lb/day	6,200	10,000	19,000	--	--
pH	pH Units	6.0 – 9.0				8.4
Total coliform bacteria	MPN/100 mL	1,000	--	--	10,000	1,600

[1] This value represents the highest reported daily maximum value for $CBOD_5$ (September 2009). There were no exceedances of effluent limitations for $CBOD_5$ during the permit term.

[2] This value represents the highest reported daily maximum value for TSS (July 2008). There were no exceedances of effluent limitations for TSS during the permit term.

Table F-3. Historic Effluent Limitations, Toxic Pollutants, Discharge Point 001

Parameter	Units	Effluent Limitations				Monitoring Data (7/08 – 11/12)
		6-Month Median	Daily Maximum	Instantaneous Maximum	30-Day Average	Maximum Reported Value
Arsenic	µg/L	733	4,237	11,245	--	4.0
	lbs/day	181	1,050	2,780	--	--
Cadmium	µg/L	146	584	1,460	--	< 5
	lbs/day	36	144	360	--	--

Parameter	Units	Effluent Limitations				Monitoring Data (7/08 – 11/12)
		6-Month Median	Daily Maximum	Instantaneous Maximum	30-Day Average	Maximum Reported Value
Chromium (Hexavalent)	µg/L	292	1,168	2,920	--	130
	lbs/day	72.1	288	721	--	--
Copper	µg/L	148	1,462	4,090	--	10
	lbs/day	36.5	361	1,010	--	--
Lead	µg/L	292	1,168	2,920	--	0.5
	lbs/day	72.1	288	721	--	--
Mercury	µg/L	5.7675	23.2875	58.3275	--	0.8
	lbs/day	1.42	5.75	14.4	--	--
Nickel	µg/L	730	2,920	7,300	--	3.5
	lbs/day	180	721	1,800	--	--
Selenium	µg/L	2,190	8,760	21,900	--	57
	lbs/day	541	2,160	5,410	--	--
Silver	µg/L	79	385.6	998.8	--	< 0.19
	lbs/day	19.5	95.2	247	--	--
Zinc	µg/L	1,760	10,520	28,040	--	20
	lbs/day	434	2,600	6,920	--	--
Cyanide	µg/L	146	584	1,460	--	59
	lbs/day	36	144	360	--	--
Total Residual Chlorine	µg/L	292	1,168	8,760	--	460 [1]
	lbs/day	72.1	288	2,200	--	--
Ammonia (as N)	µg/L	87,600	350,400	876,000	--	36,400
	lbs/day	21,600	86,500	220,000	--	--
Acute Toxicity	TUa	--	4.65	--	--	2.5
Chronic Toxicity	TUc	--	146	--	--	40
Phenolic Compounds (non-chlorinated)	µg/L	4,380	17,520	43,800	--	< 2
	lbs/day	1,080	4,330	10,800	--	--
Endosulfan	µg/L	1.314	2.6328	3.942	--	< 0.05
	lbs/day	0.324	0.649	0.973	--	--
Endrin	µg/L	0.292	0.584	0.876	--	< 0.005
	lbs/day	0.072	0.144	0.216	--	--
HCH	µg/L	0.584	1.168	1.752	--	0.034
	lbs/day	0.14	0.288	0.433	--	--
Radioactivity	Not to exceed limits specified in Title 17, Division 1, Chapter 5, Subchapter 4, Group 3, Article 3, Section 30253 of the California Code of Regulations. Reference to Section 30253 is prospective, including future changes to any incorporated provisions of federal law, as the changes take effect.					408
Acrolein	µg/L	--	--	--	32,120	< 5
	lbs/day	--	--	--	7,930	--
Antimony	µg/L	--	--	--	175,000	0.65

Parameter	Units	Effluent Limitations				Monitoring Data (7/08 – 11/12)
		6-Month Median	Daily Maximum	Instantaneous Maximum	30-Day Average	Maximum Reported Value
	lbs/day	--	--	--	43,300	--
Bis(2-Chloroethoxy)Methane	µg/L	--	--	--	642.4	< 0.5
	lbs/day	--	--	--	159	--
Bis(2-Chloroisopropyl)Ether	µg/L	--	--	--	175,000	< 0.5
	lbs/day	--	--	--	43,300	--
Chlorobenzene	µg/L	--	--	--	83,220	< 0.5
	lbs/day	--	--	--	20,500	--
Chromium (III)	µg/L	--	--	--	27,740,000	87
	lbs/day	--	--	--	6,850,000	--
Di-n-Butyl Phthalate	µg/L	--	--	--	511,000	< 5
	lbs/day	--	--	--	126,000	--
Dichlorobenzenes	µg/L	--	--	--	744,000	< 0.05
	lbs/day	--	--	--	184,000	--
Diethyl Phthalate	µg/L	--	--	--	4,818,000	< 5
	lbs/day	--	--	--	1,190,000	--
Dimethyl Phthalate	µg/L	--	--	--	119,720,000	< 2
	lbs/day	--	--	--	29,600,000	--
4,6-Dinitro-2-methylphenol	µg/L	--	--	--	32,120	< 0.5
	lbs/day	--	--	--	7,930	--
2,4-Dinitrophenol	µg/L	--	--	--	584	< 0.5
	lbs/day	--	--	--	140	--
Ethylbenzene	µg/L	--	--	--	598,600	< 0.5
	lbs/day	--	--	--	148,000	--
Fluoranthene	µg/L	--	--	--	2,190	< 0.5
	lbs/day	--	--	--	541	--
Hexachlorocyclopentadiene	µg/L	--	--	--	8,468	< 0.5
	lbs/day	--	--	--	2,090	--
Nitrobenzene	µg/L	--	--	--	715.4	< 0.5
	lbs/day	--	--	--	177	--
Thallium	µg/L	--	--	--	290	< 0.5
	lbs/day	--	--	--	72	--
Toluene	µg/L	--	--	--	12,410,000	< 0.5
	lbs/day	--	--	--	3,060,000	--
Tributylin	µg/L	--	--	--	0.2044	< 0.05
	lbs/day	--	--	--	0.0505	--
1,1,1-Trichloroethane	µg/L	--	--	--	78,840,000	< 0.5
	lbs/day	--	--	--	19,500,000	--
Acrylonitrile	µg/L	--	--	--	14.7	< 2
	lbs/day	--	--	--	3.6	--

Parameter	Units	Effluent Limitations				Monitoring Data (7/08 – 11/12)
		6-Month Median	Daily Maximum	Instantaneous Maximum	30-Day Average	Maximum Reported Value
Aldrin	µg/L	--	--	--	0.003212	< 0.005
	lbs/day	--	--	--	0.000793	--
Benzene	µg/L	--	--	--	861.4	< 0.5
	lbs/day	--	--	--	213	--
Benzidine	µg/L	--	--	--	0.010074	< 0.5
	lbs/day	--	--	--	0.00249	--
Beryllium	µg/L	--	--	--	4.818	< 0.5
	lbs/day	--	--	--	1.19	--
Bis(2-chloroethyl) ether	µg/L	--	--	--	6.57	< 0.5
	lbs/day	--	--	--	1.62	--
Bis(2-ethylhexyl) phthalate	µg/L	--	--	--	511	< 0.5
	lbs/day	--	--	--	126	--
Carbon Tetrachloride	µg/L	--	--	--	131.4	< 0.5
	lbs/day	--	--	--	32.4	--
Chlordane	µg/L	--	--	--	0.003358	< 0.005
	lbs/day	--	--	--	0.000829	--
Chlorodibromomethane	µg/L	--	--	--	1,256	< 0.5
	lbs/day	--	--	--	310	--
Chloroform	µg/L	--	--	--	18,980	< 0.5
	lbs/day	--	--	--	4,690	--
DDT	µg/L	--	--	--	0.02482	0.010
	lbs/day	--	--	--	0.00613	--
1,4-Dichlorobenzene	µg/L	--	--	--	2,628	< 5
	lbs/day	--	--	--	649	--
3,3-Dichlorobenzidine	µg/L	--	--	--	1.1826	< 0.025
	lbs/day	--	--	--	0.292	--
1,2-Dichloroethane	µg/L	--	--	--	4,090	< 0.5
	lbs/day	--	--	--	1,010	--
1,1-Dichloroethylene	µg/L	--	--	--	131.4	< 0.5
	lbs/day	--	--	--	32.4	--
Dichlorobromomethane	µg/L	--	--	--	905	< 0.5
	lbs/day	--	--	--	223	--
Dichloromethane	µg/L	--	--	--	65,700	< 0.5
	lbs/day	--	--	--	16,200	--
1,3-Dichloropropene	µg/L	--	--	--	1,299.4	< 0.5
	lbs/day	--	--	--	321	--
Dieldrin	µg/L	--	--	--	0.00584	< 0.005
	lbs/day	--	--	--	0.0014	--
2,4-Dinitrotoluene	µg/L	--	--	--	379.6	< 2

Parameter	Units	Effluent Limitations				Monitoring Data (7/08 – 11/12)
		6-Month Median	Daily Maximum	Instantaneous Maximum	30-Day Average	Maximum Reported Value
	lbs/day	--	--	--	93.7	--
1,2-Diphenylhydrazine	µg/L	--	--	--	23.36	< 0.5
	lbs/day	--	--	--	5.77	--
Halomethanes	µg/L	--	--	--	18,980	< 0.05
	lbs/day	--	--	--	4,690	--
Heptachlor	µg/L	--	--	--	0.0073	< 0.005
	lbs/day	--	--	--	0.0018	--
Heptachlor Epoxide	µg/L	--	--	--	0.0029	< 0.005
	lbs/day	--	--	--	0.00072	--
Hexachlorobenzene	µg/L	--	--	--	0.03066	< 0.5
	lbs/day	--	--	--	0.00757	--
Hexachlorobutadiene	µg/L	--	--	--	2,044	< 0.5
	lbs/day	--	--	--	505	--
Hexachloroethane	µg/L	--	--	--	365	< 0.5
	lbs/day	--	--	--	90.1	--
Isophorone	µg/L	--	--	--	106,580	< 0.5
	lbs/day	--	--	--	26,300	--
N-nitrosodimethylamine	µg/L	--	--	--	1,065.8	< 0.5
	lbs/day	--	--	--	263	--
N-nitrosdi-N-propylamine	µg/L	--	--	--	55.5	< 0.5
	lbs/day	--	--	--	13.7	--
N-nitrosodiphenylamine	µg/L	--	--	--	365	< 0.5
	lbs/day	--	--	--	90.1	--
PAHs	µg/L	--	--	--	1.2848	< 0.05
	lbs/day	--	--	--	0.317	--
PCBs	µg/L	--	--	--	0.002774	< 0.005
	lbs/day	--	--	--	0.000685	--
TCDD Equivalents	µg/L	--	--	--	5.694×10^{-7}	< 0.0000011
	lbs/day	--	--	--	1.4×10^{-7}	--
1,1,2,2-Tetrachloroethane	µg/L	--	--	--	335.8	< 0.5
	lbs/day	--	--	--	82.9	--
Tetrachloroethylene	µg/L	--	--	--	290	< 0.5
	lbs/day	--	--	--	72	--
Toxaphene	µg/L	--	--	--	0.03066	< 0.005
	lbs/day	--	--	--	0.00757	--
Trichloroethylene	µg/L	--	--	--	3,942	< 0.5
	lbs/day	--	--	--	973	--
1,1,2-Trichloroethane	µg/L	--	--	--	1,372	< 0.5

Parameter	Units	Effluent Limitations				Monitoring Data (7/08 – 11/12)
		6-Month Median	Daily Maximum	Instantaneous Maximum	30-Day Average	Maximum Reported Value
	lbs/day	--	--	--	339	--
2,4,6-Trichlorophenol	µg/L	--	--	--	42.34	< 0.5
	lbs/day	--	--	--	10.5	--
Vinyl Chloride	µg/L	--	--	--	5,256	< 0.5
	lbs/day	--	--	--	1,300	--

Source: Monterey Regional Water Pollution Control Agency, Order R3-2008-0008. Effluent data for the period from July 2008 to November 2012 retrieved from CIWQS and ICIS.

[1] This value represents the maximum reported value for total residual chlorine (August 2012). The effluent data for the period from July 2008 to November 2012 included only two values.

D. Compliance Summary

Based on the effluent data available for the period from July 2008 to November 2012, the Discharger did not violate effluent limitations.

A NPDES Permit Compliance Evaluation Inspection (CEI) was conducted at the Regional Treatment Plant on January 8, 2013.

E. Planned Changes

Brine Disposal

During the growing season, typically from March or April through October or November, MRWPCA recycles almost 100 percent of wastewater flows for irrigation uses. A small portion of secondary effluent is retained for blending with brine prior to disposal. To combat high salt concentrations in recycled wastewater, levels that are harmful to irrigated crops, in addition to a source control program, MRWPCA operates a brine disposal project to remove salts from influent flows. Approximately 4.8 million gallons of brine per year are currently diverted from the collection system and discharged directly to MRWPCA's brine disposal facilities. These wastes are not treated with influent flows and therefore do not contribute TDS to recycled wastewater.

Because of benefits to agriculture and reductions in dependence on and use of local groundwater, the MRWPCA's wastewater recycling program is very successful and enhanced by the control of salt concentrations in recycled wastewater. MRWPCA, therefore, anticipates that its brine disposal activities will increase.

This Order establishes effluent limitations, prohibitions, and monitoring requirements applicable to the discharge of brine wastes. Through the requirements of this Order the Central Coast Water Board can ensure that discharges of brine remain consistent with applicable requirements of the Clean Water Act and NPDES implementing regulations, as well as the Basin and Ocean Plans.

Groundwater Replenishment Project

The MRWPCA is moving towards pilot study of providing tertiary treatment of wastewater by micro-filtration (MF) or ultra-filtration (UF), reverse osmosis (RO), and ultra-violet (UV) hydrogen peroxide advanced oxidation. The purpose of the study is to examine the feasibility of groundwater injection of treated wastewater. This study will not result in changes to the quantity or quality of wastewater discharged from the Regional Treatment Plant during the term of this Order and is, therefore, not addressed by this Order.

III. APPLICABLE PLANS, POLICIES, AND REGULATIONS

The requirements contained in the proposed Order are based on the requirements and authorities described in this section.

A. Legal Authorities

This Order serves as Waste Discharge Requirements (WDR's) pursuant to article 4, chapter 4, division 7 of the California Water Code (commencing with section 13260). This Order is also issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. Environmental Protection Agency (USEPA) and chapter 5.5, division 7 of the Water Code (commencing with section 13370). It shall serve as a National Pollutant Discharge Elimination System (NPDES) permit for point source discharges from this facility to surface waters.

B. California Environmental Quality Act (CEQA)

Pursuant to Water Code section 13389, this action to adopt an NPDES permit is exempt from the provisions of CEQA, Public Resources Code sections 21100 - through 21177.

C. State and Federal Laws, Regulations, Policies, and Plans

1. **Water Quality Control Plans.** The Central Coast Water Board adopted the *Water Quality Control Plan for the Central Coastal Basin* (the Basin Plan), which designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for receiving waters within the Region. To address ocean waters, the Basin Plan incorporates by reference the *Water Quality Control Plan for Ocean Waters of California* (the Ocean Plan), which was adopted in 1972 and amended in 1978, 1983, 1988, 1990, 1997, 2000, 2005 and 2012. The most recent amendment to the Ocean Plan was adopted by the State Water Resources Control Board (the State Water Board) on October 16, 2012, and became effective on August 19, 2013.

   The Basin Plan implements State Water Board Resolution No. 88-63, which establishes State policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply (MUN). Because of very high levels of total dissolved solids (TDS) in the Pacific Ocean, including Monterey Bay, the receiving waters for discharges from the Monterey

Regional Water Pollution Control Agency Regional Treatment Plant meet an exception to Resolution No. 88-63, which precludes waters with TDS levels greater than 3,000 mg/L from the MUN designation. Beneficial uses established by the Basin Plan for coastal waters between the Salinas River and Point Pinos are as follows:

Table F-4. Basin Plan Beneficial Uses for the Pacific Ocean

Discharge Point	Receiving Water	Beneficial Use(s)
001	Pacific Ocean (Monterey Bay)	• Water Contact and Non-Contact Recreation • Industrial Service Supply • Navigation • Marine Habitat • Shellfish Harvesting • Commercial and Sport Fishing • Rare, Threatened, or Endangered Species

To protect the beneficial uses, the Basin Plan establishes water quality objectives and implementation programs. This Order's requirements implement the Basin Plan.

2. **Thermal Plan.** The State Water Board adopted a *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Water and Enclosed Bays and Estuaries of California* (Thermal Plan) on May 18, 1972, and amended this plan on September 18, 1975. This plan contains the following temperature objective for existing discharges to enclosed bays and coastal waters of California.

   Elevated temperature waste discharges shall comply with limitations necessary to assure protection of beneficial uses.

   The Ocean Plan defines elevated temperature wastes as:

   Liquid, solid, or gaseous material discharged at a temperature higher than the natural temperature of receiving water.

3. **California Ocean Plan**. The State Water Board adopted the *Water Quality Control Plan for Ocean Waters of California, California Ocean Plan* (Ocean Plan) in 1972 and amended it in 1978, 1983, 1988, 1990, 1997, 2000, 2005, 2009, and 2012. The State Water Board adopted the latest amendment on October 16, 2012, and was approved by the Office of Administrative Law on July 3, 2013, and subsequently the USEPA. The Ocean Plan is applicable, in its entirety, to point source discharges to the Pacific Ocean. The Ocean Plan identifies beneficial uses of ocean waters of the State to be protected as summarized in Table F-5, below.

Table F-5. Ocean Plan Beneficial Uses

Discharge Point	Receiving Water	Beneficial Use(s)
001	Pacific Ocean (Monterey Bay)	• Industrial Water Supply • Water Contact and Non-Contact Recreation, including Aesthetic Enjoyment • Navigation • Commercial and Sport Fishing • Mariculture • Preservation and Enhancement of Designated Areas of Special Biological Significance (ASBS) • Rare and Endangered Species • Marine Habitat • Fish Migration • Fish Spawning and Shellfish Harvesting

In order to protect the beneficial uses, the Ocean Plan establishes WQOs and a program of implementation. Requirements of this Order implement the Ocean Plan.

4. **Antidegradation Policy.** Federal regulation 40 C.F.R. § 131.12 requires that the State water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution 68-16. Resolution 68-16 is deemed to incorporate the federal antidegradation policy where the federal policy applies under federal law. Resolution 68-16 requires that the existing quality of waters be maintained unless degradation is justified based on specific findings. The Central Coast Water Board's Basin Plan implements, and incorporates by reference both the State and federal antidegradation policies. The permitted discharge must be consistent with the antidegradation provisions of 40 C.F.R. § 131.12 and State Water Board Resolution 68-16.

6. **Anti-Backsliding Requirements.** Sections 402 (o)(2) and 303 (d)(4) of the CWA and federal regulations at 40 C.F.R. § 122.44 (l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require effluent limitations in a reissued permit to be as stringent as those in the previous permit, with some exceptions where limitations may be relaxed.

7. **Endangered Species Act Requirements.** This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code, §§ 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. §§ 1531 to 1544). This Order requires compliance with effluent limits, receiving water limits, and other requirements to protect the beneficial uses of waters of the state, including protecting rare and endangered species. The discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

D. Impaired Water Bodies on CWA 303 (d) List

CWA section 303 (d) requires states to identify specific water bodies where water quality standards are not expected to be met after implementation of technology-based effluent limitations on point sources. For all 303 (d) listed water bodies and pollutants, the Central Coast Water Board must develop and implement TMDLs (Total Maximum Daily Loads) that will specify WLAs (Waste Load Allocations) for point sources and Load Allocations for non-point sources.

Monterey Harbor is identified as impaired by metals and sediment toxicity on the State's 2008-2010 303 (d) list of impaired water bodies, which was approved by U.S. EPA on November 12, 2011. The discharge is approximately ten miles from Monterey Harbor and not anticipated to affect this impairment. The main body of Monterey Bay is not identified on the 303 (d) List as impaired.

E. Other Plans, Policies and Regulations

1. **Discharges of Storm Water.** For the control of storm water discharged from the site of the wastewater treatment and disposal facilities, the Order requires, if applicable, the Discharger to seek authorization to discharge under and meet the requirements of the State Water Resources Control Board's Water Quality Order 97-03-DWQ, NPDES General Permit No. CAS000001, *Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities*.

2. **Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (State Water Board Order No. 2006-0003-DWQ).** This General Permit, adopted on May 2, 2006, is applicable to all "federal and state agencies, municipalities, counties, districts, and other public entities that own or operate sanitary sewer systems greater than one mile in length that collect and/or convey untreated or partially treated wastewater to a publicly owned treatment facility in the State of California." The purpose of the General Permit is to promote the proper and efficient management, operation, and maintenance of sanitary sewer systems and to minimize the occurrences and impacts of sanitary sewer overflows. The Order requires the Discharger to seek coverage under the General Permit, if applicable, and comply with its requirements. The Discharger has enrolled in the General Permit.

IV. RATIONALE FOR EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

The CWA requires point source dischargers to control the amount of conventional, non-conventional, and toxic pollutants that are discharged into the waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. NPDES regulations establish two principal bases for effluent limitations. At 40 C.F.R. § 122.44 (a) permits are required to include applicable technology-based limitations and standards; and at 40 C.F.R. § 122.44 (d) permits are required to include water quality-based effluent limitations (WQBELs) to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water. When

numeric water quality objectives have not been established, but a discharge has the reasonable potential to cause or contribute to an excursion above a narrative criterion, WQBELs may be established using one or more of three methods described at 40 C.F.R. § 122.44 (d) - 1) WQBELs may be established using a calculated water quality criterion derived from a proposed State criterion or an explicit State policy or regulation interpreting its narrative criterion; 2) WQBELs may be established on a case-by-case basis using U.S. EPA criteria guidance published under CWA Section 304 (a); or 3) WQBELs may be established using an indicator parameter for the pollutant of concern.

A. Discharge Prohibitions

1. Discharge Prohibition II.A (No discharge to Monterey Bay at a location other than as described by the Order). The Order authorizes a single, specific point of discharge to Monterey Bay; and this prohibition reflects CWA section 402's prohibition against discharges of pollutants except in compliance with the Act's permit requirements, effluent limitations, and other enumerated provisions. This prohibition is also retained from the previous permit.

2. Discharge Prohibition II.B (The rate of discharge to Monterey Bay shall not exceed 81.2 MGD). This prohibition reflects the design capacity of the ocean outfall and allows the discharge of blended secondary effluent and brine wastes above the design flow capacity of the secondary treatment facility.

3. Discharge Prohibition II.C (The influent flow to the secondary treatment system shall not exceed 29.6 MGD average dry weather flow and 75.6 MGD peak wet weather flow). This prohibition reflects the design capacity of the secondary treatment system and is intended to limit influent wastewater flows to that of the treatment facility design flows.

4. Discharge Prohibition II.D (Overflows and bypasses prohibited). The discharge of untreated or partially treated wastewater from the Discharger's collection, treatment, or disposal facilities represents an unauthorized bypass pursuant to 40 C.F.R. § 122.41(m) or an unauthorized discharge, which poses a threat to human health and/or aquatic life, and therefore, is explicitly prohibited by this Order.

5. Discharge Prohibition II.E (Discharges in a manner, except as described by the Order are prohibited). Because limitations and conditions of the Order have been prepared based on specific information provided by the Discharger and specific wastes described by the Discharger, the limitations and conditions of the Order do not adequately address waste streams not contemplated during drafting of the Order. To prevent the discharge of such waste streams that may be inadequately regulated, the Order prohibits the discharge of any waste that was not described by the Central Coast Water Board during the process of permit issuance.

6. Discharge Prohibition II.F (Discharges of radiological, chemical, or biological warfare agent or high level radioactive waste to the Ocean is prohibited). This prohibition restates a discharge prohibition established in section III. H of the Ocean Plan.

7. Discharge Prohibition II.G (Federal law prohibits the discharge of sludge by pipeline the Ocean. The discharge of municipal or industrial waste sludge directly to the Ocean or into a waste stream that discharges to the Ocean is prohibited. The discharge of sludge digester supernatant, without further treatment, directly to the Ocean or to a waste stream that discharges to the Ocean, is prohibited.) This prohibition reflects the prohibition in Chapter III. H of the Ocean Plan.

B. Technology-Based Effluent Limitations

1. Scope and Authority

NPDES regulations at 40 C.F.R. § 122.44 (a) require that permits include applicable technology-based limitations and standards. Where the U.S. EPA has not yet developed technology based standards for a particular industry or a particular pollutant, CWA Section 402 (a) (1) and U.S. EPA regulations at 40 C.F.R. § 125.3 authorize the use of best professional judgment (BPJ) to derive technology-based effluent limitations on a case-by-case basis. When BPJ is used, the permit writer must consider specific factors outlined at 40 C.F.R. § 125.3.

This Order includes limitations based on the minimum level of effluent quality attainable by secondary treatment, as established at 40 C.F.R. part 133. The Secondary Treatment Regulation includes the following limitations applicable to all publicly owned treatment works (POTWs).

Table F-6. Secondary Treatment Requirements

Parameter	Effluent Limitation		
	30-Day Avg	7-Day Avg	Percent Removal [1]
$CBOD_5$ [2]	25 mg/L	40 mg/L	85
TSS	30 mg/L	45 mg/L	85
pH	6.0 – 9.0		---

[1] 30-day average
[2] At the option of the permitting authority, effluent limitations for $CBOD_5$ may be substituted for those limitations specified for BOD_5.

In addition, the State Water Board, in Table 2 of the Ocean Plan, has established technology-based requirements, applicable to all POTWs, for oil and grease, suspended and settleable solids, turbidity, and pH.

2. Applicable Technology-Based Effluent Limitations

The following table summarizes technology-based effluent limitations established by the Order.

Table F-7. Summary of Technology-Based Effluent Limitations

Parameter	Units	Effluent Limitations			
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Maximum
$CBOD_5$ [1]	mg/L	25	40	85	--

	lbs/day	6,200	10,000	21,000	--
TSS [1]	mg/L	30	45	90	--
	lbs/day	7,400	11,000	22,000	--
Oil & Grease	mg/L	25	40	75	--
	lbs/day	6,200	10,000	19,000	--
Settleable Solids	mL/L/hr	1.0	1.5	--	3.0
Turbidity	NTUs	75	100	--	230
pH	pH units	6.0 – 9.0 at all times			

[1] 30-day average percent removal shall not be less than 85%.

All technology-based limitations are retained from the previous permit and are required by NPDES regulations at 40 C.F.R. part 133 and/or Table 2 of the Ocean Plan. Mass-based limitations for $CBOD_5$, TSS, and oil and grease are based on a discharge rate of 29.6 MGD, the average dry weather flow design treatment capacity of the Monterey Regional Water Pollution Control Agency Regional Treatment Plant.

C. Water Quality-Based Effluent Limitations (WQBELs)

1. Scope and Authority

NPDES regulations at 40 C.F.R. § 122.44 (d) require that permits include limitations more stringent than applicable federal technology-based requirements where necessary to achieve applicable water quality standards, including numeric and narrative objectives within a standard.

The process for determining “reasonable potential” and calculating WQBELs, when necessary, is intended to protect the designated uses of receiving waters as specified in the Basin and Ocean Plans, and achieve applicable water quality objectives and criteria that are contained in the Basin Plan and in other applicable State and federal rules, plans, and policies, including applicable water quality criteria from the Ocean Plan.

Where reasonable potential has been established for a pollutant, but there is no numeric criterion or objective for the pollutant, WQBELs must be established in accordance with the requirements of 40 C.F.R. § 122.44 (d) (1) (vi), using (1) U.S. EPA criteria guidance under CWA section 304 (a), supplemented where necessary by other relevant information; (2) an indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed state criterion or policy interpreting the state’s narrative criterion, supplemented with other relevant information.

2. Applicable Beneficial Uses and Water Quality Criteria and Objectives

Beneficial uses for ocean waters of the Central Coast Region are established by the Basin Plan and Ocean Plan and are described in section III.C of this Fact Sheet.

Water quality criteria applicable to ocean waters of the Region are established by the Ocean Plan, which includes water quality objectives for bacterial characteristics,

physical characteristics, chemical characteristics, biological characteristics, and radioactivity. The water quality objectives from the Ocean Plan are incorporated as receiving water limitations into this Order. In addition, Table 1 of the Ocean Plan contains numeric water quality objectives for 83 toxic pollutants for the protection of marine aquatic life and human health. Pursuant to NPDES regulations at 40 C.F.R. § 122.44(d)(1), and in accordance with procedures established by the Ocean Plan (2005), the Central Coast Water Board has performed a reasonable potential analysis (RPA) to determine the need for effluent limitations for the Table 1 toxic pollutants.

3. Determining the Need for WQBELs

Procedures for performing an (RPA for ocean dischargers are described in Section III.C and Appendix VI of the Ocean Plan. The procedure is a statistical method that projects an effluent data set while taking into account the averaging period of WQOs, the long term variability of pollutants in the effluent, limitations associated with sparse data sets, and uncertainty associated with censored data sets. The procedure assumes a lognormal distribution of the effluent data set, and compares the 95th percentile concentration at 95 percent confidence of each Table 1 pollutant, accounting for dilution, to the applicable water quality criterion. The RPA results in one of three following endpoints.

Endpoint 1 – There is "reasonable potential." An effluent limitation must be developed for the pollutant. Effluent monitoring for the pollutant, consistent with the monitoring frequency in Appendix III (Ocean Plan), is required.

Endpoint 2 - There is no "reasonable potential." An effluent limitation is not required for the pollutant. Appendix III (Ocean Plan) effluent monitoring is not required for the pollutant; the Regional Board, however, may require occasional monitoring for the pollutant or for whole effluent toxicity as appropriate.

Endpoint 3 - The RPA is inconclusive. Monitoring for the pollutant or whole effluent toxicity testing, consistent with the monitoring frequency in Appendix III (Ocean Plan), is required. An existing effluent limitation for the pollutant shall remain in the permit, otherwise the permit shall include a reopener clause to allow for subsequent modification of the permit to include an effluent limitation if the monitoring establishes that the discharge causes, has the reasonable potential to cause, or contribute to an excursion above a Table 1 water quality objective.

The State Water Board has developed a reasonable potential calculator (RPcalc 2.0), which is available at:

http://www.swrcb.ca.gov/water_issues/programs/ocean/docs/trirev/stakeholder050505/rpcalc20_setup.exe

RPcalc 2.0 was used in the development of this Order and considers several pathways in the determination of reasonable potential.

a. First Path

If available information about the receiving water or the discharge supports a finding of reasonable potential without analysis of effluent data, the Central Coast Water Board may decide that WQBELs are necessary after a review of such information. Such information may include: the facility or discharge type, solids loading, lack of dilution, history of compliance problems, potential toxic effects, fish tissue data, §303(d) status of the receiving water, or the presence of threatened or endangered species or their critical habitat, or other information.

b. Second Path

If any pollutant concentration, adjusted to account for dilution, is greater than the most stringent applicable water quality objective, there is reasonable potential for that pollutant.

c. Third Path

If the effluent data contain 3 or more detected and quantified values (i.e., values that are at or above the minimum level (ML)), and all values in the data set are at or above the ML, a parametric RPA is conducted to project the range of possible effluent values. The 95th percentile concentration is determined at 95 percent confidence for each pollutant, and compared to the most stringent applicable water quality objective to determine reasonable potential. A parametric analysis assumes that the range of possible effluent values is distributed lognormally. If the 95th percentile value is greater than the most stringent applicable water quality objective, there is reasonable potential for that pollutant.

d. Fourth Path

If the effluent data contain 3 or more detected and quantified values (i.e., values that are at or above the ML), but at least one value in the data set is less than the ML, a parametric RPA is conducted according to the following steps.

Table F-8. RPA Results for Discharges to Monterey Bay

Table 1 Pollutant	Most Stringent WQO (µg/L)	No. of Samples	No. of Non-Detects	Max Effluent Conc. (µg/L)	RPA Result, Comment

Objectives for Protection of Marine Aquatic Life					
Ammonia (as N)	600	39	0	249	**Endpoint 2 – Effluent limitation not required.**
Arsenic	8	8	3	3.0	**Endpoint 2 – Effluent limitation not required.**
Cadmium	1	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Chlorinated Phenolics	1	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Chromium (VI)	2	18	0	0.89	**Endpoint 1 – Effluent limitation is necessary.**
Copper	3	8	3	2.1	**Endpoint 2 – Effluent limitation not required.**
Cyanide	1	8	0	0.40	**Endpoint 1 – Effluent limitation is necessary.**
Endosulfan (total)	0.009	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Endrin	0.002	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
HCH	0.004	8	7	0.00023	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Lead	2	8	7	0.0034	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Mercury	0.04	8	3	0.0060	**Endpoint 2 – Effluent limitation not required.**
Nickel	5	8	3	0.024	**Endpoint 2 – Effluent limitation not required.**
Non-chlorinated Phenolics	30	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Selenium	15	8	0	0.39	**Endpoint 1 – Effluent limitation is necessary.**
Silver	0.7	8	8	0.16	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Total Residual Chlorine	2	21	19	3.2	**Endpoint 1 – Effluent limitation is necessary.**
Zinc	20	8	3	8.1	**Endpoint 2 – Effluent limitation not required.**
Objectives for Protection of Human Health - Noncarcinogens					
1,1,1-Trichloroethane	540000	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
2,4-Dinitrophenol	4.0	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
2-Methyl-4,6-Dinitrophenol	220	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Acrolein	220	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.

Antimony	1200	8	7	0.0045	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Bis(2-Chloroethoxy)Methane	4.4	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Bis(2-Chloroisopropyl)Ether	1200	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Chlorobenzene	570	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Chromium (III)	190000	8	1	0.60	**Endpoint 2 – Effluent limitation not required.**
Dichlorobenzenes	5100	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Diethyl Phthalate	33000	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Dimethyl Phthalate	820000	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Di-n-Butyl Phthalate	3500	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Ethylbenzene	4100	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Fluoranthene	15	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Hexachlorocyclo-pentadiene	58	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Nitrobenzene	4.9	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Thallium	2	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Toluene	85000	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Tributylin	0.0014	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Objectives for Protection of Human Health - Carcinogens					
1,1,2,2-Tetrachloroethane	2.3	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
1,1,2-Trichloroethane	9.4	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
1,1-Dichloroethylene	0.9	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
1,2-Dichloroethane	28	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.

1,2-Diphenylhydrazine	0.16	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
1,3-Dichloropropylene	8.9	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
1,4-Dichlorobenzene	18	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
TCDD Equivalents	3.9×10^{-9}	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
2,4,6-Trichlorophenol	0.29	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
2,4-Dinitrotoluene	2.6	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
3,3'-Dichlorobenzidine	0.0081	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Acrylonitrile	0.10	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Aldrin	2.2×10^{-5}	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Benzene	5.9	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Benzidine	6.9×10^{-5}	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Beryllium	0.033	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Bis(2-Chloroethyl)Ether	0.045	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Bis(2-Ethylhexyl)Phthalate	3.5	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Carbon Tetrachloride	0.90	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Chlordane	2.3×10^{-5}	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Chlorodibromomethane	8.6	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Chloroform	130	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
DDT (total)	0.00017	18	17	0.00068	**Endpoint 2 – Effluent limitation not required.**
Dichlorobromomethane	6.2	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.

Dieldrin	0.00004	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Halomethanes	130	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Heptachlor	0.00005	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Heptachlor Epoxide	0.00002	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Hexachlorobenzene	0.00021	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Hexachlorobutadiene	14	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Hexachloroethane	2.5	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Isophorone	730	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Methylene Chloride	450	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
N-Nitrosodimethylamine	7.3	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
N-Nitrosodi-n-Propylamine	0.38	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
N-Nitrosodiphenylamine	2.5	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
PAHs (total)	0.0088	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
PCBs	1.9×10^{-5}	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Tetrachloroethylene	2.0	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Toxaphene	0.00021	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Trichloroethylene	27	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.
Vinyl Chloride	36	8	8	ND	Endpoint 3 – RPA is inconclusive. Less than 3 detects or greater than 80% ND.

(1) If the number of censored values (those expressed as a “less than” value) account for less than 80 percent of the total number of effluent values, calculate the M_L (the mean of the natural log of transformed data) and S_L (the standard deviation of the natural log of transformed data) and conduct a parametric RPA, as described above for the Third Path.

(2) If the number of censored values account for 80 percent or more of the total number of effluent values, conduct a non-parametric RPA, as described below for the Fifth Path. (A non-parametric analysis becomes necessary when the effluent data are limited, and no assumptions can be made regarding its possible distribution.)

e. Fifth Path

A non-parametric RPA is conducted when the effluent data set contains less than 3 detected and quantified values, or when the effluent data set contains 3 or more detected and quantified values but the number of censored values accounts for 80 percent or more of the total number of effluent values. A non-parametric analysis is conducted by ordering the data, comparing each result to the applicable water quality objective, and accounting for ties. The sample number is reduced by one for each tie, when the dilution-adjusted method detection limit (MDL) is greater than the water quality objective. If the adjusted sample number, after accounting for ties, is greater than 15, the pollutant has no reasonable potential to exceed the water quality objective. If the sample number is 15 or less, the RPA is inconclusive, monitoring is required, and any existing effluent limits in the expiring permit are retained.

An RPA was conducted using effluent data reported from monitoring events from July 2008 to November 2012. The effluent data was obtained from eSMR data posted to CIWQS and from DMR data posted to ICIS for Monitoring Location EFF-001, which represents flow-weighted concentrations based on each flow stream contribution (i.e., brine wastes and secondary effluent). The following tables present results of the RPA, performed in accordance with procedures described by the Ocean Plan for the Monterey Regional Water Pollution Control Agency Regional Treatment Plant. The maximum effluent concentration adjusted for complete mixing, the applicable WQO, and the RPA endpoint for each Table 1 pollutant is identified. As shown in the following tables, the RPA commonly lead to Endpoint 3, meaning that the RPA is inconclusive, when a majority of the effluent data is reported as ND (not detected). In these circumstances, the Central Coast Water Board concludes that additional monitoring will be required for those pollutants during the term of the reissued permit and existing effluent limits will be retained.

4. WQBEL Calculations

Based on results of the RPA, performed in accordance with methods of the Ocean Plan for discharges to the Pacific Ocean, the Central Coast Water Board is establishing WQBELs for chromium (VI), cyanide, selenium, and total residual chlorine based on a conclusion of Endpoint 1. An Endpoint 2 was concluded for ammonia, arsenic, chromium (III), copper, mercury, nickel, zinc, and DDT (total). Effluent limits are not required for pollutants resulting in an Endpoint 2. All other Ocean Plan Table 1 pollutants resulted in an Endpoint 3; therefore, the limits for these pollutants are retained in this Order. The Regional Water Board is also

establishing WQBELs for whole effluent, acute and chronic toxicity, which are also pollutants or pollutant parameters identified by Table 1 of the Ocean Plan, based on information about the receiving water and/or the discharge instead of characterization of effluent monitoring data.

As described by Section III. C of the Ocean Plan, effluent limits for Table 1 pollutants are calculated according to the following equation.

$$Ce = Co + Dm (Co – Cs)$$

Where

Ce = the effluent limitation (µg/L)

Co = the concentration (the water quality objective) to be met at the completion of initial dilution (µg/L).

Cs = background seawater concentration (µg/L)

Dm = minimum probable initial dilution expressed as parts seawater per part wastewater (here, Dm = 145)

For the Monterey Regional Water Pollution Control Agency, the Dm of 145 is unchanged from Order No. R3-2008-0008. Initial dilution is the process that results in the rapid and irreversible turbulent mixing of wastewater with ocean water around the point of discharge. As site-specific water quality data are not available, in accordance with Table 1 implementing procedures, Cs equals zero for all pollutants, except the following.

Table F-9. Background Concentrations (Cs) - Ocean Plan (Table 3)

Pollutant	Background Seawater Concentration
Arsenic	3 µg/L
Copper	2 µg/L
Mercury	0.0005 µg/L
Silver	0.16 µg/L
Zinc	8 µg/L

For all other Table 1 parameters, Cs=0

Applicable water quality objectives from Table 1 of the Ocean Plan are as follows.

Table F-10. Water Quality Objectives (Co)–Ocean Plan (Table 1) Objectives for Protection of Marine Aquatic Life

Pollutant	Units	6-Month Median	Daily Maximum	Instantaneous Maximum
Arsenic	µg/L	8	32	80
Cadmium	µg/L	1	4	10
Chromium (VI)	µg/L	2	8	20
Copper	µg/L	3	12	30

Pollutant	Units	6-Month Median	Daily Maximum	Instantaneous Maximum
Lead	µg/L	2	8	20
Mercury	µg/L	0.04	0.16	0.4
Nickel	µg/L	5	20	50
Selenium	µg/L	15	60	150
Silver	µg/L	0.7	2.8	7
Zinc	µg/L	20	80	200
Cyanide	µg/L	1	4	10
Total Chlorine Residual	µg/L	2	8	60
Ammonia	µg/L	600	2400	6000
Acute Toxicity	TUa	-------	0.3	-------
Chronic Toxicity	TUc	-------	1	-------
Non-chlorinated Phenolics	µg/L	30	120	300
Chlorinated Phenolics	µg/L	1	4	10
Endosulfan (total)	µg/L	0.009	0.018	0.027
Endrin	µg/L	0.002	0.004	0.006
HCH	µg/L	0.004	0.008	0.012
Radioactivity	µg/L	-------	-------	-------

Table F-11. Water Quality Objectives (Co)–Ocean Plan (Table 1) Objectives for Protection of Human Health – (Non-Carcinogens)

Pollutant	Units	30-day Average
Acrolein	µg/L	220
Antimony	µg/L	1200
Bis(2-Chloroethoxy)Methane	µg/L	4.4
Bis(2-Chloroisopropyl)Ether	µg/L	1200
Chlorobenzene	µg/L	570
Chromium (III)	µg/L	190,000
Di-n-Butyl Phthalate	µg/L	3500
Dichlorobenzenes	µg/L	5100
Diethyl Phthalate	µg/L	33000
Dimethyl Phthalate	µg/L	820,000
2-Methyl-4,6-Dinitrophenol	µg/L	220
2,4-Dinitrophenol	µg/L	4
Ethylbenzene	µg/L	4100
Fluoranthene	µg/L	15
Hexachlorocyclopentadiene	µg/L	58
Nitrobenzene	µg/L	4.9
Thallium	µg/L	2
Toluene	µg/L	85,000
Tributyltin	µg/L	0.0014
1,1,1-Trichloroethane	µg/L	540,000

Table F-12. Water Quality Objectives (Co)–Ocean Plan (Table 1) Objectives for Protection of Human Health – (Carcinogens)

Pollutant	Units	30-day Average
Acrylonitrile	µg/L	0.1
Aldrin	µg/L	0.000022
Benzene	µg/L	5.9
Benzidine	µg/L	0.000069
Beryllium	µg/L	0.033
Bis(2-Chloroethyl)Ether	µg/L	0.045
Bis(2-Ethylhexyl)Phthalate	µg/L	3.5
Carbon Tetrachloride	µg/L	0.9
Chlordane	µg/L	0.000023
Chlorodibromomethane	µg/L	8.6
Chloroform	µg/L	130
DDT (total)	µg/L	0.00017
1,4 Dichlorobenzene	µg/L	18
3,3'-Dichlorobenzidine	µg/L	0.0081
1,2-Dichloroethane	µg/L	28
1,1-Dichloroethylene	µg/L	0.9
Dichlorobromomethane	µg/L	6.2
Methylene Chloride	µg/L	450
1,3-Dichloropropylene	µg/L	8.9
Dieldrin	µg/L	0.00004
2,4-Dinitrotoluene	µg/L	2.6
1,2-Diphenylhydrazine	µg/L	0.16
Halomethanes	µg/L	130
Heptachlor	µg/L	0.00005
Heptachlor Epoxide	µg/L	0.00002
Hexachlorobenzene	µg/L	0.00021
Hexachlorobutadiene	µg/L	14
Hexachloroethane	µg/L	2.5
Isophorone	µg/L	730
N-Nitrosodimethylamine	µg/L	7.3
N-Nitrosodi-n-Propylamine	µg/L	0.38
N-Nitrosodiphenylamine	µg/L	2.5
PAHs (total)	µg/L	0.0088
PCBs	µg/L	0.000019
TCDD Equivalents	µg/L	0.0000000039
1,1,2,2-Tetrachloroethane	µg/L	2.3
Tetrachloroethylene	µg/L	2
Toxaphene	µg/L	0.00021
Trichloroethylene	µg/L	27
1,1,2-Trichloroethane	µg/L	9.4
2,4,6-Trichlorophenol	µg/L	0.29
Vinyl Chloride	µg/L	36

Effluent limits are calculated using the equation Ce = Co + Dm (Co – Cs) as outlined above. As an example, effluent limitations are calculated as follows for total residual chlorine, chronic toxicity, and acute toxicity.

<u>Total Residual Chlorine</u>

Ce = 2 + 145 (2 – 0) = 292 µg/L (6-Month Median)

Ce = 8 + 145 (8 – 0) = 1,168 µg/L (Daily Maximum)

Ce = 60 + 145 (60 – 0) = 8,760 (Instantaneous Maximum)

Chronic Toxicity

Ce = 1 + 145 (1 - 0) = 146 TUc (Daily Maximum)

Acute Toxicity

To determine an effluent limitation for acute toxicity, the Ocean Plan allows a mixing zone that is ten percent of the distance from the edge of the outfall structure to the edge of the chronic mixing zone (the zone of initial dilution); and therefore, the effluent limitation for acute toxicity is determined by the following equation:

Ce = Co + (0.1) Dm (Co)

Where Co equals 0.3 and Dm equals 145, the effluent limitation for acute toxicity is 4.7 TUa.

Mass Based Effluent Limitations

Implementing provisions at Section III. C of the Ocean Plan require that, in addition to concentration-based limits, effluent limitations for Table 1 pollutants be expressed in terms of mass. Therefore, the Order includes mass-based limits based on a flow rate of 29.6 MGD.

Significant Figures

For consistency purposes, all limits calculated are expressed with two significant digits.

Table F-13. Effluent Limitations for the Protection of Marine Aquatic Life

Pollutant	Unit	6-Month Median	Daily Maximum	Instantaneous Maximum
Cadmium	µg/L	150	580	1,500
	lb/day[1]	36	140	360
Chromium (Hexavalent) [2]	µg/L	290	1,200	2,900
	lb/day[1]	72	290	720
Lead	µg/L	290	1,200	2,900
	lb/day[1]	72	290	720
Selenium	µg/L	2,200	8,800	22,000
	lb/day[1]	540	2,200	5,400
Silver	µg/L	79	390	1,000
	lb/day[1]	20	95	250

Pollutant	Unit	6-Month Median	Daily Maximum	Instantaneous Maximum
Cyanide [3]	µg/L	150	580	1,500
	lb/day[1]	36	140	360
Total Residual Chlorine [4]	µg/L	290	1,200	8,800
	lb/day[1]	72	290	2,200
Acute Toxicity [5]	TUa	---	4.7	---
Chronic Toxicity [5]	TUc	---	150	---
Phenolic Compounds (non-chlorinated)	µg/L	4,400	18,000	44,000
	lb/day[1]	1,100	4,300	11,000
Endosulfan	µg/L	1.3	2.6	3.9
	lb/day[1]	0.32	0.65	0.97
Endrin	µg/L	0.29	0.58	0.88
	lb/day[1]	0.072	0.14	0.22
HCH	µg/L	0.58	1.2	1.8
	lb/day[1]	0.14	0.29	0.43
Radioactivity	--	Not to exceed limits specified in California Code of Regulations, Title 22, Division 4, Chapter 15, Article 5, Section 64443		

[1] Mass limitations are based on 29.6 MGD maximum effluent flow.
[2] The Discharger may at their option meet this objective as a total chromium objective.
[3] If a discharger can demonstrate to the satisfaction of the Regional Board (subject to EPA approval) that an analytical method is available to reliably distinguish between strongly and weakly complexed cyanide, effluent limitations for cyanide may be met by the combined measurement of free cyanide, simple alkali metal cyanides, and weakly complexed organometallic cyanide complexes. In order for the analytical method to be acceptable, the recovery of free cyanide from metal complexes must be comparable to that achieved by the approved method in 40 CFR PART 136, as revised May 14, 1999.
[4] Water quality objectives for total chlorine residual applying to intermittent discharges not exceeding two hours shall be determined using the following equation:
$\log_y=-0.43(\log_x)+1.8$ where: y = the water quality objective (in µg/L) to apply when chlorine is being discharged; and
x = the duration of uninterrupted chlorine discharge in minutes.
The applicable effluent limitation must then be determined using Equation No. 1 from the Ocean Plan.
[5] See Attachment A for applicable definitions.

Table F-14. Effluent Limitations for the Protection of Human Health (Non-Carcinogens)

Pollutant	Unit	30-day Average
Acrolein	µg/L	32,000
	lb/day[1]	7,900
Antimony	µg/L	180,000
	lb/day[1]	43,000
Bis(2-Chloroethoxy)Methane	µg/L	640
	lb/day[1]	160
Bis(2-Chloroisopropyl)Ether	µg/L	180,000
	lb/day[1]	43,000
Chlorobenzene	µg/L	83,000
	lb/day[1]	21,000
Di-n-Butyl Phthalate	µg/L	510,000
	lb/day[1]	130,000
Dichlorobenzenes	µg/L	740,000

Pollutant	Unit	30-day Average
	lb/day[1]	180,000
Diethyl Phthalate	µg/L	4,800,000
	lb/day[1]	1,200,000
Dimethyl Phthalate	µg/L	120,000,000
	lb/day[1]	30,000,000
2-Methyl-4,6-Dinitrophenol	µg/L	32,000
	lb/day[1]	7,900
2,4-Dinitrophenol	µg/L	580
	lb/day[1]	140
Ethylbenzene	µg/L	600,000
	lb/day[1]	150,000
Fluoranthene	µg/L	2,200
	lb/day[1]	540
Hexachlorocyclopentadiene	µg/L	8,500
	lb/day[1]	2,100
Nitrobenzene	µg/L	720
	lb/day[1]	180
Thallium	µg/L	290
	lb/day[1]	72
Toluene	µg/L	12,000,000
	lb/day[1]	3,100,000
Tributylin	µg/L	0.20
	lb/day[1]	0.050
1,1,1-Trichloroethane	µg/L	79,000,000
	lb/day[1]	19,000,000

[1] Mass limitations are based on 29.6 MGD maximum effluent flow.

Table F-15. Effluent Limitations for the Protection of Human Health (Carcinogens)

Pollutant	Unit	30-day Average
Acrylonitrile	µg/L	15
	lb/day[1]	3.6
Aldrin	µg/L	0.0032
	lb/day[1]	0.00079
Benzene	µg/L	860
	lb/day[1]	210
Benzidine	µg/L	0.010
	lb/day[1]	0.0025
Beryllium	µg/L	4.8
	lb/day[1]	1.2
Bis(2-Chloroethyl)Ether	µg/L	6.6
	lb/day[1]	1.6
Bis(2-Ethylhexyl)Phthalate	µg/L	510
	lb/day[1]	130
Carbon Tetrachloride	µg/L	130

Pollutant	Unit	30-day Average
	lb/day[1]	32
Chlordane	µg/L	0.0034
	lb/day[1]	0.00083
Chlorodibromomethane	µg/L	1,300
	lb/day[1]	310
Chloroform	µg/L	19,000
	lb/day[1]	4,700
1,4 Dichlorobenzene	µg/L	2,600
	lb/day[1]	650
3,3'-Dichlorobenzidine	µg/L	1.2
	lb/day[1]	0.29
1,2-Dichloroethane	µg/L	4,100
	lb/day[1]	1,000
1,1-Dichloroethylene	µg/L	130
	lb/day[1]	32
Dichlorobromomethane	µg/L	910
	lb/day[1]	220
Dichloromethane (Methylene Chloride)	µg/L	66,000
	lb/day[1]	16,000
1,3-Dichloropropene	µg/L	1,300
	lb/day[1]	320
Dieldrin	µg/L	0.0058
	lb/day[1]	0.0014
2,4-Dinitrotoluene	µg/L	380
	lb/day[1]	94
1,2-Diphenylhydrazine	µg/L	23
	lb/day[1]	5.8
Halomethanes	µg/L	19,000
	lb/day[1]	4,700
Heptachlor	µg/L	0.0073
	lb/day[1]	0.0018
Heptachlor Epoxide	µg/L	0.0029
	lb/day[1]	0.00072
Hexachlorobenzene	µg/L	0.031
	lb/day[1]	0.0076
Hexachlorobutadiene	µg/L	2,000
	lb/day[1]	500
Hexachloroethane	µg/L	370
	lb/day[1]	90
Isophorone	µg/L	110,000
	lb/day[1]	26,000
N-Nitrosodimethylamine	µg/L	1,100
	lb/day[1]	260
N-Nitrosodi-n-Propylamine	µg/L	55

Pollutant	Unit	30-day Average
	lb/day[1]	14
N-Nitrosodiphenylamine	µg/L	370
	lb/day[1]	90
PAHs (total)	µg/L	1.3
	lb/day[1]	0.32
PCBs	µg/L	0.0028
	lb/day[1]	0.00068
TCDD Equivalents	µg/L	5.7E-07
	lb/day[1]	1.4E-07
1,1,2,2-Tetrachloroethane	µg/L	340
	lb/day[1]	83
Tetrachloroethylene	µg/L	290
	lb/day[1]	72
Toxaphene	µg/L	0.031
	lb/day[1]	0.0076
Trichloroethylene	µg/L	3,900
	lb/day[1]	970
1,1,2-Trichloroethane	µg/L	1,400
	lb/day[1]	340
2,4,6-Trichlorophenol	µg/L	42
	lb/day[1]	10
Vinyl Chloride	µg/L	5,300
	lb/day[1]	1,300

[1] Mass limitations are based on 29.6 MGD maximum effluent flow.

5. Whole Effluent Toxicity (WET)

Whole effluent toxicity (WET) limitations protect receiving water quality from the aggregate toxic effect of a mixture of pollutants in the effluent. WET tests measure the degree of response of exposed aquatic test organisms to an effluent. The WET approach allows for protection of the narrative “no toxics in toxic amounts” criterion while implementing numeric criteria for toxicity. There are two types of WET tests - acute and chronic. An acute toxicity test is conducted over a short time period and measures mortality. A chronic toxicity test is conducted over a longer period of time and may measure mortality, reproduction, and growth.

The Central Coast Water Board has retained acute and chronic toxicity limitations from the previous permit. Further, the effluent limitations have been calculated based on a minimum probable initial dilution of 145 to 1.

The Discharger must also maintain a Toxicity Reduction Evaluation (TRE) Workplan, which describes steps that the Discharger intends to follow in the event that acute and/or chronic toxicity limitations are exceeded. When monitoring measures WET in the effluent above the limitations established by the Order, the Discharger must

resample, if the discharge is continuing, and retest. The Executive Officer will then determine whether to initiate enforcement action, whether to require the Discharger to implement a Toxicity Reduction Evaluation, or to implement other measures.

D. Final Effluent Limitations

Final, technology-based and water quality-based effluent limitations established by the Order are discussed in the preceding sections of the Fact Sheet.

1. Satisfaction of Anti-Backsliding Requirements

The Order retains effluent limitations established by the previous permit for BOD_5, $CBOD_5$, TSS, oil and grease, settleable solids, turbidity, pH, total coliform, fecal coliform, enterococcus bacteria, total residual chlorine, acute toxicity and chronic toxicity. All WQBELs for Ocean Plan Table 1 pollutants were retained except for those for arsenic, copper, mercury, nickel, zinc, ammonia, chromium (III), and DDT based on results of the RPA as outlined in section IV.C.3 of this Fact Sheet.

The Ocean Plan was amended in 2005 to include a procedure for determining "reasonable potential" by characterization of effluent monitoring data. A RPA, using the updated Ocean Plan procedure, resulted in "no reasonable potential" (endpoint 2) for arsenic, copper, mercury, nickel, zinc, ammonia, chromium (III), and DDT.

Elimination of WQBELs for Table 1 pollutants is consistent with the exception to the CWA's anti-backsliding requirements expressed at section 402(o)(2)(B)(i) of the Act, which allows a reissued permit to include less stringent limitations when "information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods), and which would have justified the application of a less stringent effluent limitation at the time of permit issuance." In these circumstances, less stringent limitations (the elimination of limitations per the RPA) are based on new data, which were generated during the term of the previous permit, and which demonstrate no reasonable potential for discharges from the Facility to cause or contribute to exceedances of applicable water quality standards for arsenic, copper, mercury, nickel, zinc, ammonia, chromium (III), and DDT.

Consequently, the Order does not contain effluent limitations or prohibitions that are less stringent than the previous permit and is consistent with the anti-backsliding requirements.

2. Satisfaction of Antidegradation Policy

The Order does not authorize increases in discharge rates or pollutant loadings, and its limitations and conditions otherwise assure maintenance of the existing quality of receiving waters. Therefore, provisions of the Order are consistent with applicable anti-degradation policy expressed by NPDES regulations at 40 CFR 131.12 and by State Water Board Resolution No. 68-16.

3. Stringency of Requirements for Individual Pollutants

This Order contains both technology-based and water quality-based effluent limitations for individual pollutants. The technology-based effluent limitations consist of restrictions on $CBOD_5$; TSS; settleable solids; turbidity; oil and grease; and pH. Restrictions on these pollutants are discussed in section IV. B of the Fact Sheet. This Order's technology-based pollutant restrictions implement the minimum, applicable federal technology-based requirements. In addition, this Order contains effluent limitations more stringent than the minimum, federal technology-based requirements that are necessary to meet water quality standards. These limitations are not more stringent than required by the CWA.

Final technology and water quality-based effluent limitations are summarized in sections IV. B and C of this Fact Sheet.

E. Interim Effluent Limitations

The Order does not establish interim effluent limitations and schedules for compliance with final limitations. Interim limitations are authorized only in certain circumstances, when immediate compliance with newly established final water quality based limitations is not feasible.

F. Land Discharge Specifications – Not Applicable

G. Reclamation Specifications – Not Applicable

V. RATIONALE FOR RECEIVING WATER LIMITATIONS

A. Surface Water

Receiving water quality is a result of many factors, some unrelated to the discharge. This Order considers these factors and is designed to minimize the influence of the discharge on the receiving water. Receiving water limitations within the proposed Order include the receiving water limitations of the previous Order.

B. Groundwater

Groundwater limitations established by the Order include general objectives for ground water established by the Basin Plan for the Central Coast Region.

VI. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

NPDES regulations at 40 C.F.R. § 122.48 require that all NPDES permits specify requirements for recording and reporting monitoring results. Water Code sections 13267 and 13383 also authorize the Central Coast Water Board to require technical and monitoring reports. Rationale for the monitoring and reporting requirements contained in the Monitoring and Reporting Program (MRP), which is presented as Attachment E of this Order, is presented below.

A. Influent Monitoring

In addition to influent flow monitoring, influent monitoring for BOD_5 and TSS is required to determine compliance with the Order's 85 percent removal requirement for those pollutants.

B. Effluent Monitoring

Effluent monitoring requirements of the previous permit for Discharge Point 001 (the Ocean outfall) are retained in this Order.

Current Monitoring Protocol. The Discharger's outfall and brine discharge facilities currently do not allow for aggregate flow metering or sampling of as-discharged combined secondary effluent and brine wastes at high secondary effluent flows (during wet season when recycling is not being implemented) above what is required for blending to safely meet the prescribed effluent limitations. Brine wastes are stored in a holding pond and are discharged from the holding pond through a structure that allows for mixing brine wastes with secondary effluent. During the dry season, when the Discharger is recycling essentially 100% of the wastewater flow less what is needed for blending with brine wastes, the Facility is capable of aggregate flow metering and sampling downstream of a static mixer prior to entering the outfall. During the dry season, brine waste discharge flows (with minimum required secondary effluent blending) and high volume secondary effluent flows are currently metered separately and are sampled separately via grab samples that are manually composited based on the as-discharged flow proportions entering the outfall. Effluent monitoring per the Discharger's current facility configuration and effluent monitoring protocol is acceptable until the brine waste disposal facility is upgraded to handle anticipated increases in brine flows and facilitate year-round blended secondary effluent and brine waste flow metering and sampling (see Special Provision c. within section V.C.2 of the Order).

Wastewater monitored at Monitoring Location EFF-001 is a combination of brine wastes and secondary effluent. Effluent monitoring data that are reported for compliance purposes represent flow-weighted concentrations based on each flow stream contribution, which ensures a representative sample of effluent discharged from the Regional Treatment Plant.

C. Whole Effluent Toxicity Testing Requirements

Whole effluent toxicity (WET) limitations protect receiving water quality from the aggregate toxic effect of a mixture of pollutants in the effluent. Acute toxicity testing measures mortality in 100 percent effluent over a short test period and chronic toxicity testing is conducted over a longer period of time and may measure mortality, reproduction, and/or growth. This Order retains acute and chronic WET limitations and monitoring requirements from the previous permit for Discharge Point 001.

D. Receiving Water Monitoring

1. Surface Water Monitoring

The Order retains the surface water receiving water monitoring from the previous permit.

2. Groundwater

Groundwater monitoring requirements are not established by the Order.

E. Other Monitoring Requirements

1. Biosolids/Sludge Monitoring.

Biosolids monitoring requirements are retained from the previous Order.

2. Pretreatment Monitoring.

This Order retains the requirements of the previous permit to conduct pretreatment monitoring and reporting.

3. Outfall Inspection.

This Order retains the requirement of the previous permit to conduct annual, visual inspections (including dye tracer tests) of the outfall structure and report to the Central Coast Water Board regarding its physical integrity.

4. MBNMS Spill Reporting.

This Order retains the requirement of the previous permit to report all sewage spills under its control that are likely to enter ocean waters, directly to the MBNMS office.

VII. RATIONALE FOR PROVISIONS

A. Standard Provisions

Standard Provisions, which apply to all NPDES permits in accordance with 40 C.F.R. § 122.41, and additional conditions applicable to specified categories of permits in accordance with 40 C.F.R. § 122.42, are provided in Attachment D to the Order.

NPDES regulations at 40 C.F.R. § 122.41 (a) (1) and (b - n) establish conditions that apply to all state-issued NPDES permits. These conditions must be incorporated into the permits either expressly or by reference. If incorporated by reference, a specific citation to the regulations must be included in the Order. 40 C.F.R. § 123.25 (a) (12) allows the State to omit or modify conditions to impose more stringent requirements. In accordance with 40 C.F.R. § 123.25, this Order omits federal conditions that address enforcement authority specified in 40 C.F.R. § 122.41 (j) (5) and (k) (2), because the enforcement authority under

the Water Code is more stringent. In lieu of these conditions, this Order incorporates by reference Water Code section 13387 (e).

B. Special Provisions

1. Reopener Provisions

The Order may be modified in accordance with the requirements set forth at 40 C.F.R. parts 122 and 124, to include appropriate conditions or limits based on newly available information, or to implement any, new State water quality objectives that are approved by the U.S. EPA. As effluent is further characterized through additional monitoring, and if a need for additional effluent limitations becomes apparent after additional effluent characterization, the Order will be reopened to incorporate such limitations.

2. Special Studies and Additional Monitoring Requirements

a. Toxicity Reduction Requirements

The requirement to maintain a Toxicity Reduction Work Plan is retained from Order No. R3-2008-0008. When toxicity monitoring measures acute or chronic toxicity in the effluent above the limitation established by the Order, the Discharger is required to resample and retest, if the discharge is continuing. When all monitoring results are available, the Executive Officer can determine whether to initiate enforcement action, whether to require the Discharger to implement toxicity reduction evaluation (TRE) requirements, or whether other measures are warranted.

3. Best Management Practices and Pollution Prevention

a. Pollutant Minimization Program

The 2012 California Ocean Plan establishes guidelines for the Pollutant Minimization Program (PMP). At the time of the proposed adoption of this Order no known evidence was available that would require the Discharger to immediately develop and conduct a PMP. The Central Coast Water Board will notify the Discharger in writing if such a program becomes necessary.

4. Construction, Operation, and Maintenance Specifications – Not Applicable

5. Special Provisions for Municipal Facilities (POTWs Only)

a. Biosolids Management

Provisions regarding sludge handling and disposal ensure that such activity will comply with all applicable regulations.

40 C.F.R. part 503 sets forth U.S. EPA's final rule for the use and disposal of biosolids, or sewage sludge, and governs the final use or disposal of biosolids. The intent of this federal program is to ensure that sewage sludge is used or disposed of in a way that protects both human health and the environment.

U.S. EPA's regulations require that producers of sewage sludge meet certain reporting, handling, and disposal requirements. As the U.S. EPA has not delegated the authority to implement the sludge program to the State of California, the enforcement of sludge requirements that apply to the Discharger remains under U.S. EPA's jurisdiction at this time. U.S. EPA, not the Central Coast Water Board, will oversee compliance with 40 C.F.R. part 503.

40 C.F.R. § 503.4 (Relationship to other regulations) states that the disposal of sewage sludge in a municipal solid waste landfill unit, as defined in 40 C.F.R. § 258.2, that complies with the requirements in 40 C.F.R. part 258 constitutes compliance with section 405 (d) of the CWA. Any person who prepares sewage sludge that is disposed in a municipal solid waste landfill unit must ensure that the sewage sludge meets the applicable requirements of 40 C.F.R. part 503.

6. Other Special Provisions

a. Discharges of Storm Water

The Order does not address discharges of storm water from the treatment and disposal site, except to require coverage by and compliance with applicable provisions of General Permit No. CAS000001 - *Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities*.

b. Sanitary Sewer System Requirements

The Order requires coverage by and compliance with applicable provisions of General Waste Discharge Requirements for Sanitary Sewer Systems (State Water Board Order No. 2006-0003-DWQ). This General Permit, adopted on May 2, 2006, is applicable to all "federal and state agencies, municipalities, counties, districts, and other public entities that own or operate sanitary sewer systems greater than one mile in length that collect and/or convey untreated or partially treated wastewater to a publicly owned treatment facility in the State of California." The purpose of the General Permit is to promote the proper and efficient management, operation, and maintenance of sanitary sewer systems and to minimize the occurrences and impacts of sanitary sewer overflows.

7. Compliance Schedules

The Order does not establish interim effluent limitations and schedules of compliance with final limitations.

VIII. PUBLIC PARTICIPATION

The Central Coast Water Board considered the issuance of waste discharge requirements (WDRs) that serve as a National Pollutant Discharge Elimination System (NPDES) permit for the Monterey Regional Water Pollution Control Agency Regional Treatment Plant. As a step in the WDR adoption process, the Central Coast Water Board staff developed tentative WDRs. The Central Coast Water Board encouraged public participation in the WDR adoption process.

A. Notification of Interested Parties

The Central Coast Water Board notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the discharge and provided them with an opportunity to submit their written comments and recommendations. Notification was provided through **posting in the Salinas Californian on February 26, 2014**.

B. Written Comments

Staff received three written comments from the Monterey Bay National Marine Sanctuary on February 27, 2014. Those comments are summarized, along with staff's response to the comments, as follows:

1. The MBNMS requested that MRWPCA send annual reports and the brine waste disposal study to the MBNMS office.

Staff Response: Requirements for MRWPCA to send annual reports and the brine waste disposal study to the MBNMS office are included on pages D-14 and 14, respectively.

2. The MBNMS requested improvements to the map on page B-1.

Staff Response: Improvements were made to the map on page B-1.

3. The MBNMS requested that MRWPCA immediately notify the MBNMS office in the event spills enter ocean waters.

Staff Response: A requirement for MRWPCA to notify the MBNMS office in the event spills enter ocean waters is included on page E-18.

Staff received written comments from the Monterey Regional Water Pollution Control Agency, via correspondence dated March 21, 2014. Those comments are summarized, along with staff's response to the comments, as follows:

1. Page 1, Table 1. Discharger Information: include mailing address: 5 Harris Court, Building D, Monterey, CA 93940.

Staff Response: Edits were not made to the Order. This information is contained in the fact sheet, Table F-1.

2. Page 1, Table 2. Include a footnote that the termination of the MRWPCA Outfall is outside the National Marine Sanctuary Zone of Prohibition.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

3. Page 3, MRWPCA recommends including a Facility Information Section within the Order and the addition of the previous Table 4. See Below:

I. FACILITY INFORMATION

The following Discharger is subject to waste discharge requirements as set forth in this Order.

Table 4. Facility Information

Discharger	*Monterey Regional Water Pollution Control Agency*
Name of Facility	*Regional Treatment Plant*
Facility Address	*14811 Del Monte Blvd*
	Marina, CA 93933
	Monterey County
Facility Contact, Title, and Phone	*James Dix, Operations Manager, (831) 883-6183*
Environmental Contact	*Garrett Haertel, Compliance Engineer, (831) 883-6176*
Mailing Address	*MRWPCA, 5 Harris Court, Bldg D, Monterey, CA 93940*
Type of Facility	*POTW*
Facility Design Flows	
Average dry weather flow [1]	*29.6 million gallons per day (MGD)*
Peak wet weather flow [1]	*75.6 MGD*
Ultimate wet weather flow [2]	*81.2 MGD*

[1] *Treatment system*
[2] *Ocean outfall*

Staff Response: Edits were not made to the Order. This information is contained in the fact sheet, Table F-1.

4. *Page 3. MRWPCA also recommends reestablishing the "Background" and "Facility Description" Sections under the Findings Heading. From the previous permit:*

A. Background. *The Monterey Regional Water Pollution Control Agency (MRWPCA) is currently discharging pursuant to Order No. R3-2008-0008 and National Pollutant Discharge Elimination System (NPDES) Permit No.CA0048551. The Discharger submitted a Report of Waste Discharge, dated November 21, 2012, and applied for an NPDES permit renewal to discharge up to 29.6 MGD average dry weather flow of treated wastewater from the MRWPCA's Regional Treatment Plant. The application was deemed complete on March 15, 2013.*

For the purposes of this Order, references to the "discharger" or "permittee" in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

B. Facility Description. *The MRWPCA, which currently serves a population of approximately 252,000, was created in 1972. MRWPCA consists of and provides regional wastewater treatment, disposal and reclamation facilities for the cities of Monterey, Pacific Grove, Del Rey Oaks, Sand City, Marina, and Salinas, the Seaside Sanitation District, the Castroville, Moss Landing and Boronda Community Service Districts, and Fort Ord. Each member entity retains ownership and operating/maintenance responsibility for wastewater collection and transport systems up to the point of connection with interceptors owned and operated by the Discharger. Residential, commercial, and industrial wastewater is conveyed to the MRWPCA Regional Treatment Plant. The plant has an average dry weather design treatment capacity of 29.6 MGD and a peak wet weather design capacity of 75.6 MGD. The facility began operation in 1990, replacing six local wastewater treatment facilities.*

In winter months, secondary treated wastewater from the Regional Treatment Plant is discharged through a diffuser, positioned 11,260 feet offshore at a depth of approximately 100 feet, to Monterey Bay. The diffuser was designed to convey ultimate wet weather flows of 81.2 MGD. In summer months, treated wastewater is recycled for irrigation of 12,000 acres of farmland in the northern Salinas Valley. Tertiary treatment of recycled wastewater is provided for design flows of up to 29.6 MGD by the Salinas Valley Reclamation Project (SVRP), which holds tertiary treated wastewater in an 80 acre-foot storage pond before it is distributed to farmland by the Castroville Seawater Intrusion Project (CSIP). The irrigation use of recycled wastewater reduces regional dependence on and use of local groundwater, thereby minimizing saltwater intrusion.

Wastewater treatment at the Regional Treatment Plant includes aerated grit removal, primary clarifiers, trickling filters, solids contact, secondary clarifiers, and filtration. Undisinfected secondary clarifier effluent is discharged through Discharge Point 001. Sludge removed from primary and secondary treatment is thickened using dissolved air floatation and gravity thickeners. It is then pumped to anaerobic digesters where organic matter is consumed and the sludge volume is reduced. The sludge drying beds and belt filter press have been replaced with a Biosolids Dewatering Facility constructed in 2007, utilizing two very large screw presses. The current capacity of the Biosolids Facility is 19.8 dry tons per day (dtpd) at 25% solids content. A significant advantage of the new facility is that it produces biosolids cake 24 hours per day and seven days per week in any weather condition. The holding lagoons and some of the drying beds may still be utilized for emergency storage in case the screw presses require a shut down. The biosolids cake is currently being hauled to the adjacent landfill, where it is mixed with wood products and used for slope cover.

Because irrigation uses of recycled wastewater are sensitive to elevated levels of total dissolved solids (TDS), the MRWPCA has recently sought to keep such elevated TDS wastewaters segregated from the influent flow of the Regional Treatment Plant. Such wastewaters include softener regenerant wastes, groundwater nitrate removal brines and reverse osmosis brines, which are now trucked to the Regional Treatment Plant instead of being discharged to the collection system. The MRWPCA currently accepts 30,000 – 50,000 gallons per day of brine wastes by truck from business entities which

would otherwise be discharging to the sanitary sewer system. Brine wastes are currently held in a 375,000 gallon, lined holding pond at the Regional Treatment Plant and ultimately discharged directly or blended with secondary treated wastewater before being discharged through Discharge Point 001.

MRWPCA feels the inclusion of this language helps explain the complicated systems employed at our facility. Additionally, if this language and sections are added the lettering sequence will need to be updated.

Staff Response: Edits were not made to the Order. This information is contained in the Fact sheet, section II.A.

5. Page 4, II, Discharge Prohibition A. Modify as follows: "Discharge ~~of treated wastewater~~ to the Pacific Ocean " MRWPCA currently accepts and discharges wastes not classified as treated wastewater. These programs help improve water quality in the basin and all discharges to the Ocean are monitored.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

6. Page 9, Table 7, Footnote 1, Change the units for Ce from mg/L to µg/L.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

7. Page 10, III.C., Change the word reclaimed to recycled as this water quality level has been redefined per the permitted use under Order 94-82.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

8. Page 10, IV.A. Surface Water Limitations. We request that the first paragraph be revised as follows: *"The discharge shall not cause a violation of the following receiving water limitations, which are based on water quality objectives (Water-Contact Standards) contained in the Ocean Plan ~~and are a required part of this Order.~~ Compliance with these limitations shall be determined from samples collected at stations representative of the area within the waste field where initial dilution is completed except where other sampling stations are defined below:"* As an alternative, the language in Section C of the current permit would be acceptable, specifically the opening paragraph and the first sentence following the number 1.

Staff Response: Central Coast Water Board staff concurs with the comment and has made most of the editorial correction of language consistent with the requirements in the previous Order. Staff has not deleted the phrase "and are a required part of this Order." Receiving water limitations are required in this Order.

9. Page 13, V.C.2.a, Toxicity Reduction Requirements. One sentence in the last paragraph of this section (starting with "When monitoring measures toxicity in the

effluent ") is inconsistent with the Ocean Plan. That sentence states that upon an initial failed test and results of subsequent monitoring, "[t]he EO will *determine whether to initiate enforcement action*, whether to require the Discharger to implement a Toxicity Reduction Evaluation, *or to implement other measures*." However, the Ocean Plan requires the following toxicity implementation requirements to be incorporated into permits: "(1) a requirement to conduct a TRE if the discharge consistently exceeds its toxicity effluent limitation, and (2) a provision requiring a discharger to take all reasonable steps to reduce toxicity once the source of toxicity is identified." (See Ocean Plan Section III.C.10.b.) Taking enforcement action or requiring implementation of other measures based on the results of toxicity testing, prior to the conduct of a TRE, is inconsistent with the Ocean Plan. It is also inconsistent with the standard toxicity language contained in the State Permit Template. We therefore request that the subject paragraph be modified as follows: *"When monitoring detects effluent toxicity greater than a limitation in this Order, the Discharger shall resample as soon as practicable if the discharge is continuing and retest for whole effluent toxicity. Results of an initial failed test and results of subsequent monitoring shall be reported to the Executive Officer (EO) as soon as possible following receipt of monitoring results. T~~he EO will determine whether to initiate enforcement action, whether to require the discharger to implement a Toxicity Reduction Evaluation, or to implement other measures~~. If subsequent monitoring indicates that the discharge consistently exceeds a toxicity effluent limit, t~~T~~he Discharger, upon notification of the EO, shall conduct a TRE considering guidance provided by the USEPA's Toxicity Reduction Evaluation Procedures, Phases 1, 2 and 3 (EPA document nos. EPA 600/3-88/034. 600/3-88/035, and 600/3-88/036, respectively). A TRE, if necessary, shall be conducted in accordance with the following schedule."*

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language which is consistent with the previous Order.

10. Page 14, V.C.2.b. Water-Contact Monitoring (Bacterial Characteristics). This section outlines a monitoring plan for bacteriological monitoring. The plan outlines repeat sampling requirements and frequency. MRWPCA has been granted an exception to normal Water-Contact Monitoring requirements (Samples are normally collected in the surf zone). MRWPCA is allowed to collect its Water-Contact Monitoring samples off-shore due to marine mammals using the beach as a resting area producing high bacterial counts. This off-shore exception requires boat rental, and significant time and resources that other dischargers do not incur. The samples results are also not available within 24 hours of sample collection, which means that based on the "continued daily" requirement, repeat samples should be collected even if the previous sample result is less than the single sample maximum but data is not yet available. MRWPCA recommends the following changes: *"In accordance with Ocean Plan section III.D.1.b., if a single sample exceeds any of the bacteriological single sample maximum (SSM) standards contained within section V.A.1 of this Order, repeat sampling at that location shall be conducted to determine the extent and persistence of the exceedance. The EO should be notified within 24 hours of receiving analytical results and ~~R~~repeat sampling shall be conducted within 24 hours of receiving*

analytical results and continued ~~daily~~ based on a recommended frequency of the EO until the sample result is less than the SSM standard or until a sanitary survey is conducted to determine the source of the high bacterial densities."

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language consistent with the requirements in the previous Order.

11. Page D-11, VIII.B.13., On the second to last line, change the word reclaimed to recycled as this water quality level has been redefined per the permitted use under Order No. 94-82.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

12. Page D-12, VIII.C.2., This section outlines laboratory requirements for usage in compliance monitoring. MRWPCA as required by the current and proposed Orders subscribes to the regional monitoring program identified as CCLEAN. This program uses cutting edge technology and laboratory techniques to answer important and complicated questions related to receiving water monitoring. Limiting the laboratories that can be used for this program is counterintuitive. Therefore, MRWPCA recommends the following changes: "*Water quality analyses performed in order to monitor compliance with this permit shall be by a laboratory certified by the State Department of Health Services for the constituent(s) being analyzed. Bioassay(s) performed in order to monitor compliance with this permit shall be in accord with guidelines approved by the State Water Resources Control Board and the State Department of Fish and Game. If the laboratory used or proposed for use by the discharger is not certified by the California Department of Health Services or, where appropriate, the Department of Fish and Game due to restrictions in the State's laboratory certification program, the discharger shall be considered in compliance with this provision provided:*

    a. *Data results remain consistent with results of samples analyzed by the Central Coast Water Board;*

    b. *A quality assurance program is used at the laboratory, including a manual containing steps followed in this program that is available for inspections by the staff of the Central Coast Water Board; and,*

    c. *Certification is pursued in good faith and obtained as soon as possible after the program is reinstated."*

This proposed language is directly from the current Order R3-2008-0008.

Staff Response: Edits were not made to the Order. The requirements contained in this Order for the regional monitoring program identified as CCLEAN are consistent with those required of other facilities participating in the CCLEAN program and is a Central Coast Water Board Standard Provision.

13. Page D-15, VIII.G.2., This section lists phenolic compounds as a comparative result based on a "grab sample." There are phenolic compounds in the remaining priority pollutants list (Table E-5) which would be tested with a high volume water sample per Table E-4. This issue requires clarification from RWQCB staff.

Staff Response: Edits were not made to the Order. The requirements contained in this Order for the regional monitoring program identified as CCLEAN are consistent with those required of other facilities participating in the CCLEAN program.

14. Page D-15, VIII.G.4.a., Attachment D has had the titles "Federal" removed in previous sections, therefore we recommend that "Federal" be deleted from this location as well for continuity.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

15. Page D-18, VIII.G.23., Attachment D has had the titles "Federal" removed in previous sections, therefore we recommend that "Federal" be deleted from this location as well for continuity.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

16. Page E-3, Table E-1, The MRWPCA has over time proven that whole effluent disinfection is not necessary and no longer has the physical capacity to chlorinate and dechlorinate. We recommend that monitoring location EFF-001 be described as: "*Location where representative sample of effluent, which includes any component of brine waste, discharged through the ocean outfall can be collected, after treatment ~~and chlorination/dechlorination~~ and before contact with receiving water.*"

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

17. Page E-7, V.A., The approved laboratory that MRWPCA currently employs has proven that our effluent can comply with the acute toxicity objectives at full strength therefore making the serial dilutions irrelevant. We recommend adding the following sentence at the end of the first paragraph: "*If the acute toxicity objective can be met with full strength samples, the need for serial dilutions becomes unnecessary.*"

Staff Response: Edits were not made to the Order. The toxicity requirements contained in this Order are consistent with those required of similar facilities and consistent with U.S. EPA guidance on toxicity testing.

18. Page E-8, V.A/B., Chronic Toxicity should be under heading "B."

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

19. Page E-9, V.B., The last paragraph above Table E-7 identifies the speciation tests for chronic toxicity. We recommend that RWQCB staff clarify whether these tests need to be completed at least once every permit cycle or if past results can continue to be used.

Staff Response: Edits were not made to the Order. The toxicity requirements contained in this Order are consistent with those required of similar facilities and consistent with U.S. EPA guidance on toxicity testing.

20. Page E-10, V.B., The last paragraph states: "*If chronic toxicity is measured above 115 TUc, the Discharger shall re-sample and submit the results to the Central Coast Water Board as described in section V.C.2.a of this Order.*" Section V.C.2.a. is related to Toxicity Reduction Requirements which was defined in the previous Order. The 115 TUc numerical limit however is not based on Table 5 of the Order within section III.A.1.b. as was specified in the Order R3-2008-0008. We request that RWQCB staff identify where and how the 115 TUc numerical limit was generated.

Staff Response: Central Coast Water Board staff concurs with the comment. The value in the draft Order was incorrect and the correct value of 115 TUc has been inserted.

21. Page E-11, VII., Change the word reclaimed to recycled as this water quality level has been redefined per the permitted use under Order No. 94-82.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

22. Page E-13, IX.A.2., On the fourth line add: "*Central Coast Water Board* "

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

23. Page E-17, IX.B.3.e.2., Change the word filed to field.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

24. Page E-19, Table 10, Line 3 related to Semi-Annual Monitoring please change these dates from May 1st and November 1st to February 1st and August 1st to coincide with our current monitoring schedule.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

25. Page E-19, Table 10, Line 4 change the SMR due date to the following: "*Semi-Annual report submittal following the period of monitoring (following sampling as described in footnote 14 table E-4)*".

Staff Response: Edits were not made to the Order. The dates specified in Table 10 align with the Annual Report submittal dates. There are specific dates for all other due date periods (monthly, quarterly, annually).

26. Page E-19, Table 10, Line 6 change the SMR due date to the following: "*February 1st following calendar year of ~~sampling~~ inspection*"

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

27. Page E-19, X.B.4.b., In the second paragraph fourth line inside the parentheses, should the "+" should be a "±"? If not, can the RWQCB staff explain this?

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

28. Page F-4, I.A. Paragraph 1, line 4, Rey in Del Rey Oaks is spelled with an "e" not an "a."

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

29. Page F-3, Table F-1. Facility Information; change the Facility Permitted Flow and Facility Design Flow to 29.6 MGD Average Dry Weather Flow. Please change the Receiving Waters to state: "*Pacific Ocean (Monterey Bay National Marine Sanctuary, outside the Zone of Prohibition)*".

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

30. Page F-4, II.A. Paragraph 1, second to last line, " , 29.6 MGD average dry weather flow and currently treats approximately ~~21~~18 MGD."

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

31. Page F-4, II.A. Paragraph 2, line 5, " ~~reclaimed~~recycled ."

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

32. Page F-5, II.A. Paragraph 4, lines 3, 5, 8, 9, and 10, " ~~reclaimed~~recycled ."

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

33. Page F-5, II.B. Paragraph 1, At the end of this paragraph include the following sentence: "*The MRWPCA outfall/diffuser system is located outside the Monterey Bay National Marine Sanctuary Zone of Prohibition.*"

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

34. Page F-11, II.B/E. Planned Changes should be under the heading "E" not "B".

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

35. Page F-11, II.E., Brine Disposal, Paragraph 1, lines 4 and 9, " ~~reclaimed~~ recycled ."

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

36. Page F-11, II.E., Brine Disposal, Paragraph 1, line 5 MRWPCA should include a "M".

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

37. Page F-11, II.E., Brine Disposal, Paragraph 2, line 2, " ~~reclamation~~ recycling ."

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

38. Page F-11, II.E., Brine Disposal, Paragraph 2, line 3, " ~~reclaimed~~ recycled ."

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

39. Page F-24, Table F-8 Title needs to be relocated to represent Table F-8.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

40. Page F-25, The Definition for Dm within the calculation states that Dm = 114 but the initial dilution for MRWPCA is 145 as stated just below the Dm definition on Page F-25. RWQCB staff needs to clarify and/or correct this difference.

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

41. Page F-38, VIII.A. " through the following *posting in the Salinas Californian on February 26th, 2014.*"

Staff Response: Central Coast Water Board staff concurs with the comment and has made the editorial correction of language.

C. Public Hearing

The Central Coast Water Board held a public hearing on the tentative WDRs during its regular Board meeting on the following date and time and at the following location:

Date: **May 22, 2014**
Time: **8:30 a.m.**
Location: **Central Coast Water Board**
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

Interested persons were invited to attend. At the public hearing, the Central Coast Water Board voted to keep this permit on the consent calendar, and there was no objection by the discharger or the public.

Please be aware that dates and venues may change. Our Web address is http://www.waterboards.ca.gov/centralcoast/ where you can access the current agenda for changes in dates and locations.

D. Waste Discharge Requirements Petitions

Any aggrieved person may petition the State Water Resources Control Board to review the decision of the Central Coast Water Board regarding the final WDRs. The petition must be submitted within 30 days of the Central Coast Water Board's action to the following address:

State Water Resources Control Board
Office of Chief Counsel
P.O. Box 100, 1001 I Street
Sacramento, CA 95812-0100

E. Information and Copying

The Report of Waste Discharge (RWD), related documents, tentative effluent limitations and special provisions, comments received, and other information are on file and may be inspected at the address above at any time between 8:00 a.m. and 5:00 p.m., Monday through Friday. Copying of documents may be arranged through the Central Coast Water Board by calling (805) 549-3147.

F. Register of Interested Persons

Any person interested in being placed on the mailing list for information regarding the WDRs and NPDES permit should contact the Central Coast Water Board, reference this facility, and provide a name, address, and phone number.

G. Additional Information

Requests for additional information or questions regarding this Order should be directed to Peter von Langen at (805) 549-3688 or pvonlangen@waterboards.ca.gov or Sheila Soderberg at (805) 542-3592 or Sheila.Soderberg@waterboards.ca.gov.

APPENDIX G

Groundwater Sampling Procedures and Protocols

GROUNDWATER SAMPLING PROCEDURES AND PROTOCOLS[†]

Standard California procedures should be followed when collecting groundwater samples from monitoring wells. These include purging the well for at least three well volumes until pH, conductivity, and temperature are stabilized within 10 percent.

Groundwater samples should be collected at each site in the order of importance as indicated in **Table 2** below.

Table 1: Groundwater Sample Collection Order

Collection Order	Analysis	Required Laboratory	Shipment in Cooler Required/Recommended
1st	Organics including VOCs, SVOCs, and PPCPs	ELAP	Yes (cooler with bagged or blue ice)
2nd	Inorganics (general and trace minerals/ions)	ELAP	Yes (cooler with bagged or blue ice)
3rd	Major water quality cations and anions	ELAP	Yes (cooler with bagged or blue ice)
5th	Stable isotopes: $\delta^{18}O$ and δD in water $\delta^{15}N$ and $\delta^{18}O$ in water	Isotope	Yes (cooler with bagged or blue ice)
4th	Metals	ELAP	Yes (cooler with bagged or blue ice)
5th	Cyanide	ELAP	Yes (cooler with bagged or blue ice)
6th	Tritium alone	Isotope	Yes (at least 1 plastic bottle; plastic cooler required; bagged ice not necessary with shipment)
7th	Radionuclides	ELAP	Yes (cooler with bagged or blue ice)

Note: ELAP = California Environmental Laboratory Accreditation Program
Reference: Cal/EPA-DTSC (2008)

All groundwater sample collection should be under the direct supervision of a California Professional Geologist (PG), Certified Hydrogeologist (CHG), Certified Engineering Geologist (CEG) or Professional Engineer (PE) using appropriate U.S. EPA or Standard Method (SM) protocol including holding times and chain-of-custody forms. Also, we recommend collection of appropriate trip blanks and duplicate samples. Pre-cleaned sample containers should be obtained from the analytical laboratory with the appropriate preservative if required. All sample containers should be labeled with the following information:

[†] Protocol outline is a guideline only; the analytical laboratory should be contacted regarding specific protocols per their procedures and requirements.

(1) Unique sample identification (ID)

(2) Company (client) name

(3) Samplers name or initials

(4) Collection date and time

(5) Type of preservative used (if any)

Glass sample containers should be appropriately pack or packaged to assure that breakage will not occur during transport to the laboratory. Airlift shipping of collected groundwater samples is not recommended except for samples that have very short holding times (i.e., nitrate). Therefore, courier transport is recommended.

Sample Protocols for Pharmaceutical and Personal Care Products (PPCPs)

PPCP analyses are extremely sensitive with analytical results returned in in nanogram per liter or parts per trillion concentrations. Therefore, on the day of sampling, analytical laboratories that specialize in the analysis of PPCPs strongly recommend avoidance of the following products either by contact or consumption. If contact or consumption is unavoidable, then collection of field blanks is strongly recommended.

(1) **Wastewater compounds**, including:
- Soaps and detergents, including antibacterial cleansers
- Insect repellents, particularly those with DEET
- Fragrances (cologne, after shave, perfumes, deodorants
- Sunscreens
- Animal or human urine and/or excrement
- Caffeine (coffee, tea, and colas)
- Tobacco

(2) **Pharmaceutical compounds**
- Prescription drugs, medications, and hormonal substances
- Over-the counter medications
- Selected human and veterinary antibiotics

Table 2 summarizes protocols for sampling PPCPs in groundwater:

Table 2: Summary for Sampling for PPCPs in Groundwater

Sampling Parameters	Requirements
Volume	• Either 80 mL for a small test or 16.0 L total for a large test. See *container protocol* below.
Equipment	• Wear powderless nitrile laboratory gloves; change gloves with each change in activity, sample collection, or potential glove contamination. • Avoid breathing on open sample containers. • Avoid direct contact between clothing and sample containers, sampling devices, and processing equipment. Clothing may contain residual detergents, fragrances, and fire retardants. • If sampling from tap: make sure that the tap is free of aerators, strainers, or hose attachments. Flush for 3-5 minutes from a constantly flowing tap to obtain a representative sample. • If not sampling from tap: clean all sampling equipment before use using the following: - Non-antibacterial detergent - Rinse all equipment copiously with de-ionized water (DIW) after detergent wash - Follow DIW rinse with methanol rinse. Collect used methanol solution into an appropriate contained for disposal - DO NOT clean or field-rinse sample bottles supplied by the laboratory. • Sampling and processing equipment should be made from fluorocarbon polymers, glass, aluminum, or stainless steel. Avoid equipment made of Tygon, polyethylene, or other plastics.
Containers	• Use laboratory supplied, pre-cleaned containers only. Do not clean or field-rinse laboratory-supplied sample bottles. • For large volume tests use the following number of bottles: - two 1.0 L amber glass bottles for PPCP Hormones - two 1.0 L amber glass bottles for Negative PPCP - two 1.0 L amber glass bottles • Fill bottles to the neck, but do not overfill. • Tightly seal all caps • Samples to be cooled to <6 ^{o}C
Preservation	• Sodium azide (NaN_3) and ascorbic acid • Cool to <6 ^{o}C
Storage Life	• Unknown
Holding Time	• 28 days

Sampling Protocol for General Mineral Water Quality in Groundwater

General mineral water quality analyses are listed below with recommended U.S. EPA methodology. Samples will be collected in the appropriate U.S. EPA method approved containers, using preservation where required, and will meet holding times that are appropriate for the specific analyte. Samples will be labeled and accompanied by a completed chain-of-custody. An anion/cation (error balance) balance should be performed on the general mineral analysis and be within ±5% balance (Hounslow, 1995).

Table 3 summarizes required general mineral analysis for collected water samples.

Table 3: Required General Mineral Water Quality Analyses* in Groundwater

Analytes	Recommended U.S. EPA Method
Major Cations	
Calcium	200.7
Magnesium	200.7
Sodium	200.7
Potassium	200.7
Major Anions	
Bicarbonate (as HCO_3)	300
Chloride	300
Sulfate (as SO_4)	300
Minor Ions	
Iron	200.7
Manganese	200.7
Fluoride	200.7
Nitrate (as NO_3^-)	200.7
General Physical Properties and Miscellaneous Parameters	
Alkalinity (as $CaCO_3$)	310.1
Color	
Conductance (Electrical Conductivity)	120.1
Hardness (as $CaCO_3$)	200.7
Odor	
pH	9040/9045
Total Dissolved Solids (TDS)	160.1
Turbidity	

Sampling Protocol for Volatile Organic Compounds (VOCs) and Methyl-*Tertiary* Butyl Ether (MTBE) and Fuel Oxygenates and Other) in Groundwater

Collected groundwater samples shall be analyzed for five fuel oxygenates: MTBE, *tertiary* butyl alcohol (TBA), *tertiary*-amyl methyl ether (TAME), ethyl *tertiary*-butyl ether (ETBE) and di-isopropyl ether (DIPE). Samples shall be collected in the appropriate U.S. EPA method approved containers (i.e., use 40 mL VOA vials with no headspace, cool to 4° C, and preserve with HCl to pH <2). At least two VOA vials per sample should be collected. This protocol may also apply to other VOCs. Please contact the analytical laboratory before sampling.

Upon completion of sampling, record the required collection information on bottle label and complete chain-of-custody. VOA vials require packing in appropriate foam containers to prevent breakage.

Table 4 is a summary of organic compound analyses required for collected groundwater samples.

Table 4: Required U.S. EPA Method for MBE and Fuel Oxygenates in Groundwater Samples

Analytes	Recommended EPA Method
Volatile Organic Compounds (VOCs) Fuel Oxygenates (5): MTBE, TBA, TAME, ETBE, and DIPE	524.2

Sample Protocol for Delta Oxygen-18 ($\delta^{18}O$) and Delta Deuterium (δD) Stable Isotopes in Groundwater

Sampling for $\delta^{18}O$ and δD isotopes in water is relatively uncomplicated with water collected as a bulk sample in plastic bottles. To avoid and prevent the possibility of evaporation, which could enrich the residual water in the heavier isotopes (^{18}O and D), the following collection steps are recommended:

(1) Samples should be collected avoiding agitated or turbulent flow that could form bubbles leading to evaporation and isotope fractionation.

(2) Partially filled or leaky sealed/capped containers are not acceptable.

(3) Filled sample containers should be immediately capped: do not set aside without immediate sample capping (i.e., waiting to fill all sample bottles).

(4) Filled containers should be immediately labeled with required label information.

(5) Samples should be immediately placed in a cooler or ice chest. Cooling samples to < 6 or 4 ^{o}C is not required but recommended to prevent possible evaporation. However, sample cooling is strongly recommended if samples are collected during Summer and early Fall months.

Table 6 summarizes specific collection of groundwater samples for stable oxygen and deuterium isotope analyses.

Table 6: Summary for $\delta^{18}O$ and δD Stable IsotopesSampling in Groundwater

Sampling Parameters	Requirements
Volume	• Isotope analytical laboratories generally request 1.0 L. Check with the laboratory for more specific information.
Equipment	• Sanitized bailers and/or suction pumps may be used. Avoid excessive agitation to prevent evaporation which might cause isotope fractionation.
Container	• USGS recommends no field rinsing of bottles prior to sample collection. • Plastic screw cap bottle consisting or HDPE, LPE, or PP. • If samples are to be archived do not use PP; use at least 60 mL clean glass. • Caps must be tightly sealed to prevent evaporation. • Check with laboratory if they have a preference or wish to supply their own containers.
Preservation	• Tightly seal containers to prevent evaporation. Turn bottle upside down and squeeze. If water leaks out reseal bottle. • *Do not leave any headspace.* • Filtering not required. • *Do not add any chemical treatment or preservative.* • Cool storage recommended but not essential. Storage at ambient temperatures is acceptable until samples are shipped. *Do not freeze bottles if containers are completely filled.* If freezing is required for shipment, fill bottles only two-thirds full.
Storage Life	• Approximately 3 months.
Holding Time	• None

Notes:
HDPE = high density linear propylene
LPE = linear polyethylene
PP = polypropylene
References: Clark and Fritz (1997); Clark and Aravena (2005); USGS (2004 and 2005).

Suggested Sampling Protocol for Delta Nitrogen-15 ($\delta^{15}N$) and Delta Oxygen-18 ($\delta^{18}O$) Isotopes in Dissolved Nitrate (NO_3^-) In Water

Sample collection is somewhat more complicated than for $\delta^{18}O$ and δD in water. We suggest contacting the analytical laboratory for their specific protocol. Groundwater is generally collected as bulk samples, although in low nitrate waters, ion exchange resins may be required to concentrate nitrate. If possible, nitrate concentrations should be known prior to sample collection. If this cannot be done a sample split should be separately analyzed for nitrate (NO_3^-)

Table7: Summary for Sampling for $\delta^{15}N$ and $\delta^{18}O$ in Nitrate (NO_3^-)

Sampling Parameters	Requirements
Volume	• At least 4 mg nitrogen is required for $\delta^{15}N$ analysis. • If possible nitrate (NO_3^-) concentrations should have been previously determined and sent to the laboratory. • At least 20 to 25 mg NO_3^- should be present in sample. Therefore: □ if 20 to 25 mg/L NO_3^- present, collect at least 1.0 L of water □ if 10 to 12.5 mg/L NO_3^- present, collect at least 2.0 L of water □ if 1.0 to 1.25 mg/L NO_3^- present, collect at least 3.0 L water. □ For lower concentrations a resin cartridge may be required to concentrate NO_3^-; check with the laboratory.
Equipment	• No special equipment required. • Bailers and/or suction pumps may be used.
Container	• Plastic screw cap bottle consisting or HDPE, LPE, or PP. • Check with laboratory if they have a preference or wish to supply their own containers.
Preservation	• Preserve with 1mL/L of chloroform or acidify to pH 2.0 with HCL. **Do not use sodium-azide (NaN_3) or nitric (HNO_3) acid as preservatives.** • Sample bottles must be tightly sealed to prevent evaporation. • Immediately store out of sunlight, preferable in an ice chest or cooler. It is recommended that samples be kept in the dark and as cold as possible to prevent evaporation and to minimize biological/bacteriological activity, but do not freeze unless directed otherwise from the laboratory.
Storage Life	• Approximately 3 months.

Notes:
HDPE = high density linear propylene
LPE = linear polyethylene
PP = polypropylene
References: Clark and Fritz (1997); Clark and Aravena (2005).

Sampling Protocol for Tritium (T) Radiogenic Isotopes for Relative Age Dating in Groundwater

Sampling for tritium only in groundwater is relatively simple with collection in standard plastic bottles. One liter glass bottles may also be used (clear French-square type with Qorpak™ polyseal-lined caps that have been triple rinsed with water directly from the sampling port) but these are not recommended because they may break during shipment.

Sampling requirements for tritium are discussed below. It may be necessary to determine if tritium levels are likely to be by direct tritium analysis (±3 to ±8 tritium units or TU), enriched tritium analysis (±0.1 to ±0.8 TU)[‡], ultra low level (ULL) tritium analysis (±0.1 to ± 0.01 TU), or helium-3 ingrowth analysis (±0.1 to ±0.01 TU). However, direct tritium analysis is generally sufficient. Tritium analysis should not be performed in groundwater contains purgeable organic compounds (e.g., total petroleum hydrocarbons as gasoline or diesel) or volatile organic compounds (VOCs) such as trichlroethene (TCE).

Special Requirements for all Tritium Sampling

(1) For tritium analyses, groundwater samples should be collected from upgradient non-organic contaminated monitoring wells only. This is because high concentrations of organic compounds such as VOCs may cause damage to the tritium analytical equipment. Indicate on chain-of-custody if the collected groundwater samples are from the unconfined zone (and the estimated depth that the sample was drawn from), which would most likely reflect infiltrated precipitation with tritium levels that are between 1.5 TU (for the tropics) to about 10-20 TU (northern hemisphere with seasonal variations).

(2) All sampling and transfers shall be done outdoors with a required specific ban on samplers wearing glow in the dark-type wrist watches, compasses, or similar device with luminescent dials, "Indiglow™", or so called "beta" lights. It is further recommended that such devices not be worn for several days to at least a week prior to sampling because tritium from such devices is absorbed into the body. This tritium has a biological half life of approximately 10 days.

Do not perform indoor transfers because indoor atmospheres may contain water vapor (humidity) ranging to 10,000 TU derived from various luminescent signs and dials. Exposure of sampled water to such air may cause erroneous results.

(3) For indoor transfers (not recommended):

(a) Dry bottles should be first filled with argon gas.

(b) Water should never be exposed to indoor air. Pipe the water sample into the middle of, the argon-filled bottle just below the argon level. *Do not pour the argon out of the bottle by tilting the bottle.*

(c) Add nothing to the water bottle; *Do not freeze.*

(4) For outdoor transfers (recommended):

[‡] Accuracy and precision depends on the laboratory conducting tritium analysis.

(a) HDPE bottles should be filled from the sampling port just to the neck leaving a few cm^3 of air space. *Do not rinse or overflow*. Replace screw cap tightly; hold bottle upside down and squeeze hard. No leakage should occur.

(b) If glass bottles are used, fill from the sampling port to just below the threads.

(c) Add nothing else to the water bottle. *Do not freeze*.

(5) Upon completion of sampling, record information on bottle label and complete laboratory chain-of-custody form.

(6) Samples shall not be stored near any potential tritium sources (e.g., glowing clocks, watches, or signs).

(7) Ship samples to laboratory packed in an ice chest or cooler (most labs will not return these because of the cost of shipping).

Table 8 is a summary for collection of water samples for tritium isotope analysis.

Table 8: Summary for Tritium (T) Radiogenic Isotope Sampling in Groundwater

Sampling Parameters	Requirements
Volume	• 1.0 L is recommended; minimum requirements are listed below depending on tritium type (check with the lab before sampling): □ direct tritium: 25 to 50 mL □ enriched tritium: 250 to 500 mL □ ULL tritium: 500 mL to 1.0 L flushed with argon □ ^{3}He ingrowth: 50 mL, flushed with argon • Pace ZymaX Forensics requests at least one 1.0 L bottle.
Equipment	• Same as for δD and δ^{18}O in water. • Thief sampler or pump can be used; minimize contact with ambient air.
Container	• For direct, enriched, and ULL tritium, at least 1.0 liter HDPE bottles such as U.S. Department of Transportation Spec. DOT-2 or equivalent. • For ULL tritium samples, glass bottles must be perfectly dry and should have been flushed with high purity dry argon to remove absorbed moisture. • HDPE bottles should be clean and dry, preferably factory fresh with good caps, or 1.0 liter glass (e.g., Pyrex with orange PP plug seal cap). For ULL tritium, some labs may require 1.0 L glass. • For ^{3}He ingrowth, tight-sealing glass bottles are recommended.
Preservation	• No filtering or preservation required. Fill bottle with raw untreated water sample. • Sample containers should be filled to the top with no head space, tightly sealed and air tight to avoid evaporation. A slight headspace can be allowed for sample expansion during shipping. • Do not allow sample bottle to overflow when filling sample. • Avoid prolonged exposure to ambient air.
Hold Time	• None
Other	• Collect groundwater samples from wells uncontaminated by organic compounds such as purgeable organic compounds and VOCs

Notes:
ULL = Ultra Low Level
HDPE = high density linear propylene
LPE = linear polyethylene
PP = polypropylene
References: Clark and Fritz (1997); Moran, et al. (2002), Heemskerk (1998), University of Miami/RSMAS (2008a, 2008b, and 2008c); USGS (2004).

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APPENDIX H

MRWPCA Advanced Water Treatment Demonstration Facility Operational Water Quality Parameters and Checklists

DRAFT - MRWPCA Pure Water Monterey Demo Ops Water Quality Monitoring Schedule

Operator readings

Parameter	Method	Location of Sample	Sample Type	Frequency	Reason	Level of Concern
Conductivity	Handheld Meter (Myron L Comp. UltraMeter II)	RO Feed	Grab	Monthly	Meter Verification†	+/- 10% of analyzer value
		RO Permeate	Grab	Monthly	Meter Verification†	+/- 10% of analyzer value
		UV/AOP Effluent	Grab	Weekly	Verify calcite filter performance	Difference of 200 +/- 100
		Faucet	Grab	Weekly	Verify calcite filter performance	
Dissolved Ozone	Hach DR900	DO_3 #1 Sample Line	Grab	Daily*	Meter Verification†	+/- 10% of analyzer value
		Ozone Effluent	Grab	Daily*	Meter Verification†	>0.05 mg/L or +/-10% of analyzer value
H_2O_2	Hach DR900	UV Reactor Feed Water	Grab	Weekly	Verify peroxide dose	< 2 mg/L
Nitrite	Hach DR900	Secondary Effluent	24-h Comp.	Daily*	Understanding ozone demand	n/a
		Ozone Influent	Grab	Daily*	Understanding ozone demand	n/a
ORP	Handheld Meter (Myron L Comp. UltraMeter II)	UF Feed	Grab	Weekly	Meter Verification†	+/- 10% of analyzer value
pH	Handheld Meter (Myron L Comp. UltraMeter II)	UF Feed	Grab	Monthly	Meter Verification†	+/- 10% of analyzer value
		RO Feed	Grab	Daily*	Meter Verification†	+/- 10% of analyzer value
		UV/AOP Effluent	Grab	Weekly	Verify calcite filter performance	Differential of 1 +/- 0.5
		Faucet	Grab	Weekly	Verify calcite filter performance	
Temperature	Hand held thermometer	UF Feed	Grab	Monthly	Meter Verification†	+/- 10% of analyzer value
		RO Feed	Grab	Monthly	Meter Verification†	+/- 10% of analyzer value
		UV/AOP Effluent	Grab	Weekly	Verify calcite filter performance	Difference of 5 +/- 2
		Faucet	Grab	Weekly	Verify calcite filter performance	
Total Cl_2	Hach DR900	UF Feed	Grab	Daily*	Verify Chlorine Dose	Outside 3-5 mg/L
Turbidity	Hach 2100Q field meter	UF Feed	Grab	Monthly	Meter Verification†	+/- 10% of analyzer value
		UF Filtrate	Grab	Monthly	Meter Verification†	+/- 10% of analyzer value
UVT	Portable RealTech	UV/AOP Feed	Grab	Weekly	Meter Verification†	+/- 10% of analyzer value

*Daily is 5 days per week

†Record meter reading when sample is collected to compare to WQ result

Lab readings

Alkalinity	Titration (SM2320B)	UV/AOP Effluent	Grab	Weekly	Verify calcite filter performance	dAlk < 40 mg/L as $CaCO_3$
		Faucet	Grab	Weekly	Verify calcite filter performance	
Calcium	IC	UV/AOP Effluent	Grab	Weekly	Verify calcite filter performance	dCa < 40 mg/L as $CaCO_3$
		Faucet	Grab	Weekly	Verify calcite filter performance	
TDS	Filtration method (SM2540C)	UV/AOP Effluent	Grab	Weekly	Verify calcite filter performance	difference of 50 +/- 40
		Faucet	Grab	Weekly	Verify calcite filter performance	
TOC	TOC Analyzer (SM5310B)	Ozone Influent	Grab	3/week	Understanding TOC variability	n/a
		Faucet	Grab	3/week	Understanding future regulatory compliance	> 0.5 mg/L
Total coliform	Colilert QT (UF Filtrate) Colilert P/A (Faucet)	UF Filtrate	Grab	Weekly	Verify UF performance	Detactable
		Faucet	Grab	Weekly	Verify stabilization sterility	Detactable
Total Nitrogen	Nitrite (IC), Nitrate (IC) and TKN	Faucet	Grab	Weekly	Understanding future regulatory compliance	>10 mg/L

DRAFT - MRWPCA Pure Water Monterey Demo Ozone & Pre-treatment Ops Sheet

Date	Time	Ops	Applied ozone dose (mg/L)	Ozone transfer efficiency (%)	Transferred ozone dose (mg/L)	Ambient ozone (ppm)	Oxygen flowrate (scfh)	Generator power (%)	Applied ozone concentration (g/Nm^3)	Flowrate (gpm)	Venturi suction pressure (psi)	Degas ozone concentration (g/Nm^3)	DO3 #1 (mg/L)	DO3 #2 (mg/L)	ORP (mV)	Confirm water separator drainage flow	Sample conditioner coalescer water level	South & north LOX dewar level (in. H_2O)		Hypo tank level (% full)	Pressure reading upstream & downstream of strainers (psi)		Chloramine residual at UF influent (mg/L as Cl_2)
Level of concern	--	--	Atypical (Ex: < 5 or > ~20)	< 80%	Atypical (Ex: < 5 or > ~20)	> 0.10	±1 of setpoint	Atypical (Ex: 0%, < ~40% or 100%)	Atypical (Ex: < ~40)	< 30 if pump valve open	> 20	Atypical (Ex: > ~10)	±0.2 of setpoint	> 0.05 (if DO_3 #1 used for control)	> ~500 (if setpoint at 475)	No flow	Empty as needed	Replace when empty		Fill as needed	dP > ~5 psi		< 3
Example	*9:00*	*JDK*	*14.4*	*90.9%*	*12.7*	*0.03*	*60*	*49%*	*52.5*	*34.0*	*9*	*5.0*	*0.26*	*0.00*	*420*	✓	*10%*	*47.5*	*20*	*30%*	*32*	*32*	*4*

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UF System - Operations Log For Monterey, CA

UF System Unit Must be Running For Several Minuets Before Recording Readings

Operators Initials	Date	Time	UF Status at Time of Sample	Time Remaining at Time of Sample	UF Feed Pump Pressure (PI-1005)	UF Membrane Feed Pressure (PI-1016)	UF Filtrate Pressure (PI-1028)	UF Feed Temp (TIT-1004)	UF Filtrate Flow (FIT-1023)	UF Feed Turbidity (AE-1010)	UF Filtrate Turbidity (AE-1036)	TMP from Screen	Prefilter Delta P from Screen	Hours to Next Chlorine/Caustic Mini-CIP (if ON)	Hours to Next Acid Mini-CIP (if ON)	Hours to Next Chlorine/Caustic TMC (if ON)	Hours to Next Acid TMC (if ON)	Dsuring Backwash Filtrate Flow (FIT-1023)	During Backwash Air Scour Flow (FIT-1040)	pH Reading on Screen (AIT-1026)

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Reverse Osmosis - Log For Monterey, CA

Reverse Osmosis Unit Must be Running For Several Minuets Before Recording Readings

Operators Initials	Date	Time	Pre-filter Press. (PI-2012)	Post filter Press. (PI-2017)	Pump Inlet Pressure (PI-2032)	Pump Outlet Pressure (PI-2036)	RO Feed Pressure (PI-2039)	Interstage Pressure (PI-2042)	Conc. Pressure (PI-2045)	Final Pressure (PI-2052)	Permeate Pressure (PT-2065)	Inlet Hardness	Inlet Chlorine (free)	Inlet ORP (AE-2023)	Inlet Temperature (AE-2023)	Inlet pH (AE-2024)	Permeate Flow (FE-2061)	Concentrate Flow (FE-2054)	Inlet Cond. (AE-2027)	Permeate Cond. (AE-2068)	Pre-filter's Changed

DRAFT - MRWPCA Pure Water Monterey Demo UV/AOP Ops Sheet

Date	Time	Ops	Flowrate (gpm)	UVT (%)	NDMA log removal	1,4-dioxane log removal	Power (kW)	H_2O_2 pump rate on HMI (gph)	H_2O_2 dose (mg/L)	UV intensity (mW/cm^2)	BLP (%)	H_2O_2 tank level (pad)	H_2O_2 pump rate on pump (gph)	H_2O_2 in H_2O_2 skid sump	H_2O_2 line pressures (psi)	UVT analyzer humidity (%)	UVT analyzer temperature (°C)	H_2O_2 kit result after H_2O_2 dosing, A (mg/L)	RO permeate chloramine residual, B (mg/L as CL_2)	Calculated H_2O_2 residual = A - B*34/71 (mg/L)
Level of concern	--	--	> 18 < ~5	< 95%	< 1.2	< 0.5	Atypical	Atypical (Ex: < 0.0088)	Atypical (Ex: < 4)	Atypical	Atypical	Fill/replace as needed	If ≠ HMI	If H_2O_2 present	Atypical (Ex: > ~10)	> 25%	--	NA	NA	< 4
Example	*14:30*	*JDK*	*15.0*	*97.0%*	*1.58*	*0.57*	*0.94*	*0.011*	*5*	*25.18*	*92%*	*Full*	*0.0113*	*Empty*	*4, 4*	*13%*	*31*	*6.0*	*2.0*	*5.0*

DRAFT - MRWPCA Pure Water Monterey Demo Stabilization Ops Sheet

Date	Time	Ops	UV lamp on/off	Check flowrate	Calcite level	Chiller on/off	Pre-stabilized pH	Pre-stabilized temperature (°C)	Pre-stabilized conductivity (µS/cm)	Faucet pH	Faucet temperature (°C)	Faucet conductivity (µS/cm)
Level of concern	--	--	off	< 0.3 gpm per faucet (replace cartridge filter as needed)	TBD (fill as needed)	off	> 6.0 < 5.0	Atypical	> 60	< 6.0	> 24	< 50
Example	*15:30*	*JDK*	*on*	✓	*~90%*	*on*	*5.60*	*24.7*	*39.3*	*7.10*	*19.8*	*565*

Pure Water Monterey Pre-Tour Checklist (Day of Tour)

No.	Item	Date	10/13						
		Initials	JDK						
Ozone System									
1	DO_3 #1 Sensor ≥ 0.1 mg/L?		✓						
2	Effluent clear in color?		✓						
3	Ambient ozone concentration < 0.1 ppm?		✓						
UF System									
1	DIT LRV: ≥ 4 logs?		✓						
2	Filtrate turbidity < 0.2 NTU?		✓						
RO System									
1	Conductivity rejection ≥ 96.8%?		✓						
2	Permeate conductivity < 60 µS/cm?		✓						
3	Feed pH ≥ 5.8?		✓						
UV/AOP System									
1	NDMA log removal ≥ 1.20?		✓						
2	1,4-dioxane log removal ≥ 0.50?		✓						
3	UVT ≥ 95%?		✓						
Stabilization System									
1	UV power on?		✓						
2	Product water conductivity > 150 µS/cm?		✓						
3	Product water temperature < 22°C?		✓						
Water Quality Sampling									
1	Chloramine residual at UF influent ≥ 3 mg/L as Cl_2?		✓						
2	H_2O_2 residual at UV/AOP reactor influent ≥ 4 mg/L?		✓						

APPENDIX I

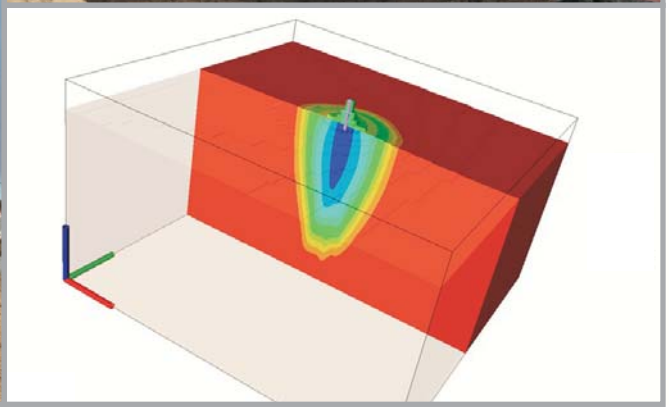
Pure Water Monterey Groundwater Replenishment Project: Draft Hydrogeologic Field Investigation: Monitoring Well Installation, Groundwater Quality Characterization, and Geochemical Assessment

DRAFT

Hydrogeologic Field Investigation: Monitoring Well Installation, Groundwater Quality Characterization, and Geochemical Assessment

February 2015

Monterey Peninsula Groundwater Replenishment (GWR) Project



DRAFT HYDROGEOLOGIC FIELD INVESTIGATION: MONITORING WELL INSTALLATION, GROUNDWATER QUALITY CHARACTERIZATION, AND GEOCHEMICAL ASSESSMENT

MONTEREY PENINSULA GROUNDWATER REPLENISHMENT (GWR) PROJECT

February 28, 2015

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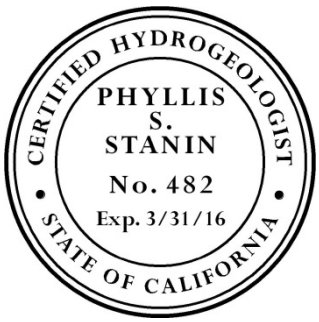
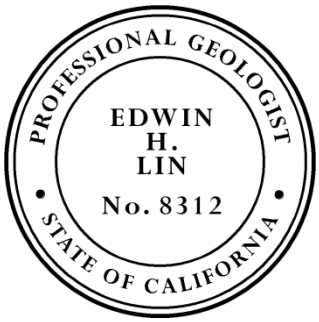
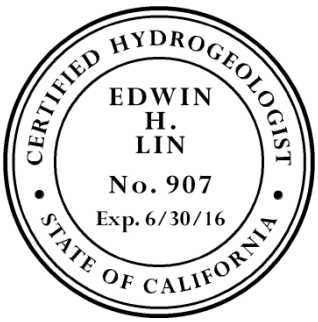


Phyllis S. Stanin, PG, CH, CEG

Vice President/Principal Geologist





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Senior Hydrogeologist

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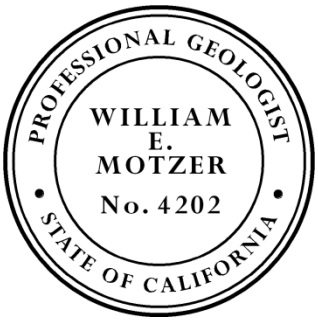

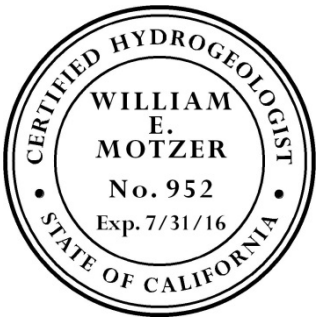

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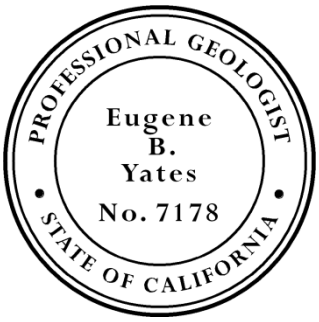

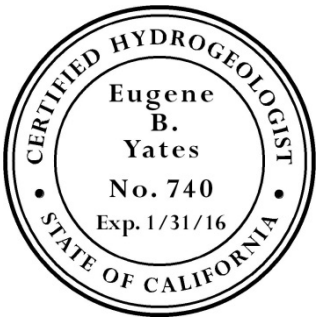

Eugene B. (Gus) Yates, PG, CH

Senior Hydrogeologist

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EXECUTIVE SUMMARY

Monterey Regional Water Pollution Control Agency (MRWPCA), in partnership with Monterey Peninsula Water Management District (MPWMD), is developing the proposed Groundwater Replenishment (GWR) project to provide an additional safe and reliable source of water supply for the Monterey Peninsula. Proposed recharge is designed to benefit the two primary water supply aquifers in the Seaside Basin - the Paso Robles Aquifer and the underlying Santa Margarita Aquifer – and will be accomplished by injecting recycled water through a combination of shallow vadose zone and deep injection wells.

To support ongoing GWR project planning, MRWPCA recently completed a hydrogeologic field investigation in the vicinity of the proposed GWR project recharge site. Key field activities included the drilling and construction of a dedicated GWR project monitoring well (MRWPCA MW-1) screened in the upper Paso Robles Aquifer using the sonic drilling method and collection of groundwater quality samples from MRWPCA MW-1 and five other local wells. Selected core samples were laboratory analyzed for hydraulic, mineralogical, and potential contaminant leaching properties. Groundwater quality samples were analyzed for a comprehensive suite of 300+ constituents/parameters to establish baseline conditions for compliance with future regulatory requirements. Collected data were used to refine the conceptual hydrogeologic model of the GWR project recharge site and evaluate potential groundwater quality impacts from proposed recharge operations through geochemical modeling. This report documents the field investigation activities, hydrogeologic information collected, and the geochemical modeling assessment.

The exploratory boring was drilled to a depth of 535 feet below ground surface (feet-bgs), and MRWPCA MW-1 was completed to a depth of 521 feet-bgs. A total of 75 feet of slotted well screen was installed from 421 to 446 feet-bgs and from 466 to 516 feet-bgs. The groundwater level in MRWPCA MW-1 was measured at 405 feet-bgs.

Subsurface conditions encountered during drilling indicated that the upper 392.5 feet is composed predominately of unconsolidated sand/silty sand with thin lenses of sandy silt. These units are representative of the Aromas Sand. While silt/clay deposits observed in the lower Aromas Sand at MRWPCA MW-1 may occur beneath the GWR project recharge site, such fine-grained deposits likely pinch out to the west (by General Jim Moore Boulevard) and north (by the Golf Course Reservoir Well). A clear lithologic transition was observed at 392.5 feet-bgs, and interpreted as the boundary between the Aromas Sand Formation and underlying Paso Robles Formation. Sediments below this transition are heterogeneous and characterized by relatively thick (10 to 20 feet) alternating fine-grained (silt/clay) and coarse-grained (sand) deposits. Sediments ranged from unconsolidated to semi-consolidated with marine (chert) and terrestrial rock fragments of possibly volcanic origin increasing with depth.

Selected core samples from 19 depth intervals were submitted to Cooper Testing Labs in Palo Alto, California for analysis of hydraulic properties, including (saturated) vertical hydraulic conductivity (Kv) and total and effective porosity. Analytical well hydraulic

equations and laboratory effective porosity and Kv estimates of selected core samples were used to evaluate the geometry of the wetted area and of recycled water recharged through proposed vadose zone wells. Results indicate that the thicknesses of sand deposits either above or below the encountered silt/clay deposits in the lower Aromas Sand are sufficient to accommodate projected injection rates, and that four (or possibly fewer) vadose zone wells can accommodate proposed vadose zone injection rates. Estimated travel time of recycled water through the coarse-grained sediments of the Aromas Sand is likely to be on the order of a few days. However, if vadose zone wells are positioned above fine-grained units in the Aromas Sand (encountered between 295 and 341 feet-bgs), the travel time for recycled water to travel through the Aromas Sand and reach the top of the Paso Robles Formation is estimated at approximately 5.9 years. An additional 3.4 years is required for recycled water to travel through the 12.5 feet of unsaturated Paso Robles Formation before reaching the current water table at 405 feet-bgs.

Water quality data from sampled monitoring and production wells indicate that local groundwater in the Paso Robles Aquifer meets drinking water standards. While some metals and radiogenic parameters were detected above regulatory limits in FO-7 Shallow, MRWPCA MW-1, and PRTIW, exceedances are clearly affected by sample turbidity. Consequently, concentrations of metals and radiogenic parameters in these wells reflect contributions from solid and dissolved phases. Of the State Water Resources Control Board Division of Drinking Water (SWRCB DDW) recycled water quality Contaminants of Emerging Concern (CoECs), NDMA was detected in groundwater collected from the PRTIW well, and caffeine and DEET were detected in MRWPCA MW-1. Although detectable, CoEC concentrations are very low - not exceeding 0.01 µg/L; this represents the first time that CoECs have been analyzed in the Seaside Basin.

Baseline groundwater quality data indicate that local groundwater in the Santa Margarita Aquifer meets drinking water standards with the exception of FO-7 Deep, for which total iron and manganese exceeded secondary MCLs. However, as mentioned above, the FO-7 Deep groundwater sample was most likely affected by turbidity, with concentrations of metals and radiogenic parameters representative of solid and dissolved phases. Of the SWRCB DDW recycled water quality CoECs, caffeine and DEET were detected in FO-7 Deep at very low concentrations not exceeding 0.01 µg/L. These constituents do not have California MCLs but have been designated as recycled water surrogates, which are required in recycled water project monitoring. Future groundwater sampling will confirm whether these CoECs continue to be detected at low concentrations or fall below laboratory detection or reporting limits.

Soluble nitroaromatic compounds (explosives) detected in soils in the Inland Ranges were not present in any of the soil cores analyzed for this field investigation. Likewise, groundwater quality samples analyzed for this investigation indicate that the Paso Robles and Santa Margarita aquifers have not been impacted locally from explosives associated with former Fort Ord activities. Accordingly, nitroaromatic compounds were not further evaluated in the geochemical modeling assessment.

Geochemical modeling was applied to selected constituents including chromium, lead, arsenic and calcite. Modeling results indicate that reactions between recycled water and formation materials along vertical flow paths could potentially result in recycled water quality changes beneath vadose zone wells with respect to chromium. However, geochemical modeling results revealed that concentration changes are likely to be small, because only trace amounts of chromium are adsorbed onto the hydrous ferric oxides coating individual quartz sand grains within the Aromas Sand. Simulation results (using pilot recycled water with pH of 7.7) indicate that almost all of the adsorbed chromium would desorb relatively quickly into solution as recharge water flows through the Aromas Sand, producing a transient initial effect. However, because the amount of chromium sorbed onto hydrous ferric oxide coatings is small, chromium concentrations would decrease following initial flushes of recharge water through the wetted zone. Arsenic and lead are adsorbed more strongly to the hydrous ferrous oxides than chromium. Therefore, the rate at which arsenic and lead desorb into solution as the injected recharge water flows through the Aromas Sand is slower but more sustained than for chromium. Estimated arsenic and lead concentrations in recharged recycled water through the Aromas Sand are predicted to be low - at about 4 µg/L for arsenic and 0.7 µg/L for lead.

Geochemical modeling further indicates that aquifer clogging by calcite precipitation is unlikely in the Aromas Sand because calcium and bicarbonate concentrations are far below levels approaching saturation. The potential for biofouling in the injection wells is low, because the injected water is very low in nitrogen and phosphorus and, therefore, would not tend to stimulate microbial growth.

Based on information collected and analyses conducted for this field investigation, the following conclusions can be made:

- The available storage capacity and hydraulic parameters of the Aromas Sand at the GWR project recharge site can accommodate proposed recycled water injection rates through four (or possibly fewer) vadose zone wells.

- The estimated vertical travel time of recycled water to flow through the Aromas Sand is dependent on the final depth of vadose zone well screens relative to potential silt/clay deposits in the lower Aromas Sand. Assuming that subsurface conditions at the GWR project recharge site are similar to those at MRWPCA MW-1, injected recycled water is estimated to reach the top of the Paso Robles Formation in a matter of a few days if vadose zone wells are screened below silt/clay deposits. If vadose zone wells are screened above any silt/clay deposits, injected recycled water is estimated to reach the top of Paso Robles Formation after 5.9 years. An estimated 3.4 years is needed for recycled water to flow through the upper 12.5 feet of unsaturated Paso Robles Formation before reaching the current water table. However, the water table is expected to rise to or above the geologic contact between the Aromas Sand and Paso Robles Formation following the initial years of GWR project operation.

- Baseline groundwater quality data indicate that local groundwater in the Paso Robles Aquifer generally meets drinking water standards. Apparent elevated concentrations of some metals and radiogenic parameters detected in the FO-7 Shallow, FO-07 Deep, MRWPCA MW-1, and PRTIW wells are impacted by turbidity in groundwater quality samples and are not considered representative.

- SWRCB DDW recycled water CoECs detected at very low concentrations in sampled wells include NDMA (PRTIW well), caffeine (MRWPCA MW-1 and FO-07 Deep), and DEET (MRWPCA MW-1 and FO-07 Deep). Future groundwater sampling, supporting the GWR monitoring program, will confirm either the continued presence or absence of these constituents.

- Metallic elements that could potentially be desorbed from mineral surfaces in the Aromas Sand include chromium (VI), arsenic, and lead. Geochemical modeling results indicate that these metals would not be leached in sufficient quantities to significantly impact the Paso Robles Aquifer.

- The potential for trace metal desorption during direct injection of recycled water into the Santa Margarita Aquifer is low and should not significantly impact groundwater quality in the Santa Margarita Aquifer.

- The potential for calcite clogging and/or biofouling in shallow vadose zone and deep injection wells is low and should not affect proposed recharge operations.

Based on the findings from this field investigation, the following are recommended to support ongoing GWR project planning:

- During the drilling of initial vadose zone and deep injection wells for the GWR project, subsurface lithologic data should be collected to evaluate the extent and thickness of potential fine-grained sediments in the lower Aromas Sand. Findings will be critical to the final design of vadose zone wells (specifically, the placement of well screen intervals).

- An additional round of groundwater quality sampling from MRWPCA MW-1 and both FO-7 wells is recommended at a minimum to establish baseline groundwater quality conditions in the vicinity of the GWR project recharge site. To obtain representative groundwater quality samples, groundwater from MRWPCA MW-1 should be pumped using a 3-inch diameter submersible pump (0.75-horsepower Grundfos 5SQE 07-320 used for well development or similar) with water quality samples collected after groundwater is determined to be turbidity-free. For all samples, groundwater should be filtered in the field through 0.45-micron filter to remove suspended solids, and collection bottles should be preservative-free to minimize potential digestion of solids in the sample prior to analysis.

1. INTRODUCTION

Monterey Regional Water Pollution Control Agency (MRWPCA), in partnership with Monterey Peninsula Water Management District (MPWMD), is developing the proposed Groundwater Replenishment (GWR) project to provide an additional safe and reliable source of water supply for the Monterey Peninsula. MRWPCA plans to construct and operate an advanced water treatment facility (AWTF) that will produce highly-purified recycled water for recharge in the Seaside Subarea of the larger Salinas Valley Groundwater Basin (referred to herein as the Seaside Basin). The GWR project will address historical overdraft conditions in the Seaside Basin and increase basin yield without increasing the risk of seawater intrusion. Proposed recharge is designed to benefit the two primary water supply aquifers in the Seaside Basin - the Paso Robles Aquifer and the underlying Santa Margarita Aquifer – and will be accomplished by injecting recycled water through a combination of shallow vadose zone and deep injection wells.

To support ongoing GWR project planning, MRWPCA recently completed a hydrogeologic field investigation in the vicinity of the proposed GWR project recharge site. Key field activities included the drilling of a deep soil boring using the sonic drilling method; construction of a dedicated GWR project monitoring well (MRWPCA MW-1) that allows for monitoring of groundwater levels and water quality in the upper Paso Robles Aquifer; and collection of groundwater quality samples from MRWPCA MW-1 and five other wells in the vicinity of the GWR recharge site. Selected sediment core samples recovered during drilling were laboratory analyzed for hydraulic, mineralogical, and potential contaminant leaching properties. Groundwater quality samples were analyzed to establish baseline conditions for a comprehensive suite of drinking water and recycled water-related parameters and additional site-specific constituents of concern. Data collected from the field were used to refine the conceptual hydrogeologic model of the GWR project recharge site and evaluate potential groundwater quality impacts from proposed recharge operations through geochemical modeling.

This report documents the field program and presents key hydrogeologic information, including laboratory data and results of geochemical model simulations used to assess the potential of GWR project-related groundwater quality impacts. Conclusions pertinent to the final design and operation of proposed recharge facilities and recycled water stabilization goals are presented along with recommendations to address existing knowledge gaps.

1.1. HYDROGEOLOGIC SETTING

The GWR project recharge site is located in the Seaside Basin, identified by the Department of Water Resources (DWR) as a subarea of the larger Salinas Valley Groundwater Basin. As shown on **Figure 1**, the Seaside Basin has been further divided into subareas based on geologic faulting, hydrostratigraphy, groundwater flow directions, and other factors (Yates, et al., 2005). The proposed well site is located within the northeastern subarea, referred to as the Northern Inland Subarea. The northern basin boundary is based on a groundwater divide that is subject to movement with changing conditions in groundwater flow (Yates, et

al., 2005; Hydrometrics, 2010). A zoomed-in map of the GWR project recharge site is shown on **Figure 2**.

Tertiary- and Quaternary-age sedimentary units deposited within the basin contain most of the usable groundwater in storage. These units overlie the Miocene-age Monterey Formation, which is composed of low permeability shale and considered the base of the groundwater basin. Surficial units are composed of unconsolidated to semi-consolidated Quaternary-age dune sands. The dune deposits are underlain by older Pleistocene sediments of the Aromas Sand Formation (Aromas Sand). In this area, the Aromas Sand is a fine- to coarse-grained, friable sandstone (Harding ESE, 2001). Collectively, the dune sands/Aromas Sand deposits are about 350 to 400 feet thick, lie above the regional water table, and are the target units for this field investigation.

Two semi-consolidated sedimentary units, the Paso Robles Formation and the Santa Margarita Sandstone, underlie the Aromas Sand and are the primary aquifer systems in the basin. **Figure 3** shows the local configuration of these geologic units using down-hole resistivity logs from two nearby wells. Included on the cross section is a generalized schematic of the monitoring well that was constructed for this field investigation (MRWPCA MW-1). The locations of the cross section and wells are shown on **Figure 2**. The Aromas Sand, Paso Robles Aquifer and Santa Margarita Aquifer are described in more detail below.

1.1.1. Aromas Sand

As shown on the cross section in **Figure 3**, the Aromas Sand thickens to the east and is approximately 400 feet thick beneath the proposed monitoring well (MRWPCA MW-1) site; it is likely to be unsaturated across the GWR project area. Because the sand is not a major aquifer unit in the basin, it has not been the focus of past hydrogeologic evaluations, and several key data gaps exist. The geologic log for FO-7 indicates the predominance of sand throughout the interval with only minor silt layers. The presence of fine-grained units that could perch or impede recharge water may influence the design of GWR project recharge facilities (e.g., elevation of vadose zone injection well screens).

1.1.2. Paso Robles Aquifer

The Paso Robles Aquifer is composed of a series of continental (fluvial and alluvial fan) deposits of inter-bedded sand, gravel, and clay mixtures. Units within the aquifer system are heterogeneous and not readily correlated throughout the basin. As shown on **Figure 3**, the thickness of the unit in the GWR project area ranges from about 250 feet to more than 350 feet.

The Paso Robles Aquifer is the shallow-most aquifer in this area, and groundwater in the unit is considered unconfined. Based on recent monitoring events, the local water table is estimated to occur close to mean sea level.

1.1.3. Santa Margarita Aquifer

The Santa Margarita Aquifer is a Miocene-age sandstone of shallow marine origin and is the most prolific aquifer system in the Seaside Basin. As shown on **Figure 3**, the unit has an

average thickness of about 300 feet in the GWR project area and consists of poorly-consolidated sand. The sandstone is transitional to the underlying Monterey Shale, which was penetrated by SMTIW No. 1 (**Figure 3**). The Santa Margarita Aquifer was not tested during this field investigation.

1.1.4. Groundwater Flow Directions

Groundwater flow beneath the GWR project area is generally westerly toward Monterey Bay. Groundwater production in both aquifers has altered the regional flow directions, especially in the vicinity of General Jim Moore Boulevard where numerous water supply wells are located. **Figure 4** shows water level contours in the shallow aquifer (Paso Robles Aquifer) (Hydrometrics, 2010). Existing groundwater flow directions beneath the proposed monitoring well location are toward the west to southwest toward the pumping wells.

1.2. GWR Project Background

Since 2005, MRWPCA has been developing the proposed GWR project to provide a safe and reliable source of water to replenish the Seaside Basin. The GWR project involves the recharge of approximately 3,500 acre-feet per year (AFY) of advanced-treated recycled water from a new AWTF to be located at the MRWPCA Regional Treatment Plant (RTP). The feed water for treatment at the new AWTF will be secondary effluent from the MRWPCA RTP. The AWTF recycled water will be conveyed by pipeline from the AWTF to newly-constructed injection wells located within the former Ford Ord military base in the western portion of the Northern Inland Subarea of the Seaside Basin (**Figure 1**). Recharged water will be stored in the groundwater basin for subsequent extraction by California American Water Company (Cal-Am) using existing downgradient production wells (**Figure 2**). The GWR project will increase the basin yield and allow Cal-Am to reduce Carmel River diversions in compliance with a state order to secure additional water supplies (MRWPCA, May 2013).

The proposed GWR project recharge site is located within an approximate 150-foot wide corridor of land about 3,000 feet long (**Figure 2**). The corridor begins approximately 1,200 feet south of Eucalyptus Road and extends south-southwest for approximately 3,000 feet toward General Jim Moore Boulevard. The southwestern end of the project is approximately 200 feet east of the road. The property is situated along dirt roads of former Fort Ord lands and along the edge of a property that is proposed for conveyance from the Fort Ord Reuse Authority (FORA) to the City of Seaside. According to the City of Seaside, this parcel edge functions as a utility right-of-way, such that injection wells would not interfere with future land development.

While other sites were evaluated, the proposed GWR project recharge site was selected as the preferred location, because it offered the following key advantages:

- Consistent with planned future development and approved by the City of Seaside
- Relatively flat, graded surface that is level with the elevation of the sidewalk
- Sufficiently large to contain drill rig and support equipment
- Upgradient of water supply wells in the basin

- Sufficiently far from water supply wells to comply with State Water Resources Control Board Division of Drinking Water (SWRCB DDW) regulations
- Within the groundwater basin subarea boundary (and away from a groundwater divide to the north)
- Within close proximity to key monitoring wells for both aquifers
- Reasonably close to General Jim Moore Boulevard and the proposed pipeline alignment

As shown in **Figure 2**, proposed injection wells include shallow vadose zone wells for indirect recharge of the Paso Robles Aquifer via the overlying Aromas Sand Formation and deep injection wells for direct recharge of the Santa Margarita Aquifer. While the number and spacing of wells shown on the figure are assumed fixed for planning purposes, the future basis of well design will be based on findings from this investigation and possibly later refined after installation and testing of the initial vadose zone and deep injection wells.

As shown on **Figure 2**, the proposed monitoring well (MRWPCA MW-1) is located along Eucalyptus Road approximately 1,200 feet north of the eastern end of the proposed GWR recharge corridor. Results of recent groundwater model flow simulations (Hydrometrics WRI, 2014) used to assess hydraulic impacts from the GWR project indicate that recycled water injected into the most northeastern proposed vadose zone well will flow towards and across MRWPCA MW-1.

1.3. PROJECT GOALS AND OBJECTIVES

The primary objectives of the field program were to collect representative hydrogeologic information in the vicinity of the proposed GWR project recharge site in order to 1) evaluate the technical feasibility of recharging advanced-treated recycled water to benefit target aquifers using shallow vadose zone and deep injection wells, 2) establish baseline groundwater level and quality conditions and a permanent monitoring point to comply with monitoring requirements set forth in the SWRCB DDW draft regulations for indirect potable reuse of advanced treated recycled water; and 3) support refinement of AWTF treatment objectives and recharge facility design and operational criteria.

To achieve these objectives, the field program focused on addressing the following key hydrogeologic issues:

1. Groundwater occurrence (depth to water table) in the GWR project area.

2. Lithologic and hydraulic properties (storage capacity and permeability) of vadose zone sediments and travel time of recycled water to the water table beneath vadose zone wells.

3. Potential recycled water quality changes beneath vadose zone wells as a product of geochemical reactions between recycled water and formation materials along vertical flow paths.

4. Potential local groundwater quality impacts in the Paso Robles Aquifer beneath vadose zone wells as a result of mixing between recycled water and shallow groundwater.

5. Potential local groundwater quality impacts in the Santa Margarita Aquifer in the vicinity of deep injection wells as a result of mixing between recycled water and shallow groundwater.

6. Existing ambient and future projected groundwater quality in the Paso Robles and Santa Margarita aquifers in comparison to drinking water standards and SWRCB DDW recycled water recharge guidelines.

7. Presence of site specific constituents of concern in unsaturated sediments and groundwater beneath vadose zone wells (potential for leaching by recycled water and subsequent groundwater quality impacts).

The monitoring well installed for this investigation was screened across the water table to allow tracking of advanced treated recycled water that will be recharged through vadose zone wells. Although the GWR project anticipates injection into both the Paso Robles Aquifer and the underlying deep Santa Margarita Aquifer, the shallow system was the primary focus of this field program. However, potential groundwater quality impacts in the Santa Margarita Aquifer as a result of direction injection of recycled water were also evaluated.

This investigation does not provide a quantitative assessment of the GWR project impacts on water levels, other production wells, and basin subsurface outflow to the ocean. To address such issues, the basin-wide numerical groundwater flow (MODFLOW) model developed by the Seaside Basin Watermaster is being used. HydroMetrics WRI (HydroMetrics), consultants to the Seaside Basin Watermaster, has been retained to simulate the proposed project including project alternatives in support of the EIR impacts assessment. Results of the modeling are presented in a series of separate technical memoranda (Hydrometrics, 2013 and 2014), which are also referenced and included as appendices in the GWR Project Recharge Impacts Assessment Report (Todd Groundwater, 2015).

1.4. SCOPE OF WORK

The scope of work developed for this field program included the following tasks:

1. Drill a deep exploratory soil boring penetrating the water table in the vicinity of the proposed GWR project recharge site.

2. Analyze selected soil cores for key lithologic, hydraulic, mineralogical, and contaminant leaching properties to support geochemical modeling objectives.

3. Design and install a dedicated GWR project monitoring well to monitor water table elevations and shallow groundwater quality.

4. Collect groundwater samples from the newly constructed monitoring well and other key wells in the vicinity of the GWR project recharge site to characterize the existing groundwater quality in the Paso Robles and Santa Margarita aquifers for drinking water, recycled water recharge, and additional site-specific constituents of concern.

5. Refine the site conceptual hydrogeologic model at the GWR recharge site; evaluate vertical and horizontal flowpaths and provide estimated subsurface travel times and mixing volumes between recycled water and groundwater.

6. Assess the compatibility of advanced-treated recycled water with local groundwater and the risk of potential groundwater quality impacts from proposed recharge operations through geochemical modeling.

1.5. REPORT ORGANIZATION

This report documents the field investigation activities, collected hydrogeologic information including laboratory analysis results, and the geochemical modeling assessment. Section 2 of this report describes the technical approach for drilling, pre-drilling planning, and key activities completed in the field. Section 3 summarizes the results of hydraulic, solid core mineralogy, core leaching, and groundwater quality analyses. Section 4 presents the refined conceptual hydrogeologic model of the GWR project recharge site and findings from the geochemical assessment used to evaluate potential groundwater quality impacts in target aquifers as a result of recycled water injection. Conclusions and recommendations are provided in Section 5, and key references are provided in Section 6.

Additional documentation of the field program is provided in appendices to this report. Appendix A includes copies of the FORA access/right-of-entry permit, City of Seaside Use/Minor Use and Encroachment permits, and Monterey County Health Department well drilling permit. Appendices B and C contain the downhole geophysical log and Department of Water Resources (DWR) well completion report for MRWPCA MW-1, respectively. Appendices D, E, and F respectively include the certified laboratory reports and chain-of-custody forms from Cooper Testing (core hydraulic testing), McCampbell Analytical (core mineralogical and leaching testing), and Alpha Analytical (groundwater quality). Detailed documentation of the geochemical modeling approach, data inputs, and simulation results are presented in Appendix G. Selected photographs of the field program are included in Appendix H.

2. FIELD INVESTIGATION ACTIVITIES

This section documents the technical approach and key activities associated with the drilling, logging, and construction of the new monitoring well (MRWPCA MW-1); selection of laboratory analyses and core samples for characterization of hydraulic, mineralogical, and contaminant leaching properties; and groundwater quality sampling of MRWPCA MW-1 and five other local wells for drinking water, recycled water, and site-specific constituents of concern.

2.1. MONITORING WELL DRILLING AND CONSTRUCTION

2.1.1. Technical Approach

The sonic drilling method was selected for the drilling and installation of MRWPCA MW-1. The sonic drilling method is a dual-casing drilling method that uses high-frequency, resonant energy to advance an outer steel casing and inner steel core barrel into the subsurface. Commonly, no drilling fluid is needed during sonic drilling; however, water is sometimes added inside the drill string to prevent hydraulic surging and unconsolidated formation materials from entering the drill string. No water was needed for the drilling of MRWPCA MW-1.

The sonic drilling method provided the following advantages for the field investigation:

- Provides continuous, relatively undisturbed cores of the subsurface with high recovery rates and good sample integrity
- Requires little to no drilling fluid, preventing onsite storage in a sensitive environment and hauling large quantities of water to the drilling site
- Produces less waste material (approximately 80 percent less than conventional drilling methods such as mud rotary)
- Does not damage the borehole-formation interface, because there is no deposition of drilling muds; results in a more efficient well and requires less development time than other drilling methods.

To minimize the friction between the active outer drill casing and native materials, a telescopic borehole design was used for this investigation. Specifically, such an approach requires an outer casing to be advanced and left in place at a relatively shallow depth. A second smaller diameter outer casing is then advanced beyond the initial outer casing (and left in place to allow for a third smaller diameter casing, and repeated as needed). For this investigation, three outer casing strings (9, 8, and 7 inches in diameter) were used to achieve the total depth of drilling.

Because the entire length of the borehole is temporarily supported by steel outer casing at the completion of drilling, conventional downhole geophysical logging using electrical methods was not possible until after MRWPCA MW-1 was constructed and the steel casing

was removed. Prior to well development, a dual induction-natural gamma radiation log of MRWPCA MW-1 was completed.

2.1.2. Permits

Prior to field mobilization, MRWPCA obtained an encroachment permit (Permit #6416) and use/minor use permit (#Up-12-07) from the City of Seaside. Additionally, a right-of-entry permit was obtained from FORA, and a water well construction permit (#13-12301) was obtained from MCHD (copies of each permit are included in **Appendix A**).

In addition to the abovementioned permits, a utility clearance ticket was obtained from Underground Service Alert, and a temporary water use permit was obtained from Marina Coast WD to access water from a fire hydrant located on the southeast corner of General Jim Moore Boulevard and Eucalyptus Road.

2.1.3. MEC Training, Rig Mobilization, and Site Control

On the morning of December 16, 2013, all field personnel from Cascade Drilling Company, Inc. (Cascade) and Todd Groundwater, as well as representatives from MRWPCA, Monterey County MCHD, and City of Seaside participated in a 30-minute Munitions and Explosives of Concern (MEC) training course, coordinated by Arcadis U.S. on behalf of FORA. MEC training was also completed by field personnel from Welenco and Blaine Tech Services on January 27, 2014 prior to geophysical logging and water quality sampling activities performed for this investigation.

Following the MEC training, Cascade mobilized a 600T Sonic drill rig and support vehicles to the MRWPCA MW-1 site. A rectangular-shaped construction zone was delineated around the proposed monitoring well location using traffic pylons and caution tape in accordance with FORA and City of Seaside requirements (see inset on **Figure 2**). The dimensions of the construction zone were 100 feet in length (along Eucalyptus Road) and 75 feet in width (from the road median to approximately 50 feet southeast of the road). Core samples were contained at all times during the field program in the construction zone south of the sidewalk to provide safe access for logging and photography.

Traffic control measures, including Type 1 barricades (e.g., *Bike Lane Closed* and *Road Work Ahead* signs), were placed along Eucalyptus Road both uphill and downhill of the drilling work area in accordance with the City of Seaside traffic control guidelines (see inset of **Figure 2**). Additionally, a public notice describing the field program and associated City of Seaside permits was posted on the locked access gate at the intersection of Eucalyptus Road and General Jim Moore Boulevard and on lamp posts east of the work area. Photographs of the sonic drilling rig setup, site/traffic control measures, and public notice are provided in **Appendix H**.

Prior to the start of both shifts of work on December 16, 2013, Todd Groundwater conducted a health and safety plan (HSP) tailgate meeting with all Cascade field personnel to cover safety topics including the identification of key health and safety personnel,

potential physical hazards, and Personal Protection Equipment (PPE) requirements. Protective actions and the emergency response plan were also reviewed.

2.1.4. Drilling, Coring, and Logging of the Boring

Following hand-auguring of borehole for the first 10 feet for precautionary reasons, sonic drilling was conducted on a 24-hour basis over three days from 1 pm on December 16, 2013 to 11 am on December 19, 2013. A total drilling depth of 535 feet below ground surface (feet-bgs) was achieved. During drilling, the inner casing (core barrel) was vibrated 10 feet ahead of the outer casing to collect relatively undisturbed formation cores. At 10-foot intervals, the core barrel was brought up to the surface, and the soil core was extruded into Visqueen plastic sleeves in 2.5-foot increments and temporarily stored in wooden core boxes. A telescopic borehole design was used, resulting in a boring with decreasing diameter with depth. Specifically, a 9-inch outer diameter casing was advanced to 160 feet, an 8-inch outer casing was advanced to 400 feet, and a 7-inch outer casing was advanced to 530 feet. Sediment cores were extracted in the upper 400 feet of boring with a 7-inch diameter core barrel and from 400 to 535 feet-bgs with a 6-inch core barrel. Based on the final boring diameters and depths, approximately 135 cubic feet (5 cubic yards) of formation material were removed from the boring.

Core samples were examined, described, and photo-logged in the field by a California-licensed Professional Geologist from Todd Groundwater. **Figure 5** shows the geologic log developed from examination of soil cores for MRWPCA MW-1. Additionally, detailed lithologic descriptions are presented in the DWR well completion report in **Appendix C** and photographs of selected core samples are shown in **Appendix H**. Selected soil cores were transported under chain-of-custody to respective laboratories for additional analysis (see **Section 2.1.8** for details). All remaining soil cores were removed from plastic sleeves and wooden storage boxes and spread evenly within the soil laydown area (south of the sidewalk within the work area) in accordance with FORA requirements.

2.1.5. Well Construction

MRWPCA MW-1 was successfully constructed over a 28-hour period from 12 PM on December 19, 2013 to 4 PM on December 20, 2013. The well profile of MRWPCA MW-1 is provided on **Figure 5**, and well completion details are included on the first page of DWR well completion report in **Appendix C**. As shown in the figure and well completion report, MRWPCA MW-1 was completed to a depth of 521 feet-bgs using 3-inch diameter Schedule 80 PVC well casing (3.5-inch outside diameter with wall thickness of 0.6-inch) and screen. Native material was used to backfill the borehole from 521 to 535 feet-bgs.

A total of 75 feet of 0.020-inch slotted well screen was installed from 421 to 446 feet-bgs and from 466 to 516 feet-bgs opposite coarse-grained sediments below the water table. The water table was measured at 405 feet-bgs following initial placement of the well casing/screen assembly on December 19, 2013 and 405 feet below the top of PVC casing (feet below TOC) following completion of well development on January 28, 2014). The well screen was positioned to maximize the utility of the well to characterize ambient and future

groundwater levels and quality. A stainless steel well centralizer was placed at 465 feet on the screen assembly to ensure a consistent thickness of artificial filter pack and bentonite/cement around the PVC casing/screen assembly.

Following placement of the PVC casing and screen assembly, artificial filter pack material (#3-graded Monterey Beach sand) was tremied into the annular space (between the PVC casing and temporary outer steel casing) from the bottom of the well to 10 feet above the top of the upper well screen. Bentonite pellets were then tremied and hydrated to create a well seal from 50 to 411 feet-bgs. Adequate time for hydration (and expansion) of the bentonite pellets was allowed prior to sealing the annulus with cement-bentonite grout from 50 feet-bgs to just below ground surface. A total of 54 bags of 47-pound Portland cement were mixed with 300 gallons of water. A tremie pipe was used to slowly pour the cement-bentonite grout seal while the drive casing was simultaneously removed. The cement seal was tremied into the annulus from approximately 2 to 4 AM on December 20, 2013. The well was completed at the surface with a 12-inch diameter, bolted wellbox vault with locking lid seated in a 36-inch diameter by 14-inch deep cement collar tinted lamp black in color in accordance with City of Seaside requirements. Photographs of the well installation and surface completion are provided in **Appendix H**.

2.1.6. Well Development and Geophysical Logging

Well development activities were performed to ensure that residual sediment and turbidity in the well were removed prior to geophysical logging and groundwater quality sampling. Well development of MRWPCA MW-1 was conducted over a two-day period on January 27 and 28, 2014 using a combination of swabbing, bailing, and pumping. All development water was temporarily stored in holding tanks on the Smeal rig to suspended sediment to settle prior to decanting the partially clarified water from the top of the holding tanks. Development water was discharged to the nearest storm drain inlet on Eucalyptus Road as approved by the City of Seaside. The storm drain system routes water to subsurface infiltration galleries that ultimately recharge the groundwater system.

On the morning of January 27, 2014, Cascade mobilized a well development rig to the MRWPCA MW-1 site. Initial sounding of the well revealed that 20 feet of fine silt had collected at the bottom of the well, which is typical following well construction. This sediment was removed from the well by bailer. Following initial bailing and prior to swabbing, geophysical logging of MRWPCA MW-1 using dual induction-natural gamma radiation detection tools was performed by Welenco from 11:15 AM to 12:45 PM on January 27, 2014. Geophysical logs are reproduced on **Figure 5** to allow cross-referencing with the geologic log and well profile. The original geophysical log printouts are provided in **Appendix B**.

After the geophysical logging, the well was swabbed and bailed for an additional 10 hours (on January 27 and 28, 2014). Swabbing was accomplished using a surge block for the entire length of each well screen interval. Approximately 30 gallons of development water were bailed from the well at the completion of swabbing and stored in temporary holding tanks on the development rig. A 3-inch diameter, 0.75-horsepower submersible pump (Grundfos

5SQE 07-320) was then installed in MRWPCA MW-1 with the pump intake set at 450 feet below TOC. Pumping commenced at a 12:45 PM at a discharge rate of 1.0 gpm. The pumping rate was gradually increased to a maximum rate of 3.8 gpm. The pump was turned off after 3 hours of pumping at 3:45 PM, at which time pumped water was relatively turbidity-free. A total of 400 gallons of development water were bailed/pumped, temporarily stored in tanks, and eventually discharged to the storm drain. Prior to turning off the pump, the water level in the well had stabilized at 411 feet below TOC; the water level in the well recovered to pre-pumping conditions (405 feet below TOC) within 20 minutes after the pump was turned off.

2.1.7. Hydrogeologic Conditions

Figure 5 depicts the subsurface hydrogeologic conditions encountered during drilling and well construction details for MRWPCA MW-1. As illustrated in the figure (and detailed geologic log in **Appendix C**), the upper 392.5 feet of drilling encountered predominately well-sorted, fine to medium-coarse sand and silty sand with occasional thin lenses of sandy silt. Sediment color was consistent and ranged from light brownish-yellow to dark yellowish-brown. The induction log confirms the presence of fine-grained silt in the Aromas Sand Formation from 295 to 300 feet-bgs and silt and silty, sandy clay deposits interbedded with fine- to medium-coarse sand from 317 to 341 feet-bgs. These sediments are representative of the Aromas Sand.

It is possible that the silt/clay lenses observed in the lower Aromas Sand correspond to "sand and clay" units observed in the Aromas Sand at Well FO-07 to the east (see **Figure 2** for well location) from 190 to 210 feet-bgs and from 240 to 260 feet-bgs (MPWMD, 1994). However, geologic information (including electrical resistivity logs) for three wells along General Jim Moore Boulevard – the Paso Robles Test Injection Well (PRTIW), Santa Margarita Test Injection Well (SMTIW), and Seaside Middle School Test Well (see **Figure 2** for well locations) – do not confirm the presence of any silt/clay lenses in the Aromas Sand (Fugro West, Inc., 1998; Padre Associates, Inc., 2002; and Pueblo Water Resources, Inc., 2012). Additionally, the well completion report for the Golf Course Reservoir well adjacent to MRWPCA MW-1 does not indicate any silt or clay in the Aromas Sand. Based on these existing data, it appears that while the silt/clay deposits observed in the lower Aromas Sand at MRWPCA MW-1 may occur beneath the GWR project recharge site, these finer-grained deposits likely pinch out to the west (by General Jim Moore Boulevard) and north (by the Golf Course Reservoir Well).

At 392.5 feet-bgs, a clear lithologic transition was observed in core samples and confirmed in the geophysical logs. Sediments immediately below this transition are composed predominantly of dark grey, dense sandy silt and silty clay. This transition represents the boundary between the Aromas Sand and underlying Paso Robles Formation. Reddish-brown sand deposits observed at FO-7 (see **Figure 2**) and interpreted as the contact between the Aromas Sand and Paso Robles formations (MPWMD, 1994) were not encountered at MRWPCA MW-1.

The water table was measured at 405 feet-bgs in MRWPCA MW-1, or about 12.5 feet below the geologic contact between the Aromas Sand and Paso Robles formations. Core samples and geophysical logs indicate that the upper 140 feet of the Paso Robles Formation is highly heterogeneous and characterized by relatively thick (typically 10 to 20 feet), alternating fine-grained and coarse-grained deposits. Well-rounded white chert cobbles up to 2 inches in diameter and partially consolidated sediments were observed from about 488 to 510 feet-bgs. Sediments encountered in the final 15 feet of drilling were composed of semi-consolidated olive grey, sandy-silty clay with white rock fragments (possibly volcanic ash origin) as large as 6 inches in diameter. The fragments were reactive to acid, indicating the presence of calcium carbonate. It is noted that the apparent lithologic anomaly in the induction log from 460 to 470 feet-bgs is caused by the steel centralizer installed on the well casing/screen assembly.

2.2. Laboratory Analysis of Selected Core Samples

Figure 6 shows the depth intervals from which soil cores were selected for laboratory analysis. The soil core analysis program was scoped to characterize the hydraulic and geochemical properties of the deep vadose zone at the GWR project recharge site. Hydraulic analyses were used to provide an estimate of vertical percolation rates and storage capacity of the vadose zone. Geochemical analyses supported geochemical modeling to screen for constituents of concern in vadose zone sediments that may be leached by water recharged via vadose zone wells and thus potentially impact local groundwater quality. Additional information on the core analysis program is presented below.

2.2.1. Core Hydraulic Testing

As shown in **Table 1**, core samples from 19 depth intervals (ranging from 27.5 to 420 feet-bgs) were submitted to Cooper Testing Labs in Palo Alto, California for analysis of hydraulic properties, including (saturated) vertical hydraulic conductivity and total and effective porosity. Selected core hydraulic analyses provide information necessary to estimate the available storage and subsurface travel time of recycled water in the vadose zone.

Core samples were selected to allow for characterization of the varied lithologies composing the vadose zone. While preliminary design of vadose zone and direct injection wells assume a screen interval below 150 feet-bgs, long-term maintenance will require pumping and disposal of development water in onsite percolation ponds. Thus, the hydraulic and storage properties of sediments in the upper 150 feet of Aromas Sand were also analyzed.

For each selected depth interval, soil samples were extracted from cores contained in sonic drilling core bags using 3-inch diameter, 6-inch long brass tubes and capped with plastic caps and Teflon tape. It is noted that while extraction resulted in minor sample disturbance, the core structure was effectively preserved with minimal re-packing of brass tubes. One brass tube sample for each of the 19 depth intervals was collected and submitted for vertical hydraulic conductivity analysis. Additionally, one brass tube for 15 of the 19 depth intervals was collected and submitted for total and effective porosity analyses.

Table 1. Summary of Core Hydraulic Testing

Discrete Formation Samples			Vertical K (Kv)	Total and Effective Porosity
Sample Interval (feet-bgs)	USCS Lithology Type	Lithologic Description		
27.5 - 30.0	SP	10YR 6/6 Yellowish brown fine sand, moist	x	x
58.0 - 60.5	SP-SM/SP	58.0-59.0 10YR 5/9 Yellowish brown silty fine sand lenses, dry; 59.0-60.5 10YR 5/9 Yellowish brown fine	x	x
98.5 - 101	SP-SM	10YR 6/6 Yellowish brown silty fine sand lenses, dry	x	x
124.5 - 127	SP-SM	10YR 6/6 Yellowish brown silty fine sand, dry	x	x
139.5 - 142	SP	10YR 5/8 Yellowish brown fine sand, dry	x	x
174.5 - 177.0	SP	10YR 6/6 Yellowish brown silty fine sand nodules, dry	x	x
197.0 - 200.0	SM	10YR 6/6 Yellowish brown silty fine sand, dry	x	x
223.0 - 225.5	SP	10YR 6/6 Yellowish brown fine sand with minor silt, dry	x	x
259.5 - 262.0	SP	10YR 5/6 Dark yellowish brown fine sand, very moist	x	x
274.5 - 277.0	SP	10YR 5/6 Dark yellowish brown fine sand, dry	x	x
297.0 - 298.5	ML	10YR 3/4 Dark yellowish brown dense clayey silt with fine sand, moist	x	NA
298.5 - 301.0	ML/CL/SP	298.5-300.0 10YR 6/4 Light yellowish brown sense clayey silt with fine sand, moist; 300.0-300.7 10YR 6/4 Light yellowish brown silty clay, moist; 300.7-301.0 10YR 7/3 Very pale brown silty fine sand, dry	x	x
324.5 - 327	CL/ML	324.5-325.0 10YR 5/4 Yellowish brown silty clay (10/90), moist;	x	x
337.0 - 339.0	CL	10YR 6/6 Yellowish brown fine sandy, silty, clay (20/20/60), moist	x	NA
349.5 - 352.0	SP	10YR 5/8 Yellowish brown fine to medium coarse sand (70/30), dry	x	x
357.0 - 359.5	SW	10YR 6/4 Light yellowish brown fine to coarse sand, dry	x	x
377.0 - 379.5	SP	10YR 6/6 Yellowish brown very fine sand, dry	x	x
405.0 - 407.5	ML	10YR 3/1 Very dark gray clayey silt, very dense, dry	x	NA
417.5 - 420.0	ML	10YR 4/3 Brown fine to medium coarse sandy silt (40/60), dry	x	NA

Notes:
NA = not analyzed
Vertical K (KV) = saturated vertical hydraulic conductivity
feet-bgs = feet below ground surface

The four depth intervals not analyzed for porosity represented fine-grained deposits in the vadose zone and sediments below the water table. Saturated vertical hydraulic conductivity testing was performed on the two saturated core samples (below 405 feet-bgs) to provide a basis for estimation of horizontal hydraulic conductivity in the upper Paso Robles Aquifer.

Results of core hydraulic testing are presented in **Section 3** along with discussion of storage capacity and subsurface travel time. Laboratory reports from Cooper Testing and the chain-of-custody form are presented in **Appendix D**.

2.2.2. Solid Core, Extraction, and Leaching Test Analyses

A solid core, extraction, and core leaching test program was developed to assess the potential for anthropogenic and naturally-occurring constituents to be leached or dissolved as a result of proposed GWR project recharge. A subset of core samples was analyzed for various properties to support the geochemical modeling assessment, which was used to predict 1) potential changes in recycled water quality along vertical flow paths through the Aromas Sand and unsaturated portion of the Paso Robles Formation and 2) potential groundwater quality impacts to the Paso Robles Aquifer.

2.2.2.1. Solid Core Analyses

Table 2 summarizes the solid core analyses conducted for this investigation. As shown in the table, soil cores from 10 depth intervals ranging from 27.5 to 474.5 feet-bgs were submitted to McCampbell Analytical in Pittsburg, California for analysis of mineralogical properties and presence of other parameters, including naturally-occurring chemicals found in the Aromas Sand and anthropogenic chemicals that have been detected in soil at the Inland Ranges that may be solubilized. Mineralogical analysis serves to define the overall bulk formation chemistry and character of the vadose zone and the potentially affected Paso Robles Aquifer. It is also needed to understand source(s) of naturally-occurring constituents in the formation that may be dissolved by recharge water and impact shallow groundwater.

2.2.2.2. Hydroxylamine-Hydrochloride Extraction (HA-HCl) Test

As shown in **Table 2**, a Hydroxylamine-Hydrochloride Extraction Test for Ferric Hydroxide (Mahoney Geochemical Modeling, 2013) was also performed on two samples from the Aromas Sand (200.0 – 202.5 feet-bgs and 364.5 – 367.0 feet-bgs). This procedure was selected to measure the amount of hydrous ferric oxide (HFO) in a soil sample, which may be critical in estimating the potential for metals (including arsenic, chromium, and divalent metals) to desorb into solution as recharged water flows through the Aromas Sand.

Table 2. Summary of Solid Core Analyses and Hydroxylamine-Hydrochloride (HA-HCl) Extraction Test

McCampbell Analytical Work Order Number	Discrete Formation Samples			Soil Core Analyses										Hydroxylamine-Hydrochloride (HA-HCl) Extraction for Ferric Hydroxide
				Mineralogical				Other Parameters						
	Sample Interval (feet-bgs)	USCS Lithology Type	Lithologic Description	XRD with quantitative phase analysis	Resin impregnation thin section	SEM - EDA Analysis	XRF or Total Dissolution	Exchangable Cations using Ammonium Acetate	Phosphorus	Chromium VI	Perchlorate	TOC - TN by combustion	Nitroaromatic Compounds (explosives)	
1312545	27.5 - 30.0	SP	10YR 6/6 Yellowish brown fine sand, moist	X	X	X	X	X	X	X	X	X	X	NA
	74.0 - 75.5	SP/ML	10YR 6/6 Yellowish brown fine sand with minor silt lenses and nodules, dry (74.0 - 75.0) 10YR 4/6 Dark yellowish brown silt with minor fine sand and clay, dry (75.0 - 75.5)	X	X	X	X	X	X	X	X	X	X	NA
	98.5 - 101.0	SP-SM	10YR 6/6 Yellowish brown silty fine sand lenses, dry	X	X	X	X	X	X	X	X	X	X	NA
	139.5 - 142.0	SP	10YR 5/8 Yellowish brown fine sand, dry	X	X	X	X	X	X	X	X	X	X	NA
	200.0 - 202.5	SM	10YR 6/8 Brownish yellow silty fine sand, dry	X	X	X	X	X	X	X	X	X	X	X
	297.0 - 298.5	ML	10YR 3/4 Dark yellowish brown dense clayey silt with fine sand, moist	X	X	X	X	X	X	X	X	X	X	NA
	364.5 - 367.0	SP	10YR 6/6 Yellowish brown medium coarse to coarse sand, dry	X	X	X	X	X	X	X	X	X	X	X
1312650	398.5 - 401.0	ML	10YR 3/1 Very dark gray clayey silt, very dense, dry	X	X	X	X	X	X	X	X	X	X	NA
	433.0 - 435.0	SP	10YR 4/4 Dark yellowish brown silty fine sand, moist	X	X	X	X	X	X	X	X	X	X	NA
	472.0 - 475.5	SM-SC/SM	5YR 5/3 Olive silty, clayey fine to medium coarse sand (30/10/60), wet (472.0 - 474.0) 5YR 5/3 Olive silty fine sand (40/60), wet (474.0 - 475.5)	X	X	X	X	X	X	X	X	X	X	NA

Notes:
NA = Not Analyzed
SEM - EDA = Scanning Electron Microscopy-Energy Dispersive X-Ray Analyzer
TOC = Total organic carbon
TN = Total nitrogen
XRD = Energy Dispersive X-Ray Analysis
XRF = X-Ray Florescence (combined with total dissolution provides major elements as oxides)

2.2.2.3. Core Leaching Test Analysis

Table 3 summarizes the core leaching test analyses conducted for this investigation.

A modified Toxicity Characteristic Leaching Procedure (TCLP) test was performed by McCampbell Analytical on 8 of the 10 core samples analyzed for mineralogical properties. The traditional TCLP is a regulatory procedure principally designed to determine mobility of organic and inorganic analytes in liquid, solid, and multiphasic wastes principally from soil samples to simulate leaching through a landfill. TCLP extraction normally uses an acetic acid extraction under simulated short term (18 and 48 hours) and long-term (48–84 days) conditions.

The leaching test procedure used for this investigation utilizes the same equipment in the USEPA TCLP Extraction method; however, the acetic acid extraction method was determined to be overly aggressive for estimating the leaching potential of recycled water through vadose zone sediments at the GWR recharge site. Therefore, the following modifications were made to provide the most meaningful results in support of the geochemical modeling assessment:

1. The acetic acid/sodium hydroxide leaching solution used in the TCLP Extraction method was replaced with stabilized pilot recycled water to more accurately simulate subsurface geochemical conditions during recharge.

2. The 1-to-20 ratio of soil-to-leachate solution used in the TCLP Extraction method was increased to 1-to-5 and tumbling time was increased to 7 days (tumbling time for the TCLP Extraction method is 18 hours) to more closely represent actual field conditions during recharge and to increase the sensitivity of the leaching test to characterize leaching potential.

3. Collection of final leachate in 60 mL vials and centrifuging at 2,500 rpm for 12 hours (prior to filtering leachate through 0.45-micron filter paper) to address elevated turbidity in leachate observed in leaching test trials.

The eight samples are representative of the varied lithologies in the Aromas Sand and upper Paso Robles Aquifer. Leaching tests were not performed for the shallowest (27.5 – 30.0 feet-bgs) or deepest (472.0 – 474.5 feet-bgs) samples submitted to McCampbell Analytical, as the former sample is above future vadose zone injection well screens, and the latter sample is the deeper of two core samples below the water table.

To provide a reliable estimate of the leaching potential during recharge, stabilized pilot recycled water provided by MRWPCA's AWTF design engineer, Trussell Technologies, Inc. (Oakland, California) was supplied to McCampbell Analytical under chain-of-custody and used in the leaching tests. To mimic the proposed GWR project recycled water, Trussell Technologies collected reverse-osmosis (RO) permeate from the MRWPCA pilot AWTF and stabilized the permeate using a bench-scale, post-treatment stabilization unit to more

Table 3. Summary of Core Leaching Test Analyses

McCampbell Analytical Work Order Number	Discrete Formation Samples			Leachate Test using Stabilized Pilot Recycled Water																		
							Anions					Other Ions/Compounds								Additional Parameters		
	Sample Interval (feet-bgs)	USCS Lithology Type	Lithologic Description	Major Cations and Anions	Title 22 CAM 17 Metals (plus Al)	Trace Ions (Fe, Mn, Li, Sr, Zn)	Nitrate and Nitrite	TKN	Ammonia	Flouride	Bromide	Chlorine	Chromium VI	DOC	Inorganic Carbon as CO_2	Phosphorus	Silicon	Sulfide	Uranium	Total and Speciated Alkalinity	ORP, pH, Turbidity	Langelier Saturation Index
1312545	74.0 - 75.5	SP/ML	10YR 6/6 Yellowish brown fine sand with minor silt lenses and nodules, dry (74.0 - 75.0) 10YR 4/6 Dark yellowish brown silt with minor fine sand and clay, dry (75.0 - 75.5)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	98.5 - 101.0	SP-SM	10YR 6/6 Yellowish brown silty fine sand lenses, dry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	139.5 - 142.0	SP	10YR 5/8 Yellowish brown fine sand, dry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	200.0 - 202.5	SM	10YR 6/8 Brownish yellow silty fine sand, dry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	297.0 - 298.5	ML	10YR 3/4 Dark yellowish brown dense clayey silt with fine sand, moist	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	364.5 - 367.0	SP	10YR 6/6 Yellowish brown medium coarse to coarse sand, dry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1312650	398.5 - 401.0	ML	10YR 3/1 Very dark gray clayey silt, very dense, dry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	433.0 - 435.0	SP	10YR 4/4 Dark yellowish brown silty fine sand, moist	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Notes:
Al = aluminum
Ca = Calcium
DOC = Dissolved Organic Carbon
Fe = Iron
Mg = Magnesium
Mn = Manganese
SEM - EDA = Scanning Electron Microscopy-Energy Dispersive X-Ray Analyzer
TKN = Total Kjeldahl Nitrogen
TOC = Total organic carbon
TN = Total nitrogen
XRD = Energy Dispersive X-Ray Analysis
XRF = X-Ray Fluorescence (combined with total dissolution provides major elements as oxides)

closely approximate the water quality anticipated from the full-scale AWTF. Stabilization methods included the addition of calcium as calcium chloride ($CaCl_2$) and sodium hydroxide (NaOH) to increase alkalinity followed by bubbling of CO_2 gas into the RO water to decrease the pH to a target goal. The Langelier Saturation Index (LSI) and pH thresholds established for full-scale RO permeate stabilization for the Orange County Water District (OCWD) Groundwater Replenishment System (GWRS) were used to guide stabilization. A total of 32 liters of stabilized pilot recycled water was supplied for the leaching tests.

Additional description of the leaching test procedure is provided in the McCampbell Analytical laboratory report provided in **Appendix E**.

Leaching tests provide an estimate of the potential for leaching constituents from the vadose zone during injection. The analysis is conservative, because the stabilized pilot water is slightly more aggressive (as indicated by a negative LSI value) than the proposed final recycled water from the full-scale AWTF. Depending on the results of the leaching analyses and geochemical modeling from this investigation, the stabilization process for the final recycled water may be modified to prevent any potentially undesirable impacts to groundwater quality.

Final leachate was analyzed for the following parameters:

- CCR 17 metals, including arsenic and chromium
- Major cations and anions
- Nitrogen species (nitrate, nitrite, total ammonia, TKN)
- Total and Speciated Alkalinity
- Phosphorus
- Silicon
- Chromium(VI)
- Chlorine
- DOC and Inorganic Carbon as CO_2
- Sulfide
- Oxygen Reduction Potential (ORP)
- pH
- Turbidity

Perchlorate and nitro-aromatic (explosive) compounds were not detected in solid core samples; therefore, these constituents were not analyzed in leachate. Additionally, due to sample volume limitations, leachate was not analyzed for total and dissolved oxygen, specific conductance, and LSI.

Prior to the leaching tests, stabilized pilot water was analyzed for the same parameters analyzed in leachate, including total and dissolved oxygen, specific conductance, and LSI.

Results of core leaching tests are presented in **Section 3**, and pertinent laboratory reports and chain-of-custody forms are provided in **Appendix E**.

2.2.3. Soil Volume Removed from Investigation Site

Overall, approximately 36,000 cubic centimeters (0.05 cubic yards) of formation material were removed from the project site. About 24,000 cubic centimeters (or 0.03 cubic yards) of formation material were removed in 34 brass tubes for hydraulic analysis. An additional 12,000 cubic centimeters (0.02 cubic yards) of formation material were removed in glass sample bottles for mineralogical and leaching test analyses.

2.3. GROUNDWATER QUALITY SAMPLING

Groundwater quality samples were collected from MRWPCA MW-1 and five other wells in the vicinity of the GWR project recharge site for this investigation. All sampling was performed by field technicians from Blaine Tech Services (Blaine Tech) based out of San Jose, California. Sampling was performed over three days (January 29 and 30 and February 3, 2014). To satisfy laboratory minimum holding times for specific analyses, groundwater quality samples were picked up and transported by courier under chain-of-custody to Alpha Analytical Laboratories in Ukiah, CA by 3 PM each day.

2.3.1. Wells Sampled

The five wells sampled in addition to MRWPCA MW-1 include three monitoring wells (FO-07 Shallow, FO-07 Deep, and Santa Margarita ASR MW), one irrigation well (Paso Robles Test Injection Well [PRTIW] at Mission Memorial Cemetery), and one municipal production well (City of Seaside Well 4). Well locations are shown on **Figure 2**. Pertinent well information is provided in **Table 4**.

Table 4. Summary of Groundwater Quality Well Sampling Program

Sample Date	Well	Aquifer	Owner	Type	Pump	Sampling Method	Casing Material Type	Top Screen (feet-bgs)	Bottom Screen (feet-bgs)	Depth to Water[1] (feet-TOC)
01/29/14	MRWPCA MW-1	PR	MRWPCA	Monitor	Bladder	LDPE tubing	PVC	421	516	404.7
01/29/14	PRTIW	PR	Mission Memorial	Production	Existing	Inline spigot	STEEL	345	445	
01/30/14	FO-07 Shallow	PR	MPWMD	Monitor	Bladder	LDPE tubing	PVC	600	640	453.4
01/30/04	ASR MW-1	SM	MPWMD	Monitor	Existing	Inline spigot	STEEL	480	700	
02/03/14	FO-07 Deep	SM	MPWMD	Monitor	Bladder	LDPE tubing	PVC	800	840	491.3
02/03/14	City of Seaside #4	PR	City of Seaside	Production	Existing	Inline spigot	STEEL	330	550	

Notes:
There is blank casing from 590 to 610 feet-bgs in ASR MW-1
PVC = poly vinyl chloride
PR = Paso Robles Aquifer
SM = Santa Margarita Aquifer

A brief description of the five wells sampled in addition to MRWPCA MW-1 for this investigation is provided below:

FO-7 Shallow and FO-7 Deep: Owned by MPWMD, FO-7 is a nested well located along Eucalyptus Road approximately 2,000 feet northeast of MRWPCA MW-1. One well (FO-7 Shallow) is screened in the Paso Robles Aquifer (600 to 640 feet-bgs), while the other well (FO-07 Deep) is screened in the Santa Margarita Aquifer (800 to 840 feet-bgs). Both wells have long-term water level measurements and are being used to assess local groundwater flow conditions. Due to the small casing diameter (2-inch) and significant depth to water (>450 feet-TOC) in both wells, water quality samples have not been collected from these wells prior to this field program.

Santa Margarita ASR Monitoring Well MW-1: Owned by MPWMD, this well is a formal Margarita ASR site monitor well and is currently used to monitor groundwater quality for the Santa Margarita ASR project. The well has an upper screen from 480 to 590 feet-bgs and a lower screen from 610 to 700 feet-bgs. The well was sampled from a sampling port (spigot) on the existing discharge line. Water was pumped using the existing pump.

PRTIW at Mission Memorial Cemetery: Owned by Mission Memorial Cemetery, the PRTIW well is located west of General Jim Moore Boulevard across from the Santa Margarita ASR wells. This well is screened in the Paso Robles Aquifer from 345 to 445 feet-bgs. The well was sampled from a spigot using the existing pump.

City of Seaside 4: Owned by the City of Seaside, this well is located southwest of the GWR project recharge site west of General Jim Moore Boulevard and south of San Pablo Avenue. The well is screened is screened from 330 to 550 feet-bgs in the Paso Robles Aquifer. The well was sampled from a spigot using the existing pump.

2.3.2. Sampling Procedures

Blaine Tech utilized a low-flow, micro-purge bladder pump (Model QED ST1102) with disposable low-density polyethylene (LDPE) drop tubing to sample MRWPCA MW-1 and both FO-7 wells. A flow-through cell (YSI Model 556) was placed on the discharge line, providing real-time measurement of ORP, dissolved oxygen, pH, temperature, specific conductance, and turbidity. Groundwater quality samples were collected once stability in field parameters was achieved. Elevated turbidity was observed during sampling of all three wells (~80 NTU for MRWPCA MW-1, ~150 NTU for FO-7 Shallow, and ~40 NTU for FO-7 Deep).

Existing pumps and spigots were used to collect groundwater quality samples from the Santa Margarita ASR Monitoring Well, PRTIW, and City of Seaside 4. For this reason, measurements of ORP, pH, temperature, and turbidity were performed only once. Due to the method of sampling from a spigot and the potential for reaction between the water sample and oxygen in the atmosphere, it is likely that ORP measurements overestimate the oxidation potential of water sampled from these wells.

Groundwater quality samples were not filtered in the field prior to collection in sample bottles provided by Alpha Analytical. To satisfy laboratory minimum holding times for all requested analyses, groundwater quality samples were picked up and transported by courier under chain-of-custody to Alpha Analytical Laboratories in Ukiah, CA.

2.3.3. Laboratory Analyses

The groundwater analytical program developed for this investigation considers former land uses with Fort Ord, regulatory requirements for SWRCB DDW Groundwater Replenishment and Reuse (GRRP) projects, and potential site-specific contamination issues. Objectives of the sampling program included the following:

- Characterize the local water quality of the Paso Robles and Santa Margarita aquifers
- Evaluate the source and age of groundwater and timing of recharge in the Paso Robles Aquifer
- Provide data for SWRCB DDW-required baseline sampling for recycled water recharge
- Test for Fort Ord constituents of concern in the area

SWRCB DDW regulations were used to develop a list of parameters for analysis. At a minimum, the draft regulations require analysis of the following Groundwater Replenishment Reuse Project (GRRP) constituent categories in downgradient monitoring wells:

> (1) Priority Toxic Pollutants [chemicals listed in the Water Quality Standards, Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California, and 40 CFR Part 131, Federal Register 65(97), May 18, 2000, p. 31682] specified by the SWRCB DDW, based on review of the GRRP's engineering report
>
> (2) Chemicals with notification levels that the Department has specified, based on a review of the GRRP's engineering report and the affected groundwater basin(s); and
>
> (3) Other chemicals that the SWRCB DDW may specify based on site-specific conditions.

For item (3) above, a complete suite of inorganic analyses that included major anions and cations and total dissolved solids (TDS) were analyzed, allowing for an overall characterization of the groundwater chemistry. Nitrogen compounds and total organic carbon were also included in the analytical program. Nitroaromatic/nitramine compounds detected in soil in the Inland Ranges and further in selected core samples from this investigation were analyzed in groundwater samples. Finally, general physical parameters including hardness, odor, color and turbidity were also included.

The final component of the analysis program includes analytes that provide information on the timing of natural recharge and provide a source signature for the groundwater sample. These data provide an indication of whether groundwater in nearby wells originates from

the same source area and provide insight into flow paths and travel times. For this investigation, stable isotopes (oxygen/hydrogen and nitrogen/oxygen) and radiogenic isotopes (tritium) were analyzed.

3. LABORATORY ANALYTICAL RESULTS

This section presents the results of laboratory core (hydraulic, mineralogical, and leaching test) and groundwater quality analyses conducted for this hydrogeologic investigation. Evaluations of vadose zone storage capacity and estimates for subsurface travel time of recharge water are presented. Additionally, the relevance is discussed of core mineralogical/leaching test results and groundwater quality analyses to the geochemical assessment of recycled water and local groundwater compatibility.

3.1. CORE HYDRAULIC TESTING

Results of the core hydraulic testing are shown in **Table 5**. Statistical measures are discussed for sample groups based on their general lithology. Accordingly, samples of similar lithology are highlighted in the table as follows: coarse-grained sediments (USCS type = SP, SW, or SM) are highlighted in yellow and fine-grained sediments (USCS type = ML or CL) are highlighted in brown.

3.1.1. Total and Effective Porosity

As shown in **Table 5**, the total porosity of Aromas Sand samples (above 405 feet-bgs) falls within a relatively narrow range from 34 to 50 percent. The average total porosity for coarse-grained samples (45 percent) is only slightly higher than that for fine-grained samples (39 percent). In contrast, the effective porosities of Aromas Sand samples cover a relatively broad range from 4 to 40 percent. The average effective porosity for coarse-grained samples in the Aromas Sand (34 percent) is much higher than that for fine-grained samples (9 percent). As shown in the table, the total porosity for each sample can be divided into two components: water-filled and air-filled porosity. Closer examination reveals that the air-filled porosity is similar to the corresponding effective porosity for each sample. This relationship is expected, given that the effective porosity is effectively synonymous with specific yield, which is defined as the amount of water that a unit volume of aquifer (after being saturated) yields by gravity. Due to the smaller pore spaces and limited connection between pores, a fine-grained sediment (silt/clay) typically has a much lower effective porosity/specific yield compared to a coarse-grained sediment (sand).

3.1.2. Vertical Hydraulic Conductivity

As shown in **Table 5**, the estimated (saturated) vertical hydraulic conductivity (Kv) of selected samples covers a broad range (from 0.002 feet per day [feet/day] to greater than 300 feet/day). The average Kv for coarse-grained samples within the Aromas Sand is much higher than that for fine-grained samples. Remarks made in the laboratory reports indicate that laboratory Kv estimates for coarse-grained sediments in the Aromas Sand are likely overestimated as a result of fines migrating out of the sample during the saturation and testing phases. Based on these remarks, a Kv estimate of 20 feet/day for coarse-grained deposits within the Aromas Sand is assumed to be representative of actual in-situ Kv values.

Table 5. Core Hydraulic Testing Results

Discrete Formation Samples			Total Porosity	Air-filled Porosity	Water-filled Porosity	Effective Porosity	Vertical K (K_v)	Lab Remarks
Sample Interval (feet-bgs)	USCS Lithology Type	Lithologic Description	%	%	%	%	feet/day	
27.5 - 30.0	SP	10YR 6/6 Yellowish brown fine sand, moist	46.3	37.9	8.3	39.8	104	a
58.0 - 60.5	SP-SM/SP	58.0-59.0 10YR 5/9 Yellowish brown silty fine sand lenses, dry; 59.0-60.5 10YR 5/9 Yellowish brown fine	47.0	39.3	7.7	36.7	40	a
98.5 - 101	SP-SM	10YR 6/6 Yellowish brown silty fine sand lenses, dry	46.0	39.1	6.9	39.9	54	a
124.5 - 127	SP-SM	10YR 6/6 Yellowish brown silty fine sand, dry	44.6	37.6	7.0	37.5	78	a
139.5 - 142	SP	10YR 5/8 Yellowish brown fine sand, dry	42.6	33.4	9.2	29.5	34	a
174.5 - 177.0	SP	10YR 6/6 Yellowish brown silty fine sand nodules, dry	46.2	40.8	5.4	40.3	52	a
197.0 - 200.0	SM	10YR 6/6 Yellowish brown silty fine sand, dry	44.3	40.4	3.9	36.4	162	a
223.0 - 225.5	SP	10YR 6/6 Yellowish brown fine sand with minor silt, dry	44.7	39.7	5.0	31.1	108	a
259.5 - 262.0	SP	10YR 5/6 Dark yellowish brown fine sand, very moist	47.5	38.9	8.6	35.3	30	a
274.5 - 277.0	SP	10YR 5/6 Dark yellowish brown fine sand, dry	46.0	38.2	7.7	34.6	40	a
297.0 - 298.5	ML	10YR 3/4 Dark yellowish brown dense clayey silt with fine sand, moist	NA	NA	NA	NA	0.01	
298.5 - 301.0	ML/CL/SP	298.5-300.0 10YR 6/4 Light yellowish brown sense clayey silt with fine sand, moist; 300.0-300.7 10YR 6/4 Light yellowish brown silty clay, moist; 300.7-301.0 10YR 7/3 Very pale brown silty fine sand, dry	44.0	3.9	40.2	4.1	0.006	
324.5 - 327	CL/ML	324.5-325.0 10YR 5/4 Yellowish brown silty clay (10/90), moist; 325.0-327.0 10YR 5/4 Yellowish brown clayey silt (20/80), dry	33.7	12.7	21.1	13.1	0.02	
337.0 - 339.0	CL	10YR 6/6 Yellowish brown fine sandy, silty, clay (20/20/60), moist	NA	N/A	NA	NA	0.002	
349.5 - 352.0	SP	10YR 5/8 Yellowish brown fine to medium coarse sand (70/30), dry	41.5	26.3	15.2	26.0	350	a
357.0 - 359.5	SW	10YR 6/4 Light yellowish brown fine to coarse sand, dry	39.8	29.1	10.7	27.7	192	a
377.0 - 379.5	SP	10YR 6/6 Yellowish brown very fine sand, dry	49.5	40.8	8.7	24.3	18	a
405.0 - 407.5	ML	10YR 3/1 Very dark gray clayey silt, very dense, dry	NA	NA	NA	NA	0.11	
417.5 - 420.0	ML	10YR 4/3 Brown fine to medium coarse sandy silt (40/60), dry	NA	NA	NA	NA	0.57	

Notes:
NA = Not Analyzed
a - Vertical conductivity values influenced by significant amount of fines migrated out of sample during saturation and testing phases.
USCS = Unified Soil Classification System
Vertical K = Vertical Hydraulic Conductivity
feet-bgs = feet below ground surface

As expected, Kv estimates of fine-grained lenses in the Aromas Sand are much lower, ranging from 0.002 feet/day to 0.02 feet/day with a median value of 0.01 feet/day.

3.1.3. Vadose Zone Well Capacity Estimates

Vertical hydraulic conductivity estimates of coarse-grained deposits within the Aromas Sand can be used to evaluate the feasibility of injecting proposed GWR project flows (350 AFY) through vadose zone wells and to optimize well design. Specifically, the well discharge (injection) rate can be estimated by applying the following equation developed by Zangar (Bouwer, 1978):

$$Q = \frac{K}{\left(3ln\left(\frac{Lw}{rw}\right)\right)} * (\pi Lw(3Lw + 2Si))$$

where, K = Hydraulic conductivity of the wetted zone, feet/day
Q = Discharge (injection) rate, feet^3/day
Lw = Depth of water in the well, feet
Rw = Effective radius of well, feet
Si = Vertical distance from bottom of the well to the water table or impermeable surface, feet

The equation shows that the injection rate is a function of the hydraulic conductivity of the wetted zone at and beneath the injection well, effective radius of the well (equal to the borehole radius), depth of water in the well during active injection, and the vertical distance from the bottom of the well to the water table or impermeable surface.

For the proposed GWR project, an estimated 350 to 370 AFY of recycled water from the AWTF will be recharged through four vadose zone wells at the GWR recharge site. These annual recharge estimates are based on the availability and amounts of source waters, capacity of the AWTF, minimum delivery targets, and operational guidelines evaluated in the Recharge Impacts Assessment Report (Todd, 2015). Table 1 of the Recharge Impacts Report provides the potential recycled water delivery schedules for the project. The vadose zone injection rate is expected to fluctuate seasonally based on the availability of recycled water sources with maximum monthly rates ranging from 217 to 242 gallons per minute [gpm]), depending on the simulated delivery schedules. Assuming four vadose zone wells, the maximum rate of injection in a single vadose zone well is expected to range from about 54 to 61 gpm.

To determine the effective length of well screen and artificial filter pack needed to accommodate a specific injection rate, the Zangar equation can be re-arranged to solve for the depth of the water in the well (Lw). Assuming a maximum injection rate of 65 gpm per vadose zone well, a hydraulic conductivity of 20 feet/day, effective well (borehole) radius of 1.0 feet, and a conservative vertical distance from the bottom of the well to the water table of 10 feet, the depth of water in the well would only be about 22 feet. This depth to water is

the effective length of well screen with artificial filter pack needed to accommodate the 65 gpm injection rate. For perspective, if the actual hydraulic conductivity of the wetted zone was only 10 feet/day (versus 20 feet/day), the depth of water in the well would increase slightly to 35 feet. As an additional comparison, if all of the recycled water (350 AFY) was injected into one vadose zone well (at a rate of 242 gpm), and assuming a hydraulic conductivity of 20 feet/day, then the estimated depth of water in that well would be about 50 feet. These calculations indicate that the thickness of sand deposits either above or below the silt/clay deposits observed in the lower Aromas Sand at MRWPCA MW-1 are sufficient to accommodate projected injection rates, and that four (or possibly fewer) vadose zone wells can accommodate proposed vadose zone injection rates.

3.1.4. Vadose Zone Flow and Travel Time Estimates

During continuous recharge through a homogeneous, isotropic sediment, a vertical hydraulic gradient of 1.0 can be reasonably assumed within the wetted zone. In turn, the downward velocity of infiltrating water will approach the saturated vertical hydraulic conductivity (Kv). If the downward velocity of recharged water for a given volumetric flow rate is known, then the horizontal cross-sectional area needed to accommodate that volumetric flow rate can be calculated. Beneath a vadose zone well, the horizontal cross-sectional area can be assumed to be a circle with a radius, r.

The cross-sectional area necessary to accommodate a specific injection flow rate could be estimated using the volumetric equation for a cylinder with consideration for the effective porosity of sediments in which recycled water will be temporarily stored, as shown below:

$$V = H\pi r^2 / n$$

$$r = \sqrt{(Vn)/(H\pi)}$$

where, h = cylinder height (equivalent to the downward velocity of infiltrating water over a specific time period)
r = cylinder radius, equivalent to radius of saturation,
n = effective porosity

To use a simplified example, assume that recycled water is injected into one vadose zone well at 65 gpm opposite coarse-grained sediments of the Aromas Sand over a one-day period. Over that one day period, 12,513 cubic feet (ft^3) of water is injected. If the average downward velocity of water through those coarse-grained sediments of the Aromas Sand is equal to the assumed Kv of 20 feet/day, then the length of the wetted zone after 1 day is equal to 20 feet. Assuming the average effective porosity of 34 percent for coarse-grained sediments in the Aromas Sand, the horizontal cross-sectional area of the wetted zone needed to accommodate the volume of injected water is equivalent to a circle with a radius of 24 feet.

Based on the example above, if the vadose zone well screen is positioned 100 feet above fine-grained deposits in the Aromas Sand (located between 295 and 339 feet-bgs), recycled

water will flow downward at a rate of approximately 20 feet/day within a 24-foot radius cylinder beneath the vadose zone well and reach the uppermost fine-grained deposit within a few days (once saturated flow conditions are established following continuous recharge). Fine-grained deposits in the Aromas Sand have a much lower Kv (on average 0.01 feet/day), and water will migrate through these deposits more slowly. As a consequence, recycled water flowing downward through the highly permeable sands will be partially deflected by and flow on the top of fine-grained deposits. The cross-sectional area of the wetted zone will increase until the volumetric flow rate through fine-grained deposits is equal to the rate of infiltrating water from above the top of the fine-grained deposit.

The vadose zone flow process is dynamic and is a function of several factors, including the horizontal hydraulic conductivity of vadose zone sediments, the variable buildup of hydraulic pressure on top of the fine-grained deposit with distance away from the point below the vadose zone well, and the variability of Kv under variable, partially-saturated conditions). However, a preliminary estimate of the cross-sectional area of the wetted zone through the fine-grained deposits can be calculated in the same manner by applying the volumetric equation for the cylinder. Assuming a Kv for fine-grained sediments in the Aromas Sand of 0.01 feet/day and a vertical hydraulic gradient of 1.0 reveals that the cross-sectional area equivalent to a circle with a radius of 1,100 feet is needed to accommodate 65 gpm flowing through the fine-grained deposits in the lower Aromas Sand.

Similar to the calculations in estimating the cross-sectional area of flow through the lithologic deposits of the Aromas Sand, preliminary estimates of vertical travel time can be calculated by assuming 1-dimensional flow conditions and a unit hydraulic gradient of 1.0. As discussed above, it is reasonable to assume that velocities will approach saturated Kv estimates during periods of consistent recharge. Based on the estimated Kv of 20 feet/day, travel time through the coarse-grained sediments of the Aromas Sand is on the order of a few days. However, if vadose zone wells are positioned above the fine-grained units in the Aromas Sand (encountered between 295 and 341 feet-bgs), the travel time for recycled water to travel through the Aromas Sand and reach the top of the Paso Robles Formation increases significantly. Based on an average Kv of 0.01 feet/day and the total thickness of fine-grained deposits of 21.5 feet (occurring between 295 and 341 feet-bgs), the travel time for recycled water to flow through fine-grained deposits of the Aromas sand is estimated at 5.9 years. An additional 3.4 years is needed for recycled water to travel through the 12.5 feet of unsaturated Paso Robles Formation before reaching the current water table at 405 feet-bgs (assuming a Kv of 0.01 feet/day).

It should be recognized that these preliminary travel time estimates do not consider the time required for saturated conditions within the wetted zone to be established and for recycled water to migrate horizontally on top of fine-grained deposits. However, the travel time estimates are conservative (overestimated) as they do not consider the expected rise of the water table to or above the geologic contact between the Aromas Sand and Paso Robles Formation following the initial years of recharge operations. Furthermore, these estimates assume that fine-grained deposits similar to those encountered at MRWPCA MW-1 extend across the GWR project recharge site with similar thickness and/or are not

significantly tilted to allow recycled water to bypass fine-grained deposits and arrive at the water table more quickly (see Section 2.1.7 for discussion of subsurface conditions in the vicinity of the GWR recharge site).

3.2. CORE MINERALOGICAL RESULTS

3.2.1. Mineralogical Composition

A summary of the mineralogical composition and characteristics of sediments representing the Aromas Sand and Paso Robles Formation based on thin-section examination of core samples is presented in **Table 6**. Results of energy dispersive x-ray by x-ray diffraction and x-ray fluorescence analyses of core samples are presented in **Tables 7 and 8**.

3.2.1.1. Aromas Sand

As shown in the tables, the Aromas Sand is largely unconsolidated lithic arkosic sand with silty and sandy-shale interbeds or layers. The arkosic sands are largely composed of mono- and polycrystalline quartz and feldspar with minor amounts of chert and igneous rock fragments such as granite, granodiorite, and rhyolite. Chert and shale, silty shale, and silty mudstone are in the more "shaley" interbedded layers. EcoEngineers (2008) reported that the Aromas Sand ranged from 68 to 71% quartz (SiO_2). X-ray dispersive analysis for this study showed that the Aromas Sand is predominantly silicon dioxide (quartz) which ranges from 46.14% in the more silty interbedded layers to 71.75% in the more quartz-rich layers. Traces of iron oxide and iron hydroxide cement and traces of siderite (iron carbonate) were noted. Minor quantities of clay minerals, largely illite and mixed layered chlorite and smectite (montmorillonite) were also noted. Accessory minerals were detected in trace amounts, including hornblende, biotite, apatite, spinel and epidote; zircon, magnetite, augite, and sphene. Only minor amounts of organic matter were noted. Magnetite and perhaps titanium-bearing ilmenite in the Aromas Sand may contain chromium. In a previous study of the Aromas Aquifer for the Soquel Creek Water District (Todd Engineers, 2002; see also Motzer, 2005), magnetite occurred as a solid solution series with ilmenite.

3.2.1.2. Paso Robles Aquifer

The Paso Robles Aquifer is unconsolidated to semi-consolidated and in places is a consolidated silty mudstone with interbeds of arkosic lithic sand and sandstone. The siltstone is largely matrix supported with partly disaggregated Individual fragments of silty mudstone. Formation mineralogy is more variable than the overlying Aromas Sand consisting (in decreasing order) of monocrystalline and minor polycrystalline quartz, organic matter, feldspar (plagioclase greater than orthoclase), chert, hornblende, mica, and magnetite. Igneous rock fragments when present range from granite to granodiorite. Sedimentary rock fragments consist mostly of mudstone and shale to silty shale. The matrix, when observed in thin sections, shows clay-rich, mixed layered illite and smectite with minor amounts of chlorite and kaolinite. Pyrite (FeS_2) replacement is associated with altered organic matter particles. Feldspars exhibit interparticle dissolution and clay replacement resulting from weathering.

3.2.1.3. Bulk Chemical Analysis

As described in Section 2.2.2.1, a mineralogical analysis serves to define the overall bulk formation chemistry and character of the vadose zone formation and potentially affected aquifer. Bulk sample analysis also contributes to an understanding of naturally-occurring

Table 6. Solid Core Analysis Results: Mineralogical Characterization by Thin-Section Examination

Formation	Aromas Sand	Paso Robles
Characteristics	**7 samples: 27.5' to 367.0'**	**3 samples: 398.5' to 474.5 '**
Lithologic Classification	Unconsolidated lithic arkosic sand to arkosic silty with sandy shale (layers)	Silty mudstone to lithic arkosic sandstone
Textures	• Fine-to medium-grained • Well to moderately sorted and very poorly sorted • Subangular to subrounded grains	• Coarse silt to coarse sand • Very poorly sorted to moderately sorted sandstone • Subangular siltstone fragments • Minor scattered quartz-rich sand grains
Mean Grain Diameter Range (mm)	0.020 to 0.28	0.045 to 0.53
Maximum Grain Diameter Range (mm)	0.75 to 1.51	0.33 to 0.85
Fabric	• Generally unconsolidated to disaggregated sand with minor clay matrix. • Silty layers are quartz and feldspar-rich with sand irregularly spaced in shale groundmass • Parallel bedded and matrix supported quartz and feldspar-rich silt layers	• Siltstone is matrix supported, partly disaggregated fragments • Individual fragments of silty mudstone • Sandstone layers
Mineralogy: approximate decreasing relative abundance	• Quartz: mono- and polycrystalline • Feldspar: plagioclase and orthoclase (plag > ortho) • Igneous rock fragment (RF): granite, granodiorite, rhyolite • Chert • Shale, silty shale, silty mudstone • Traces of hornblende, biotite, apatite, spinel and epidote; zircon, magnetite, augite, sphene. • Minor organic matter	• Quartz: monocrystalline and minor polycrystalline • Organic matter • Feldspar (plag > otho) • Igneous RFs: granite to granodiorite • Mudstone and shale to silty shale RFs • Chert RFs • Organic matter • Hornblende • Mica • Magnetite
Cements/Matrix Constituents	• Authigenic quartz, feldspar, and siderite • Overgrowth on quartz and detrital feldspar • Traces of iron oxide and iron hydroxide cement • Traces of siderite • Clays: illite, mixed layered chlorite, smectite	• Clay-rich; mixed layered illite/smectite • Minor chlorite and kaolinite • Pyrite replacement associated with altered organic matter particles • Feldspars exhibit interparticle dissolution and clay replacement • Pyrite cement
Weathering Characteristics	Feldspar corroded and altered to clay with and comingled amorphous iron oxide cement	• Interparticle dissolution of feldspar with clay replacement Pyrite cement

Notes:
Sample analyses by Mineralogy, Inc., Tulsa, OK. Complete mineralogical analyses in May 5, 2014 Final Test Reports

Table 7. Solid Core Analysis Results: Energy Dispersive X-Ray Analysis

Aromas Sand											
27.5'-30.0'				74.0'-75.5'				98.5'-101.0'			
Element	**Wt %**	**Compound**	**Wt %**	**Element**	**Wt %**	**Compound**	**Wt %**	**Element**	**Wt %**	**Compound**	**Wt %**
Carbon (C)	**3.90**	CO_2	**14.20**	Carbon (C)	**3.91**	CO_2	**14.32**	Carbon (C)	**2.67**	CO_2	**9.77**
Oxygen (O)	**53.24**	**–**	**–**	Oxygen (O)	**53.085**	**–**	**–**	Oxygen (O)	**51.975**	**–**	**–**
Sodium (Na)	**1.92**	Na_2O	**2.58**	Sodium (Na)	**2.18**	Na_2O	**2.93**	Sodium (Na)	**2.24**	Na_2O	**3.02**
Aluminum (Al)	**5.29**	Al_2O_3	**9.99**	Aluminum (Al)	**5.42**	Al_2O_3	**10.24**	Aluminum (Al)	**5.78**	Al_2O_3	**10.91**
Magnesium (Mg)	**–**	MgO	**–**	Magnesium (Mg)	**–**	MgO	**–**	Magnesium (Mg)	**–**	MgO	**–**
Silicon (Si)	**31.84**	SiO_2	**68.12**	Silicon (Si)	**31.54**	SiO_2	**67.47**	Silicon (Si)	**33.03**	SiO_2	**70.65**
Sulfur (S)	—	SO_3	—	Sulfur (S)	**1.64**	SO_3	**4.09**	Sulfur (S)	—	SO_3	—
Potassium (K)	**1.99**	K2O	**2.39**	Potassium (K)	**2.32**	K_2O	**2.8**	Potassium (K)	**2.35**	K_2O	**2.83**
Calcium (Ca)	**0.68**	CaO	**0.95**	Calcium (Ca)	**0.66**	CaO	**0.92**	Calcium (Ca)	**0.99**	CaO	**1.38**
Titanium (Ti)	**0.12**	TiO_2	**0.2**	Titanium (Ti)	**0.1**	TiO_2	**0.17**	Titanium (Ti)	**0.07**	TiO_2	**0.11**
Iron (Fe)	**1.03**	Fe_2O_3	**1.47**	Iron (Fe)	**0.8**	Fe_2O_3	**1.15**	Iron (Fe)	**0.93**	Fe_2O_3	**1.32**
Total	**100.00**	**Total**	**100.00**	**Total**	**100.00**	**Total**	**100.0**	**Total**	**100.00**	**Total**	**100.0**

Aromas Sand											
139.5'-142.0'				200.0'-202.5'				297.0'-298.5'			
Element	**Wt %**	**Compound**	**Wt %**	**Element**	**Wt %**	**Compound**	**Wt %**	**Element**	**Wt %**	**Compound**	**Wt %**
Carbon (C)	**3.05**	CO_2	**11.17**	Carbon (C)	**3**	CO_2	**10.99**	Carbon (C)	**8.67**	CO_2	**31.78**
Oxygen (O)	**52.565**	**–**	**–**	Oxygen (O)	**51.885**	**–**	**–**	Oxygen (O)	**56.185**	**–**	**–**
Sodium (Na)	**2.04**	Na_2O	**2.76**	Sodium (Na)	**2.19**	Na_2O	**2.95**	Sodium (Na)	**0.84**	Na_2O	**1.13**
Magnesium (Mg)	**–**	MgO	**–**	Magnesium (Mg)	**–**	MgO	**–**	Magnesium (Mg)	**2.18**	MgO	**3.61**
Aluminum (Al)	**5.83**	Al_2O_3	**11.02**	Aluminum (Al)	**4.94**	Al_2O_3	**9.34**	Aluminum (Al)	**4.34**	Al_2O_3	**8.19**
Silicon (Si)	**32.82**	SiO_2	**70.22**	Silicon (Si)	**32.58**	SiO_2	**69.69**	Silicon (Si)	**21.57**	SiO_2	**46.14**
Sulfur (S)	—	SO_3	—	Sulfur (S)	**1.64**	SO_3	**4.09**	Sulfur (S)	—	SO_3	—
Potassium (K)	**1.99**	K_2O	**2.39**	Potassium (K)	**3.03**	K_2O	**3.65**	Potassium (K)	**1.16**	K_2O	**1.39**
Calcium (Ca)	**0.65**	CaO	**0.91**	Calcium (Ca)	**1.06**	CaO	**1.49**	Calcium (Ca)	**1.93**	CaO	**2.7**
Titanium (Ti)	**0.13**	TiO_2	**0.21**	Titanium (Ti)	**-**	TiO_2	**-**	Titanium (Ti)	**0.23**	TiO_2	**0.38**
Iron (Fe)	**0.94**	Fe_2O_3	**1.34**	Iron (Fe)	**3.33**	Fe_2O_3	**1.9**	Iron (Fe)	**2.33**	Fe_2O_3	**3.33**
Total	**100.0**	**Total**	**100.0**	**Total**	**100.0**	**Total**	**100.0**	**Total**	**100.0**	**Total**	**100**

Notes:
X-Ray Analysis summary from Mineralogy, Incorporated, Tulsa, OK May 5, 2014 Final Test Report

Table 7. Solid Core Analysis Results: Energy Dispersive X-Ray Analysis (continued)

Aromas Sand				Paso Robles							
364.5'-367.0'				398.5'-401.0'				433.0'-435.0'			
Element	**Wt %**	**Compound**	**Wt %**	**Element**	**Wt %**	**Compound**	**Wt %**	**Element**	**Wt %**	**Compound**	**Wt %**
Carbon (C)	**2.49**	CO_2	**9.13**	Carbon (C)	**4.62**	CO_2	**16.93**	Carbon (C)	**5.92**	CO_2	**21.69**
Oxygen (O)	**51.605**	—	—	Oxygen (O)	**52.785**	—	—	Oxygen (O)	**53.855**	—	—
Sodium (Na)	**1.57**	Na_2O	**2.11**	Sodium (Na)	**0.92**	Na_2O	**1.24**	Sodium (Na)	**1.86**	Na_2O	**2.51**
Magnesium (Mg)	—	MgO	-	Magnesium (Mg)	**2.23**	MgO	**3.7**	Magnesium (Mg)	**0.79**	MgO	**1.31**
Aluminum (Al)	**5.2**	Al_2O_3	**9.82**	Aluminum (Al)	**8.03**	Al_2O_3	**15.16**	Aluminum (Al)	**6.09**	Al_2O_3	**11.5**
Silicon (Si)	**33.54**	SiO_2	**71.75**	Silicon (Si)	**23.14**	SiO_2	**49.49**	Silicon (Si)	**25.6**	SiO_2	**54.76**
Sulfur (S)	—	SO_3	—	Sulfur (S)	**1.64**	SO_3	**4.09**	Sulfur (S)	—	SO_3	—
Potassium (K)	**3.56**	K_2O	**4.29**	Potassium (K)	**0.88**	K_2O	**1.07**	Potassium (K)	**1.06**	K_2O	**1.28**
Calcium (Ca)	**1.09**	CaO	**1.53**	Calcium (Ca)	**1.15**	CaO	**1.61**	Calcium (Ca)	**1.47**	CaO	**2.06**
Titanium (Ti)	-	TiO_2	—	Titanium (Ti)	**0.44**	TiO_2	**0.74**	Titanium (Ti)	**0.37**	TiO_2	**0.62**
Iron (Fe)	**0.96**	Fe^2O_3	**1.37**	Iron (Fe)	**4.17**	Fe_2O_3	**5.96**	Iron (Fe)	**2.99**	Fe_2O_3	**4.28**
Total	**100.0**	**Total**	**100.0**	**Total**	**100.0**	**Total**	**100.0**	**Total**	**100.0**	**Total**	**100.0**

Paso Robles			
472.0'-474.5'			
Element	**Wt %**	**Compound**	**Wt %**
Carbon (C)	**4.2**	CO_2	**15.41**
Oxygen (O)	**52.945**	—	—
Sodium (Na)	**1.44**	Na_2O	**1.95**
Magnesium (Mg)	—	MgO	-
Aluminum (Al)	**4.47**	Al_2O_3	**8.45**
Silicon (Si)	**30.84**	SiO_2	**65.98**
Sulfur (S)	—	SO_3	—
Potassium (K)	**2.25**	K_2O	**2.71**
Calcium (Ca)	**1.47**	CaO	**2.06**
Titanium (Ti)	**0.24**	TiO_2	**0.4**
Iron (Fe)	**2.13**	Fe_2O_3	**3.05**
Total	**100.0**	**Total**	**100.0**

Notes:

X-Ray Analysis summary from Mineralogy, Incorporated, Tulsa, OK May 5, 2014 Final Test Report

Table 8. Solid Core Analysis Results: Major Elements as Oxides from X-Ray Fluorescence Analysis

		Formation:	Aromas Sand								Paso Robles		
Analyte	**Method**	**Units**	**RL**	**27.5'-30.0'**	**74.0'-75.5'**	**98.5'-101.0'**	**139.5'-142.0'**	**200.0'-202.5'**	**297.0''-298.5'**	**364.5'-367.0'**	**398.5'-401.0'**	**433.0'-435.0'**	**472.0'-474.5'**
Major Elements as Oxides (XRF or Total Dissolution)													
Aluminum Oxide (Al_2O_3)	SW6020	wt%	0.280	8.7	10	10	9.8	10	6.6	14	12	9.9	8.0
Barium Oxide (BaO)	SW6020	wt%	0.056	0.10	0.10	0.10	0.10	0.11	0.062	0.10	ND	0.064	0.078
Calcium Oxide (CaO)	SW6020	wt%	0.360	0.99	1.1	1.1	0.98	1.3	2.2	1.2	1.8	2.1	1.9
Iron Oxide (FeO)	SW6020	wt%	0.019	0.70	0.62	0.55	0.72	0.64	1.8	0.68	5.0	2.8	1.6
Potassium Oxide (K_2O)	SW6020	wt%	0.150	2.8	3.1	3.0	2.9	3.2	1.4	2.8	1.6	1.5	1.7
Magnesium Oxide (MgO)	SW6020	wt%	0.025	0.18	0.17	0.18	0.20	0.22	2.3	0.22	2.7	1.0	0.45
Manganese Oxide (MnO)	SW6020	wt%	0.026	ND	ND	ND	ND	ND	0.11	ND	0.052	0.028	ND
Sodium Oxide (Na_2O)	SW6020	wt%	0.020	2.00	2.2	2.3	2.0	2.4	1.2	2.10	1.2	2.2	2.0
Phosphorous pentoxide (P_2O_5)	SW6010B	%	0.0035	0.020	0.027	0.026	0.024	0.035	0.093	0.066	0.13	0.094	0.14
Silicon Dioxide (SiO_2)	SW6010B	%	0.032	4.0	1.1	1.4	1.1	1.6	1.4	0.64	1.1	0.78	1.1
Strontium Oxide (SrO)	SW6020	wt%	0.024	0.028	0.032	0.032	0.029	0.034	0.030	0.032	ND	0.035	0.036
Titanium Oxide (TiO_2)	SW6020	wt%	0.025	0.099	0.075	0.068	0.094	0.083	ND	0.080	0.57	0.27	0.14

Notes:
Sum of major elements as oxides are less than expected 100 percent, due to incomplete digestion primarily of silica dioxide, which is typically in the 75 to 99 percent range.
(See McCampbell Analytical explanation of issues pertaining to major elements as oxide analysis in Appendix E)
Core samples collected from Sonic Drilling cores collected in MW-1 boring at depth in feet (') below ground surface.
EPA = U.S. Environmental Protection Agency
mg/kg = milligram per kilogram
µg/kg = micrograms per kilogram
wt % = weight percent
ND = Not detected or below method reporting limits (RL)
SM = Standard Method

constituents in the analyzed formations that may be dissolved by recharge water and in turn possibly impact shallow groundwater. These may be essential for both a conceptual and geochemical model.

Table 7 shows results of the x-ray dispersive analysis as conducted by Mineralogy, Inc. The analysis shows the weight percent for detected elements derived from the x-ray dispersive peaks; these were then normalized to give elemental oxide compound formula in weight percent. The sum of both the elemental analyses and compound formula is 100 percent. Their complete report showing the energy dispersive x-ray peaks for each detected element is in **Appendix E**.

X-ray fluorescence analysis was conducted by McCampbell Analytical with their results shown on **Table 8.** It is noted that the results are less than the expected 100 percent for the major oxide analyses. This apparent error is due to incomplete digestion primarily of silica dioxide, which is typically in the 75 to 99 percent range (see McCampbell Analytical explanation of issues pertaining to major elements as oxide analysis in **Appendix E**).

3.2.2. Other Parameters

Table 9 summarizes the results of solid core analyses for exchangeable cations, other ions, and nitroaromatic/nitramine (explosive) compounds.

3.2.2.1. Cation Exchange Capacity (CEC)

Ion exchange in minerals, organic matter and clays depends on the crystalline structure and on the chemical composition of any solution in contact with that structure. Clay minerals are particularly important in ion-exchange reactions because ion exchange reactions in clays are reversible due to chemical reactions taking place between ions attached to the mineral's surface and ions in a solution in contact with that surface. Generally, the excess charge on the mineral is negative; therefore, it attracts cations from solution to neutralize this charge. Ion-exchange capacity is commonly measured in chemical equivalents of a base adsorbed at pH 7. The CEC measures the ability of a soil to adsorb cations in exchangeable forms, and ranges are calculated on the basis of a standard (in milliequivalents per 100 grams or meq/100g) as shown on **Table 10**.

Table 9 contains "raw" or uncorrected CEC data for the extraction that used ammonium acetate as an exchange reagent. The major cations: barium (Ba), calcium (Ca), lithium (Li), magnesium (Mg), sodium (Na), potassium, strontium (Sr) are reported in milligrams per kilograms (mg/kg). This method has been recommended by the Soil Science Society of America (SSSA) because it is highly repeatable, precise, a direct measure of a soil's CEC, and is useful for alkaline (pH greater than 7) soils common in the west where hydrogen ion (H^+) concentrations do not have taken into account as in acid soils. However, to compare different soil CECs, the uncorrected data must be converted to a standard given in meq/100g. A CEC calculator was used to determine the standard CECs in meq/100g as summarized in **Table 11.**

Table 9. Solid Core Analysis Results: Exchangeable Cations, Other Ions, Nitroaromatics/Nitramines

		Formation:		Aromas Sand							Paso Robles		
Analyte	**Method**	**Units**	**RL**	**27.5'-30.0'**	**74.0'-75.5'**	**98.5'-101.0'**	**139.5'-142.0'**	**200.0'-202.5'**	**297.0''-298.5'**	**364.5'-367.0'**	**398.5'-401.0'**	**433.0'-435.0'**	**472.0'-474.5'**
Exchangeable Cations using Ammonium Acetate (SSSA Pt 3, Ch 40)													
Barium (Ba)	SW6020	mg/kg	0.50	10	9.5	8.9	20	9.9	17	8.3	12	9.2	12
Calcium (Ca)	SW6020	mg/kg	100	150	450	130	180	180	2,500	220	3,300	2,900	910
Lithium (Li)	SW6020	mg/kg	0.050	ND	ND	ND	ND	ND	ND	ND	0.30	0.24	ND
Magnesium (Mg)	SW6020	mg/kg	20	110	120	91	110	80	780	52	840	750	340
Potassium	SW6020	mg/kg	5.0	15	57	21	32	36	90	22	180	140	78
Sodium (Na)	SW6020	mg/kg	10	60	71	46	64	52	200	52	160	160	99
Strontium (Sr)	SW6020	mg/kg	2.0	3.3	2.9	2.3	4.2	3.1	27	2.3	31	24	11
Other Ions:													
Phosphorous (P)	SW6010B	mg/kg	15	88	120	110	110	150	4,000	290	570	410	610
Chromium-6 [Cr(VI)]	SW7199	mg/kg	4.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perchlorate (ClO_4^-)	EPA 6850	µg/kg	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Nitrogen (N)	EPA 415.1	mg/kg	200	310	210	420	450	380	1,500	770	1,000	560	710
Total Organic Carbon (TOC)	SM 5310Bm	mg/kg	200	ND	ND	ND	ND	ND	19,000	ND	9,300	ND	340
Nitroaromatics and Nitramines (Explosives):													
2-Am-DNT	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Am-DNT	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DNB	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-DNT	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-DNT	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HMX	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NB	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-NT	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-NT	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-NT	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RDX	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-TNB	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-TNT	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetyl	SW8330	mg/kg	0.080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes: EPA = U.S. Environmental Protection Agency mg/kg = milligram per kilogram ND = Not detected or below method reporting limits (RL)

Table 10. Ranges of Cation Exchange Capacity for Different Minerals and Soils

Mineral	CEC (meq/100g)	Soil	CEC (meq/100g)
Chlorite	10-40	Organic Matter	>200
Illite	10-40	Sand (general)	2-7
Kaolinite	3-15	Sand (light colored	3-5
Smectite (Montmorillonite)	80-150	Sandy loam	2-18
Vermiculite	100-150	Loam	8-22
Glauconite	20	Silt loam	9-27
Palygoskite	20	Clay loam	4-32
Oxides and hydroxides	2-6	Clay	5-60

Sources: Carroll (1959); Langmuir, et al. (2004).

Table 11 shows that the Aromas Sand has an average CEC of 4.70 meq/100 g. This is consistent with known sand CEC ranges as shown in **Table 10** and an average CEC of 4.9 meq/100g for Aromas Sand analyses conducted by EcoEngineers (2008) for the Monterey Peninsula Water Management District's Phase 1 ASR project. One depth interval (297.0 to 298.5 feet) had a CEC of 19.859 meq/100g consistent with a silt-clay interval at this depth. The Paso Robles Aquifer had a CEC average of 17.93 common to silt and clays, which dominate the Paso Robles Aquifer.

Table 11. Summary of Aromas Sand and Paso Robles Aquifer Cation Exchange Capacity (CEC)

Cation	Aromas Sand: meq/100g							
	27.5-30.0'	74.0-75.5'	98.5-101.0'	139.5-142.0	200.0-202.5'	297.0-298.5	364.5-367.0	Average
Ba^{2+}	0.015	0.014	0.013	0.029	0.014	0.025	0.012	0.02
Ca^{2+}	0.735	2.206	0.637	0.882	0.882	12.255	1.078	2.67
Li^{+}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Mg^{2+}	0.905	0.749	0.749	0.905	0.658	6.417	0.428	1.54
K^{+}	0.038	0.146	0.054	0.082	0.092	0.230	0.056	0.10
Na^{+}	0.261	0.309	0.200	0.278	0.226	0.870	0.226	0.34
Sr^{2+}	0.137	0.007	0.005	0.010	0.007	0.062	0.005	0.03
H^{+}	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
TOTAL	**2.091**	**3.430**	**1.658**	**2.186**	**1.880**	**19.859**	**1.806**	**4.70**

Cation	Paso Robles: meq/100g			
	398.5-401.0'	433.0-435.0'	472.0-476.5	Average
Ba^{2+}	0.017	0.013	0.017	0.02
Ca^{2+}	16.176	14.216	4.461	11.62
Li^{+}	0.000	0.004	0.000	0.00
Mg^{2+}	6.911	6.170	2.797	5.29
K^{+}	0.460	0.358	0.200	0.34
Na^{+}	0.696	0.696	0.431	0.61
$Sr2^{+}$	0.055	0.071	0.025	0.05
H^{+}	0.000	0.000	0.000	0.00
TOTAL	**24.316**	**21.529**	**7.931**	**17.93**

Note: CEC reported in mg/kg recalculated in milliequivalents per 100 grams (meq/100g)
Sample depth interval in feet (') below ground surface
H^{+} input for acid soils only.

3.2.2.2. Percent of Base Saturation

The percent of base saturation is defined as the relative availability of exchangeable cations; it is calculated by dividing each of the cation's CEC in meq/100g by the total amount of meq/100g multiplied by 100. In a leaching environment, a gradual loss of base cations would be expected. **Table 12** shows that for the Aromas Sand and Paso Robles Aquifer, Ca^{2+} dominates as the exchangeable cations as follows:

$$Ca^{2+} > Mg^{2+} > Na^{+} > K^{+} > Sr^{2+} > Ba^{2+} > Li^{+}$$

The Aromas Sand has such low CECs that the amount of cations that could be leached and transported is very low. The amount of leachable cations in the Paso Robles (most likely dominated by clays in the mudstone and weathered feldspar) is much higher. Thus, some cation exchange is expected. While the CEC of Paso Robles sediments is higher compared to Aromas Sand, because of its limited unsaturated thickness, CEC processes are not expected to significantly impact groundwater quality with respect to drinking water standards and thus were not further evaluated through geochemical modeling.

Table 12. Summary of Aromas Sand and Paso Robles Formation Cation Base Saturation in Percent (%)

Cation	Aromas Sand : % Base Saturation							
	27.5-30.0'	74.0-75.5'	98.5-101.0'	139.5-142.0	200.0-202.5'	297.0-298.5	364.5-367.0	Average
Ba^{2+}	0.70	0.40	0.78	1.33	0.77	0.12	0.67	**0.68**
Ca^{2+}	35.16	64.32	38.44	40.36	46.93	61.71	59.71	**49.52**
Li^{+}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Mg^{2+}	43.28	21.83	45.16	41.39	35.00	32.31	23.69	**34.67**
K^{+}	1.84	4.25	3.24	3.74	4.90	1.16	3.12	**3.18**
Na^{+}	12.48	9.00	12.07	12.73	12.03	4.38	12.52	**10.75**
Sr^{2+}	6.55	0.19	0.32	0.44	0.38	0.31	0.29	**1.21**
H^{+}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	**100.00**

Cation	Paso Robles: % Base Saturation			
	398.5-401.0'	433.0-435.0'	472.0-476.5	Average
Ba^{2+}	0.07	0.06	0.22	**0.12**
Ca^{2+}	66.53	66.03	56.25	**62.93**
Li^{+}	0.00	0.02	0.00	**0.01**
Mg^{2+}	28.42	28.66	35.27	**30.78**
K^{+}	1.89	1.66	2.52	**2.02**
Na^{+}	2.86	3.23	5.43	**3.84**
Sr^{2+}	0.23	0.33	0.32	**0.29**
H^{+}	0.00	0.00	0.00	**0.00**
TOTAL	100.00	100.00	100.00	**100.00**

Note: CEC reported in mg/kg recalculated in milliequivalents per 100 grams (meq/100g) (see previous table) and calculated on a percent basis of total exchangeable cations.
Sample depth interval in feet (') below ground surface.

3.2.2.3 Other Ions and Explosive Compounds

As shown in **Table 9**, concentrations of chromium(VI), perchlorate, and nitroaromatic/nitramine (explosive) compounds in all 10 samples analyzed were below method reporting limits. Chromium as Cr(VI) probably occurs at low concentrations (µg/kg) sorbed to iron oxide-hydroxide coatings either on quartz grains and/or iron oxide-hydroxides in the matrix of the Aromas Sand.

Detectable concentrations of phosphorous occur in the Aromas Sand (88 to 4,000 mg/kg) and Paso Robles Aquifer (410 to 610 mg/kg). Phosphorous commonly occurs in the accessory mineral apatite [hydrated calcium phosphate or $Ca_5(PO_4)_3(OH)$] which has been identified in the mineralogical sample analysis by Mineralogy, Inc. (see **Appendix E**). Phosphorous most likely occurs as phosphate (PO_4^{2-}) and numerous studies have been conducted on adsorption of PO_4^{2-} to iron oxide and aluminum oxide surfaces (see for example Torrent, et al., 1990; Rene, et al., 2001; Antelo, et al., 2005).

Detectable total nitrogen (N) occurs throughout the Aromas and Paso Robles, most likely occurring either as nitrate (NO_3^2) nitrogen-rich organic compounds either sorbed to quartz grain surfaces or to iron oxide-hydroxide coatings. Total organic carbon (TOC) is present in the Aromas Sand at 19,000 mg/kg and in the Paso Robles at 9,300 mg/kg. The TOC is from organic rock fragments detected in the matrix fraction as identified in the Mineralogical, Inc. report (**Appendix E**).

3.3. Hydroxylamine - Hydrochloride (HA-HCl) Extraction for Ferric Hydroxide (FeOH)

Table 13 summarizes the results of the Hydroxylamine-Hydrochloride Extraction Test conducted on two coarse-grained sand samples from the Aromas Sand. This analytical procedure was developed by Mahoney Geochemical Consulting, LLC (MGH) (Mahoney, 2013). The method allows measurement of the amount of hydrous ferric oxide in a soil sample. Hydrous (amorphous) ferric oxide (HFO) is considered to be the primary sorbent phase for arsenic (As), chromium (Cr), divalent metals, and uranium (U) in soils. Because HA-HCl is a reducing agent, it reduces the sample's HFO. The low pH and high chloride concentration then stabilizes the dissolved ferrous iron. The analyzed HFO concentration can then be used to model trace metal adsorption using PHREEQC surface complexation models. Similarly, manganese oxides (MnO_x) also act as a sorbent, and this procedure may also quantify the amount of manganese oxide. Variations of MGH's procedure have been used in many applications; slight variations are allowed as long as the overall goal is met.

HA-HCl analysis was performed for two Aromas Sand samples, which were analyzed for aluminum (Al), arsenic (As), calcium (Ca), chromium(VI), ferric hydroxide (as iron) (FeOH), lead (Pb), magnesium (Mg), manganese (Mn), mercury (Hg), selenium (Se), uranium (U), and silica (for iron oxide) (SiO_2). Detectable amounts in mg/kg of Al, As, Ca, FeOH, Pb, Mg, Mn and SiO_2 are present in the sorbed iron oxide phases that coated quartz grains or are present as oxide matrices in the Aromas Sand. The detectable As, Cr(VI) and Pb concentrations were used in the geochemical modeling.

Table 13. Hydroxylamine-Hydrochloride (HA-HCl) Extraction Test

			Formation:	Aromas Sand	
Analyte	**Method**	**Units**	**RL**	**200-202.5'**	**364.5-367.0**
Aluminum (Al)	HH/TM-7	mg/kg	50	2,400	1,800
Arsenic (As)	HH/TM-7	mg/kg	0.50	1.8	0.72
Calcium (Ca)	HH/TM-7	mg/kg	100	810	820
Chromium-6 [Cr(VI)]	HH/TM-7	mg/kg	0.40	ND	ND
Ferric Hydroxide as Iron	HH/TM-7	mg/kg	20	3,300	2,500
Lead (Pb)	HH/TM-7	mg/kg	0.50	1.1	0.73
Magnesium (Mg)	HH/TM-7	mg/kg	20	770	590
Manganese (Mn)	HH/TM-7	mg/kg	20	37	37
Mercury	HH/TM-7	mg/kg	0.05	ND	ND
Selenium (Se)	HH/TM-7	mg/kg	0.50	ND	ND
Uranium (U)	HH/TM-7	mg/kg	0.50	ND	ND
Silica for Iron Oxide	HH/TM-7	mg/kg	11.0	6,500	5,200

Notes:
Core samples collected from sonic drilling cores collected in MW-1 boring at depth in feet (') below ground surface.
mg/kg = milligram per kilogram
ND = Not detected or below method reporting limits (RL)
HH/TM-7 = Hydroxylamine-Hydrochloride Extraction Test Procedure (Mahoney Geochemical, 2013)

3.4. CORE LEACHING TEST RESULTS WITH PILOT WATER

3.4.1. Pilot Recycled Water Quality

Water quality results for pilot recycled water used in core leaching tests are presented in **Table 14**. Pilot water was prepared by Trussell Technologies LLC of Oakland, California. As shown in the table, the pilot water is relatively depleted of most minerals and has a TDS concentration of 74 mg/L. Stabilization procedures included the addition of calcium chloride and sodium hydroxide to raw permeate to increase alkalinity followed by bubbling CO_2 below $CaCO_3$ saturation to reduce pH. The pilot water has a resulting Langelier Saturation Index (LSI) of -1.6, which is slightly more negative (i.e., has a slightly greater leaching potential) than the proposed full-scale stabilized AWTF water. The pilot water also has a relatively high positive oxidation-reduction potential of 629 mV, indicating that the pilot water will oxidize reduced species in its presence.

Detectable cations (Ba^{2+}, Ca^{2+}, N^{+}, and K^{+}) and detectable anions (Cl^{-} and NO_3^{-} as N and as nitrate, and SO_4^{2-}) were present, which are to be expected from the addition of calcium chloride ($CaCl_2$) and sodium hydroxide (NaOH) to stabilize the raw permeate. However, it should be noted that the detected anions were also present in the laboratory blank suggesting that some anions may be an artifact of laboratory contamination.

Chromium VI [Cr(VI)] was detected in the analyzed pilot water at 0.21 µg/L. The presence of Cr(VI) may be the result of Cr^{3+} ions in the permeate water subsequently oxidized to Cr^{6+} ions after UV oxidation/ozonization. Ionic Cr^{3+} and/or Cr^{6+} have smaller ionic diameters (0.138 nm and 0.104 nm, respectively; see Railsback, 2004) than the ultrafilter pores (≥3.0 nm in diameter); therefore, it is possible that Cr ions could pass through the utrafilter pores. The detected Cr(VI) was taken into account in the geochemical modeling.

Table 14. Stabilized Pilot Recycled Water Quality

Analyte	Method	Units	RL	Results
CCR 17 Metals+ Miscellaneous Elements:				
Aluminum (Al)	EPA 200.8	µg/L	500	ND
Antimony (Sb)	EPA 200.8	µg/L	5.0	ND
Arsenic (As)	EPA 200.8	µg/L	5.0	ND
Barium (Ba)	EPA 200.8	µg/L	50	140
Beryllium (Be)	EPA 200.8	µg/L	5.0	ND
Cadmium (Cd)	EPA 200.8	µg/L	2.5	ND
Calcium (Ca)	EPA 200.8	µg/L	1,000	11,000
Chromium (Cr)	EPA 200.8	µg/L	5.0	ND
Cobalt (Co)	EPA 200.8	µg/L	5.0	ND
Copper (Cu)	EPA 200.8	µg/L	5.0	ND
Iron (Fe)	EPA 200.8	µg/L	200	ND
Lead (Pb)	EPA 200.8	µg/L	5.0	ND
Lithium (Li)	EPA 200.8	µg/L	50	ND
Magnesium (Mg)	EPA 200.8	µg/L	50	ND
Manganese (Mn)	EPA 200.8	µg/L	200	ND
Mercury (Hg)	EPA 200.8	µg/L	0.25	ND
Molybdenum (Mo)	EPA 200.8	µg/L	5.0	ND
Nickel (Ni)	EPA 200.8	µg/L	5.0	ND
Potassium (K)	EPA 200.8	µg/L	500	2,000
Selenium (Se)	EPA 200.8	µg/L	5.0	ND
Silver (Ag)	EPA 200.8	µg/L	1.0	ND
Sodium (Na)	EPA 200.8	µg/L	1,000	19,000
Strontium (Sr)	EPA 200.8	µg/L	200	ND
Thallium (Tl)	EPA 200.8	µg/L	5.0	ND
Uranium (U)	EPA 200.8	µg/L	5.0	ND
Vanadium V)	EPA 200.8	µg/L	5.0	ND
Zinc (Zn)	EPA 200.8	µg/L	50	ND
Anions:				
Bromide (Br)	EPA 300.1	mg/L	0.10	ND
Chloride (Cl)	EPA 300.1	mg/L	0.10	2.0*
Fluoride (F)	EPA 300.1	mg/L	0.10	ND
Nitrate (NO_3) as N	EPA 300.1	mg/L	0.10	0.64*
Nitrate as NO_3	EPA 300.1	mg/L	0.10	2.8*
Nitrite (NO_2) as N	EPA 300.1	mg/L	0.10	ND
Nitrite as N	EPA 300.1	mg/L	0.10	ND
Sulfate (SO_4)	EPA 300.1	mg/L	0.10	0.11*
Total and Speciated Alkalinity as $CaCO_3$:				
Total	SM 2320B	mg $CaCO_3$/L	1.0	43.0
Carbonate ($CaCO_3$)	SM 2320B	mg $CaCO_3$/L	1.0	ND
Bicarbonate (HCO_3)	SM 2320B	mg $CaCO_3$/L	1.0	43.0
Hydroxide (OH)	SM 2320B	mg $CaCO_3$/L	1.0	ND
Other Ions/Compounds:				
Phosphorous (P)	EPA 200.7	µg/L	500	ND
Silicon (Si)	EPA 200.7	µg/L	500	520
Chromium-6 [Cr(VI)}	EPA 218.6	µg/L	0.20	0.21
Chlorine (Cl_2)	SM 4500-CI DE	mg/L	0.40	2.1
Dissolved Organic Carbon (DOC)	EPA 415.3	µg/L	0.70	1.3
Inorganic Carbon (IC) as CO_2	EPA 415.3	mg/L	3.7	40
Sulfide (S^{2-})	SM 4500 S-2D	mg/L	0.050	ND
Total Ammonia as N	EPA 350.1	mg/L	0.10	1.3
Total Kjeldahl Nitrogen (TKN) as N	EPA 351.2	mg/L	0.30	1.4

Table 14. Stabilized Pilot Recycled Water Quality (continued)

Analyte	Method	Units	RL	Results
Additional Parameters:				
Dissolved Oxygen (DO)	SM 4500 OG	mg DO/L @ °C	1.00	8.57 @23.1 °C
Oxygen Reduction Potential (ORP)	SM 2580B	±,mV vs. NHE	636	636 @26.3 °C
pH	SM 4500H+B	pH units @ 25 °C	0.05**	7.70
Specific Conductivity (EC)	SM2510B	µmhos/cm @ 25 °C	10.0	139
Langelier Saturation Index (LSI)	calculated	—	—	−1.6

Notes:
Pilot Water sample produced and stabilized by Trussell Technologies, Inc., Oakland, CA. Delivered to Todd Groundwater on February 12, 2014; transported to McCampbell Analytical, Inc. (McCampbell), Pittsburg, CA by Todd Groundwater.
Analyzed by McCampbell from April 24, 2014 to May 2, 2014. Final report on May 16, 2014.
* = detected in laboratory method blank
** = accuracy
CCR 17 = California Code of Regulations Title 22 metals also known as California Assessment Manual (CAM) 17 metals
EC = Electrical conductivity or Specific Conductance
EPA = U.S. Environment al Protection Agency
mg/L = milligram per liter or parts per million (ppm)
µg/L = micrograms per liter or parts per billion (ppb)
µmhos/cm = micro mhos per centimeter equivalent to µS/cm (microSiemans per centimeter)
ND = Not detected or below method reporting limits (RL)
SM = Standard Method

3.4.2. Core Leaching Test Results

Table 15 summarizes the results from core leaching tests. Key findings summarized by constituent are presented below based on the comparison of leachate concentration and respective drinking water standard. It is noted that measured leachate concentrations represent the concentration of a 5:1 pilot water-to-rock ratio used in the modified TCLP extraction procedure. Assuming 30 percent porosity and a specific gravity of 2.65 for rock, the leaching test concentrations shown in **Table 15** theoretically represent the average concentration of the initial 30.9 pore volumes of pilot water passing through the selected sample. Whether or not initial pore volume average concentrations in leachate would be sustained or decrease following additional flushes of pilot water is dependent on the amount of constituent present and associated reaction geochemistry. The effects of pore water dilution and reaction geochemistry between pilot water and formation materials is considered in the geochemical modeling assessment.

3.4.2.1. Leachate Metals

Aromas Sand Samples: Of the six (6) Aromas Sand leachate samples analyzed, concentrations for the following metals (excluding major cations) were detected within their respective regulatory limit:

- Arsenic (2 samples: 5.5 and 7.6 µg/L in 74.0 – 75.5 and 364.5 – 367.0 feet-bgs samples, respectively)
- Barium (4 samples: 8 to 930 µg/L in samples from 74.5 to 367.0 feet-bgs)

- Chromium (total) (2 samples: 24.0 and 6.2 µg/L in 297.0 – 298.5 and 364.5 – 367.0 feet-bgs samples, respectively)
- Copper (1 sample: 33 µg/L in 297.0 – 298.5 feet-bgs sample)
- Lead (1 sample: 11 µg/L in 297.0 – 298.5 feet-bgs sample)
- Zinc (3 samples: 59 to 550 µg/L in samples from 200.0 to 367.0 feet-bgs)

Of the six (6) Aromas Sand leachate samples analyzed, concentrations of the following metals (excluding major cations) exceeded their respective regulatory limit:

- Aluminum (two samples: 4,300 and 4,800 µg/L in 297.0 – 298.5 and 364.5 – 367.0 feet-bgs samples, respectively),
- Cadmium (1 sample: 6.0 µg/L in 297.0 – 298.5 feet-bgs sample)
- Iron (three samples: 1,100 to 8,700 µg/L from 200.0 to 367.0 feet-bgs)
- Manganese (1 sample: 360 µg/L in 297.0 – 298.5 feet-bgs sample)

Paso Robles Samples: Of the two (2) Paso Robles leachate samples analyzed, concentrations for the following metals (not including major cations) were detected within their respective regulatory limit:

- Aluminum (1 sample: 970 µg/L in 398.5 – 401.0 feet-bgs sample)
- Barium (2 samples: 50 and 200 µg/L in 398.5 – 401.0 and 433.0 – 435.0 feet-bgs samples, respectively)
- Zinc (1 sample: 500 µg/L in 398.5 – 401.0 feet-bgs sample)

Of the two (2) Paso Robles leachate samples analyzed, concentrations of the following metals exceeded their respective regulatory limit:

- Cadmium (1 sample: 24.0 µg/L in 398.5 – 401.0 feet-bgs sample)
- Iron (1 sample: 48,000 µg/L in 398.5 – 401.0 feet-bgs sample)
- Manganese (1 sample: 4,300 µg/L in 398.5 – 401.0 feet-bgs sample)
- Nickel (1 sample: 1,800 µg/L in 398.5 – 401.0 feet-bgs sample)

Despite establishment of rigorous protocols to minimize the influence of turbidity in leachate analyses (see **Appendix E** for description on laboratory leaching/extraction methodology and turbidity study), metals concentrations in leachate are likely impacted due to turbidity. Specifically, the strong correlation between "dissolved" concentrations of aluminum, iron, and silicon in the two deepest Aromas Sand samples and shallow Paso Robles sample suggests the digestion of suspended solids (colloids) prior to analysis (extract turbidity measurements are provided at the bottom row of **Table 15**). Additionally, the detections of cadmium, nickel, vanadium, and zinc further support this hypothesis, because these metals would not typically be in solution at the pH levels observed. The presence of turbidity is a product of the tumbling procedure used in the modified TCLP and is not expected in the aquifer.

Notwithstanding the limitations of the metals results, the information provides a preliminary estimate of leaching potential of pilot water through Aromas Sand and Paso

Robles Formation sediments. Together, with the results of the solid core analyses and HA-HCl extraction test, the pilot water leachate tests help to identify potential reactions warranting further evaluation through geochemical modeling.

3.4.2.2. Anions

Of the six (6) Aromas Sand and two (2) Paso Robles leachate samples analyzed, concentrations for chloride, fluoride and nitrate were detected within their respective regulatory limit. Sulfate was detected at 2,000 mg/L concentrations in one sample (398.5 – 401.0 feet-bgs), exceeding the regulatory limit of 250 mg/L. Examination of the Energy Dispersive X-Ray Analysis (**Table 7**) shows that the 398.5 – 401.0 feet-bgs sample is composed of 1.64 percent sulfur by weight, similar to the 74.0 – 75.5 and 200.0 – 202.5 feet-bgs samples. While sulfate is also detected in the latter two samples, leachate concentrations are two orders of magnitude lower in those samples. As summarized in **Table 6** (thin-section mineralogical analysis), pyrite replacement associated with altered organic matter particles is a characteristic of the 398.5 – 401.0 feet-bgs sample. Therefore, it is likely that the elevated sulfate concentration in leachate from this sample is a result of iron sulfide (pyrite) oxidation to sulfate, due to the higher ORP of the pilot water (629 mV; see **Table 14**) compared to local groundwater (409 mV; see MRWPCA MW-1 in **Table 16C**).

3.4.2.3. Other Ions/Compounds

Of the eight (8) leachate samples analyzed, chromium(VI) was detected in six samples (all in the Aromas Sand) at concentrations ranging from 0.6 to 1.6 µg/L, below the proposed primary MCL of 10 µg/L.

Chlorine concentrations in leachate range from 0.74 to 1.7 mg/L, slightly less than in the GWR pilot water (2.9 mg/L), suggesting attenuation through volatilization.

With the exception of leachate from the 398.5 – 401.0 feet-bgs sample, leachate pH values are similar to or slightly above the laboratory-measured pH value for the GWR pilot water used in the tests (pH = 7.45) and within the regulatory limit. Based on the consistency of the pH values of leachate from other samples and the range of lithologies represented, the pH value of the leachate from the 398.5 – 401.0 feet-bgs sample (pH = 5.04) is a clear outlier. It is possible that the decrease in pH in leachate from this sample is associated with the oxidation of pyrite to sulfate in the upper Paso Robles.

Table 15. Core Leachate Test Results

				Formation:	Aromas							Paso Robles		
Analyte	**Method**	**Units**	**RL**	**CA Primary MCL****	**27.5'-30.0'**	**74.0'-75.5''**	**98.5'-101.0'**	**129.5'-142.0'**	**200.0'-202.5'**	**297.0''-298.5'**	**364.5'-367.0'**	**398.5'-401.0'**	**433.0'-435.0'**	**472.0'-474.5'**
Leachate Metals:														
Aluminum (Al)	EPA 200.8	µg/L	500	1,000	NA	ND	ND	ND	900*	4,300*	4,800*	970*	ND	NA
Antimony (Sb)	EPA 200.8	µg/L	5.0	6.0	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Arsenic (As)	EPA 200.8	µg/L	5.0	10	NA	5.5*	ND	ND	ND	ND	7.6*	ND	ND	NA
Barium (Ba)	EPA 200.8	µg/L	50	1,000	NA	8.1*	180*	140*	330*	930*	490*	50*	200*	NA
Beryllium (Be)	EPA 200.8	µg/L	5.0	4.0	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Cadmium (Cd)	EPA 200.8	µg/L	2.5	5.0	NA	ND	ND	ND	ND	6.0*	ND	24*	ND	NA
Calcium (Ca)	EPA 200.8	µg/L	1,000	—	NA	14,000*	5,200*	4,300*	6,200*	71,000*	9,400*	540,000*	6,700	NA
Chromium (Cr)	EPA 200.8	µg/L	5.0	50	NA	ND	ND	ND	ND	24*	6.2*	ND	ND	NA
Cobalt (Co)	EPA 200.8	µg/L	5.0	—	NA	ND	ND	ND	ND	ND	ND	240	ND	NA
Copper (Cu)	EPA 200.8	µg/L	5.0	1,300	NA	ND	ND	ND	ND	33*	ND	ND	ND	NA
Iron (Fe)	EPA 200.8	µg/L	200	300(S)	NA	ND	ND	ND	1,100*	8,700*	1,500*	48,000*	ND	NA
Lead (Pb)	EPA 200.8	µg/L	5.0	15	NA	ND	ND	ND	ND	11*	ND	ND	ND	NA
Lithium (Li)	EPA 200.8	µg/L	50	—	NA	ND	ND	ND	ND	ND	ND	140*	ND	NA
Magnesium (Mg)	EPA 200.8	µg/L	200	—	NA	4,700*	2,300*	1,900*	2,000*	18,000*	1,600*	150,000*	1,900*	NA
Manganese (Mn)	EPA 200.8	µg/L	200	50(S)	NA	ND	ND	ND	ND	360*	ND	4,300*	ND	NA
Mercury (Hg)	EPA 200.8	µg/L	0.25	2	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Molybdenum (Mo)	EPA 200.8	µg/L	5.0	—	NA	16*	ND	ND	ND	ND	ND	ND	14*	NA
Nickel (Ni)	EPA 200.8	µg/L	5.0	100	NA	ND	ND	ND	ND	30*	5.5*	1,800*	ND	NA
Potassium (K)	EPA 200.8	µg/L	500	—	NA	4,600*	2,600*	2,400*	3,600*	2,600*	5,400*	20,000*	2,500*	NA
Selenium (Se)	EPA 200.8	µg/L	5.0	50	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Silver (Ag)	EPA 200.8	µg/L	1.9	100(S)	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Sodium (Na)	EPA 200.8	µg/L	1,000	—	NA	26,000*	22,000*	22,000*	26,000*	42,000*	36,000*	48,000*	25,000*	NA
Strontium (Sr)	EPA 200.8	µg/L	200	—	NA	ND	ND	ND	ND	680*	ND	3,300*	ND	NA
Thallium (Tl)	EPA 200.8	µg/L	5.0	2	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Uranium (U)	EPA 200.8	µg/L	5.0	20	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Vanadium V)	EPA 200.8	µg/L	5.0	—	NA	6.5*	ND	ND	8.3*	31*	17*	ND	ND	NA
Zinc (Zn)	EPA 200.8	µg/L	50	5,000(S)	NA	ND	ND	ND	59*	550*	62*	500*	ND	NA
Extract Turbidity		**NTU**			**NA**	**NA**	**NA**	**NA**	**5.7**	**67.0**	**7.7**	**7.0**	**NA**	**NA**

Table 15. Core Leachate Test Results (continued)

				Formation:	Aromas							Paso Robles		
Analyte	**Method**	**Units**	**RL**	**CA Primary MCL****	**27.5'-30.0'**	**74.0'-75.5''**	**98.5'-101.0'**	**139.5'-142.0'**	**200.0'-202.5'**	**297.0''-298.5'**	**364.5'-367.0'**	**398.5'-401.0'**	**433.0'-435.0'**	**472.0'-474.5'**
Anions:														
Bromide (Br)	EPA 300.1	mg/L	0.10	—	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Chloride (Cl)	EPA 300.1	mg/L	1.0	250(S)	NA	20	20	20	20	26	21	22	22	NA
Fluoride (F)	EPA 300.1	mg/L	0.10	2.0	NA	0.31	0.22	0.26	0.28	0.32	0.48	1.1	0.14	NA
Nitrate as N	EPA 300.1	mg/L	0.10	10	NA	0.64	0.64	0.65	0.64	0.67	0.65	0.61	0.67	NA
Nitrate as(NO_3^-)	EPA 300.1	mg/L	0.45	45	NA	2.8	2.8	2.9	2.8	3.0	2.9	2.7	3.0	NA
Nitrite as N	EPA 300.1	mg/L	0.10	1.0	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Nitrite as (NO_2^-)	EPA 300.1	mg/L	0.33		NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Sulfate (SO_4)	EPA 300.1	mg/L	1.0	250(S)	NA	11	0.42	0.93	0.34	20	8.5	2,000	0.88	NA
Total and Speciated Alkalinity as $CaCO_3$:														
Total	SM2320B	mg $CaCO_3$/L	1.00	—	NA	73.0	40.0	37.0	46.0	170	59.0	1.07	44.7	NA
Carbonate ($CaCO_3$)	SM2320B	mg $CaCO_3$/L	1.00	—	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Bicarbonate (HCO_3)	SM2320B	mg $CaCO_3$/L	1.00	—	NA	73.0	40.0	37.0	46.0	170	59.0	1.07	44.7	NA
Hydroxide (OH)	SM2320B	mg $CaCO_3$/L	1.00	—	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Other Ions/Compounds:														
Phosphorous (P)	EPA 200.7	µg/L	500	—	NA	ND	ND	ND	ND	22,000*	1,000*	ND	ND	NA
Silicon (Si)	EPA 200.7	µg/L	500	—	NA	7,400*	8,900*	11,000*	12,000*	110,000*	28,000*	24,000*	10,000*	NA
Chromium-6 [Cr(VI)]	EPA 218.6	µg/L	0.20	10***	NA	0.86	1.60	2.40	0.61	1.60	0.77	ND	ND	NA
Chlorine	SM4500-Cl DE	mg/L	0.40	4.0	NA	1.5	1.6	1.3	1.6	ND	1.7	ND	0.74	NA
Dissolved Organic Carbon (DOC)	EPA 415.3	mg/L	0.70	—	NA	1.4	1.2	1.1	2.2	16	3	6.4	1.2	NA
Inorganic Carbon (IC) as CO_2	EPA 415.3	mg/L	3.7	—	NA	67	37	34	40	56	43	10	41	NA
Sulfide (S^{2-})	SM4500 S-2 D	mg/L	0.050	—	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
Total Ammonia as N	EPA 350.1	mg/L	0.10	—	NA	0.72	0.58	0.44	0.50	ND	0.42	1.8	0.27	NA
Total Kjeldahl Nitrogen (TKN) as N	EPA 351.2	mg/L	0.30	—	NA	0.82	1.4	0.55	0.73	3.1	0.73	2.3	0.39	NA
Additional Parameters:														
Oxygen Reduction Potential (ORP)	SM2580B, MAI	+/- mv vs. NHE	10	—	NA	577 @ 23.9°C	663 @ 23.6°C	665 @ 23.4°C	650 @ 23.9°C	479 @ 25.3°C	666 @ 24.3°C	438 @ 24.3°C	649 @ 26.4°C	NA
pH	SM4500H+B	+/-, pH units @ 25°C	0.05	6.5-8.5****	NA	8.44	7.65	7.44	7.83	7.95	8.11	5.04	7.84	NA
Extract Turbidity	**NTU**				**NA**	**NA**	**NA**	**NA**	**5.7**	**67.0**	**7.7**	**7.0**	**NA**	**NA**

Notes:
For pilot water analysis used in standard leaching test (Table 7) see Table 14.
* Concentrations questionable due to high turbidity in leachate (see bottom line in table)
** CA Primary MCL = California Department of Public Health Primary MCL. Dash (—) indicates no listing or no MCL indicated. (S) = secondary MCL
*** Proposed CA Primary MCL Cr(VI) April 15, 2014
**** Range required by U.S. Environmental Protection Agency (U.S.EPA) Secondary MCL
EPA = U.S. Environmental Protection Agency
Core samples collected from Sonic Drilling cores collected in MW-1 boring at depth in feet (‘) below ground surface.
mg/L = milligram per liter or parts per million (ppm)
µg/L = micrograms per liter or parts per billion (ppb)
NA = Not analyzed
ND = Not detected or below method reporting limits (RL)
NTU = nephalometric turbidity unit
SM = Standard Method

3.5. GROUNDWATER QUALITY RESULTS

Table 16 summarizes the groundwater quality analytical program conducted for this investigation. Full laboratory results for the 300+ constituents/parameters analyzed are grouped into common categories and presented in **Tables 16A through 16P**. Data were used to characterize groundwater quality source type and age beneath the GWR project recharge area. Additionally, potential constituents of concern, including former Fort Ord constituents and chemicals of emerging concern (CoECs), were screened to identify which constituents satisfy or exceed respective California drinking water standards. Results of the groundwater quality characterization are described below. Complete copies of the analytical laboratory reports are provided in **Appendix F**.

3.5.1. Source Water Geochemical Plotting and Fingerprinting

3.5.1.1. Stiff Diagrams

Stiff Diagrams are straight-line plots of cation and anion concentrations in milliequivalents per liter (meq/L). Data points are plotted along three parallel horizontal axes on each side of a vertical axis. Individual points are then connected to produce a polygonal pattern. The patterns or shapes of the polygons can be compared to typical standard patterns for groundwater or seawater or compared to polygons from other wells to identify samples of similar water chemistry. **Figure 7** shows Stiff diagrams for each of the six wells sampled for this investigation (diagrams with bold outline) as well as for other local wells in the vicinity. Diagrams are color-coded to indicate the well construction and the aquifer represented by the polygons. Yellow and green Stiff diagrams indicate a well screened in the Paso Robles Aquifer or the Santa Margarita Aquifer, respectively, while the orange Stiff diagrams indicate screens in both aquifers. Also shown on the map is a Stiff diagram representing the treated Carmel River water injectate for the ASR wellfields (labeled ASR injectate) and GWR pilot recycled water.

The stiff diagrams on **Figure 7** depict the unique groundwater signatures for well screened in the Paso Robles and Santa Margarita aquifers in the basin. The four Paso Robles wells sampled (MRWPCA MW-1, FO-7 shallow, PRTIW, and City of Seaside #4) exhibit a sodium-chloride signature. TDS concentrations for the four wells average 252 mg/L. In contrast, the two Santa Margarita wells sampled (FO-7 deep and ASR MW-1) exhibit a relatively balanced calcium/sodium-bicarbonate/chloride signature; the average TDS concentration of the two wells is 510 mg/L. The chemical signature of wells screened in both aquifers more closely resembles the Santa Margarita signature, suggesting that the Santa Margarita Aquifer is contributing more water to the well than the Paso Robles Aquifer.

The ASR injectate and GWR pilot recycled water both have unique geochemical signatures compared to the groundwater signatures in the basin. Because the ASR injectate is shallow groundwater water from the Carmel Valley Alluvial Aquifer and recycled water is highly purified then selectively stabilized, both waters are less mineralized than the native Seaside Basin groundwater, as indicated by the narrow Stiff diagrams for both waters. The signature

of the ASR injectate has a calcium-bicarbonate signature, while the GWR pilot recycled water has a sodium-chloride/bicarbonate signature.

Table 16. Groundwater Quality Analytical Program – Laboratory Summary

Laboratory	Analytes	Tables
Alpha Analytical Laboratory	Anions	16A
Alpha Analytical Laboratory/McCampbell Analytical	Metals (Including Major Cations) and Cr(VI)	16B
Alpha Analytical Laboratory	Conventional Chemistry and Other Parameters	16C
Alpha Analytical Laboratory	Chlorinated Pesticides and PCBs	16D
Alpha Analytical Laboratory	Nitrogen and Phosphorus Pesticides	16E
Alpha Analytical Laboratory	Organic Analytes	16F
Alpha Analytical Laboratory	Chlorinated Acids	16G
Alpha Analytical Laboratory	Carbamates	16H
Alpha Analytical Laboratory	Other Organic Compounds	16I
Alpha Analytical Laboratory	Volatile Organic Compounds (VOCs)	16J
Alpha Analytical Laboratory UL Laboratory and Pace Analytical	Semivolatile Organic Compounds (VOCs)+Dioxin	16K
Alpha Analytical Laboratory	Haloacetic Acids	16L
ALS Environmental	Nitroaromatics and Nitramines (Explosives)	16M
Weck Laboratories, Inc.	Pharmaceuticals and Personal Care Products (PPCPs)	16N
UL Laboratory and GEL Laboratories	Radiogenic: Gross Alpha, Beta; Radium 226 and 228, Strontium 90	16O
ZyMax Forensics	Stable Isotopes of oxygen and hydrogen in water, nitrogen and oxygen in nitrate	16P
Asbestos TEM Laboratories, Inc.	Asbestos	16C
Isotech	Tritium (enriched)	16O

Table 16A: Anions

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		mg/L								Type
Bicarbonate (HCO_3^-)	SM2320B	0.060	66	210	68	70	130	270	–	–
Bromate (BrO_3^-)	EPA 300.1	0.005	ND	ND	ND	ND	ND	ND	0.010	CSMCL-ESMCL
Chloride (Cl^-)	EPA 300.0	0.30	59	100	44	79	86	120	250	CSMCL-ESMCL
Chlorite (ClO_2^-)	EPA 300.0	0.020	ND	ND	ND	ND	ND	ND	1.0	CSMCL-ESMCL
Fluoride (F^-)	EPA 300.0	0.070	ND	ND	ND	ND	ND	0.15	2.0/4.0	CPMCL/EPMCL
Nitrite as N	EPA 300.0	0.02	ND	ND	ND	ND	ND	ND	1.0	CPMCL/EPMCL
Nitrate as NO_3^-	EPA 300.0	0.20	13	0.60	2.4	2.7	11	0.42	45	CPMCL/EPMCL
Sulfate (SO_4^{2-})	EPA 300.0	0.090	14	24	13	9.9	89	73	250	CPMCL/EPMCL

Table 16B: Metals (Including Major Cations)

Analyte	Method	Units	MDL	City of Seaside 4	FO-7**** Deep	FO-7**** Shallow	MRWPCA MW-1****	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
Aluminum (Al)	EPA 200.8	µg/L	8.0	ND	170****	3,700****	2,700****	4.3	4.8	1,000/200	CPMCL/CMCL
Antimony (Sb)	EPA 200.8	µg/L	0.080	ND	0.75	3.7	0.51	0.033	0.34	6	CPMCL-EPMCL
Arsenic (As)	EPA 200.8	µg/L	0.28	1.2	7.6****	210****	2.8****	1.6	1.6	10	CPMCL-EPMCL
Barium (Ba)	EPA 200.8	µg/L	0.12	26	72****	1,200****	40****	59	66	1,000/2000	CPMCL/EPMCL
Beryllium (Be) (Total)	EPA 200.8	µg/L	0.080	ND	ND	0.68	0.044	ND	ND	4	CPMCL-EPMCL
Boron (B)	EPA 200.8	µg/L	24	42***	140***	25***	36***	32***	90***	–	–
Cadmium (Cd) Total	EPA 200.8	µg/L	0.080	ND	ND	3.3	0.15	0.10	0.51	5	CPMCL-EPMCL
Calcium (Ca) Total	EPA 200.7	mg/L	0.010	14	53	29	17	37	76	–	–
Chromium (Cr) Total	EPA 200.8	µg/L	0.32	3.6	1.7	790****	13****	3.4	ND	50/100	CPMCL/CMCL
Cr(VI)	EPA 218.6	µg/L	0.050*	3.4	ND	1.7	1.1	1.6	ND	10	CPMCL**
Copper (Cu) Total	EPA 200.8	µg/L	0.16	1.1	1.6	14****	3.7	1.9	4.3	1,300/1,000	CPMCL-EPMCL/ CSMCL-ESMCL
Iron (Fe) Total	EPA 200.8	µg/L	7.2	ND	1100****	80,000****	4,000****	67	21	300	CSMCL-ESMCL
Lead (Pb) Total	EPA 200.8	µg/L	0.080	ND	1.3****	42****	1.3****	0.061	0.78	15	CPMCL-EPMCL
Magnesium (Mg) Total	EPA 200.7	mg/L	0.0080	6.5	6.8	3.8	6.5	10	22	–	CPMCL-EPMCL
Manganese (Mn) Total	EPA 200.8	µg/L	0.12	0.25	83****	20,000****	150****	1.1	23	50	CSMCL-ESMCL
Mercury (Hg) Total	EPA 245.1	µg/L	0.060	ND	ND	0.11	ND	ND	0.85	2	CPMCL-EPMCL
Nickel (Ni) Total	EPA 200.8	µg/L	0.24	0.54	2.8****	26****	8.1****	1.3	4.0	100	CPMCLC
Potassium (Total)	EPA 200.7	mg/L	0.0080	2.0	3.7	3.6	3.4	3.1	5.1	–	–
Selenium (Se) Total	EPA 200.8	µg/L	0.28	0.66***	1.8	1.3***	1.5***	2.2	1.8***	50	CPMCL-EPMCL
Silver (Ag) Total	EPA 200.8	µg/L	0.080	ND	ND	0.11	0.028	ND	ND	2	CPMCL-EPMCL
Sodium (Na) Total	EPA 200.7	mg/L	0.020	43	86	38	50	64	91	–	–
Thallium (Tl)	EPA 200.8	µg/L	0.080	ND	ND	0.19	0.027	0.045	ND	2	CPMCL-EPMCL
Uranium (U)	EPA 200.8	pCi/l	0.080	ND	1.6	0.62	0.33	0.20	1.3	20	CPMCL
Vanadium (V)	EPA 200.8	µg/L	1.2	2.5	5.8****	34****	9.5****	1.6	0.76	–	–
Zinc (Zn)	EPA 200.8	µg/L	2.0	2.9	52***	300***	69***	75***	25***	5,000	CPMCL-EPMCL

Notes: * Reporting Level or RL. ** Proposed April 15, 2014. *** Reported in laboratory blank. ****Analysis questionable due to high turbidity (see Table 16C)

Table 16C: Conventional Chemistry and Other Parameters

Analyte	Method	Units	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
			Concentration								Type
Asbestos by TEM (chrysotile/amphibole)*	EPA 100.2	MFL	0.1-1.1	ND	ND	ND	ND	ND	ND	7.0	CSMCL-ESMCL
Bicarbonate ($HCO3^-$)	SM2320B	mg/L	0.060	66	210	68	70	130	270	–	–
Color	SM2120B	Color Units	3.0	ND	4.0	4.0	28	6.0	3.0	15	CSMCL
Dissolved Oxygen (DO)	Field	mg/L	***	NA	4.61	4.83	5.09	NA	NA	–	–
MBAS, calculated as LAS, mw 340	SM5540C	mg/L	0.030	ND	ND	ND	ND	ND	ND	5.0	CSMCL-ESMCL
Odor	EPA 140.1	T.O.N.		ND	ND	ND	1.4	ND	ND	3	CSMCL-ESMCL
Oxygen Reduction Potential (ORP)	Field	mV	***	(332)	396.6	423.3	408.9	(392.0)	(354.0)	–	–
Perchlorate (ClO_4^-)	EPA 314.0	µg/L	0.90	ND**	1.9**	ND**	ND**	1.1**	ND**	6.0	CPMCL
pH	Field	units	***	(8.25)	7.68	8.11	8.23	(6.39)	(7.09)	6.5-8.5	ESMCL
Specific Conductance (or Electrical Conductivity (EC)	SM2510B	µmhos/cm or µS/cm	1.0	340	660	280	270	440	900	900	CSMCL
	Field		***	(378)	669	292	409	(630)	(958)		
Temperature	Field	°C	***	(19.1)	15.5	15.7	18.5	(16.3)	(19.7)	–	–
Total Dissolved Solids (TDS)	SM2540C	mg/L	5.0	250	460	190	220	350	560	500	CSMCL-ESMCL
Turbidity	SM2130B	NTU	0.040	0.32	10	550	71	0.98	0.37	1/5	CPMCL-EPMCL/ CSMCL-ESMCL
			***	1.0	40	150	82.3	6.0	2.0		
Nitrate + Nitrite as N	EPA 300.0	mg/L	0.0086	3.0	0.13	0.55	0.61	2.4	0.094	10	CSMCL-ESMCL
Total Organic Carbon (TOC)	SM5310C	mg/L	0.100	0.274	0.190	0.768	0.898**	0.519**	0.627	–	–
Cyanide (CN^-)	10-204-00-1X	mg/L	0.0020	0.0028	0.0023	ND	ND	ND	ND	0.15/0.20	CPMCL/EPMCL

Notes:
* Calculated asbestos structures >10 micrometers (µm)
** Detected in Laboratory Blank
*** Field instruments calibrated to within 10% by Blaine Tech Services. Raw ORP field readings correct using instrument supplied calculator. Field values in parenthesis indicate reading taken at surface access port and not down hole.

Table 16D: Chlorinated Pesticides and PCBs

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Aldrin	EPA 508	0.10	ND	ND	ND	ND	ND	ND	–	–
Chloroneb	EPA 508	0.20	ND	ND	ND	ND	ND	ND	–	–
Chlorbenzilate	EPA 508	2.0	ND	ND	ND	ND	ND	ND	–	–
Chlorothalonil	EPA 508	0.030	ND	ND	ND	ND	ND	ND	–	–
DCPA	EPA 508	0.020	ND	ND	ND	ND	ND	ND		
4,4'-DDD	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
4,4'-DDE	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
4,4'-DDT	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
Dieldrin	EPA 508	0.010	ND	ND	ND	ND	ND	ND	–	–
Endosulfan I	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
Endosulfan II	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
Endosulfan sulfate	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
Endrin	EPA 508	0.030	ND	ND	ND	ND	ND	ND	2.0	CPMCL-EPMCL
Endrin aldehyde	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
HCH-alpha (α-BHC)	EPA 508	0.010	ND	ND	ND	ND	ND	ND	–	–
HCH-beta (β-BHC)	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
HCH-delta (δ-BHC)	EPA 508	0.030	ND	ND	ND	ND	ND	ND	–	–
HCH-gamma (γ-BHC) (Lindane)	EPA 508	0.010	ND	ND	ND	ND	ND	ND	0.2	CPMCL-EPMCL
Heptachlor	EPA 508	0.010	ND	ND	ND	ND	ND	ND	0.01/0.4	CPMCL/EPMCL
Heptachlor epoxide	EPA 508	0.010	ND	ND	ND	ND	ND	ND	0.01/0.2	CPMCL/EPMCL

Table 16D: Chlorinated Pesticides and PCBs (continued)

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Hexachlorobenzene	EPA 508	0.010	ND	ND	ND	ND	ND	ND	1.0	CPMCL-EPMCL
Hexachlorocyclo-pentadiene	EPA 508	0.040	ND	ND	ND	ND	ND	ND	50	CPMCL-EPMCL
Methoxychlor	EPA 508	0.020	ND	ND	ND	ND	ND	ND	30/40	CPMCL/EPMCL
cis-Permethrin	EPA 508	0.070	ND	ND	ND	ND	ND	ND	–	–
trans-Permethrin	EPA 508	0.090	ND	ND	ND	ND	ND	ND	–	–
Propachlor	EPA 508	0.070	ND	ND	ND	ND	ND	ND	–	–
Trifluralin	EPA 508	0.020	ND	ND	ND	ND	ND	ND	–	–
PCB (Aroclor)-1016	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1221	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1232	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1242	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1248	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB (Aroclor)-1254	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
PCB -(Aroclor)1260	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
Total PCBs	EPA 508	0.30	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL
Toxaphene	EPA 508	0.40	ND	ND	ND	ND	ND	ND	3	CPMCL-EPMCL
Chlordane (tech)	EPA 508	0.030	ND	ND	ND	ND	ND	ND	0.1/2	CPMCL/EPMCL

Table 16E: Nitrogen and Phosphorus Pesticides

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Alachlor	EPA 507	0.50	ND	ND	ND	ND	ND	ND	2.0	CPMCL-EPMCL
Atrazine	EPA 507	0.30	ND	ND	ND	ND	ND	ND	–	–
Bromacil	EPA 507	0.50	ND	ND	ND	ND	ND	ND	–	–
Butachlor	EPA 507	0.40	ND	ND	ND	ND	ND	ND	–	–
Dimethoate	EPA 507	0.20	ND	ND	ND	ND	ND	ND	–	–
Metolachlor	EPA 507	0.30	ND	ND	ND	ND	ND	ND	–	–
Metribuzin	EPA 507	0.40	ND	ND	ND	ND	ND	ND	–	–
Molinate	EPA 507	0.20	ND	ND	ND	ND	ND	ND	20	CPMCL
Prometryn	EPA 507	0.50	ND	ND	ND	ND	ND	ND	–	–
Propachlor	EPA 507	0.30	ND	ND	ND	ND	ND	ND	–	–
Simazine	EPA 507	0.30	ND	ND	ND	ND	ND	ND	4.0	CPMCL-EPMCL
Thiobencarb	EPA 507	0.20	ND	ND	ND	ND	ND	ND	70/1	CPMCL/CSMCL

Table 16F: Organic Analytes

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
1,2-Dibromo-3-chloropropane	EPA 504.1	0.0040	ND	ND	ND	ND	ND	ND	0.2	CPMCL-EPMCL
1,2-Dibromoethane (EDB)	EPA 504.1	0.0050	ND	ND	ND	ND	ND	ND	0.5	CPMCL-EPMCL

Table 16G: Chlorinated Acids

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
2,4,5-T	EPA 515.1	0.40	ND	ND	ND	ND	ND	ND	–	–
2,4,5-TP (Silvex)	EPA 515.1	0.50	ND	ND	ND	ND	ND	ND		
2,4-D	EPA 515.1	0.80	ND	ND	ND	ND	ND	ND	–	–
2,4-DB	EPA 515.1	4.0	ND	ND	ND	ND	ND	ND	–	–
4-Nitrophenol	EPA 515.1	0.70	ND	ND	ND	ND	ND	ND	–	–
Acifluorfen	EPA 515.1	0.50	ND	ND	ND	ND	ND	ND	–	–
Bentazon	EPA 515.1	0.40	ND	ND	ND	ND	ND	ND	18	CPMCL
Dicamba	EPA 515.1	0.40	ND	ND	ND	ND	ND	ND	–	–
Dichlorprop	EPA 515.1	1.0	ND	ND	ND	ND	ND	ND	–	–
Dinoseb	EPA 515.1	0.80	ND	ND	ND	ND	ND	ND	7	CPMCL-EPMCL
Pentachlorophenol	EPA 515.1	0.20	ND	ND	ND	ND	ND	ND	1	CPMCL-EPMCL
Picloram	EPA 515.1	0.50	ND	ND	ND	ND	ND	ND	500	CPMCL-EPMCL

Table 16H: Carbamates

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
3-Hydroxycarbofuran	EPA 531.1	0.90	ND	ND	ND	ND	ND	ND	–	–
Aldicarb	EPA 531.1	0.70	ND	ND	ND	ND	ND	ND	3	EPMCL
Aldicarb sulfone	EPA 531.1	0.70	ND	ND	ND	ND	ND	ND	3	EPMCL
Aldicarb sulfoxide	EPA 531.1	0.80	ND	ND	ND	ND	ND	ND	4	EPMCL
Carbaryl	EPA 531.1	0.70	ND	ND	ND	ND	ND	ND	–	–
Carbofuran	EPA 531.1	2.0	ND	ND	ND	ND	ND	ND	18/40	CPMCL/EPMCL
Methiocarb	EPA 531.1	2.0	ND	ND	ND	ND	ND	ND	–	–
Methomyl	EPA 531.1	2.0	ND	ND	ND	ND	ND	ND	–	–
Oxamyl	EPA 531.1	0.80	ND	ND	ND	ND	ND	ND	50/200	CPMCL/EPMCL
Propoxur (Baygon)	EPA 531.1	2.0	ND	ND	ND	ND	ND	ND	–	–

Table 16I: Other Organic Compounds

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Diquat	EPA 549.2	2.0	ND	ND	ND	ND	ND	ND	20	CPMCL-EPMCL
Endothall	EPA 548.1	2.0	ND	ND	ND	ND	ND	ND	100	CPMCL-EPMCL
Glyphosate	EPA 547	3.0	ND	ND	ND	ND	ND	ND	700	CPMCL-EPMCL

Table 16J: Volatile Organic Compounds (VOCs)

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Acetone	EPA 524.2	0.80	ND	ND	2.0	ND	ND	ND	–	–
Acrylonitrile	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Benzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	1/5	CPMCL/EPMCL
Bromobenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Bromochloromethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Bromodichloromethane	EPA 524.2	0.50	ND	ND	ND	ND	ND	ND	80	CPMCL-EPMCL
Bromoform	EPA 524.2	0.50	ND	ND	ND	ND	ND	ND	80	CPMCL-EPMCL
Bromomethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
n-Butylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Sec-Butylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	100/10	CPMCL-EPMCL
Tert-Butylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Carbon disulfide	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Carbon tetrachloride	EPA 524.2	0.30	ND	ND	ND	ND	ND	ND	0.5/5	CPMCL/EPMCL
Chlorobenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	70/100	CPMCL/EPMCL
Chloroethane	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Chloroform	EPA 524.2	0.50	ND	ND	ND	ND	1.2	0.87	80	CPMCL-EPMCL
Chloromethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
2-Chlorotoluene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
4-Chlorotoluene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Dibromochloromethane	EPA 524.2	0.50	ND	ND	ND	ND	ND	ND	80	CPMCL-EPMCL
1,2-Dibromo-3-chloropropane	EPA 524.2	0.36	ND	ND	ND	ND	ND	ND	0.2	CPMCL-EPMCL
1,2-Dibromethane (EDB)	EPA 524.2	0.14	ND	ND	ND	ND	ND	ND	0.05	CPMCL-EPMCL
1,2-Dichlorobenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	600	CPMCL-EPMCL
1,3-Dichlorobenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,4-Dichlorobenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	5/75	CPMCL/EPMCL
Trans-1,4-Dichloro-2-butene	EPA 524.2	0.095	ND	ND	ND	ND	ND	ND	–	–

Table 16J: Volatile Organic Compounds (VOCs) (continued)

Analyte	Method	MDL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Dichlorodifluoromethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,1-Dichloroethane	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	5	CPMCL
1,2-Dichloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	0.5/5	CPMCL/EPMCL
1,1-Dichloroethene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	5	CPMCL
Cis-1,2,-Dichloroethene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	6/70	CPMCL/EPMCL
Trans-1,2-Dichloroethene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	10/100	CPMCL/EPMCL
1,2-Dichloropropane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	10/100	CPMCL/EPMCL
1,3-Dichloropropane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
2,2-Dichloropropane	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
1,1-Dichloropropene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Cis-1,3-Dichloropropene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	0.5	CPMCL
Trans-1,3,Dichloropropene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,3-Dichloropropene(total)	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
2-Hexanone	EPA 524.2	0.097	ND	ND	ND	ND	ND	ND	–	–
Ethylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND		
Hexachlorobuteadiene	EPA 524.2	0.30	ND	ND	ND	ND	ND	ND	1,200	CPMCL
Isopropylbenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
p-Isopropyltoluene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Methyl ethyl ketone	EPA 524.2	0.40	ND	ND	ND	ND	ND	ND	–	–
Methyl iodide	EPA 524.2	0.12	ND	ND	ND	ND	ND	ND	–	–
Methyl isobutyl ketone	EPA 524.2	0.30	ND	ND	ND	ND	ND	ND	–	–
Methylene chloride	EPA 524.2	0.40	ND	ND	ND	ND	ND	ND	5/5	CPMCL/EPMCL
Naphthalene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
n-Propylbenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Styrene	EPA 524.2	0.10	ND	ND	ND	0.18	ND	ND	100/100	CPMCL/EPMCL
1,1,1,2-Tetrachloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,1,2,2-Tetrachloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	1	CPMCL
Tetrachloroethane	EPA 524.2	0.20	ND	ND	ND	ND	0.20	ND	5/5	CPMCL/EPMCL

Table 16J: Volatile Organic Compounds (VOCs) (continued)

Analyte	Method	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
		µg/L								Type
Toluene	EPA 524.2	0.10	ND	ND	ND	2.0	ND	ND	150/1000	CPMCL/EPMCL
1,2,3-Trichlorobenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
1,2,4-Trichlorobenzene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	5/70	CPMCL/EPMCL
1,1,1-Trichloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	200/200	CPMCL/EPMCL
1,1,2-Trichloroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	5/5	CPMCL/EPMCL
Trichloroethene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Trichlorofluoromethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	150	CPMCL
Trichlorotrifluoroethane	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
1,2,3-Trichloropropane	EPA 524.2	0.13	ND	ND	ND	ND	ND	ND	–	–
1,2,4-Trimethylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
1,3,5-Trimethylbenzene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Vinyl chloride	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	0.5/2	CPMCL/EPMCL
m,p-Xylene	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
o-Xylene	EPA 524.2	0.10	ND	ND	ND	ND	ND	ND	–	–
Xylenes (total)	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	1,750/10,000	CPMCL/EPMCL
Trihalomethanes (total)	EPA 524.2	0.50	ND	ND	ND	ND	1.2	0.87	–	–
Methyl tert-butyl ether	EPA 524.2	0.50	ND	ND	ND	ND	ND	ND	–	–
Ethyl tert-butyl ether	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–
Tert-amyl methyl ether	EPA 524.2	0.20	ND	ND	ND	ND	ND	ND	–	–

Table 16K: Semivolatile Organic Compounds (SVOCs)

Analyte	Method	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirements	
			µg/L							Type
Benzo (a) pyrene	EPA 525.2	0.080	ND	ND	ND	ND	ND	ND	–	–
Di(2-ethylhexyl)adipate	EPA 525.2	0.40	ND	ND	ND	ND	ND	ND	400/400	CPMCL/EPMCL
Di(2-ethylhexyl)phthalate	EPA 525.2	0.20	ND	ND	ND	0.29	ND	ND	4/6	CPMCL/EPMCL
2,3,7,8-Tetrachlorodibenzo-p-Dioxin*	EPA 1613	0.000005	ND	ND	ND	ND	ND	ND	0.00003	CPMCL-EPMCL

Notes:
* Dioxin reported in pg/L; converted to µg/L

Table 16L: Haloacetic Acids

Analyte	Methods	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
		µg/L								Type
Monobromoacetic Acid	EPA 552.2	0.8	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Monochloroacetic Acid	EPA 552.2	1.1	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Dibromoacetic Acid	EPA 552.2	0.8	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Dichloroacetic Acid	EPA 552.2	1.0	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Trichloroacetic Acid	EPA 552.2	1.0	ND	ND	ND	ND	ND	ND	60	CPMCL-EPMCL
Total Haloacetic Acids (HAA5)	EPA 552.2	1.0	ND	ND	ND	ND	ND	ND	*	*

Notes:
* See individual analytes for regulatory requirements.

Table 16M: Nitroaromatics and Nitramines (Explosives)

Analyte	Methods	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
		µg/L								Type
HMX	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
RDX	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
1,3,5-Trinitrobenzene	8330B	0.20	ND	ND	ND	ND	ND	ND	–	–
1,3-Dinitrobenzene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
3,5-Dinitroaniline	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
Tetryl	8330B	0.10	ND	ND	ND	ND	ND	ND	–	–
Nitrobenzene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
4-Amino-2,6-dinitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
2-Amino-4,6-dinitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
2,4,6-Trinitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
2,6-Dinitrotoluene	8330B	0.20	ND	0.064*	0.070*	ND	ND	0.037*	–	–
2,4-Dinitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
2-Nitrotoluene	8330B	0.10	ND	ND	ND	ND	ND	ND	–	–
4-Nitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
3-Nitrotoluene	8330B	0.098	ND	ND	ND	ND	ND	ND	–	–
Nitroglycerin	8330B	0.98	ND	ND	ND	ND	ND	ND	–	–
Pentaerythritol Tetranitrate	8330B	0.49	ND	ND	ND	ND	ND	ND	–	–

Notes:
* Detected in laboratory blank sample; estimated J value.

Table 16N: Pharmaceutical and Personal Care Products (PPCPs)

Analyte	Method	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission	ASR MW-1	Regulatory Requirements	
		µg/L								Type
N-nitrosodiethylamine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-nitrosodimethylamine	EPA 1625M	0.002	ND*	ND*	NA	ND	0.0054	ND	0.01	NL
N-nitrosodi-n-butylamine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-nitrosodimethylethylene	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-Nitrosomorpholine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-nitrosopiperdine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
N-Nitrosopyrrolidine	EPA 1625M	0.002	ND	ND	NA	ND	ND	ND	–	–
17-α-ethynlestradiol	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	–	–
17-β-estradiol	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	–	–
Esdtrone	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	0.0009-1.8	DWEL
Progesterone	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	–	–
Testosterone	EPA 1694M-API	0.001	ND	ND	ND	ND	ND	ND	–	–
Bisphenol A	EPA 1694M-ESI−	0.001	0.009*	0.062*	ND*	0.390*	ND*	1.400*	–	–
Gemfibrozil	EPA 1694M-ESI−	0.001	ND	ND	ND	ND	ND	ND	–	–
Ibuprofen	EPA 1694M-ESI−	0.001	ND	ND	ND	ND	ND	ND	–	–
Iopromide	EPA 1694M-ESI−	0.005	ND	ND	ND	ND	ND	ND	–	–
Naproxen	EPA 1694M-ESI−	0.001	ND	ND	ND	ND	ND	ND	–	–
Salicylic acid	EPA 1694M-ESI−	0.050	52	ND	ND	ND	ND	ND	–	–
Triclosan	EPA 1694M-ESI−	0.002	ND	ND	ND	ND	ND	ND	0.35-2,600	DWEL
Aceltaminophen	EPA 1694M/ESI+	0.020	ND	ND	ND	ND	ND	ND	–	–
Amoxicillin	EPA 1694M=ESI+	0.001	ND	ND	ND	0.014	ND	ND	–	–
Atenolol	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Atorvastatin	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Azithromycin	EPA 1694M-ESI+	0.010	ND	ND	ND	ND	ND	ND	–	–
Caffeine	EPA 1694M-ESI+	0.001	ND	0.0027	ND	0.0068	ND	ND	0.35	DWEL
Carbamazepine	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Ciprofloxacin	EPA 1694M-ESI+	0.005	ND	ND	ND	0.0059	ND	ND	–	–
Cotinine	EPA 1694M-ESI+	0.002	ND	ND	ND	ND	ND	ND	–	–

Table 16N: Pharmaceutical and Personal Care Products (PPCPs) (continued)

Analyte	Method	MRL	City of Seaside 4	FO-7 Deep	FO-7 Shallow	MRWPCA MW-1	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
		µg/L								Type
DEET	EPA 1694M-ESI+	0.001	ND	0.0023	ND	0.006	ND	ND	2.5-6,300	DWEL
Diazepam	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Fluoxetine	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Methadone	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Oxybenzone	EPA 1694M-ESI+	0.001	ND	ND	0.0012	0.087	ND	ND	–	–
Phenyloin	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Primidone	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
Sucralose	EPA 1694M-ESI+	0.005	ND	ND	ND	ND	ND	ND	175,000	DWEL
Sulfamethoxazolke	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–
TCEP	EPA 1694M-ESI+	0.001	0.0067	ND	ND	0.0064	ND	ND	–	–
TCPP	EPA 1694M-ESI+	0.001	0.0052*	0.0025*	0.0026*	0.011*	0.0032*	0.0016*	–	–
TDCPP	EPA 1694M-ESI+	0.001	0.0011	0.0031	ND	0.0038	ND	ND	–	–
Trimethoprim	EPA 1694M-ESI+	0.001	ND	ND	ND	ND	ND	ND	–	–

Notes:
Laboratory analytical data sheets reported detected values in ng/L; converted to µg/L.
* Detected in laboratory blank sample
NA = Not analyzed for FO-7 Shallow because laboratory instrumental problems resulted in unsuccessful runs; insufficient sample volume remaining for re-analysis.

Table 16O: Radiogenic

Analyte	Method	DL	City of Seaside 4	FO-7 Deep**	FO-7 Shallow**	MRWPCA MW-1**	PRTIW Mission Memorial	ASR MW-1	Regulatory Requirement	
		pCi/L								Type
Gross Alpha	7110B	3.00	0.29±0.39	3.0±0.5	125±5	6.3±1.2	8.7±1.2	2.8±1.1	15	CPMCL-EPMCL
Gross Beta	7110B	4.0	1.4±0.5	4.5±0.5	114±2	7.5±1.1	8.8±0.9	5.6±1.0	50	CPMCL-EPMCL
Radium 226	7500-RaB	1.00	0.48±0.46	0.47±0.43	22±2.2	0.62±0.31	1.9±0.9	0.73±0.42	‡	–
Radium 228	7500-Ra D	1.00	0.11±0.38	0.44±0.38	16.3±1.2	-0.08±0.51	2.2±0.7	0.45±0.45	‡	–
Combined Radium	calculated	1.00	0.59±	0.91±0.57	38.3±2.4	0.54±0.60	4.1±0.7	1.18±0.62	5	CPMCL-EPMCL
Strontium 90	905.0	2.00*	0.339±0.692	-0.439±0.720	0.748±1.140	0.090±1.070	-1.27±0.850	-0.883±0.948	8	CPMCL-EPMCL
Tritium***	Enriched	–	0.70±0.15 (0.2233)	<1.0 (<3.19)	<1.00 (<3.19)	<1.0 (<3.19)	0.75±0.16 (2.39)	<1.00 (<2.19)	(20,000)	CPMCL
Uranium	200.8	0.080	ND	1.6	0.62	0.33	0.20	1.3	20/30†	CPMCL/EPMCL†

Notes:
* MRL for strontium 90
** Turbid sample
*** Tritium (enriched) reported in tritium units (TU) where 1.0 TU = 3.19 pCi/L. Values in parenthesis are in pCi/L.
† In micrograms per liter (µg/L)
‡ MCL for Ra226+Ra228 only.

Table 16P: Stable Isotopes in Water and Nitrate

Sample	Water (H_2O)				Nitrate (NO_3^-)			
	$\delta^{18}O$		δD		$\delta^{15}N$		$\delta^{18}O$	
	‰	1σ	‰	1σ	‰	1σ	‰	1σ
Monitoring Wells:								
City of Seaside 4	-6.62	0.06	-44.27	0.32	1.4	0.2	0.7	0.4
FO-7 Deep	-7.18	0.06	-48.55	0.32	*	0.2	*	0.4
FO-7 Shallow	-6.36	0.06	-45.44	0.32	8.7	0.2	4.2	0.4
MRWPCA MW-1	-6.56	.0.06	-43.87	0.32	8.9	0.2	4.4	0.4
PRTIW Mission Memorial	-6.14	0.06	-40.68	0.32	2.5	0.2	1.3	0.4
ASR MW-1	-6.4	0.06	-45.90	0.32	*	0.2	*	0.4

Notes:
* Analysis did not produce a reliable compound specific isotope analysis (CSIA) value.
δD = ratio of deuterium to hydrogen (D/H) against Vienna Standard Mean Ocean Water (VSMOW) standard
$\delta^{18}O$ = ratio of $1^8O/^{16}O$ against VSMOW standard
$\delta^{15}N$ = ratio of $^{15}N/^{14}N$ against standard of nitrogen in air
‰ = per mil or parts per thousand
1σ = analytical precision of one sigma

General Notes for Tables 16A to 16P:

Samples collected from January 29-30, 2014 and February 3, 2014; received and analyzed, unless otherwise noted, by Alpha Analytical Laboratory, Inc., Ukiah, CA
– (dash) = no data reported
EPA = U.S. Environmental Protection Agency
CPMCL = California Department of Public Health (CDPH) (now SWRCB Division of Drinking Water) Primary Maximum Contaminant Level
CSMCL = California Department of Public Health (CDPH) (now SWRCB Division of Drinking Water) Secondary Maximum Contaminant Level
DWEL = U.S. EPA Drinking Water Equivalent Level; advisory only and not to be construed as legally enforceable Federal standards.
EPMCL = U.S. Environmental Protection Agency Primary Maximum Contaminant Level
ESMCL = U.S. Environmental Protection Agency Secondary Maximum Contaminant Level
NL = CDPH (now SWRCB Division of Drinking Water) Notification Level – advisory in nature and not an enforceable standard
California MCL for Gross Beta = 50 pCi/L; U.S. EPA Primary MCL (EPMCL) = 4 millirems per year (mrem/yr)
CU = Color Units
MFL = Millions of fibers per liter
µg/L = micrograms per liter or parts per billion (ppb)
µS/cm = microSiemans per centimeter (formerly µmohs/cm)
mg/L = milligrams per liter or parts per million (ppm)
pg/L = picograms per liter or parts per quadtrillion (ppq)
pCi/L = picoCuries per liter
TU = tritium units
NTU = Nephalometric Turbidity Units
SM = Standard Method
MFL = Millions of fibers per liter
MRL = Minimum Reporting Limit
ND = Not detected or below MRL
NA = Not analyzed
TEM = Transmission Electron Microscopy

The ionic concentrations for the ASR injectate are lower than in the Santa Margarita Aquifer and the injectate appears to have slightly higher magnesium and sulfate content than most wells in the Paso Robles Aquifer. Although not clearly demonstrated by the Stiff diagrams, recent TDS concentrations in the ASR-1 and ASR-2 indicate mixing with the injectate (HydroMetrics, March 2014).

3.5.1.2. Source Water (Trilinear) Diagram

Inorganic water quality data from the six wells sampled for this investigation were plotted on a Trilinear Diagram (**Figure 8**). This technique plots the major anions and cations in percent meq/L (% meq/L) to differentiate samples of varying water quality. Data from the wells screened in the Paso Robles Aquifer and Santa Margarita Aquifer are color-coded in yellow and green respectively to facilitate aquifer comparisons. Data from an ASR injectate sample (blue) and the GWR pilot recycled water (purple) are also included on the diagram for comparison.

The figure shows that groundwater in wells from both aquifers range from neutral-type to sodium-potassium-type (for cations) and bicarbonate-carbonate-type, to neutral-type, to chloride-type (for anions). In the diamond portion of the diagram, the groundwater samples from both shallow and deep aquifers are generally clustered together toward the center, suggesting that groundwater in both aquifers is derived from similar sources. There is slight differentiation between the two aquifers. Most of the groundwater samples from the Paso Robles wells (yellow) have a more distinct sodium-chloride (saline) signature, while the Santa Margarita wells have a more neutral signature.

The ASR injectate appears slightly different from the groundwater signature, especially with respect to chloride (lower) and sulfate (slightly higher). However, the sample from ASR MW-1 plots closely to the ASR injectate sample, indicating mixing between local groundwater and injected water.

The GWR project pilot water is a sodium-bicarbonate type. This signature is a product of the stabilization technique of the raw permeate, which involves the addition of calcium chloride, sodium hydroxide and bubbling of CO_2 gas. The signature plots near the edge of other data points.

3.5.1.3. Stable Isotopes – Oxygen/Deuterium in Water and Nitrogen-Oxygen in Dissolved Nitrate

<u>Water - Oxygen-Hydrogen (Deuterium) Isotopes:</u> Molecular water (H_2O) is largely composed of two oxygen isotopes: oxygen-16 (^{16}O) and ^{18}O. Water molecules that have more ^{16}O are less dense than water that has a larger component of the heavier ^{18}O. This variation occurs when water evaporates from the oceans, resulting in water vapor containing more atoms composed of ^{16}O.This process is also known as isotopic fractionation. When the “lighter” water vapor condenses as precipitation, the resulting liquid water will have a larger component of ^{16}O than ^{18}O. Oxygen isotope fractionation also occurs at different rates at different latitudes and climates because water vapor condensation is temperature-dependent and, therefore the ratio of $^{18}O/^{16}O$ in rain and snow will change with latitude and elevation. The higher the latitude or

the elevation, the lower the $\delta^{18}O$[1] value; these vary from approximately 0‰ Vienna Standard Mean Ocean Water (VSMOW) at the equator to about –50 to –55‰ VSMOW at the poles. The stable isotope of hydrogen, known as hydrogen-2 (^{2}H) or deuterium (D) also fractionates from hydrogen-1 (^{1}H); therefore δD ($^{1}H/^{2}H$) ratios are also directly proportional to $^{18}O/^{16}O$ ratio fractionation.

A plot of the $\delta^{18}O$ concentration versus the δD will therefore show unique characteristics for water samples collected from different latitudes, climates, seasons, hydrologic basins, hot springs, and soil clay minerals. In general, precipitation data can be plotted as a straight-sloping line, known as the Global Meteoric Water Line (MWL) using the equation:

$$\delta D = (8\delta^{18}O) + 10$$

Deviations from the MWL occur by the physicochemical processes described above, particularly evaporation. Local variations also occur and local MWLs can be calculated from precipitation data and shown on the plot.

In the absence of collected or sampled local precipitation, an online calculator (Bowen, 2014) was used to determine the local $\delta^{18}O$-δD fingerprint" for precipitation. Local O-D isotope precipitation values are determined by inputting latitude, longitude, and elevation (in meters) into the calculator.

Stable isotope (oxygen-deuterium) data are summarized in **Table 16P**. **Figure 9** shows the oxygen-deuterium data for the six water quality samples collected for this investigation. The figure shows the data for the Paso Robles and Santa Margarita Aquifers and for calculated precipitation data. It appears that Paso Robles and Santa Margarita water are from the same or similar sources with little to no influence by infiltrating precipitation. However, in the absence of an isotopic signature for Carmel Valley Alluvial Water, exact sources cannot be determined at this time.

<u>Nitrogen and Oxygen Isotopes in Dissolved Nitrate (NO_3^-) and Nitrate Containing Compounds:</u> Stable nitrogen and oxygen isotopes are useful in indicating sources when nitrate is present in surface or groundwater. Delta nitrate-nitrogen ($\delta^{15}N_{nitrate}$) and nitrate-oxygen ($\delta^{18}O_{nitrate}$) isotope ratios in water can be used to identify nitrate sources and fate in vadose zone soil and in groundwater. Nitrogen has two stable isotopes: ^{14}N (99.63%) and ^{15}N (0.37%). The wide difference in the isotopic abundance allows for the determination of distinctive isotopic signatures for determining nitrate sources, including those from natural

[1] By established convention, isotopic ratios are defined as delta (δ) values. The δ value, in per mills (‰), can be obtained by the equation: $\boldsymbol{\delta\ (isotope) = [[R_{(sample)} - R_{(standard)}]/R_{(standard)}] - 1\ (1{,}000)}$, where: δ (isotope) = values in per thousand (‰) or per mill and $R_{(sample)}$ = the ratio of the first and second isotope such as $^{18}O/^{16}O$, and $R_{(standard)}$ = the ratio of the isotopes used in international or other standards; a commonly used standard for $^{18}O/^{16}O$ is Vienna - Standard Mean Ocean Water or VSMOW. A δ value with a positive (+) sign corresponds to an increase of the first isotope (e.g. ^{18}O) with respect to the standard indicating that the sample is enriched with the heavier isotope. A minus (-) sign indicates a decrease in a sample with respect to the standard indicating that the sample is depleted with respect to the heavier isotope. Standards have been established by the International Atomic Energy Agency (IAEA) and the National Institute of Standards and Technology (NIST).

and anthropogenic sources such as septic systems, sanitary sewage effluents, domestic animal wastes, and home and farm usage of nitrogen fertilizer. In analyzed samples, the ratio of $^{15}N/^{14}N$ is compared with the Standard Mean Ocean Chlorine (SMOC) to provide $\delta^{15}N$. The abundance of ^{15}N in the atmosphere remains relatively constant because of the inert character of atmospheric nitrogen; this value is fixed at 0.36765 percent, which essentially results in a $\delta^{15}N$ of zero. The $\delta^{15}N$ and $\delta^{18}O$ can be shown on a plot with the ranges of known natural and anthropogenic sources (see for example Silva, et al., 2002). Other sources of nitrates include explosives and pyrotechnics such as fireworks, flares, torches and munitions. More recently nitrogen and oxygen isotopic data have become available for these sources (Pennington, et al. 1999, Widory, et al., 2009; Bordeleau, et al., 2013).

Figure 10 shows the plot of $\delta^{15}N$ and $\delta^{18}O$ for four Paso Robles groundwater samples. Although there are some overlaps in the various source ranges, the plot suggest that the nitrate sources are either from natural soil nitrogen or ammonia in fertilizer and rain and not from nitrate contained in TNT.

3.5.1.4. Groundwater Age Dating

Radiogenic tritium data (summarized in **Table 16O**) were applied to the following equation to estimate the age of groundwater in wells sampled for this investigation:

$$^{3}H = {}^{3}H_o \ln(e^{-\lambda t})$$

$$t = \ln({}^{3}H_o/\lambda)/0.056$$

where, ^{3}H = tritium analysis in water in tritium units (TU)
$^{3}H_o$ = pre-nuclear bomb testing tritium in precipitation
λ = decay constant of tritium at 0.056 per year beginning with pre-bomb tritium concentration
t = time (age) in years

Calculations using the tritium concentration data indicate that groundwater in two of four wells screened in the Paso Robles Aquifer (PRTIW and City of Seaside #4) are approximately 32 to 33 years old (assuming an average pre-bomb concentration of 4.5 TU). The estimated age of groundwater in the other two Paso Robles Aquifer wells (MRWPCA MW-1 and FO-7 Shallow) and both Santa Margarita Aquifer wells (FO-7 Deep and ASR MW-1) are each greater than 27 years old (tritium concentrations do not allow for more precise estimation). Considering that shallow Carmel Valley Alluvial Aquifer water is currently injected in adjacent ASR wells, the calculated age for ASR MW-1 using tritium data may be overestimated. This is because the tritium concentration of the Carmel Valley Alluvial Aquifer water is near zero, which makes it appear to be very old water, when in fact it has an effective age close to 0 years old.

3.5.2. Potential Constituents of Concern

3.5.2.1. Constituents Exceeding California Primary MCLs

For the more than 300 constituents and parameters analyzed in each of the six wells for this monitoring event, only the constituents in **Table 17** below were not within the California primary MCLs for drinking water standards. In addition, only two wells (FO-7 Shallow and MRWPCA MW-1) had any exceedances. Elevated turbidity values indicate that even these exceedances are not likely representative of actual groundwater concentrations as discussed in more detail below.

Table 17. Constituents Exceeding California Primary MCLs

Analyte	Method	Units	MDL	FO-7 Shallow	MRWPCA MW-1	California Primary MCL
Turbidity	**SM2130B**	**NTU**	**0.040**	**550**	**71**	**5***
Aluminum (Al)	EPA 200.8	µg/L	8.0	3,700	2,700	1,000
Arsenic (As)	EPA 200.8	µg/L	0.28	210		10
Barium (Ba)	EPA 200.8	µg/L	0.12	1,200		1,000
Chromium (Cr) Total	EPA 200.8	µg/L	0.32	790		50
Lead (Pb) Total	EPA 200.8	µg/L	0.080	42		15
Gross Alpha	7110B	pCi/L	3.00	125 ±5		15
Gross Beta	7110B	pCi/L	4.0	114 ±2		50
Combined Radium	calculated	pCi/L	1.00	38.3 ±2.4		5

*5 NTU is a secondary MCL and is included on the table for comparison purposes.

As shown in **Table 17**, the only constituents with laboratory concentrations above primary MCLs were five metals and several radiogenic parameters. However, these constituents are also the types most affected by turbidity in groundwater samples; as shown on the table, the well with the most exceedances (FO-7 Shallow) is the well with the highest turbidity value (550 NTU). One exceedance occurred in one other well (MRWPCA MW-1) and is correlated with the second-highest turbidity value (71 NTU). Turbidity in these samples result from small particles of aquifer material (or pre-development solids from drilling fluids) being entrained in the groundwater sample; these particles interfere with the laboratory methods and result in concentrations of constituents in the solids rather than actual concentrations dissolved in the groundwater. The constituents on Table 17 are all naturally-occurring constituents associated with aquifer materials and/or remnant drilling fluids. Therefore it is likely that all constituents included in the program meet drinking water standards.

Both of these wells are relatively small-diameter monitoring wells. As previously discussed, the small-diameter casings and deep water table have limited the ability to develop these three monitoring wells in order to produce a turbid-free groundwater sample for analysis. As such, it is recommended that future sampling programs incorporate techniques, including sampling with a higher capacity pump (at MRWPCA MW-1) and field filtering to minimize the effects of turbidity.

3.5.2.2. Former Ford Ord Constituents

Given the historical land use of the former Fort Ord lands, the MRWPCA field program included groundwater analyses for chemicals of concern associated with former Fort Ord activities. The six groundwater samples from the MRWPCA field program were analyzed for 17 explosive compounds (nitroaromatics and nitramines) by U.S. EPA Method 8330B. In addition, two metals associated with explosive compounds (beryllium and lead) were also analyzed. These data were compared to available California primary drinking water MCLs and SWRCB DDW Notification Levels (NLs) as summarized in **Table 18**. NLs are non-regulatory, health-based advisory levels established by SWRCB DDW for contaminants in drinking water for which MCLs have not been established. NLs represent the concentration of a contaminant in drinking water that SWRCB DDW has determined does not pose a significant health risk, but warrants notification to the local governing body.

As shown in **Table 18**, the only explosive constituent detected in groundwater samples was 2,6-DNT (dinitrotoluene). This constituent was also detected in laboratory blank samples, which are samples of laboratory water (not groundwater) analyzed for quality assurance/quality control (QA/QC) purposes. Detections of this constituent at similar levels in the laboratory blank sample indicate that 2,6-DNT is likely a laboratory contaminant and not actually present in groundwater. Although the constituent may be present in several groundwater *samples*, the laboratory blank data suggest that it was introduced into the samples in the laboratory. Further, detections of 2,6-DNT in FO-7 Shallow, FO-7 Deep, and ASR MW-1 were below the laboratory reporting level (RL), meaning that the concentration of 2.6-DNT in samples is too low to be quantified. Given the laboratory QA/QC data for 2,6-DNT, the low levels of the detections, and the absence of additional explosives in groundwater, data indicate that groundwater has not been impacted locally from explosives associated with former Fort Ord activities.

For the metals analysis, both beryllium and lead – as naturally occurring substances – were detected in several groundwater wells above the reporting limits. Beryllium was detected in groundwater collected from ASR-2, FO-7 Shallow, and MRWPCA MW-1, although all of the detections met the California Primary MCL for drinking water. Other wells in the database did not detect beryllium above the laboratory reporting limits.

Lead was also detected in groundwater collected from ASR-1, ASR-2, FO-7 Shallow, FO-7 Deep, Mission Memorial PRTIW, MRWPCA MW-1, and Paralta. The detection in FO-7 Shallow (42 µg/L) was above the MCL (15 µg/L), but appears anomalous with respect to other detections of lead in the database. The concentration of 42 µg/L is the highest concentration in the database by an order of magnitude, which included lead analyses from 13 wells sampled from 2011 through 2014. The second highest concentration was detected in ASR-2 at 3.0 µg/L (also included on **Table 18**). Except for FO-7 Shallow, all of the detections were below the MCL for lead.

Table 18. Groundwater Analyses for Explosives and Associated Metals

Constituent	Wells with Detections*	Minimum Reporting Limit (RL)	Detected or Reported Concentration	California Primary MCL	California NL	Comments
		µg/L				
Explosives*						
HMX (cyclotetramethylene tetranitramine)	None	0.099-0.12	ND	None	350	
RDX (cyclotrimethylene trinitramine) (cyclonite)	None	0.099-0.12	ND	None	0.3	
1,3,5- TNB (trinitrobenzene)	None	0.20-0.22	ND	None	None	
1,3-dinitobenzene	None	0.098-0.12	ND	None	None	
3,5-dinitoaniline	None	0.098-0.30	ND	None	None	
TETRYL (2,4,6 trinitro-phenylmethyl-nitramine)	None	0.10-0.12	ND	None	None	
nitrobenzene	None	0.099-0.12	ND	None	None	
4-Amino-2,6-dinitrotoluene	None	0.098-0.11	ND	None	None	
2-amino-4,6-dinotrotoluene	None	0.098-0.11	ND	None	None	
2,4,6-trinitrotoluene (TNT)	None	0.098-0.11	ND	None	1	
2,6-DNT (dinitrotoluene)	FO-7 Shallow	0.20	0.070***	None	None	high turbidity
	FO-7 Deep	0.23	0.064***	None	None	slightly turbid
	ASR MW-1	0.10	0.037***	None	None	
2,4-DNT (dinitrotoluene)	None	0.10	ND	None	None	
2-nitrotoluene	None	0.11	ND	None	None	
4-nitrotoluene	None	0.098-0.12	ND	None	None	
3-nitrotoluene	None	0.098-0.12	ND	None	None	
NG (nitroglycerine) (triniroglycerol)	None	0.99-1.2	ND	None	None	
pentaerythritol tetranitrate	None	0.49-0.56	ND	None	None	
Metals**						
Beryllium (Be)	ASR-2	0.050	0.7	4.0		
	FO-7 Shallow	0.020	0.68			high turbidity
	MRWPCA MW-1	0.020	0.044			turbid
Lead (Pb)	ASR-1	0.020	0.78	15.0		
	ASR-2	0.010	3.0			
	FO-7 Shallow	0.020	**42.0**			high turbidity
	FO-7 Deep:	0.080	1.3			slightly turbid
	PRTIW: Mission Memorial	0.020	0.061			
	MRWPCA MW-1	0.020	1.3			turbid
	Paralta	0.001	3.0			

Notes:

* Nitroaromatics and nitramines by U.S. EPA Method 8330B: Samples received and submitted by Alpha Analytical Laboratory, Ukiah, CA to ALS Environmental (ALS), Kelso, WA on February 5, 2014; analyzed by ALS on February 8, 2014.

**** Metals by U.S. EPA Method 200.8 analyzed by Alpha Analytical Laboratory, Ukiah, CA, February 5-11, 2014.

***Constituent also detected in laboratory blank indicating a laboratory contaminant that may not be present in groundwater. All detections were below Reporting Limits (J values) and are not quantifiable.

µg/L = micrograms per liter or parts per billion (ppb)

MCL = Maximum Contaminant Level for drinking water

ND = Not detected above the method detection level for any of the samples from the six wells.

As previously mentioned, the 2014 sampling of FO-7 Shallow was the first time that the small-diameter monitoring well had been sampled for water quality. Sampling produced a highly turbid sample (550 NTU), likely relating to the inability to properly develop the well when installed in 1994 as a water level monitoring well. As such, the metals analytical data are likely the result of particle interference and are not likely representative of dissolved lead concentrations in groundwater.

Given the absence of explosives and the relatively low levels of beryllium and lead (with the exception of FO-7 Shallow where data are suspect), the data do not indicate that former Fort Ord activities have impacted groundwater in the near-project wells.

3.5.2.3. Constituents of Emerging Concern (CoECs)

As defined in the Recycled Water Policy, CoECs are chemicals in personal care products (PCPs), pharmaceuticals including antibiotics, antimicrobials, agricultural and household chemicals, hormones, food additives, transformation products and inorganic constituents. These chemicals have been detected in trace amounts in surface water, wastewater, recycled water, and groundwater and have been added to the monitoring requirements for any project involving recharge of recycled water.

The SWRCB Recycled Water Policy CoEC monitoring requirements were based on the recommendations of an expert panel. As part of the SWRCB DDW Draft Groundwater Replenishment Regulations for injection projects, a project sponsor's Engineering Report must recommend CoECs for monitoring in recycled water and groundwater in addition to the Recycled Water Policy requirements. For injection projects that produce recycled water using RO and AOP, the monitoring requirements in the Recycled Water Policy only apply to recycled water prior to and after treatment (no groundwater sampling). The CoECs are health-based, treatment-performance based indicators, or both:

- 17-*β*-estradiol - steroid hormone (health-based indicator)
- Caffeine – stimulant (health-based and performance-based indicator)
- N-nitrosodimethylamine (NDMA) – disinfection byproduct (health-based and performance-based indicator)
- Triclosan – antimicrobial (health-based indicator)
- N,N-diethyl-metatoluamide (DEET) – personal care product (performance-based indicator)
- Sucralose – food additive (performance-based indicator)

None of the CoECs currently have MCLs for drinking water. For NDMA, SWRCB DDW has established an NL of 0.01 µg/L.

To provide baseline conditions for these CoECs in the Seaside Groundwater Basin, the six wells sampled in the recent MRWPCA field program were analyzed for the six CoECs and other pharmaceuticals/PCPs included in U.S. EPA Laboratory methods 1625M and 1694 (APCI and ESI+). Full results are provided in **Table 16N**. Detections of the six CoECs are summarized in **Table 19**.

Table 19. Groundwater Analyses for CoECs

Constituent*	Wells with Detections**	Minimum Reporting Limit (RL)	Detected or Reported Concentration	Comments
		µg/L***		
NDMA (nitrosodimethylamine)	PRTIW (Mission Memorial)	0.002	0.0054	CAEPA NL =0.01
17-β-estradiol	None	0.001	ND	
Triclosan	None	0.002	ND	
Caffeine	FO-7 Deep	0.001	0.0027	
	MRWPCA MW-1		0.0068	
DEET (n,n-diethyl-m-toluamide)	FO-7 Deep	0.001	0.0023	
	MRWPCA MW-1		0.0060	
Sucralose	None	0.005	ND	

Notes:

* NDMA by EPA Method 1625M; 17-β-estradiol and triclosan by EPA Method 1694-APCI; caffeine, DEET, and sucralose by EPA 1694-ESI+.

** Groundwater analyzed from wells ASR-1, City of Seaside 4, FO-7 Shallow, FO-7 Deep, PRTIW Mission Memorial, and MRWPCA MW-1.

*** Analyses reported on laboratory analytical data sheets in nanograms per liter (ng/L) or parts per trillion. Converted to micrograms per liter (µg/L) or parts per billion (ppb).

Samples received by Alpha Analytical Laboratory, Ukiah, CA; submitted to Weck Laboratories, Inc. (Weck), City of Industry, CA, on February 5, 2014; analyzed by Weck from February 11 to February 19, 2014.

CAEPA = California Environmental Protection Agency.

U.S. EPA = U.S. Environmental Protection Agency.

MCL = Maximum Contaminant Level for drinking water.

ND = Not detected.

NL = Notification level.

As indicated in **Table 19**, NDMA was detected in groundwater collected from the PRTIW well at 0.0054 µg/L; caffeine was detected in FO-7 Deep and MRWPCA MW-1 at 0.0027 and 0.0068 µg/L, respectively. DEET was detected in FO-7 Deep and MRWPCA MW-1 at 0.0023 and 0.0060 µg/L, respectively. Estradiol (17-β), triclosan, and sucralose were not detected above reporting limits in groundwater collected from any of the six wells.

These data represent the first time that CoECs have been analyzed in the Seaside Basin. Data will be confirmed through future groundwater sampling events that will support the monitoring program proposed in the SWRCB DDW Engineering Report for the Proposed Project. Nonetheless, only a few constituents were detected and levels were very low (all less than 0.01 µg/L).

4. GEOCHEMICAL COMPATIBILITY MODELING EVALUATION

When two water types with different water chemistry are mixed (such as the proposed GWR project recycled water and groundwater), the compatibility of the waters requires examination. There are two fundamental concerns related to potential chemical reactions. The first is that combining the two types of water might cause some minerals to precipitate out of solution and clog the pores of the aquifer. Precipitation typically involves common minerals composed of relatively abundant ions, such as carbonates and hydrous silicates. The second concern is that the injected water might cause toxic trace elements to dissolve or desorb from rock surfaces in the aquifer. Examples include arsenic, chromium, lead and mercury.

Geochemical modeling is a tool that can be used to investigate both concerns. Geochemical models are computer programs that simulate mineral dissolution and precipitation, oxidation and reduction, cation exchange, and adsorption of ions onto the surfaces of rock particles that comprise the aquifer matrix. There are hundreds of minerals that share many elements in common. Therefore, the models apply numerical methods to simultaneously solve thousands of equations representing the thermodynamics of the various reactions, drawing on a large database of experimentally-derived coefficients. This study used two geochemical modeling codes developed by the U.S. Geological Survey. PHREEQC simulates the equilibration of one liter of groundwater with the chemistry of the rock materials with which it is in contact by solving a large number of simultaneous equations representing the thermodynamics of all possible mineral dissolution, precipitation, cation exchange, and adsorption reactions given the chemical elements present in the water-rock system Parkhurst and Appelo, 1999). PHREEQC is widely used for investigations of this type. A second model, PHAST, was used to simulate movement of injected water from the Aromas Sand into the Paso Robles Formation. It superimposes PHREEQC geochemical modeling onto a finite-difference groundwater flow and chemical transport model (Parkhurst and others, 2010).

The first step in a geochemical modeling study is to define a conceptual model of the flow system, including flow paths and rates, the elements and minerals present in the aquifer, and the types of reactions that might occur. Data from laboratory analyses of the rock and fluid phases are then incorporated, and parameters are adjusted if needed to successfully simulate existing groundwater quality. The model can then be used to test hypotheses about possible reactions, test the sensitivity of simulated concentrations to parameters such as pH or pe[2], and simulate proposed project operation.

[2] The parameter pe is a measure of oxidation-reduction potential (eh is another measure) and can be calculated as pe = Eh(volts)/0.05916 at 25°Celsius.

4.1. SITE CONCEPTUAL MODEL

4.1.1. Natural Recharge and Recycled Water Flowpaths

The hydrogeologic system at the GWR project recharge site and for several miles upgradient consists of three layers. The top layer is the Aromas Sand, which is above the water table but transmits about 2 inches per year of rainfall recharge as vertical unsaturated flow. The total thickness is approximately 400 feet in the vicinity of MRWPCA MW-1. The middle layer consists of the Paso Robles Formation, which is estimated to be about 250 feet thick in the vicinity of the GWR project recharge site. Coincidentally, the water table is within a few feet of the top of the formation, so it is considered fully saturated in the conceptual model. Upon arriving at the water table, the natural recharge flow abruptly becomes horizontal and moves westward down the regional water-level gradient. The Santa Margarita Aquifer underlies the Paso Robles Formation and is approximately 250 feet thick beneath the GWR project recharge site. Recharge to the Santa Margarita Aquifer occurs via downward leakage from the Paso Robles Formation, which is accelerated by the substantial amount of groundwater pumping from the Santa Margarita Aquifer. Additionally, recharge to the Santa Margarita Aquifer also occurs to the East where the sandstone unit has a shallow subcrop beneath surficial sands and outcrops near the inland boundaries of the basin.

Figure 11 shows a conceptual diagram of the flow pattern of recycled water injected into the Aromas Sand in cross section. Recycled water injected into the Aromas Sand would create a localized zone of saturation close to the vadose zone well, and the water would flow downward under gravity. The columnar zone of saturation would widen along the descent path due to the effects of subtle layering within the Aromas Sand. The recharge would create a mound in the water table that would result in flow radially outward as well as downward within the saturated Paso Robles materials. Eventually, the injected water could arrive at a well screened in the Paso Robles Formation or leak down to the Santa Margarita Aquifer.

Recycled water injected into the Santa Margarita Aquifer would be under fully saturated conditions and would flow radially outward from the well. The body of injected water would gradually move westward under the influence of the regional water-level gradient.

4.1.2. Potential Geochemical Reactions

Several types of geochemical reactions between the recycled water, ambient groundwater and aquifer materials could potentially cause operational problems for the injection well or pose a health risk for downgradient groundwater users, as follows:

- **Biofouling of the well screen and adjacent aquifer by iron bacteria**. Various types of iron bacteria occur naturally in soil environments and can become established in and near the well screen. Their metabolisms involve oxidation or reduction of iron, and they produce a mucilaginous coating in the process that can quickly clog the well screen, gravel pack and adjacent aquifer materials. Bacterial growth can be limited by the availability of nitrogen or phosphorus; accordingly, if concentrations

of those nutrients in the injected water are greater than in the aquifer, bacterial growth could be stimulated. In any event, the bacterial clogging can be controlled by periodically treating the well with chlorine.

- **Clogging of aquifer pores due to precipitation of common minerals (scaling).** For example, a previous modeling analysis of Carmel River water injected into the Santa Margarita Aquifer concluded that chalcedony (opaline silica) might precipitate in the injection zone (EcoEngineers, 2008?). Mineral precipitation depends on the solubilities of the minerals that could form from the dissolved ions present in solution.

- **Mobilization of toxic metals already present in aquifer rock materials.** Metal ions stick to rock surfaces by a combination of chemical bonds and electrostatic forces, and the overall process is called adsorption. The ratio of adsorbed ions to ions in solution varies widely by element and is influenced by the total amount of that element in the system, the type of mineral surface, the types and concentrations of other metallic elements present, the pH and the composition of the solution. It is possible for ions that are adsorbed under natural flow conditions to desorb when a different type of water is injected into the aquifer. For example, adsorption-desorption processes are often quite sensitive to pH.

Some of the possible geochemical reactions listed above can be resolved directly from the empirical data collected for this investigation without geochemical modeling. In the case of biofouling, bacterial growth is not likely to be stimulated if the nitrogen and phosphorus concentrations in the injected water are less than in ambient groundwater. Phosphorus was <0.5 mg/L in the pilot water, and the only nitrate measurement above the detection limit of 0.1 mg/L was the same as measured in a laboratory blank. In contrast, nitrogen averaged 1.6 mg/L in Paso Robles wells (range 0.5-2.9 mg/L). Phosphorus was not measured in the Paso Robles well water samples. Phosphorus was detected above the 0.5 mg/L detection limit in two of the six Aromas pilot water leaching test samples. Both of those samples had elevated turbidity. If phosphorus is present in groundwater, its concentration is typically low because it tends to precipitate as apatite (a mineral that contains phosphorus). Therefore, it is likely that the detected phosphorus was part of the colloidal material that was creating the turbidity. In any case, phosphorus concentrations were low in both the pilot water and leach tests. The lack of biofouling at nearby wells that have been injecting Carmel River water into the Santa Margarita Aquifer for a number of years further suggests that phosphorus and nitrate in recycled water will not create biofouling problems. The phosphorus concentration in river water was 0.34 mg/L, and the concentration neither increased nor decreased when the water was leached through aquifer solids in the laboratory (EcoEngineers, 2008). The nitrogen and phosphorus data suggest that injected GWR recycled water would not stimulate bacterial growth by increasing the supply of nutrients.

With respect to clogging of pores due to mineral precipitation, the major ions in the pilot water are sodium, calcium and bicarbonate, indicating that calcium carbonate (calcite) would be the most likely precipitate. Also, Paso Robles Formation groundwater is near

saturation with respect to calcite. The pilot water is dilute, however, with a TDS concentration of only about 75 mg/L, of which calcium contributes 11 mg/L. Precipitation of a silicate mineral such as chalcedony (SiO_2) is also unlikely due to the low silica concentration in pilot water, which was 1.1 mg/L. Chalcedony is soluble up to 4.9 mg/L at 25°C. Precipitation of chalcedony is unlikely, but the situation with calcite is less clear. Accordingly, carbonate mineral chemistry was evaluated through geochemical modeling.

The metallic elements that could potentially be desorbed from mineral surfaces are indicated primarily by the results of the HA-HCl extraction test. Toxic metals not detected in the HA-HCl extraction test included mercury, selenium and uranium. Chromium was not detected, but the laboratory used an analytical method with a detection limit higher than the expected concentrations. Metals detected in the HA-HCl extraction test included arsenic and lead. Thus, chromium, arsenic, and lead warranted additional evaluation through geochemical modeling.

Although cadmium, nickel, vanadium, and zinc were also detected in pilot water leaching tests, those detections are associated with turbidity produced by mechanical agitation during testing, which would not occur in the aquifer. These metals are expected to remain strongly adsorbed under the relatively high pH conditions present in the vadose zone and aquifer. Therefore, these metals were not further evaluated through geochemical modeling.

Potential geochemical reactions during injection of GWR water into the Santa Margarita Aquifer can be deduced from laboratory and modeling work completed for the existing Carmel River water ASR project (EcoEngineers, 2008). The GWR pilot water is nearly identical to river water with respect to pH and oxidation-reduction potential, which are the principal variables controlling adsorption and desorption. Other major ions are about one-third as concentrated in the pilot water compared to river water. The EcoEngineers study included two leaching tests of aquifer materials: one with river water (representing project operation) and a more aggressive TCLP leach test that strips most adsorbed metals from the solid surfaces (which was probably less aggressive than the HA-HCl leach test used in this study). Both tests were done on materials from two depth intervals in the Santa Margarita. The chromium, arsenic and lead concentrations in the TCLP leachate were below the detection limit of 100 µg/L in both samples. This detection limit is fairly high, but it rules out the possibility of large amounts of those metals in the aquifer. A much lower detection limit of 0.5 µg/L was used for the river water leach tests, and concentrations of the metals were less than that detection limit in both samples. Mercury was detected at 0.2 to 0.4 µg/L, which is less than the drinking water MCL (2 µg/L). Given the similar pH and oxidation-reduction potential of river water and GWR water, it can be concluded that GWR recycled water would also not cause any metals to desorb in significant quantities. Laboratory results from the EcoEngineers study are adequate in addressing whether toxic metals would leach during direct injection of GWR recycled water into the Santa Margarita Aquifer, and geochemical modeling is therefore unnecessary.

4.2. MODELING OBJECTIVES

Based on the potential geochemical reactions described above, the geochemical modeling objectives are as follows:

- Determine the likelihood of calcite precipitation (scaling) that could clog pores and decrease aquifer permeability near the injection well or in the Paso Robles Formation.
- Determine whether the injected water could mobilize naturally-occurring chromium, arsenic or lead by desorption or mineral dissolution.
- Calculate mixing and dilution when the injected plume moves from the Aromas Sand into the Paso Robles Formation.
- Determine the sensitivity of all of the above to water quality characteristics of the injected water in order to identify recommended adjustments to condition the water prior to injection.

4.3. MODELING APPROACH

A detailed technical memorandum documenting the geochemical modeling approach, data inputs, and results is presented in **Appendix G**. This section summarizes the model development, calibration, and results.

4.3.1. Injection into Aromas Sand

Injection of recycled water into the Aromas Sand was simulated using PHREEQC. Because the Aromas Sand is unsaturated, mixing with native groundwater was not simulated. The modeling of toxic metals consisted of simulating the adsorption/desorption reactions that occur when the aquifer is saturated with recycled water. The composition of the adsorption surface is almost certainly hydrous ferric oxide (HFO), which is the coating on the quartz sand grains that gives the Aromas Sand its characteristic red color. Equilibrium constants defining the adsorption of chromium, arsenic and lead onto HFO are included in PHREEQC's thermodynamic database. The key steps in modeling were (1) estimating the percentage of total HFO that is in contact with the solution, (2) defining the initial composition of metal ions adsorbed onto the HFO surface, and (3) adjusting the model to represent the water-to-rock ratio that was used for the pilot water leach test. Three of the laboratory tests provided input values or calibration constraints. The bulk chemistry analysis of aquifer cores indicated the total amount of iron present, which was 3.33 weight percent in the Aromas Sand 200-foot sample (see **Table 7**). The HA-HCl test indicated the total amounts of metal ions adsorbed onto the exposed HFO, and the pilot water leach test indicated the amount of each adsorbed element likely to desorb under project operating conditions. Less than 100 percent of the HFO is in contact with pore water because under natural conditions HFO has

usually begun crystallizing into goethite. Typically, only 1 to 10 percent of the HFO actually functions as an adsorption surface in an aquifer.

The model was calibrated by trial-and-error in a two-step process. In the first step, the percent of total HFO that is exposed to pore water was selected, and the surface was "loaded" with chromium, arsenic and lead by assuming concentrations of those metals in a loading solution. Then the loading solution was replaced with pilot water, and the simulated equilibrium concentrations of the three metals in the pore water were compared with the measured concentrations from the pilot water leach test. The percent exposed HFO and the loading solution concentrations were both adjusted during calibration.

The water-to-rock ratio for the pilot water leach test was 30.9 times greater than the volume of water that would normally be in contact with that amount of solid material in the aquifer. To correct for this, the leach test was simulated using PHREEQC's one-dimensional advective transport capabilities. This represented the test as 30.9 pore volumes of water flowing sequentially through a fixed amount of aquifer solids, and averaging the equilibrium concentrations of the 30.9 pore volumes.

4.3.2. Percolation from Aromas Sand into Paso Robles Formation

The flow geometry becomes more three-dimensional when the saturated column of injected water flowing down through the Aromas Sand reaches the water table in the Paso Robles Formation and begins to spread radially and downward, as well as shift laterally under the influence of the regional gradient. A PHAST model was constructed to simulate the transport and mixing of the arriving plume within the Paso Robles Formation. The model grid represented a 5,000 x 5,000-foot square region with 50-foot cell spacing. The total thickness was 300 feet, of which the top 50 feet was unsaturated and represented the Aromas Sand. The Aromas Sand cells included the mineral adsorption surface calibrated from the PHREEQC simulations. Vertical grid spacing was 5 feet for the top 70 feet, 10 feet for the next 90 feet, and 20 feet for the bottom 140 feet.

Flow in the Paso Robles Formation included a regional gradient of about 40 feet per mile established by constant-head boundaries on opposite sides of the grid. The downward gradient caused by groundwater pumping from the underlying Santa Margarita Aquifer was represented by a well 106 feet away from the injection well, screened near the bottom of the model and pumping at a rate of 25 gpm. For both the Aromas Sand and Paso Robles aquifers in the model, the horizontal hydraulic conductivity was assumed to be 5 feet/day; the vertical hydraulic conductivity was assumed to be 0.5 feet/day; and horizontal and vertical dispersivity were assumed to be 50 and 5 feet, respectively. The selected value of vertical hydraulic conductivity is small for a sand formation, but it represents the effects of subtle layering within the sand and is conservative because a low value increases the total volume of formation that becomes saturated during injection and hence the total mass of desorbed metal ions.

Pilot water was injected at a rate of 110 gpm via a well at the center of the grid screened over a 40-foot interval at the base of the Aromas Sand, below the silty horizons noted in

borehole logs. It is noted that the assumed injection rate and Kv are both conservative, because they tend to maximize the saturated volume of Aromas Sand during injection, which maximizes the simulated mass of desorbed chromium. The average maximum injection rate per vadose zone well under project operation is expected to be less than 65 gpm (see Section 3.1.3) based on the potential recycled water delivery schedules for the project summarized in Table 1 of the Recharge Impacts Assessment Report (Todd, 2015). The estimated vertical hydraulic conductivity (Kv) measured in selected coarse-grained cores of the Aromas Sand was about 20 feet per day. This lower pumping rate and higher conductivity would result in a narrower column of saturation descending from the injection well to the water table.

Measured water quality at the FO-7 Shallow well was used to represent ambient groundwater quality in the Paso Robles Formation. This well was selected because it was the only Paso Robles well at which pH was measured at the well screen rather than at the ground surface. Pressure decreases when groundwater is brought up to the ground surface, which causes gases to effervesce out of solution. In the case of carbon dioxide, this lowers the pH of the water, which can strongly affect metal adsorption/desorption processes.

The simulation began with the water table at an elevation equal to the contact between the Aromas Sand and Paso Robles Formation. Injection was simulated over a 6-year period. The injected water created a mounded cone of saturation in the Aromas Sand surrounding the injection well, enabling the injected water to flow in a continuously saturated environment down the cone and then radially outward and downward within the Paso Robles Formation.

4.4. MODEL RESULTS

4.4.1. Injection into Aromas Sand

The calibration targets for metals were the measured concentrations of chromium, arsenic and lead from the pilot water leach tests. For each metal, the measured concentrations from the tests of six Aromas depth intervals were averaged, and that value was compared with the average concentration of the first 30.9 pore volumes of pilot water simulated using the PHREEQC advective model. For chromium, the measured concentration was 1.3 µg/L and the simulated concentration was 2.6 µg/L. Simulated chromium concentrations dropped rapidly during the course of advection. Almost all of the chromium that had been loaded onto the mineral surfaces desorbed within the first 0.5 pore volumes of displacement. This “first flush” of chromium release resulted in a pore water concentration of 31 µg/L, which is three times the proposed MCL for drinking water. Over the next two pore volumes, the simulated concentration quickly dropped to the concentration in pilot water, which was 0.21 µg/L. The simulated average concentration does not reveal this important sequence of events. There is not much adsorbed chromium at the outset, but at a pH of 7.7 the pilot water desorbed almost all of the available chromium. This process creates a brief spike in dissolved chromium concentration whenever injected water first contacts unsaturated Aromas Sand. As this spike flows through downgradient saturated flow paths in the Paso Robles Formation, the peak concentration quickly declines due to dispersion and mixing

with ambient groundwater. Furthermore, the first flush would occur only during project start-up. The cone of saturation within the Aromas Sand gradually stabilizes at a size corresponding to the conservatively simulated 110 gpm injection rate over a period of less than six years. As long as the zone of saturation does not continue to expand, there would be no further release of chromium.

The measured arsenic concentrations in the pilot water leach tests of the six Aromas Sand depth intervals included four non-detects (less than 5 µg/L) and two detections at 5.5 and 7.6 µg/L. Assuming a roughly normal distribution, an average of 4 µg/L is a reasonable assumption. The arsenic drinking water MCL is 10 µg/L. The average simulated concentration was 4.2 µg/L. Unlike chromium, the simulated concentration remained nearly constant over successive pore volume displacements. This is because arsenic has very different adsorption characteristics (partition coefficient) than chromium. It adsorbs much more strongly to HFO, and only a small percentage desorbs with each new pore volume of water. The result is a more sustained release resulting in low concentrations in solution.

Measured lead concentrations were more difficult to average. Five of the six samples were non-detects (less than 5 µg/L) and one sample (with the highest turbidity) had a concentration of 11 µg/L. For modeling purposes, an average measured concentration of 3 µg/L was assumed. The simulated concentration was 0.691 µg/L and remained constant through successive pore volume displacements at a pH of 7.7. Lead tends to be more strongly adsorbed at higher pH because it is present in solution as a cation, whereas chromium and arsenic are present as chromate and arsenate anions. The measured and simulated concentrations were each below the drinking water MCL of 15 µg/L.

4.4.2. Percolation from Aromas Sand to Paso Robles Formation

Simulation results from the PHAST model show that the chromium that desorbed when pilot water first wetted the Aromas Sand was rapidly diluted by dispersion (mixing) in the Paso Robles Formation. The chromium release was a one-time event when saturation was established at the onset of injection. That volume of pore water was thereafter diluted by subsequent injection – which did not cause any further release of chromium – and mixing into an ever-expanding plume of injected water moving through the Paso Robles Formation. The relative volumes of source area (saturation within the Aromas Sand) and plume in the Paso Robles after one year of project operation can be seen in **Figure 12**. The figure shows a block diagram of simulated concentrations. The upper (clear) layer of the block is the unsaturated Aromas Sand. The green layer is the Paso Robles Formation. The plume within the Paso Robles forms a chili-pepper shape pointing downward, and the zone of saturation is the “stem” of the pepper pointing upwards into the Aromas Sand. The maximum concentration at any point on the outer surface of the plume was 4.0 µg/L.

A close-up view of the zone of saturation in the Aromas Sand is shown in **Figure 13.** The injection well is represented by the pink column of squares. The colored areas are parts of the surface of the zone of saturation where chromium concentrations are greater than the pilot-water concentration of 0.21 µg/L. The interior of the zone and the underlying plume in the Paso Robles Formation have concentrations equal to or less than the injected water.

After six years of continuous injection, the simulated plume had reached a steady-state size and the largest chromium concentration anywhere in the system was 3.8 µg/L.

The arsenic and lead concentrations in the injected water were both lower than their respective concentrations in the Paso Robles Formation, even when ambient concentrations were assumed to be less than one-tenth of measured concentrations to correct for suspected turbidity influences. Consequently, the plume of injected water was simply diluting ambient concentrations in the aquifer. **Figure 14** shows the plume for arsenic after six years of injection, with concentrations increasing from 0.4 µg/L at the center of the plume to 10 µg/L at the outer edge of the plume and beyond (representative of simulated background concentrations in the surrounding aquifer). The pattern for lead had an identical shape, with concentrations increasing from 0.06 µg/L at the center to 4.2 µg/L in the surrounding aquifer.

Calcite is more likely to dissolve than precipitate when the injection plume enters the Paso Robles Formation. Because the pH of the injected water (7.7) is less than the pH of ambient Paso Robles groundwater (8.1), the solubility of calcite increases. The corresponding solubility indices in the simulation were -0.02 (essentially neutral) in Paso Robles groundwater and -0.98 (undersaturated) in the injected water. Consequently, there could be a small amount of initial calcite dissolution when the plume first arrives at a new location in the aquifer, but the total mass of calcite in the aquifer is too large to be substantially diminished.

4.5. CONCLUSIONS

Chromium is present in the Aromas Sand in trace amounts adsorbed onto the hydrous ferric oxide coating of the quartz sand grains. At a pH of 7.7 (the pH of the recycled water produced by pilot tests of the advanced wastewater treatment process) almost all of the adsorbed chromium would de-sorb into solution. This is a transient initial effect, because the amount of chromium adsorbed onto the mineral grains is small. Calibration of a PHREEQC geochemical model to measured concentrations from a pilot water leach test indicated that the initial mass of chromium is quite small. The “first flush” of chromium is rapidly diluted by mixing into the Paso Robles Formation along with subsequent volumes of injected water. When the zone of saturation around the injection well equilibrates with the injection rate, there is no further release of chromium. In the model, steady-state geochemical conditions were reached in about six years. The maximum concentration on the surface of the expanding zone of saturation was 4.0 µg/L, which occurred after one year of injection.

Arsenic and lead are both adsorbed much more strongly than chromium at the pH levels anticipated. Consequently, only small amounts are released into solution as the injected water flows through the Aromas Sand, resulting in sustained but low concentrations of about 4 µg/L for arsenic and 0.7 µg/L for lead.

Aquifer clogging due to calcite precipitation is unlikely in the Aromas Sand because calcium and bicarbonate concentrations are far below levels approaching saturation. Ambient groundwater in the Paso Robles Formation is at saturation with respect to calcite, but the lower pH of the injected water would tend to dissolve rather than precipitate calcite.

The potential for biofouling in the injection wells is low, because the injected water is very low in nitrogen and phosphorus and, therefore, would not tend to stimulate microbial growth.

The risk of trace metal desorption during injection of recycled water into the Santa Margarita Aquifer can be inferred from previous studies of injecting Carmel River water. The two types of injected water are very similar in terms of pH and oxidation-reduction potential and are therefore expected to have similar effects with respect to adsorption/desorption processes. The previous studies found no indications that significant concentrations of metals would be released into solution, and those results can reasonably be extended to injection of recycled water.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. CONCLUSIONS

5.1.1. Hydrogeologic Conditions

Based on information collected and findings from this field investigation, and assuming that subsurface conditions at the GWR project recharge site are similar to those at MRWPCA MW-1, the following conclusions can be made:

- The Aromas Sand at MRWPCA MW-1 is 392.5 feet thick, composed primarily of coarse-grained sediments. Some fine-grained deposits occur in the lower portion of the formation and may extend across the GWR project recharge site.

- The geologic contact between the Aromas Sand and Paso Robles Formation at the MRWPCA MW-1 site occurs at 392.5 feet-bgs.

- The current groundwater level in MRWPCA MW-1 is 405 feet-bgs, or 12.5 feet below the geologic contact between the Aromas Sand and Paso Robles Formation.

- The thickness of sand deposits either above or below the silt/clay deposits in the lower Aromas Sand are sufficient to accommodate maximum injection rates through four (or possibly fewer) vadose zone injection wells.

- The estimated available storage capacity of the Aromas Sand indicates that the GWR project recharge site can accommodate 350 AFY of recycled water recharge through proposed vadose zone wells. This conclusion is based on an estimated radius of saturation of 24 feet through the coarse-grained deposits composing most of the Aromas Sand and 1,100 feet through the silt and clay units in the lower portion of the unit.

- Estimated travel time of recycled water to flow through the Aromas Sand is dependent on the final depth of vadose zone screens relative to silt/clay deposits in the lower Aromas Sand (assumed to be present across the GWR project recharge site for planning purposes).

    - If vadose zone wells are screened below the silt/clay deposits, injected recycled water is estimated to reach the top of the Paso Robles Formation in a matter of a few days.

    - If vadose zone wells are screened above the silt/clay deposits, injected recycled water is estimated to reach the top of Paso Robles Formation after 5.9 years.

    - An estimated 3.4 years is needed for recycled water to flow through the upper 12.5 feet of unsaturated Paso Robles Formation before reaching the current

water table. However, the water table is expected to rise to or above the geologic contact between the Aromas Sand and Paso Robles Formation following the initial years of GWR project operation.

5.1.2. Groundwater Quality

- Local groundwater quality in the Paso Robles Aquifer meets drinking water standards with the exception of metals and radiogenic parameters detected in the FO-7 Shallow, MRWPCA MW-1, and PRTIW wells. However, FO-7 Shallow and MRWPCA MW-1 had turbidities of 550 and 71 NTU, respectively. The detected metal and radiogenic concentrations were affected by the excessive turbidity and the reported analyses are a reflection of constituents in the solid phase rather than dissolved constituents. The PRTIW well had a turbidity of 0.98 just below the California Primary MCL of 1.0 NTU with a reported radium-228 concentration of 2.2 pCi/L; the California Primary MCL is 2.0 pCi/L. However, the combined radium (radium 226 + radium 228) was below the California Primary MCL of 5.0 pCi/L.

- SWRCB DDW recycled water quality CoECs in sampled Paso Robles wells include NDMA detected in groundwater collected from the PRTIW well at 0.0054 µg/L; caffeine detected in MRWPCA MW-1 at 0.0068 µg/L; and DEET detected in MRWPCA MW-1 at 0.0060 µg/L. Although detectable, CoEC concentrations are very low, not exceeding 0.01 µg/L, and represent the first time that CoECs have been analyzed in the Seaside Basin. These constituents do not have California MCLs but have been designated as recycled water surrogates, which are required in recycled water project monitoring. Future groundwater sampling events, supporting the monitoring program, will confirm either the continued presence or absence of these constituents.

- Local groundwater quality in the Santa Margarita Aquifer meets drinking water standards with the exception of FO-7 Deep which had total iron and manganese at 1,000 µg/L and 83 µg/L, respectively. However, the FO-7 Deep groundwater sample was most likely affected by turbidity and is not considered representative.

- SWRCB DDW recycled water quality constituents of concern in sampled Santa Margarita wells include caffeine and DEET detected in FO-7 Deep at 0.0027 and 0.0023 µg/L, respectively. Although detectable, CoEC concentrations are very low, not exceeding 0.01 µg/L, and represent the first time that CoECs have been analyzed in the Seaside Basin. Future groundwater sampling events, supporting the monitoring program, will confirm either the continued presence or absence of these constituents.

- Soluble nitroaromatic compounds detected in soils in the Inland Ranges were not present in any of the six wells sampled for this investigation.

5.1.3. Geochemical Compatibility of Recycled Water and Groundwater

- Soluble nitroaromatic compounds detected in soils in the Inland Ranges were not present in any of the soil cores analyzed for this field investigation. Therefore, they were not included in the geochemical modeling.

- Potential changes in injected recycled water quality beneath vadose zone wells as a product of geochemical reactions between recycled water and formation materials along vertical flow paths are small. The Aromas Sand contains trace amounts of chromium adsorbed onto the hydrous ferric oxide coatings of the quartz sand grains. Geochemical modeling indicates that with a pH of 7.7 for the pilot recycled water, almost all adsorbed chromium would desorb into solution. However, this is a transient initial effect, because the amount of chromium adsorbed onto the mineral grains is small. Arsenic and lead are both adsorbed much more strongly to hydrous ferrous oxides than chromium. Consequently, only small amounts are released into solution as the injected water flows through the Aromas Sand, resulting in sustained but low concentrations of about 4 µg/L for arsenic and approximately 0.7 µg/L for lead.

  Aquifer clogging by calcite precipitation is unlikely in the Aromas Sand, because calcium and bicarbonate concentrations are far below levels approaching saturation.

  Biofouling would not pose a problem for the injection wells because the injected water is very low in nitrogen and phosphorus and therefore would not tend to stimulate microbial growth.

- The potential for local groundwater quality impacts in the Paso Robles Aquifer beneath vadose zone wells as a result of mixing between recycled water and shallow groundwater is also quite small. The “first flush” of chromium is rapidly diluted by mixing into the Paso Robles Formation along with subsequent volumes of injected water. No further release of chromium will occur when the zone of saturation around the injection well equilibrates with the injection rate. In the model, a steady-state condition was reached in about six years. The maximum concentration on the surface of the expanding zone of saturation was 4.0 µg/L, which occurred after one year of injection.

  Ambient groundwater in the Paso Robles Formation is at saturation with respect to calcite, but the lower pH of the injected water would tend to dissolve rather than precipitate calcite.

- Potential local groundwater quality impacts in the Santa Margarita Aquifer in the vicinity of deep injection wells as a result of mixing between recycled water and shallow groundwater are very low. Risk of trace metal desorption during injection of recycled water into the Santa Margarita Aquifer can be inferred from previous studies of injected Carmel River water. The two injected water types have similar pH

and oxidation-reduction potential and are therefore expected to have similar effects with respect to adsorption/desorption processes. Previous studies found no indications that significant metal concentrations would be released into solution, and those results can reasonably be extended to injection of recycled water.

- The potential is also low for groundwater quality impacts due to the presence of site specific constituents of concern in unsaturated sediments and groundwater beneath vadose zone wells. Potential for leaching by recycled water and subsequent groundwater quality impacts is very low, but should be confirmed with subsequent groundwater monitoring.

5.1.4. Knowledge Gaps

Data collected from this field investigation have allowed for considerable refinement of the conceptual hydrogeologic model at the GWR recharge site. However, the following knowledge gaps still exist, some of which can be addressed during drilling and installation of proposed injection wells:

- The occurrence, thickness, and directional tilt of fine-grained layers in the Aromas Sand would dictate the flow direction and vadose zone travel time of recycled water injected above such deposits. Specifically, geologic data suggest that the silt/clay deposits observed in the lower Aromas Sand at MRWPCA MW-1 may occur beneath the GWR project recharge site and pinch out to the west (by General Jim Moore Boulevard) and north (by the Golf Course Reservoir well). Accordingly, additional subsurface data are needed to refine these interpretations.

- Concentrations for metals and other ions in groundwater samples collected from MRWPCA MW-1 and both FO-7 wells are clearly impacted by turbidity (and the subsequent digestion of suspended solids during preparation for laboratory analysis). Additional groundwater quality sampling is needed to confirm analyses from this investigation and further establish baseline groundwater quality conditions.

5.2. RECOMMENDATIONS

Based on the results of the field investigation and existing knowledge gaps, the following additional activities are recommended for GWR project planning purposes:

- During the drilling of initial vadose zone and deep injection wells for the GWR project, subsurface lithologic data should be collected and closely evaluated to determine the extent and thickness of potential fine-grained sediments in the lower Aromas Sand. Findings will be critical to the final design of vadose zone wells (specifically, the placement of well screen intervals).

- An additional round of groundwater quality sampling from MRWPCA MW-1 and both FO-7 wells at a minimum is recommended. To obtain representative groundwater quality samples, groundwater from MRWPCA MW-1 should be pumped using a 3-inch diameter submersible pump (0.75-horsepower Grundfos 5SQE 07-320 used for well development or similar) with water quality samples collected after groundwater is determined to be turbidity-free. Because the casing diameter of both FO-7 wells is 2 inches, a low-flow bladder pump using micro-purge technique (similar to that used by Blaine Tech Services for this field investigation), is recommended for sampling of both FO-7 wells. Samples from FO-7 and MRWPCA-MW-1 should be pre-filtered through 0.45-micron filter paper in the field during sample collection to remove remaining suspended solids. If approved by the analytical laboratory, sample collection bottles should be preservative-free to minimize the potential for digestion of solids in the sample during transport and prior to analysis. This may also be done within the required protocols without field filtering, if samples are submitted and received by the laboratory within at least the first 24 hours after sample collection. The laboratory then filters and/or centrifuges samples prior to acid preservation.

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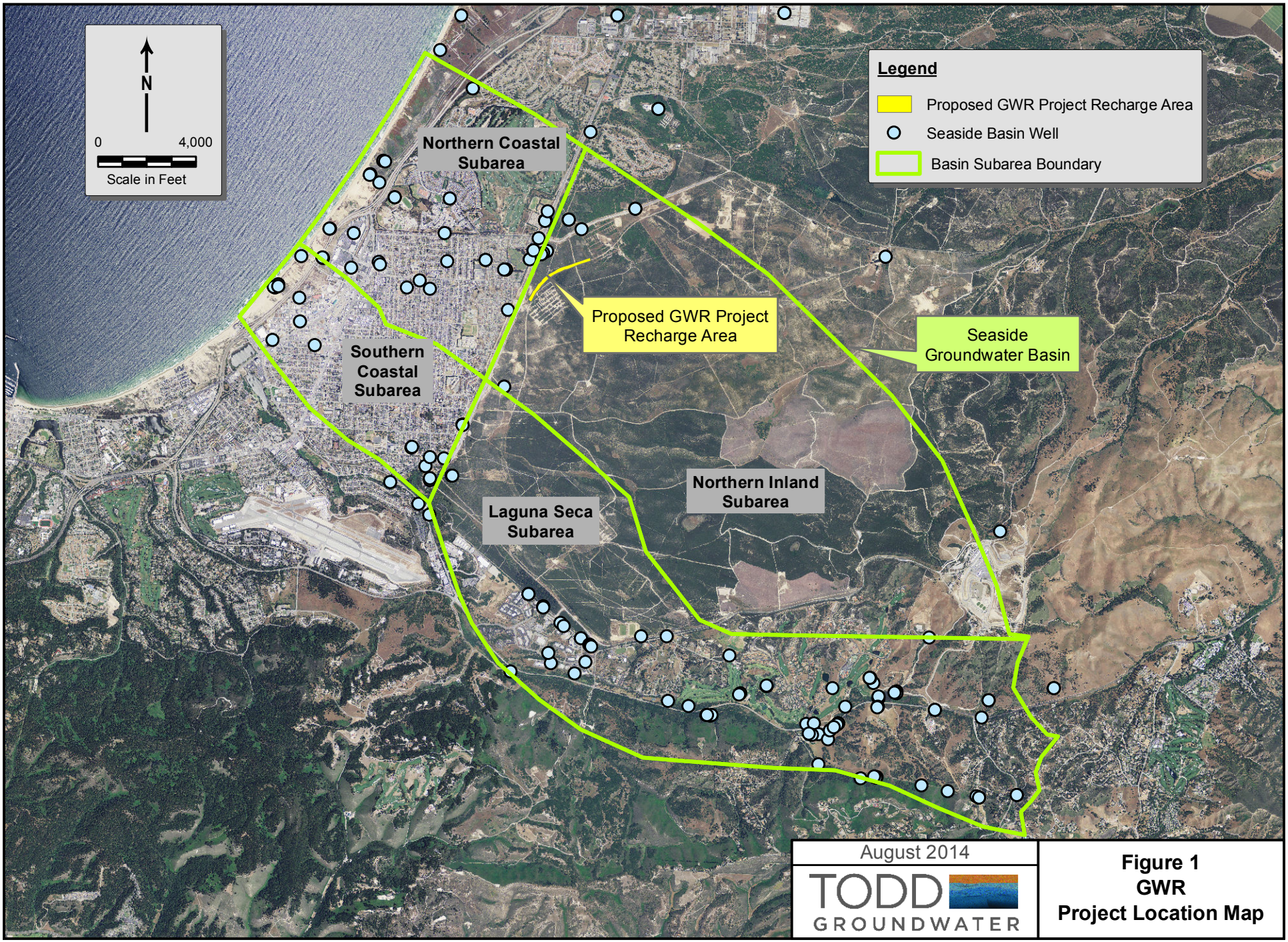
FIGURES



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TODD GROUNDWATER

Figure 1
GWR
Project Location Map

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Figure 2
GWR Project Location and Field Investigation Work Area

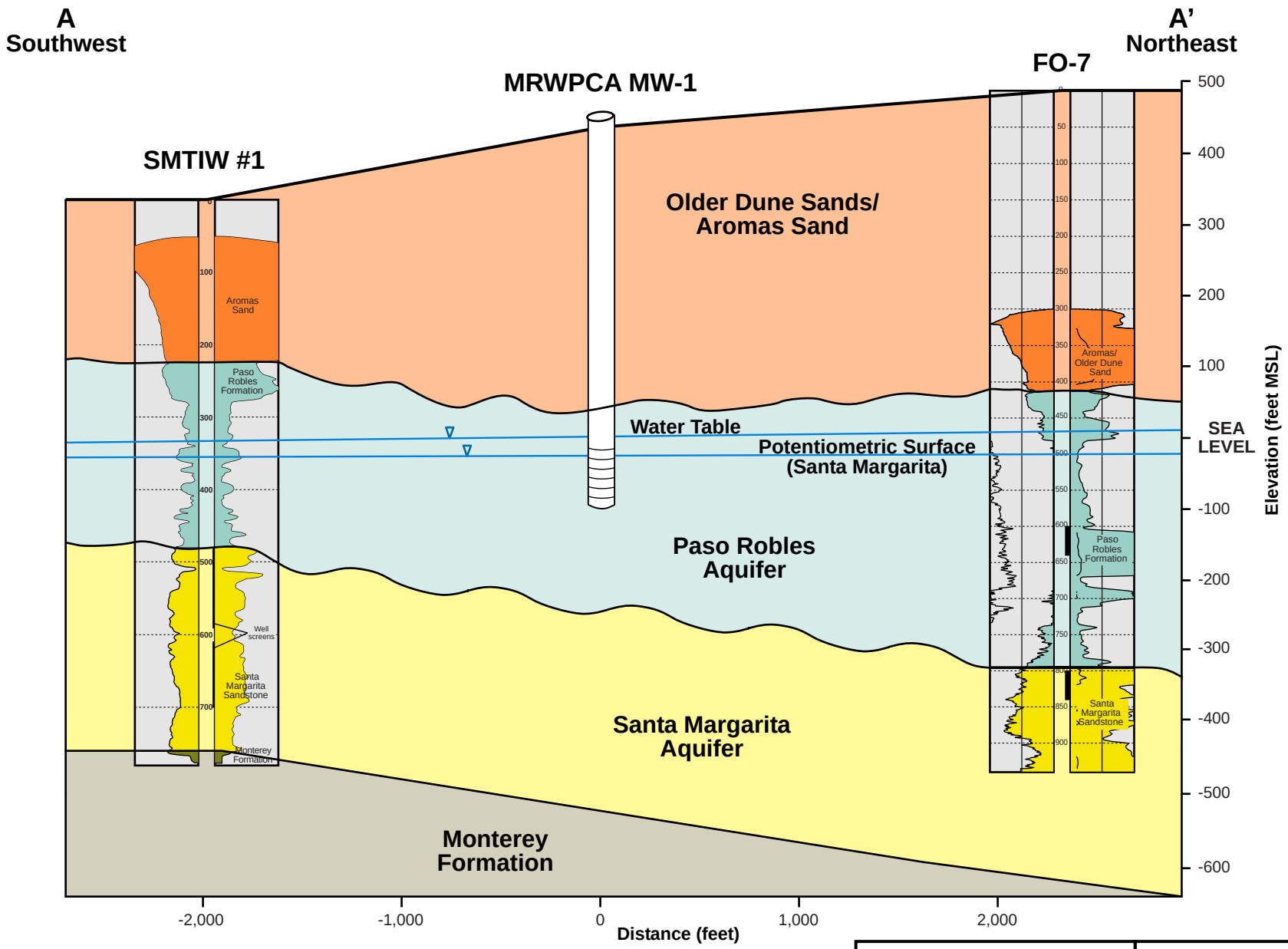

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Figure 3
Cross Section A - A' across Project Site

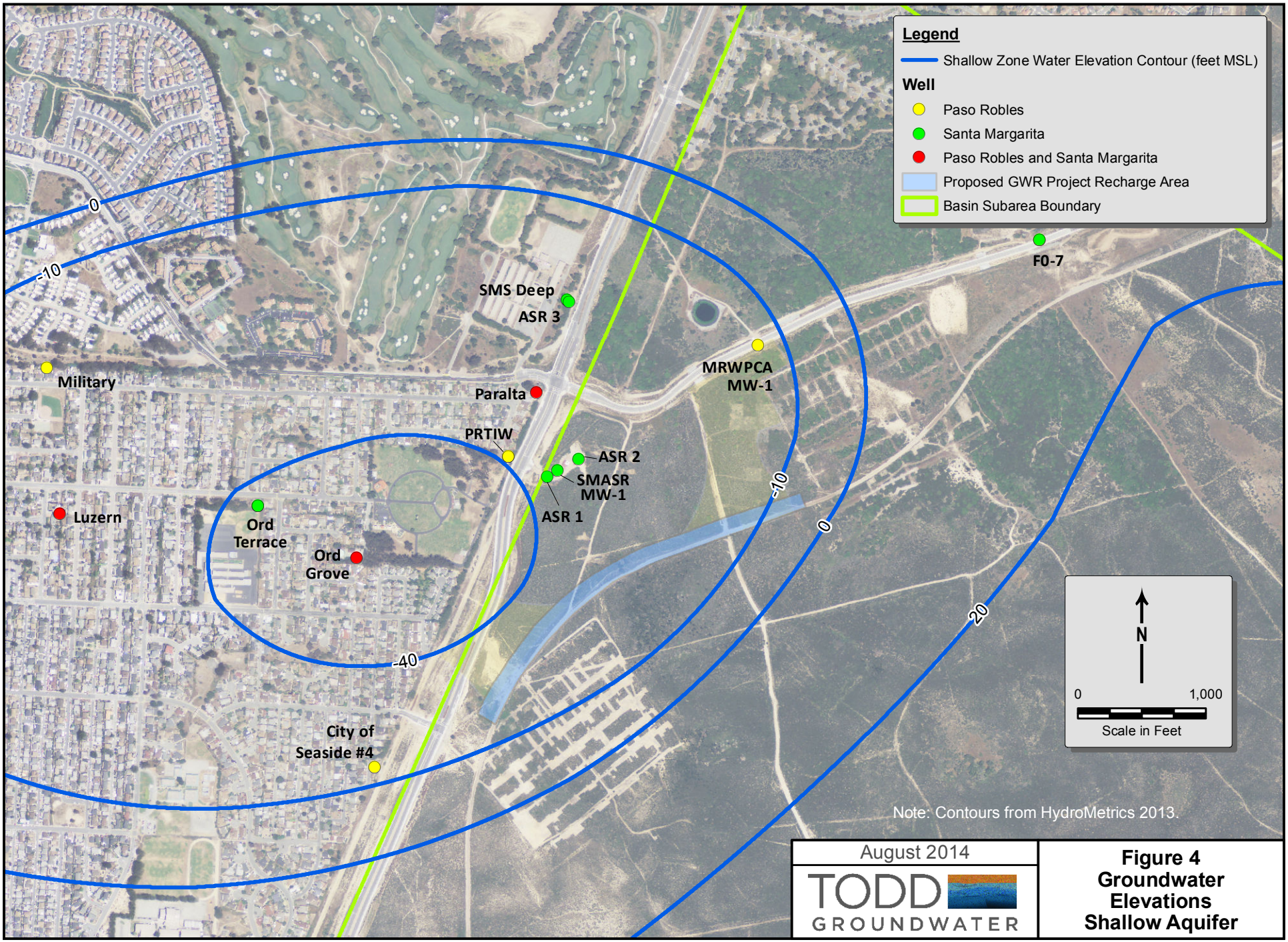

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Figure 4
Groundwater Elevations Shallow Aquifer

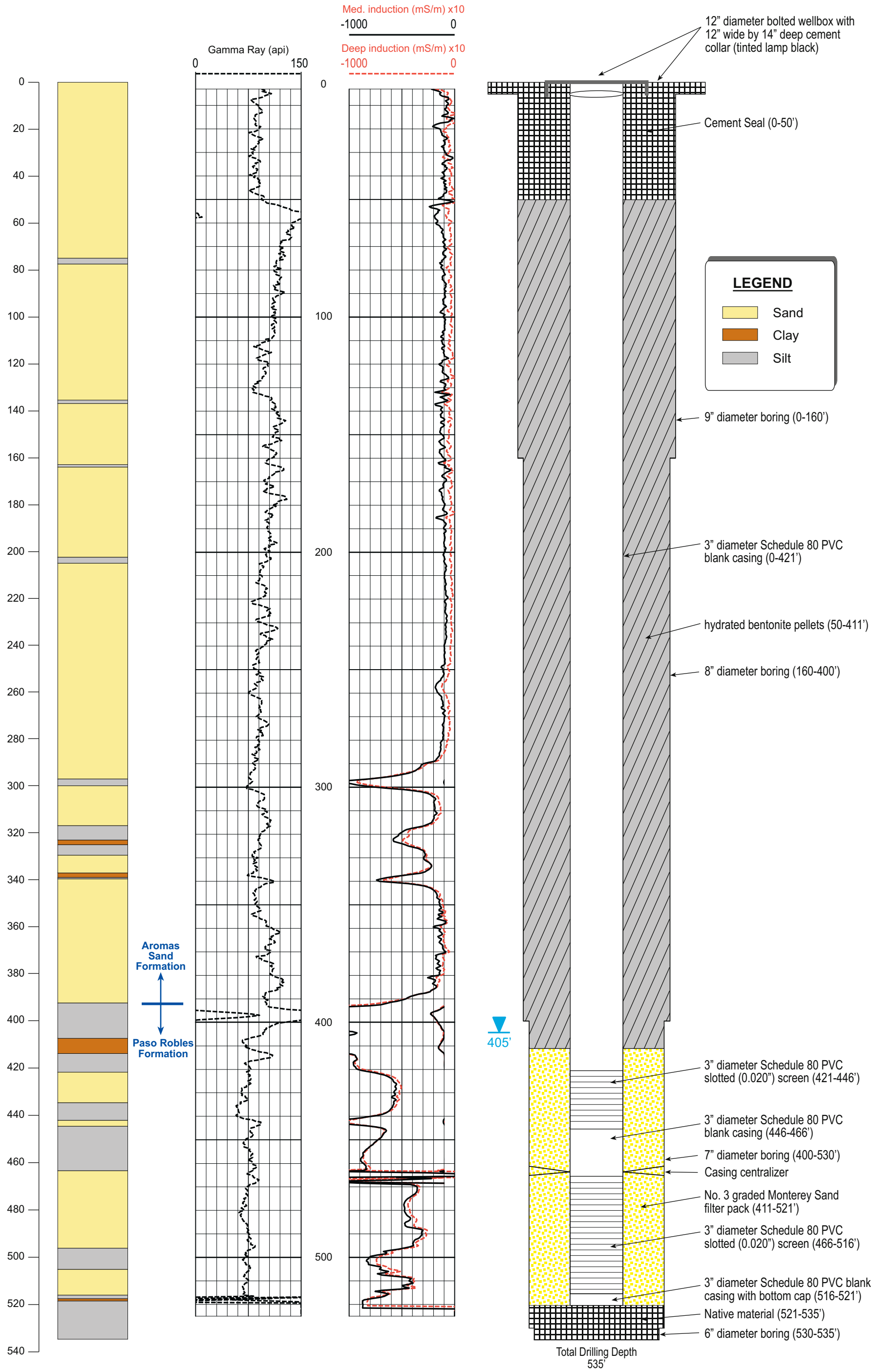

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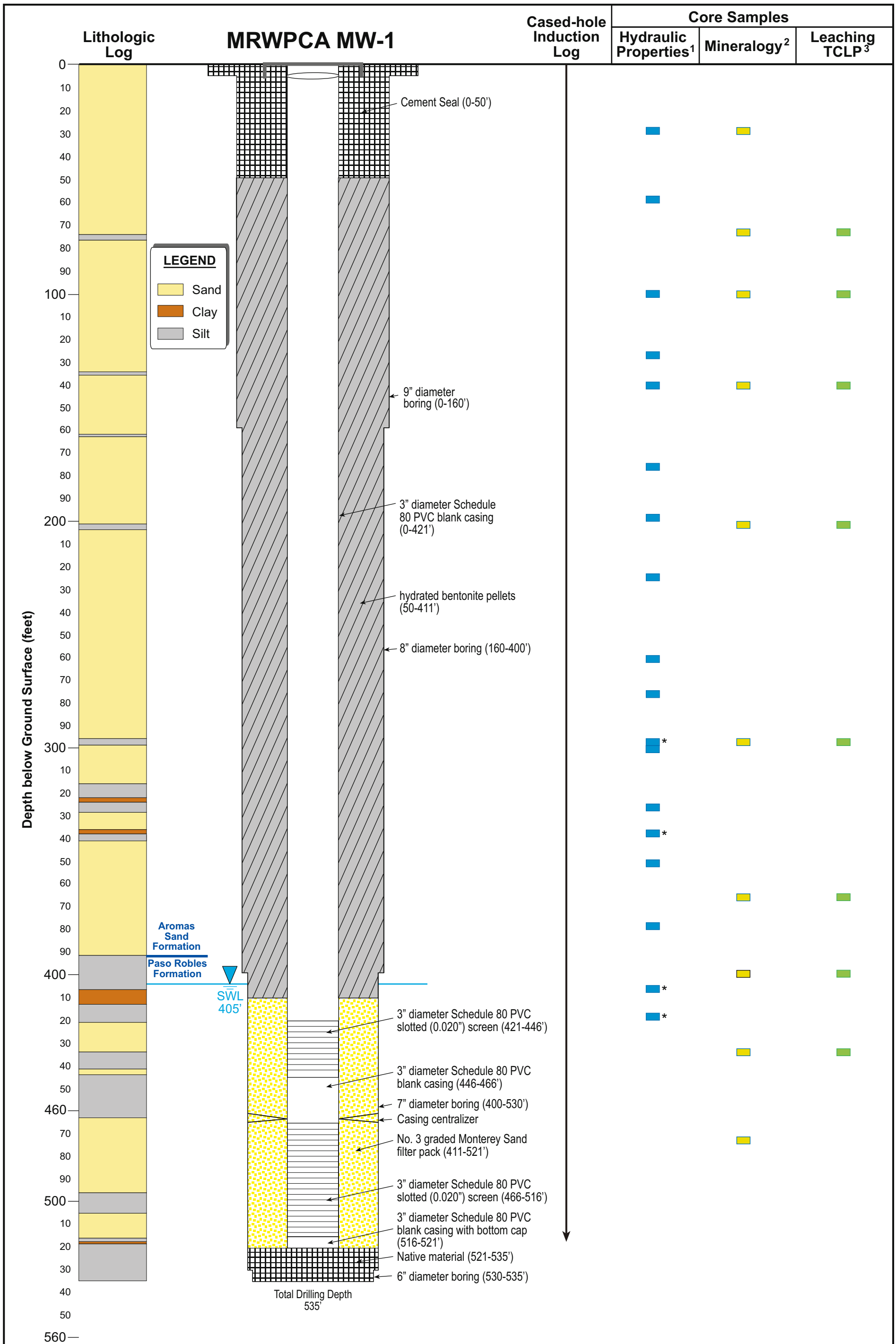
Figure 5
Well Profile
MRWPCA MW-1



Lithologic Log from MW-1

[1] Hydraulic properties include total porosity, effective porosity, and vertical hydraulic conductivity (* total/effective porosity not analyzed)

[2] Mineralogy by thin section, XRD, SEM-EDA

[3] Leaching by modified Toxicity Characteristic Leaching Procedure using Pilot Water

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Figure 6
Core Sampling Program

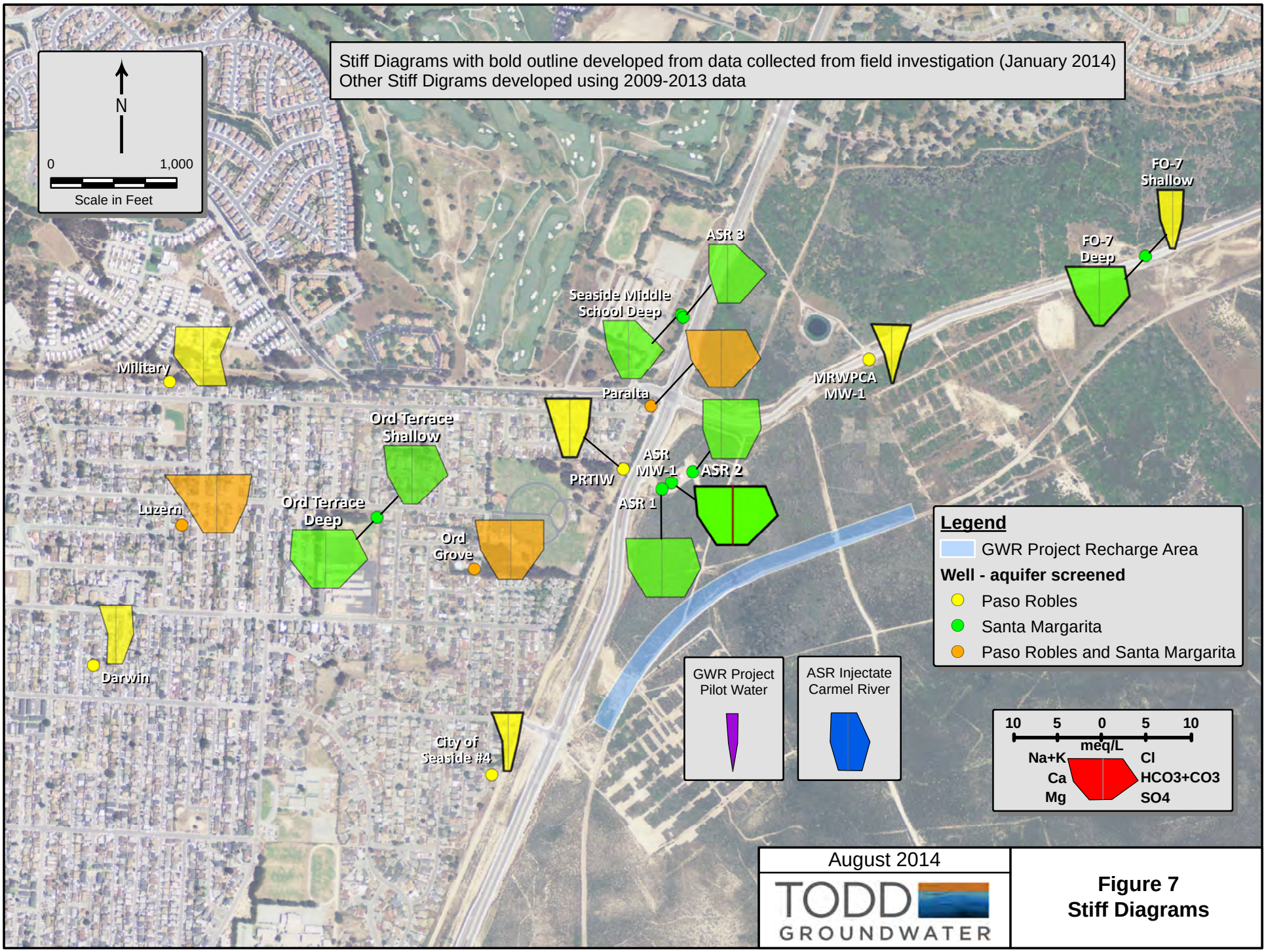
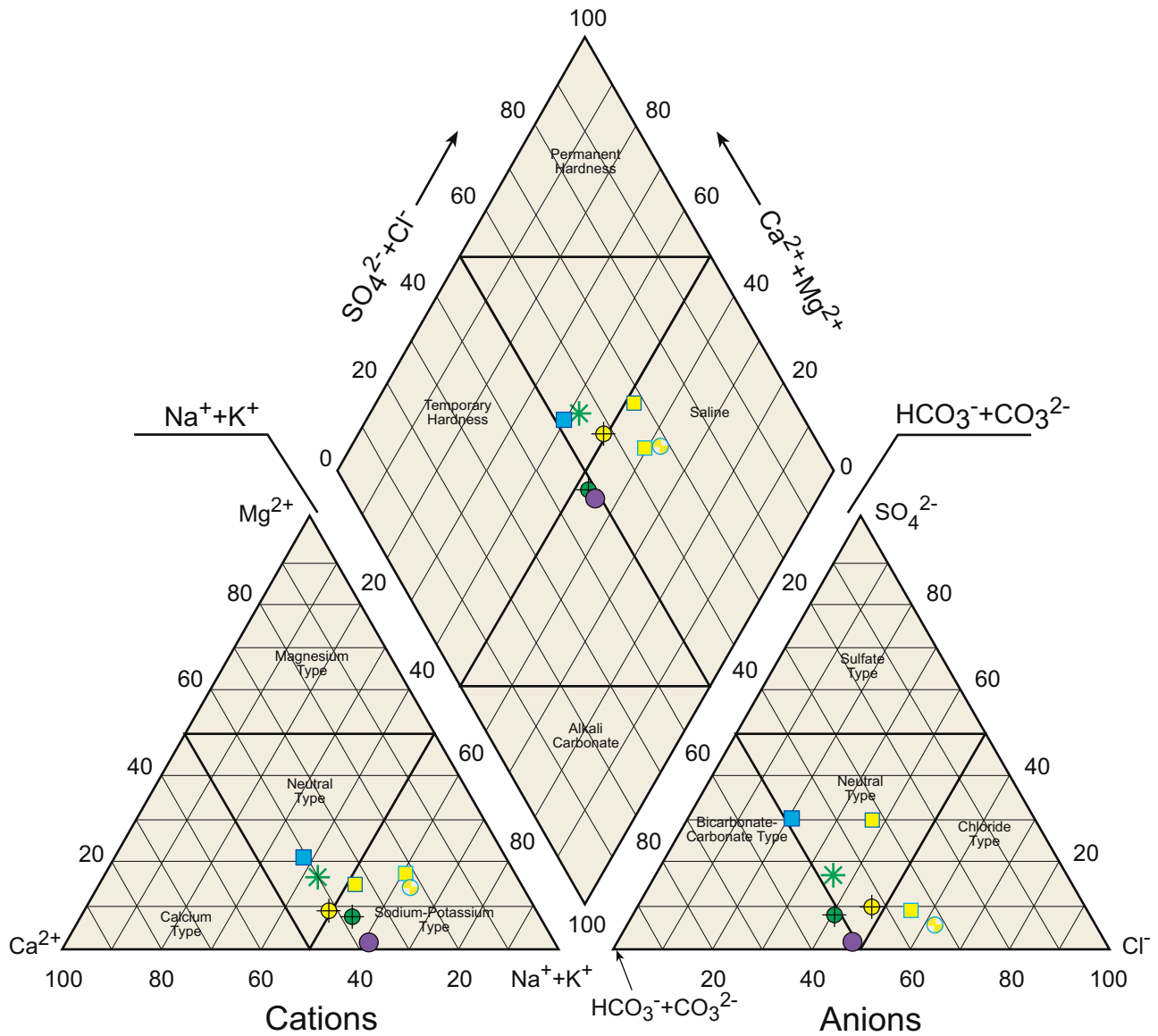


Figure 7
Stiff Diagrams



Legend

Paso Robles Aquifer

- MRWPCA MW-1
- City of Seaside 4
- FO-7 Shallow
- PRTIW Mission Memorial

Santa Margarita Aquifer

- FO-7 Deep
- ASR MW-1

Injectate

- ASR Injectate - Carmel River
- GWR Pilot Water

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Figure 8
Source Water (Trilinear) Diagram

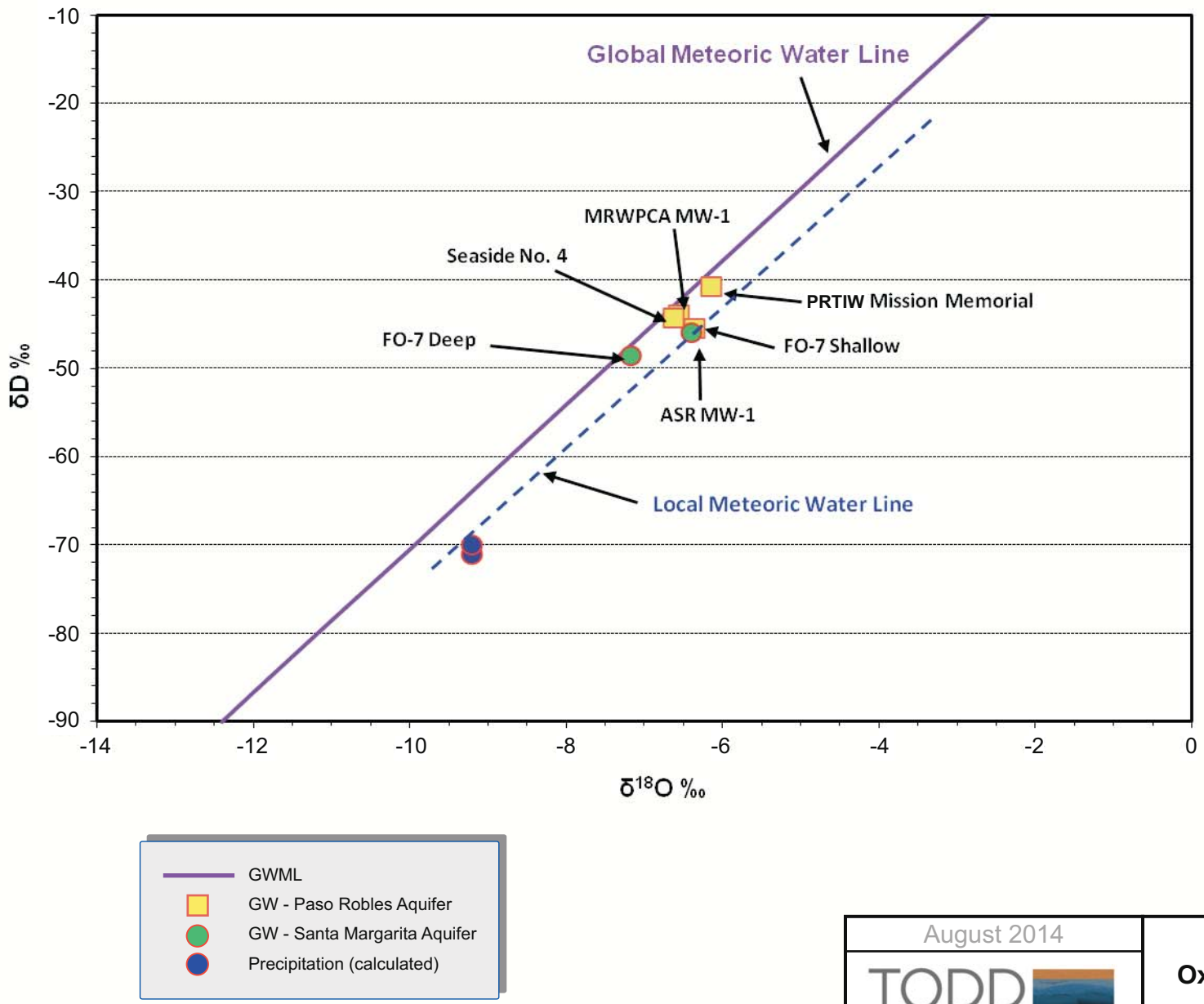

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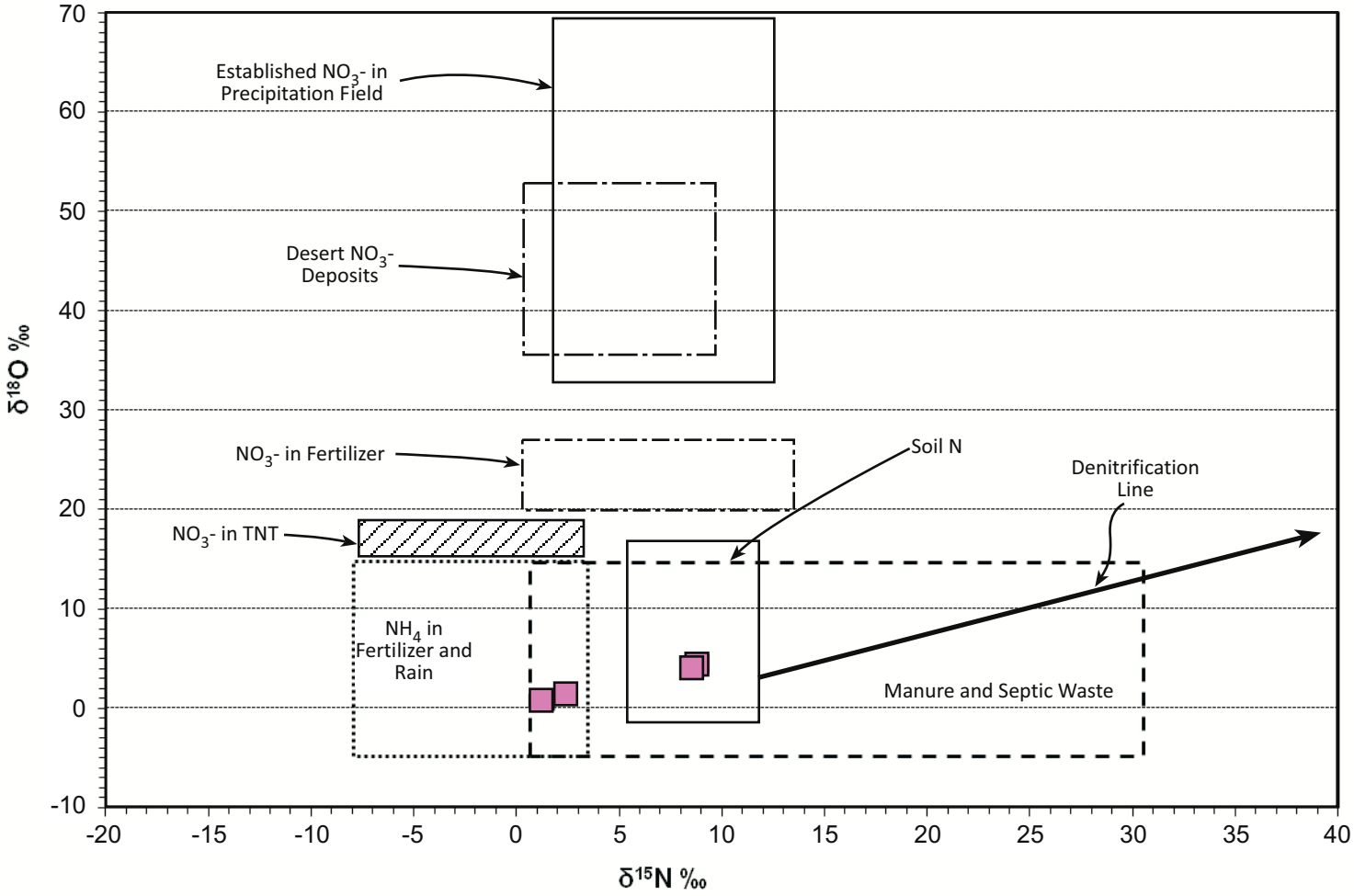
Figure 9
Oxygen-Deuterium Isotopes in Water



Paso Robles

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Figure 10
Nitrogen Isotopes

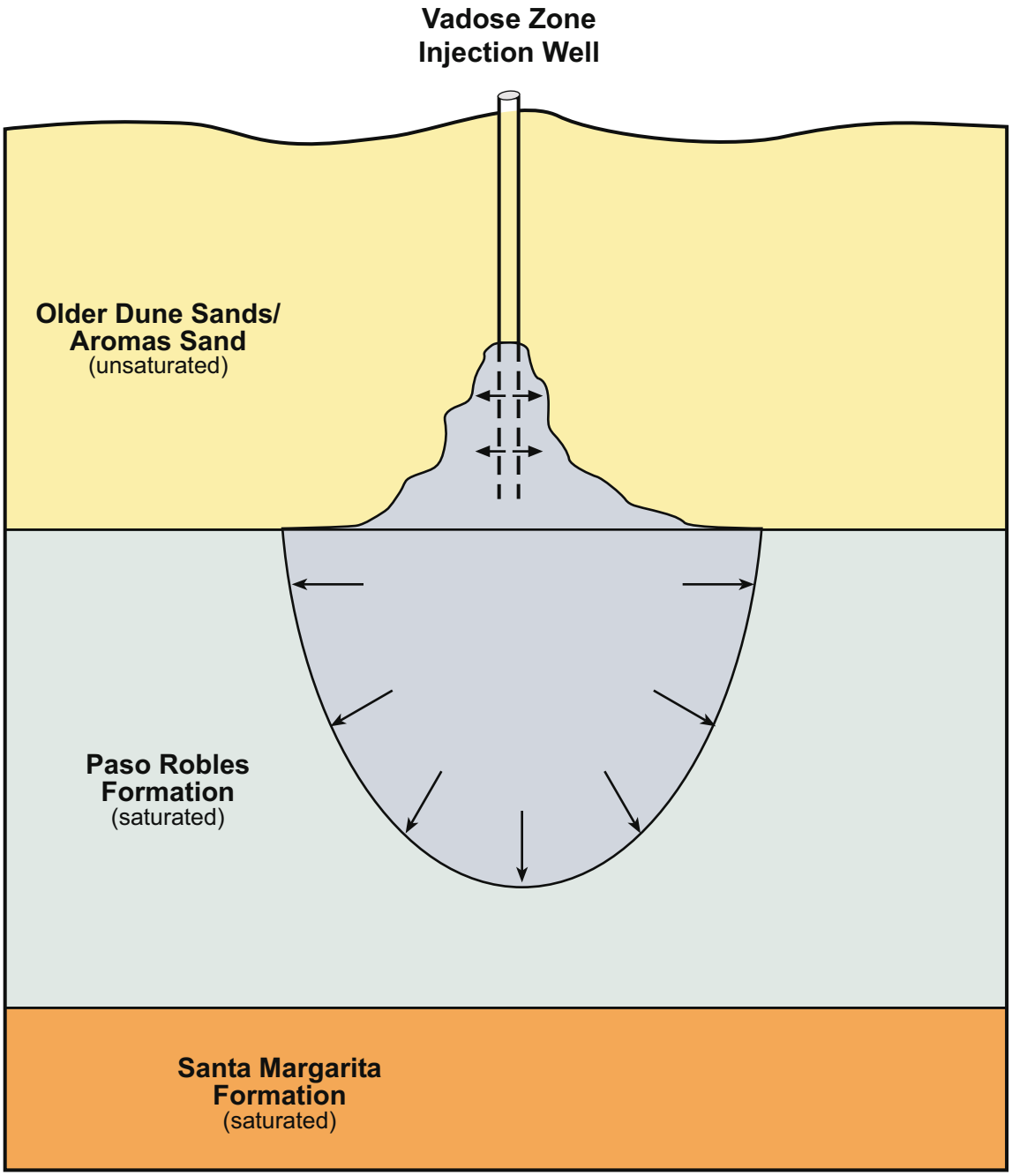

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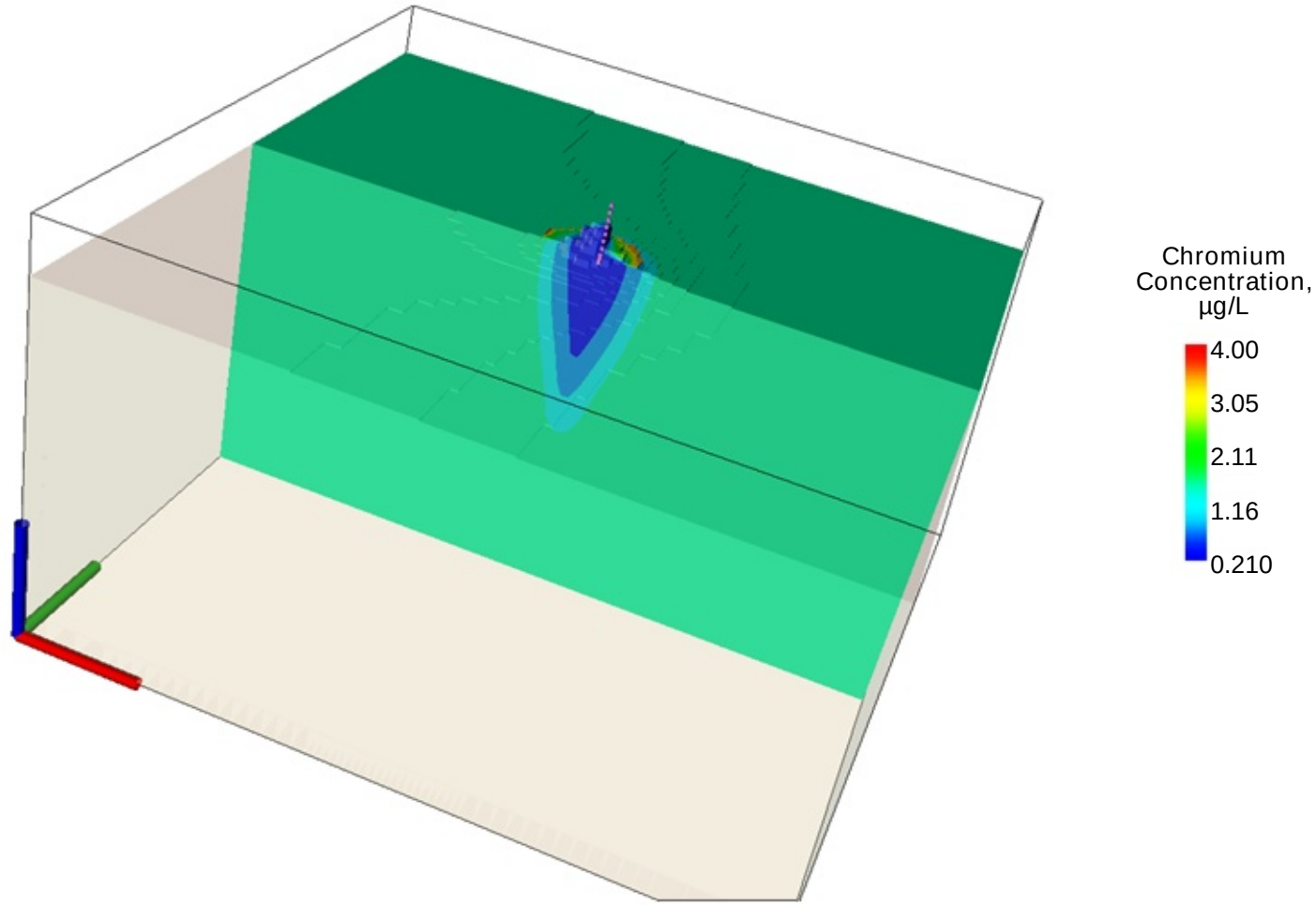
Figure 11
Conceptual Diagram of Injected Water Flow



Time = 1 year

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Figure 12
Block Diagram of Simulated Chromium Plume after One Year of Injection

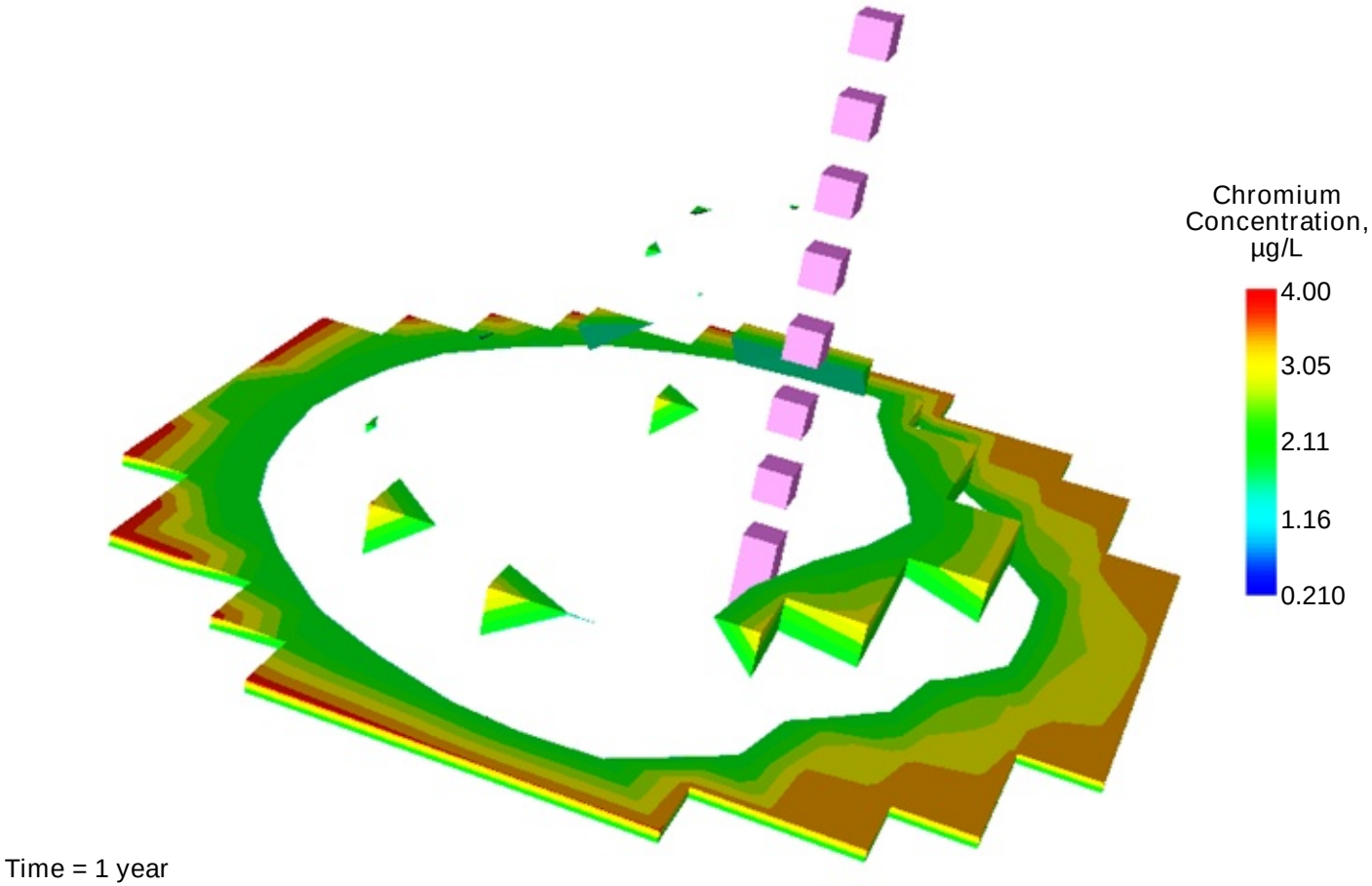

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Figure 13
Close-up View of Chromium Concentrations on Outer Surface of Aromas Zone of Saturation after One Year of Injection

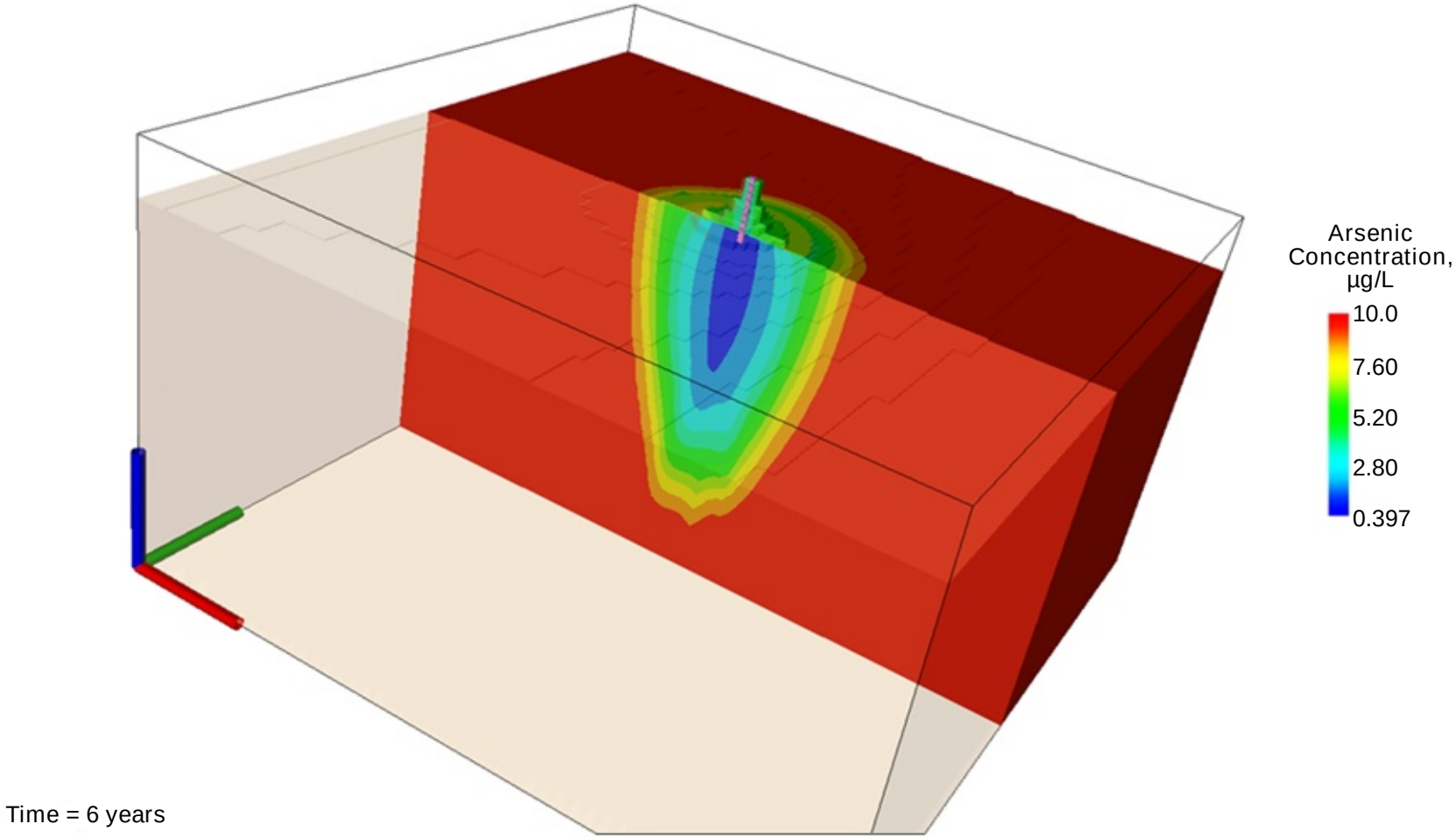

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Figure 14
Block Diagram
Showing Arsenic
Concentrations after
Six Years of Injection

APPENDIX A

Project Permits

1. FORA Right-of-Entry Permit

2. City of Seaside Encroachment Permit and Use/Minor Use Permit,

3. Monterey County Health Department Well Construction Permit

FORT ORD REUSE AUTHORITY
920 2ND AVENUE, SUITE A, MARINA, CALIFORNIA 93933
PHONE: (831) 883-3672 · FAX: (831) 883-3675
WEBSITE: www.fora.org

August 6, 2013

Keith Israel, General Manager
Monterey Regional Water Pollution Control Agency
5 Harris Court, Bldg. D
Monterey, CA 93940

RE: Right of Entry: Monterey Regional Water Pollution Control Agency Monitoring Well Installation

Dear Mr. Israel:

This Fort Ord Reuse Authority (FORA) Right of Entry (ROE) outlines terms of use for select former Fort Ord areas to support Monterey Regional Water Pollution Control Agency ("MRWPCA" – including its officers, directors, agents, staff and contractors) Monitoring Well Installation. This ROE is limited to the Monitoring Well Installation and improvement work as shown on the attached Exhibit "D," Figure 2 – UXO Support Work Plan and may be canceled by FORA with thirty (30) days notice. FORA may suspend the ROE without notice for cause (such as breach of the ROE).

This ROE provides MRWPCA with limited access to FORA owned property that is currently undergoing Munitions and Explosive of Concern (MEC) remediation efforts. FORA may stop MRWPCA's activities and to perform MEC remediation activities and supporting activities. FORA will work with MRWPCA to attempt to minimize the impacts of MEC remediation efforts on MRWPCA's activities. This ROE may not be assigned.

Usage and restrictions are based on conditions in this ROE and the attached:

- Exhibit "A" – FORA Letter to the City of Seaside dated May 24, 2012, Acknowledgment and Acceptance of City of Seaside Application for the Seaside Groundwater Monitoring Well Project

- Exhibit "B" – Technical Memorandum Monterey Regional Water Pollution Control Agency Seaside Groundwater Basin Monitoring Well Project, dated August 6, 2013.

- Exhibit "C" – Requirements for Soils Management Monterey Regional Water Pollution Control Agency Seaside Groundwater Basin Monitoring Well Project, dated August 6, 2013.

- Exhibit "D" – UXO Support Work Plan Monterey Regional Water Pollution Control Agency Seaside Groundwater Basin Monitoring Well Project, dated August 6, 2013.

- Exhibit "E" – The DTSC letter dated August 2, 2013 after reviewing the Technical Memorandum, Requirements for Soils Management, UXO Support Work Plan for the proposed MRWPCA Monitoring Well Installation improvements before receiving regulatory site closure.

Use of the described FORA owned Monitoring Well Installation site is permitted under the following terms:

1. FORA makes no representation as to the condition of these properties/facilities. MRWPCA accepts responsibility to inspect the facilities prior to use to determine that the premises are safe and suitable for the proposed activities.

2. MRWPCA will meet the terms for construction of the Monitoring Well Installation improvements, as approved by FORA and DTSC with concurrence by the U.S. Environmental Protection Agency (EPA), to protect the health and safety of MRWPCA personnel, staff and contractors. This ROE terminates upon completion of the work shown in Exhibit "D," Figure 2 – UXO Support Work Plan.

3. MRWPCA agrees to defend, indemnify, and hold FORA, the jurisdictions, DTSC and EPA, their officers, employees, contractors and agents harmless from and against any and all liability, loss, expense, including reasonable attorneys' fees, or claims for injury or damages arising from MRWPCA's activities, work stoppages, delays or time lost for implementing, monitoring, or enforcing any provisions of this ROE including the attached exhibit documents.

4. Use of the property is subject to federal and/or State of California protections from impact to endangered species. MRWPCA agrees to comply with these regulations and instruct their members in awareness of these species.

5. MRWPCA agrees to provide FORA with proof of insurance and add FORA and its agents and the City of Seaside as additionally insured on MRWPCA's general liability insurance policy. This ROE will not be valid until a properly completed certificate of insurance has been submitted to FORA.

6. MRWPCA agrees to refrain from any ground penetrating activities, unless previously approved in writing by FORA.

7. MRWPCA will notify FORA of any dumping that may have occurred on the property as soon as sighted.

8. MRWPCA will not litter and will remove any trash that their contractors may leave.

9. MRWPCA will notify the Seaside Police Department immediately of any illegal activities on the properties and follow up by providing FORA with a description of the activities as soon as possible by calling the FORA ESCA Hotline (831) 883-3506.

10. MRWPCA will survey and stake and fence the ASR well site before beginning construction to insure that soils do not leave the site.

Once this property is transferred to the City of Seaside this ROE becomes void. Upon transfer, MRWPCA work on the transferred land must cease immediately unless the City of Seaside grants permission. MRWPCA is also responsible for obtaining appropriate permission from the City of Seaside to use the subject area not owned by FORA.

Please indicate your agreement to the conditions of this ROE by signing in the space provided below.

Sincerely,

Stan Cook
Real Property and Facilities Manager

Acceptance:

Monterey Regional Water Pollution Control Agency

Keith Israel, General Manager Date: 8/8/13

CITY OF SEASIDE
PUBLIC WORKS DEPARTMENT
440 HARCOURT AVENUE, SEASIDE 93955
(831)899-6825

PERMIT NO: 6414

APPLICATION AND PERMIT FOR ENCROACHMENT IN CITY RIGHT OF WAY

NAME OF CONTRACTOR/APPLICANT: Cascade Drilling LP CELL PHONE: 562-964-1691

ADDRESS: 555 S Harbor Blvd. La Habra, CA 90631 PHONE: 562-964-1691

CONTRACTORS LICENSE: 938110 CITY BUSINESS LICENSE: pending

ADDRESS OF PROPOSED WORK: South side Eucalyptus Rd, approx. 1,700' east of General Jim Moore Blvd.

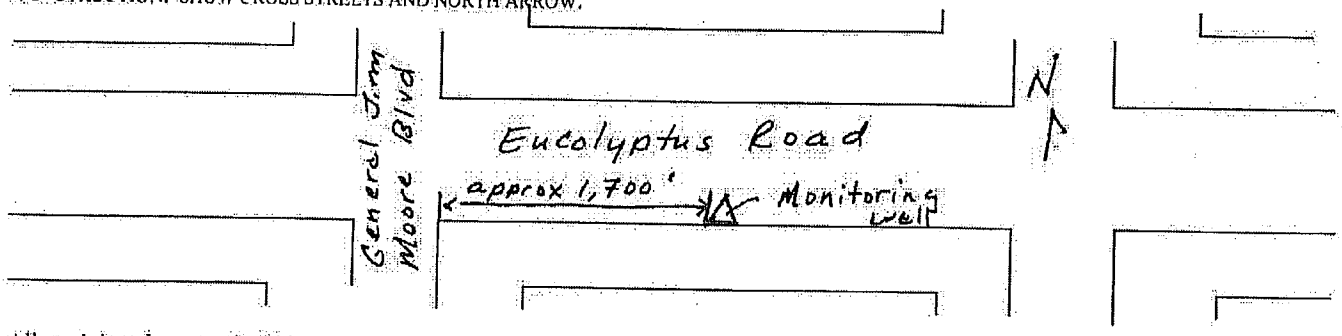
PROPOSED STARTING DATE: November 1, 2013

(NOTE: PLEASE CALL FOR INSPECTION 48 HOURS BEFORE BEGINNING WORK)

TYPE OF WORK: ☐ STREET IMPROVEMENTS ☐ STREET EXCAVATION ☐ DRIVEWAY ☐ SIDEWALK

DESCRIBE WORK PROPOSED: Drill monitoring well in south bicycle lane of Eucalyptus Rd, install flush cap, repair with concrete.

SHOW LOCATION OF EXISTING STREET IMPROVEMENTS TO BE REMOVED AND REPLACED AND LOCATION OF NEW WORK WITH REFERENCE TO PROPERTY LINES. PROVIDE INSPECTOR WITH GRADE SHEETS FOR STORM DRAINS, SEWERS, CURBS, ETC. ONE DAY IN ADVANCE OF CONSTRUCTION. SHOW CROSS STREETS AND NORTH ARROW.



All work is to be started within 30 days of the initial issuance of this permit and completed in an expeditious manner as determined by the engineer. The applicant agrees to properly maintain said encroachment at no expense to the City and to indemnify the City from any liability arising out of or caused by said encroachment, and that all work shall be in accordance with City Standards. The applicant unconditionally guarantees and implies warranty for all materials and workmanship affected by this permit for a period of one year from the date of acceptance of the work. Acceptance by the City of the work completed under this permit is not a waiver of the applicant's obligations as stated above.

APPLICANT'S SIGNATURE

10/02/13
APPLICATION DATE

APPLICANT IS TO NOTIFY THE FOLLOWING:
- ☐ UNDERGROUND SERVICE ALERT (1-800-227-2600)
- ☐ POLICE (899-6748)
- ☐ FIRE (899-6790)
- ☐ MONTEREY-SALINAS TRANSIT (MST) FAX LOCATION TO 899-7789
- ☐ WESTMED AMBULANCE (796-6444)

NOTE/STANDARD PLANS:
Adhere to conditions dated 10/7/13.
Valid only with approved Use Permit.
~~Call to 48 hours in advance of work.~~
Call to arrange inspection of repair.
Install pedestrian traffic control.

PERMIT FEE: $205 BOND NA

RECEIPT NO:

PERMIT ISSUED BY:

SEASIDE PUBLIC WORKS DEPT. DATE 10/8/13

I HAVE EXAMINED THE WORK COVERED BY THIS PERMIT AND FIND THAT IT IS IN ACCORDANCE WITH THE STANDARDS OF THE CITY OF SEASIDE AND RECOMMEND ACCEPTANCE.

ENCROACHMENT INSPECTOR DATE

CITY OF SEASIDE

Resource Management Services | Planning Division

Use Permit / Minor Use Permit Application

UP-12-07
MUP-11-____
File # 10221

TO BE COMPLETED BY APPLICANT

Project Address or Location: South of and adjacent to Eucalyptus Road; approx. 1,800 ft east of General Jim Moore Boulevard **APN:** 031-151-048-000

Project Description (attach if needed): (See attached Summary Project Description, June 6, 2012 and Work Plan, March 2012)

Applicant / Primary Contact:

Name: Monterey Regional Water Pollution Control Agency (MRWPCA) / Robert Holden

Address: 5 Harris Ct # D City: Monterey State: CA Zip: 93940

Phone Contact: 831-645-4634 Email: bobh@mrwpca.com

Property Owner:

Name: Fort Ord Reuse Authority (FORA)/ Michael A. Houlemard, Jr. - Executive Officer

Address: 920 2nd Ave., Suite A City: Marina State: CA Zip: 93933

Phone Contact: 831-883-3672 Email: Michael@fora.org

Property Owner's Statement: "By my signature, I hereby certify that I am the legal owner of record of the property identified in this application and that I approve of the requested action herein. I further certify that all data, information, plans and evidence submitted as part of this application is true and correct to the best of my knowledge."

Signature: N/A (See letter from FORA, in Tab 7) **Date:** June 7, 2012

Submittal Requirements

1. **Plan Set** - All plans shall be accurate and clearly drawn to scale on sheets a minimum size of 18"x24" and up to a maximum size of 24" x 36" using either an engineer's or architect's scale. **Five (5) full-size folded copies** shall be submitted with the application for initial review. Once any revisions are made and the application is deemed complete, **eight (8) full-size folded copies** and **one (1) set of reduced copies** (11"x17") of the amended plans will be required. The set of reduced plans may be submitted electronically in PDF format.
2. **Project Description** – Describe the proposed use of the subject property or tenant space including a description of the business and/or use, operational hours, use of floor area and outside areas, number of employees, number of seats (*restaurant uses and meeting spaces*), number of fleet vehicles, and any other relevant information.
3. **Site Plan** – Show all property lines and dimensions, adjacent streets and alleys, required setbacks, structures, driveways, parking spaces, landscaped areas, signs, trash enclosures, etc. on a scaled plan of the entire subject property. Include all north arrow, structure dimensions, distances from other structures, and distances to adjacent property lines.
4. **Floor Plan** – Include existing and proposed plans for all tenant spaces, interior living spaces, windows, walls and doors.
5. **Elevations** – Include all exterior elevations. *(New Construction only)*
6. **Pre-stamped envelopes** for all properties within a 300-foot radius (*consult staff for amount*)
7. Additional information as requested by Staff following initial review of the project.

TO BE COMPLETED BY STAFF

☒ ***Large Commercial*** *(≥ 5,000 sq. ft) $2,575* ☐ ***Small Commercial*** *(< 5,000 sq. ft) $2,060*

☐ ***Single-Family Dwelling*** *$670* ☐ ***Multi-family*** *(more than 1 dwelling) $2,266* ☐ ***Minor Use Permit*** *$515*

Fee Collected: $2575.00 Receipt #: 165519 Accepted By: T.O. Date Accepted: 6/12/12

Updated 1/.3/2011

MONTEREY COUNTY

DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH BUREAU
1270 Natividad Road
Salinas, CA 93906
(831) 755-4507

WATER WELL CONSTRUCTION PERMIT

WELL PERMIT #13-12301 | **ISSUED: 10/29/2013**
INTENDED USE: Monitoring Well | **EXPIRES:10/29/2014**

SITE LOCATION: Eucalyptus Rd | **APN:031-151-048-000**

OWNER:MRWPCA | **PHONE: 831-645-4634**

ADDRESS:5 Harris Ct. BLDG 5

CITY: Monterey

DRILLING CONTRACTOR: Cascade Drilling | **LICENSE:988110**

ISSUED BY: Marni Flagg

CONDITIONS OF APPROVAL:

1. All requirements set forth in Monterey Code Chapter 15.08 and Bulletins 74-81 and 74-90, shall be complied with at all times.

2. The well shall be at least 100 feet from any septic tank; any portion of any leach field or animal enclosure; 50 feet from any sewer main, line or lateral; and 150 feet from any seepage pit. If type of absorption field is unknown, the distance shall be 150 feet.

3. Location of the well shall not prevent the installation, relocation or expansion of the septic system on any adjoining lot.

4. Water well permit shall be kept on site at all times while work is in progress.

5. The well shall be drilled in the approved location delineated on the attached map, Exhibit A. The well cannot be drilled in any other location without prior approval from Monterey County Health Department, Environmental Health Bureau (EHB) and receipt of an amended permit.

6. Any water well on the premises which is to be abandoned, or which has been abandoned shall be properly destroyed within six months of the completion of this well.

7. Notify the EHB at least 24 hours prior to moving on site.

8. Notify the EHB 24 hours prior to the time you expect to place any seal.

9. If the seal(s) cannot be witnessed by the EHB, a detailed, written description of the seal(s) shall be submitted to the EHB within ten days.

10. Surface construction features of the completed well shall be in accordance with the California Well Standards Bulletin 74-81 and Bulletin 74-90 Section 10.

11. The permit applicants shall indemnify and hold harmless the County and its officers, agents, and employees from actions or claims of any description brought on account of any injury or damages sustained, by any person or property resulting from the issuance of the permit and the conduct of the activities authorized under said permit.

12. Issuance of this permit to construct a water well does not create, transfer, assign or acknowledge any legal rights to water associated with this property.

13. Issuance of this permit to construct a water well does not guarantee that the well can be approved for domestic use.

14. A geologic log shall be performed and it shall be submitted to the EHB before the well is sealed. Interpretation of the geologic log shall be provided by the contractor indicating the best location(s) for sealing off poor quality water and the proposed seal depth. The exact location of sanitary and strata seals shall be approved by the EHB in consultation with any appropriate water management agency before the well is sealed. The permit applicant may request review of the approved seal depth by a 3rd party licensed hydrogeologist at the applicant's expense if the applicant disagrees with EHB's decision.

15. The well shall be constructed as designed in Exhibit B.

PLEASE NOTE THE FOLLOWING:

1. **Monterey Peninsula Water Management Requirements** (MPWMD): The proposed well is located within the MPWMD boundary and will be subject to MPWMD requirements. It is recommended you review MPWMD requirements prior to construction:

END

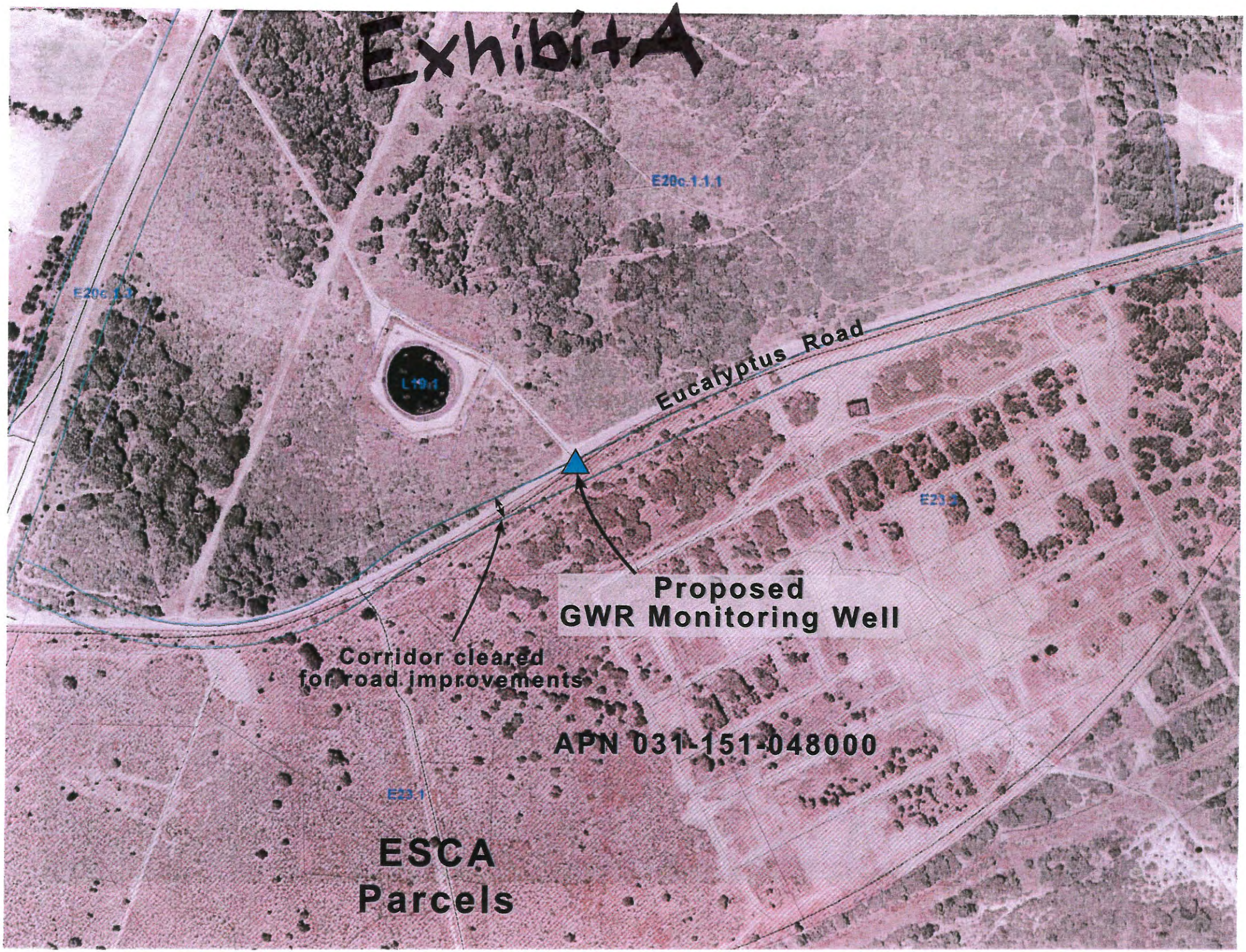
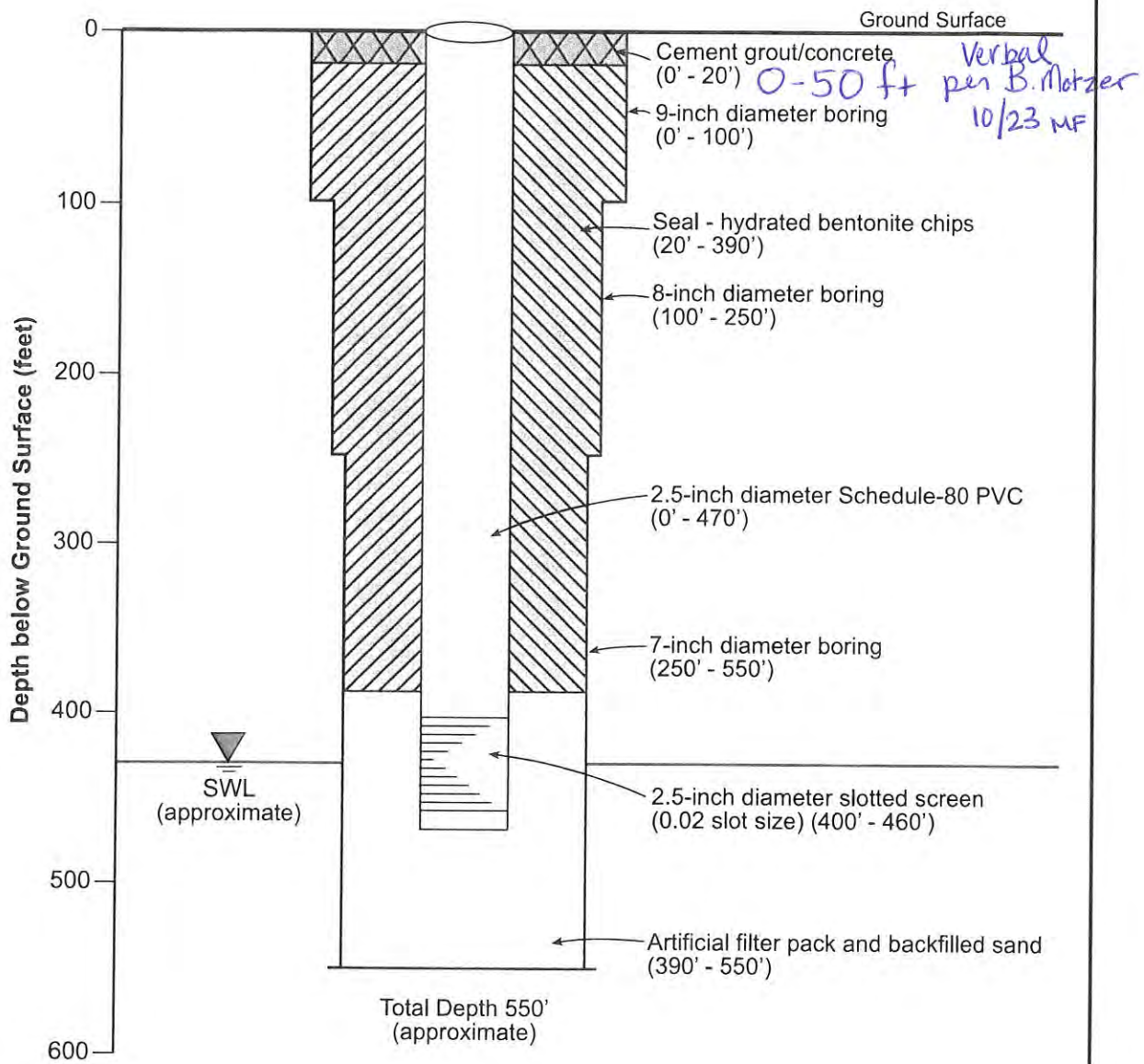


Exhibit A
E20c.1.1.1
E20c.1.3
L19.1
Eucalyptus Road
E23.2
Proposed
GWR Monitoring Well
Corridor cleared
for road improvements
APN 031-151-048000
E23.1
ESCA
Parcels

Exhibit B

Proposed Monitoring Well
Groundwater Replenishment (GWR) Project



Notes:

Drilling with Sonic Drill Rig 600T

Total depth to be determined in the field based on core samples

Continuous core samples:
- 7-inch diameter core (0'-100')
- 6-inch diameter core (100'-250')
- 4-inch diameter core (250'-550')

SWL = static water level (water table)

May 2012	**Figure 1**
TODD ENGINEERS Alameda, California	**Proposed Monitoring Well Construction Diagram**

APPENDIX B

Dual Induction – Natural Gamma Ray Geophysical Log

welenco

5201 Woodmere Drive, Bakersfield, CA 93313-- www.welenco.com--(800) 445-9914
California Contractor's License No. 722373

DUAL INDUCTION - GAMMA RAY LOG

FILING NO.

COMPANY Todd Engineers

WELL MW-1

FIELD Fort Ord

STATE California COUNTY Monterey

LOCATION:
Eucalyptus Road off of General Jim Moore

OTHER SERVICES:
None

JOB NO.
16825

SEC: 13 TWP: 15S RGE: 1E LAT.: 36° 37' 21.8" LONG.: 121° 48' 42.6" MERIDIAN.: Mt. Diablo

Permanent Datum: Ground Level, **Elev.** 437 **Ft. Elev.: K.B.** _____ **Ft.**
Log Measured From: Top of Casing, 0 **Ft. Above Perm. Datum** **D.F.** _____ **Ft.**
Drilling Measured From: Ground Level **G.L.** 437 **Ft.**

Date	Jan. 27, 2014			
Type Of Log	Dual Induction			
Run	One			
Depth-Driller	521 Ft	Ft	Ft	Ft
Depth-Logger	521 Ft	Ft	Ft	Ft
Top Logged Interval	3 Ft	Ft	Ft	Ft
Btm. Logged Interval	518 Ft	Ft	Ft	Ft
Type Fluid In Hole	Water			
Fluid Level	N/A Ft	Ft	Ft	Ft
Max Temp	N/A °F	°F	°F	°F
Operating Rig Time	N/A Hr	Hr	Hr	Hr
Van No. / Location	LV-3 / Bfld			
Recorded By	Dan Ihde			
Witnessed By	Bill Motzer			

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	TYPE	FROM	TO
1	In	Ft	Ft	3 In	Sch 80	Surf Ft	521 Ft
2	In	Ft	Ft	In		Ft	Ft
3	In	Ft	Ft	In		Ft	Ft

Miscellaneous Information

Remarks:

A recreational GPS accurate to +/- 45 feet set for Datum NAD27 was used to calculate Latitude, Longitude & Elevation values. The Section, Township, and Range then determined using the TRS program (TRS accuracy is not guaranteed). The TRS program converts Latitude and Longitude to Section, Township, and Range. The NOTICE at the bottom of this heading also applies.

Steel centralizer at 463 feet.

Drilled By: Cascade Drilling

Perforated Intervals:

421 Ft. To 516 Ft.		

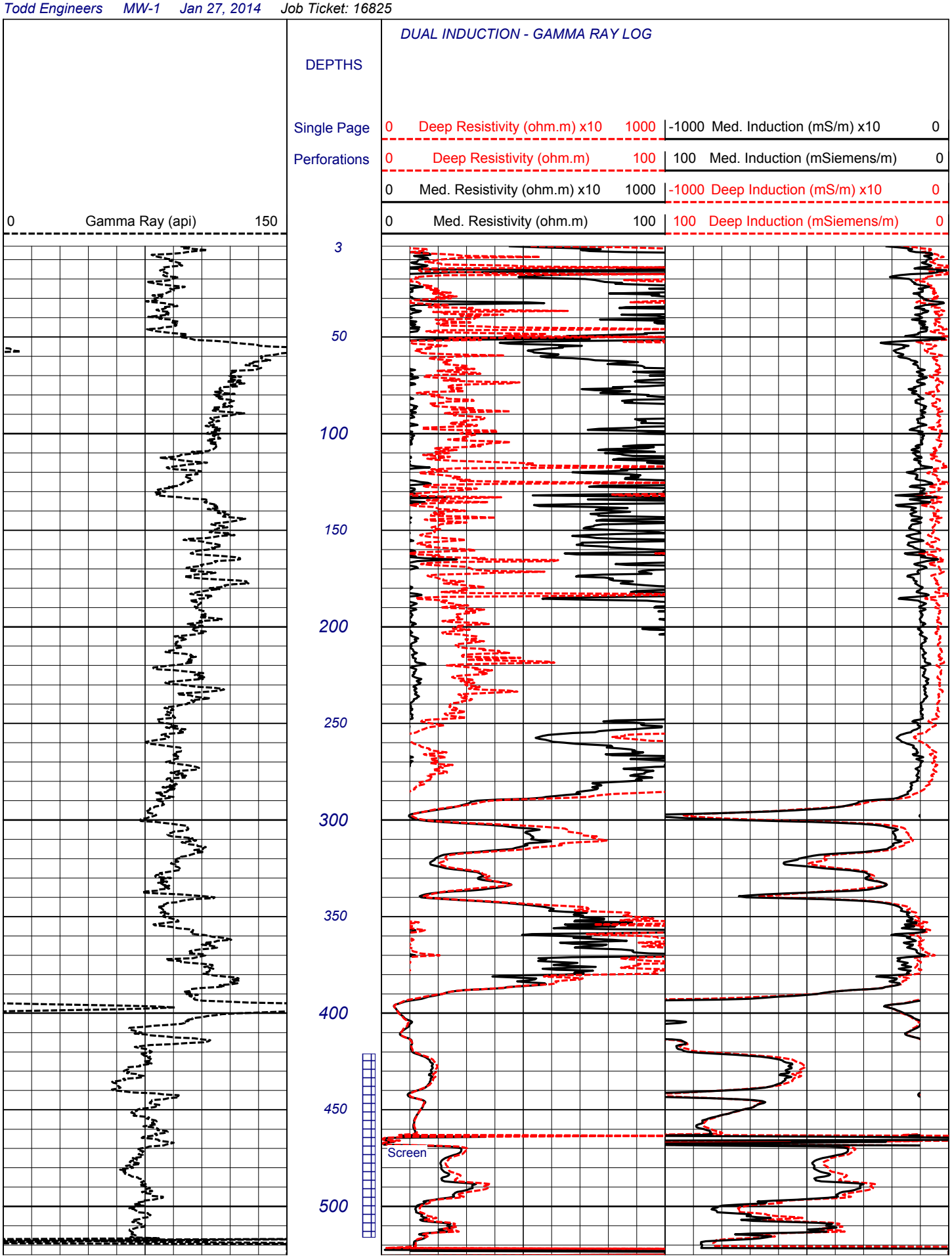
Line Speed:

Borehole Volume Calculations:

Other Information:

NOTICE: All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

welenco, inc. January 27, 2014


DUAL INDUCTION - GAMMA RAY LOG
DEPTHS
Single Page
Perforations
0 Gamma Ray (api) 150
0 Deep Resistivity (ohm.m) x10 1000
-1000 Med. Induction (mS/m) x10 0
0 Deep Resistivity (ohm.m) 100
100 Med. Induction (mSiemens/m) 0
0 Med. Resistivity (ohm.m) x10 1000
-1000 Deep Induction (mS/m) x10 0
0 Med. Resistivity (ohm.m) 100
100 Deep Induction (mSiemens/m) 0
3
50
100
150
200
250
300
350
400
450
500
Screen

APPENDIX C

DWR Well Completion Report

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0196315

Page 1 of 10

Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

Local Permit Agency Monterey County Health Department

Permit Number 13-12301 Permit Date 10/29/13

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Sonic Drilling Fluid

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0		(SP) 10YR 6/8 Brownish yellow fine sand, dry
8		(SP) 10YR 6/8 Brownish yellow very fine to fine
		sand, dry
10.0		(SP) 10YR 6/8 Brownish yellow fine sand, dry
12.5		(SP) 10YR 6/8 Brownish yellow fine sand, moist
15.0		(SP) 10YR 5/6 Dark yellowish brown very fine to
		fine sand with minor rounded pebbles up to 0.5"
		diameter, trace silt, moist
16.0		(SP) 10YR 5/6 Dark yellowish brown fine sand with
		minor gravel, moist
17.5		(SP) 10YR 7/6 Yellowish brown fine sand, moist
18.5		(SP-ML) 10YR 4/6 Dark yellowish brown fine sand
		with silty fine sand modules, moist
22.5		(SP) 10YR 5/8 Yellowish brown fine sand, moist
25		(SP) 10YR 6/6 Yellowish brown fine sand, moist
30		(SP) 10YR 6/6 Yellowish brown fine sand with
		with minor silt nodules, slightly moist
32.5		(SP) 10YR 6/8 Brownish yellow fine sand, moist
35		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt nodules, slightly moist
38		(SP) 10YR 5/8 Yellowish brown fine sand, slightly
		moist
40.5		(SP) 10YR 6/8 Brownish yellow fine sand, slightly
		moist
43		(SP) 10YR 6/6 Yellowish brown fine sand, slightly
		dry
48		(SP) 10YR 5/6 Dark yellowish brown fine sand,
		slightly dry
50.5		(SP) 10YR 5/8 Yellowish brown silty fine sand
		nodules, dry

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

Well Owner

Name Monterey Regional Water Pollution Control Agency

Mailing Address 5 Harris Court, Building D

City Monterey State CA Zip 93940

Well Location

Address Eucalyptus Road (1,800' east of Gen. Jim Moore Blvd)

City Seaside County Monterey

Latitude 36 Deg. 37 Min. 22 Sec. N Longitude 121 Deg. 48 Min. 43 Sec. W

Datum NAD83 Dec. Lat. 36.62269 Dec. Long. 121.8119

APN Book 031 Page 151 Parcel 048000

Township 15S Range 1E Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

⦿ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

○ Water Supply
☐ Domestic ☐ Public
☐ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
⦿ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 405 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	160	9	Blank	PVC Sch. 80	0.6	3.5		
160	400	8	Blank	PVC Sch. 80	0.6	3.5		
400	421	7	Blank	PVC Sch. 80	0.6	3.5		
421	446	7	Screen	PVC Sch. 80	0.6	3.5	Milled Slots	0.020
446	466	7	Blank	PVC Sch. 80	0.6	3.5		
466	516	7	Screen	PVC Sch. 80	0.6	3.5	Milled Slots	0.020

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	50	Cement	Neat Cement
50	411	Bentonite	Hydrated pellets
411	521	Filter Pack	#3 graded sand
521	535	Fill	Native fill

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Edwin Lin, Todd Engineers
Person, Firm or Corporation

2490 Mariner Sq Loop, Ste, 215 Alameda CA 94501
Address City State Zip

Signed
C-57 Licensed Water Well Contractor

Date Signed

988110
C-57 License Number

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Certified Copy Water Code § 13752

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0196316

Page 2 of 10

Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

Local Permit Agency Monterey County Health Department

Permit Number 3-12301 Permit Date 10/29/2013

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
58		(SP-SM) 10YR 5/9 Yellowish brown silty fine sand
		lenses, dry
59		(SP) 10YR 5/9 Yellowish brown fine sand with
		minor silt, dry
60.5		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand
		lenses, dry
65.5		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt, dry
70		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt nodules, dry
72.5		(SP) 10YR 5/8 Yellowish brown fine sand with
		minor silt nodules, dry
74		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt lenses and nodules, dry
75		(ML) 10YR 4/6 Dark yellowish brown silt with minor
		fine sand and clay, dry
77.5		(SP-SM) 10YR 5/6 Dark yellowish brown fine sand
		with large silt nodules, dry
80		(SP) 10YR 6/8 Brownish yellow fine sand with
		minor silt, dry
82.5		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt nodules, dry
85		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt, dry
88		(SP) 10YR 7/8 Brownish yellow fine sand, dry
90.5		(SP) 10YR 6/6 Yellowish brown fine sand, dry
93		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand
		nodules, dry
96		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand
		dry

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

Well Owner

Name Monterey Regional Water Pollution Control Agency

Mailing Address 5 Harris Court, Building D

City Monterey State CA Zip 93940

Well Location

Address Eucalyptus Road (1,800' east of Gen. Jim Moore Blvd)

City Seaside County Monterey

Latitude 36 Deg. 37 Min. 22 Sec. N Longitude 121 Deg. 48 Min. 43 Sec. W

Datum NAD83 Dec. Lat. 36.62269 Dec. Long. 121.8119

APN Book 031 Page 151 Parcel 048000

Township 15S Range 1E Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

- ◉ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 405 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
516	521	7	Blank	PVC Sch. 80	0.3	3.5		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Edwin Lin, Todd Engineers
Person, Firm or Corporation

2490 Mariner Sq Loop, Ste, 215 Alameda CA 94501
Address City State Zip

Signed
C-57 Licensed Water Well Contractor

Date Signed 988110
C-57 License Number

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

California Water Code § 13751

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0196317

Page 3 of 10

Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

Local Permit Agency Monterey County Health Department

Permit Number 13-12301 Permit Date 10/29/2013

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
103.5		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt, dry
106		(SP-SM) 10YR 5/6 Dark yellowish brown with silty
		fine sand nodules, dry
109.5		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand
		lenses, dry
114.5		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt, dry
117		(SP-SM) 10YR 6/8 Brownish yellow silty fine sand
		nodules, dry
122		(SP-SM) 10YR 5/8 Yellowish brown silty fine sand,
		dry
124.5		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand,
		dry
127		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand
		lenses, dry
129.5		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand,
		dry
135.5		(ML) 10YR 4/4 Dark yellowish brown fine sandy
		silt, dry
137		(SP) 10YR 5/8 Yellowish brown fine sand, dry
139.5		(SP) 10YR 5/8 Yellowish brown fine sand with
		minor clay, dry
142		(SP-SM) 10YR 6/8 Brownish yellow fine sand with
		silt nodules, dry
147		(SP-SM) 10YR 5/6 Dark yellowish brown fine sand
		with silt nodules, dry
149.5		(SP-SM) 10YR 6/6 Yellowish brown fine sand with
		silt nodules, dry
152		(SP-SM) 10YR 6/8 Brownish yellow silty fine sand,

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

Well Owner

Name Monterey Regional Water Pollution Control Agency

Mailing Address 5 Harris Court, Building D

City Monterey State CA Zip 93940

Well Location

Address Eucalyptus Road (1,800' east of Gen. Jim Moore Blvd)

City Seaside County Monterey

Latitude 36 Deg. 37 Min. 22 Sec. N Longitude 121 Deg. 48 Min. 43 Sec. W

Datum NAD83 Dec. Lat. 36.62269 Dec. Long. 121.8119

APN Book 031 Page 151 Parcel 048000

Township 15S Range 1E Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

- ◉ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 405 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☐ Other

Attach additional information, if it exists.

Certification Statement

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Name Edwin Lin, Todd Engineers

Person, Firm or Corporation

2490 Mariner Sq Loop, Ste, 215 Alameda CA 94501

Address City State Zip

Signed

C-57 Licensed Water Well Contractor Date Signed 988110 C-57 License Number

CA Water Code § 13751

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0196318

Page 4 of 10

Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

Local Permit Agency Monterey County Health Department

Permit Number 13-12301 Permit Date 10/29/2013

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
		dry
154.5		(SP-SM) 10YR 5/8 Yellowish brown silty fine sand
		dry
157		(SP) 10YR 6/8 Brownish yellow fine sand with
		minor silt nodules, dry
159		(SP-SM) 10YR 5/6 Dark yellowish brown silty fine
		sand nodules, dry
161.5		(SP-SM) 10YR 5/8 Yellowish brown silty fine sand,
		dry
163		(ML) 10YR 6/6 Yellowish brown silt, dry
164		(SM) 10YR 5/6 Dark yellowish brown silty fine
		sand, dry
169.5		(SP) 10YR 6/8 Brownish yellow fine sand with
		minor silt, dry
172		(SP-SM) 10YR 5/6 Dark yellowish brown fine to
		medium coarse sand with silt nodules, dry
174.5		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt, dry
177		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand,
		dry
179.5		(SP-SM) 10YR 5/8 Yellowish brown silty fine sand
		lenses, dry
182		(SM) 10YR 6/8 Brownish yellow silty fine sand, dry
189.5		(SM) 10YR 6/6 Yellowish brown silty fine sand, dry
200		(SM) 10YR 6/8 Brownish yellow silty fine sand, dry
202.5		(ML-SM) 10YR 6/4 Light yellowish brown silt with
		fine sand, dry
205		(SM) 10YR 6/6 Yellowish brown silty fine sand, dry
211		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt, dry

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

Well Owner

Name Monterey Regional Water Pollution Control Agency

Mailing Address 5 Harris Court, Building D

City Monterey State CA Zip 93940

Well Location

Address Eucalyptus Road (1,800' east of Gen. Jim Moore Blvd)

City Seaside County Monterey

Latitude 36 Deg. 37 Min. 22 Sec. N Longitude 121 Deg. 48 Min. 43 Sec. W

Datum NAD83 Dec. Lat. 36.62269 Dec. Long. 121.8119

APN Book 031 Page 151 Parcel 048000

Township 15S Range 1E Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

- ◉ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 405 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☐ Other

Attach additional information, if it exists.

Certification Statement

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Name Edwin Lin, Todd Engineers

Person, Firm or Corporation

2490 Mariner Sq Loop, Ste, 215 Alameda CA 94501

Address City State Zip

Signed

C-57 Licensed Water Well Contractor Date Signed 988110 C-57 License Number

CA Water Code § 13751

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State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0196319

Page 5 of 10

Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

Local Permit Agency Monterey County Health Department

Permit Number 13-12301 Permit Date 10/29/2013

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
212.5		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand
		lenses, dry
215		(SM) 10YR 6/6 Yellowish brown very fine sand and
		silt, dry
217.5		(SP) 10YR 6/4 Light yellowish brown fine sand
		with minor silt nodules, dry
220		(SP) 10YR 6/4 Light yellowish brown fine sand with
		minor silt , cry
223		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt , dry
225.5		(SP) 10YR 6/4 Light yellowish brown fine sand
		with minor silt, dry
228		(SP-SM) 10YR 6/6 Yellowish brown silty fine sand
		nodules, dry
232.5		(SP-SM) 10YR 5/6 Dark yellowish brown silty fine
		sand lenses, dry
235		(SP) 10YR 6/6 Yellowish brown fine sand with
		minor silt, dry
237.5		(SP) 10YR 6/6 Yellowish brown medium coarse
		sand
240		(SP) 10YR 4/4 Dark yellowish brown fine sand
		with minor silt, dry
242.5		(SP) 10YR 5/6 Dark yellowish brown fine sand
		with minor silt, dry
245		(SP-SM) 10YE 6/8 Brownish yellow silty fine sand
		nodules, dry
247.5		(SP) 10YR 6/8 Brownish yellow fine sand with
		minor silt, dry
249		(SM) 10YR 5/6 Dark yellowish brown silty fine
		sand, dry

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

Well Owner

Name Monterey Regional Water Pollution Control Agency

Mailing Address 5 Harris Court, Building D

City Monterey State CA Zip 93940

Well Location

Address Eucalyptus Road (1,800' east of Gen. Jim Moore Blvd)

City Seaside County Monterey

Latitude 36 Deg. 37 Min. 22 Sec. N Longitude 121 Deg. 48 Min. 43 Sec. W

Datum NAD83 Dec. Lat. 36.62269 Dec. Long. 121.8119

APN Book 031 Page 151 Parcel 048000

Township 15S Range 1E Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

- ◉ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 405 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Edwin Lin, Todd Engineers

Person, Firm or Corporation

2490 Mariner Sq Loop, Ste, 215 Alameda CA 94501

Address City State Zip

Signed

C-57 Licensed Water Well Contractor Date Signed 988110 C-57 License Number

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Certified CA Water Code § 13752

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0196320

Page 6 of 10

Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

Local Permit Agency Monterey County Health Department

Permit Number 13-12301 Permit Date 10/29/2013

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
250		(S) 10YR 5/6 Dark yellowish brown fine sand with
		minor silt, dry
252		(SP) 10YR 5/6 Dark yellowish brown fine sand, dry
257		(SP) 10YR 5/6 Dark yellowish brown fine sand,
		very moist
267		(SP) 10YR 5/6 Dark yellowish brown fine sand, dry
269.5		(SP) 10YR 5/6 Dark yellowish brown fine sand, dry
277		(SP) 10YR 4/6 Dark yellowish brown fine sand, dry
283.5		(SP-SM) 10YR 5/6 Dark yellowish brown silty fine
		sand, dry
287		(SM) 10YR 5/6 Dark yellowish brown silty fine
		sand, moist
289.5		(SM) 10YR 6/4 Light yellowish brown silty fine
		sand, moist
297		(ML) 10YR 3/4 Dark yellowish brown dense
		clayey silt with fine sand, moist
298.5		(ML) 10YR 6/4 Light yellowish brown dense clayey
		silt with fine sand, moist
300		(CL) 10YR 6/4 Light yellowish brown silty clay,
		moist
300.7		(SP) 10YR 7/3 Very pale brown silty fine sand, dry
301		(SP) 10YR 7/7 Very pale brown fine sand, dry
303.5		(SP) 10YR 6/6 Yellowish brown fine sand, dry
307		(SP) 10YR 7/4 Very pale brown fine sand, dry
309		(SP) 10YR 7/6 Yellowish brown fine sand, dry
316		(SP) 10YR 7/6 Yellowish brown silty fine sand, dry
317		(ML) 10YR 5/8 Yellowish brown fine sandy, clayey
		silt (20/30/50), moist
319.5		(ML) 10YR 5/4 Yellowish brown fine sandy silt
		(40/60), moist

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

Well Owner

Name Monterey Regional Water Pollution Control Agency

Mailing Address 5 Harris Court, Building D

City Monterey State CA Zip 93940

Well Location

Address Eucalyptus Road (1,800' east of Gen. Jim Moore Blvd)

City Seaside County Monterey

Latitude 36 Deg. 37 Min. 22 Sec. N Longitude 121 Deg. 48 Min. 43 Sec. W

Datum NAD83 Dec. Lat. 36.62269 Dec. Long. 121.8119

APN Book 031 Page 151 Parcel 048000

Township 15S Range 1E Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

- ◉ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 405 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Edwin Lin, Todd Engineers

Person, Firm or Corporation

2490 Mariner Sq Loop, Ste, 215 Alameda CA 94501

Address City State Zip

Signed

C-57 Licensed Water Well Contractor Date Signed C-57 License Number 988110

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

CA Water Code § 13751

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0196321

Page 7 of 10

Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

Local Permit Agency Monterey County Health Department

Permit Number 13-12301 Permit Date 10/29/2013

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
323		(CL) 10YR 5/4 Yellowish brown silty clay
		(10/90), moist
325		(ML) 10YR 5/4 Yellowish brown clayey silt (20/80)
		dry
327		(ML) 10YR 5/4 Yellowish brown fine sandy, clayey
		silt (20/20/60), dry
329.5		(SP) 10YR 6/8 Brownish yellow fine sand, dry
337		(CL) 10YR 6/6 Yellowish brown fine sandy, silty,
		clay, (20/20/60), moist
339		(ML) 10YR 6/6 Yellowish brown fine sandy, clayey,
		silt (30/20/50), dry
339.5		(ML) 10YR 6/6 Yellowish brown fine sandy, clayey,
		silt (40/10/50), dry
341		(SM) 10YR 5/8 Yellowish brown silty fine sand
		(30/70), dry
342		(SP) 10YR 5/8 Yellwoish brown fine sand, dry
347		(SP) 10YR 5/8 Yellowish brown fine to medium
		coarse sand (70/30), dry
349.5		(SP) 10YR 5/8 Yellowish brown fine to medium
		coarse sand (60/40), dry
352		(SP) 10YR 5/8 Yellowish brown fine to medium
		coarse sand (70/30), dry
353.5		(SP) 10YE 5/8 Yellowish brown fine sand, dry
354.5		(SP) 10YR 6/4 Light yellowish brown fine to
		medium coarse sand (60/40), dry
357		(SW) 10YR 6/4 Light yellowish brown fine to
		coarse sand, dry
359.5		(SW) 10YR 6/4 Light yellowish brown fine to
		coarse sand with silt (80/20), dry

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

Well Owner

Name Monterey Regional Water Pollution Control Agency

Mailing Address 5 Harris Court, Building D

City Monterey State CA Zip 93940

Well Location

Address Eucalyptus Road (1,800' east of Gen. Jim Moore Blvd)

City Seaside County Monterey

Latitude 36 Deg. 37 Min. 22 Sec. N Longitude 121 Deg. 48 Min. 43 Sec. W

Datum NAD83 Dec. Lat. 36.62269 Dec. Long. 121.8119

APN Book 031 Page 151 Parcel 048000

Township 15S Range 1E Section

Location Sketch

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North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

- ◉ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 405 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

- ☐ Geologic Log
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- ☐ Geophysical Log(s)
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- ☐ Other

Attach additional information, if it exists.

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Name Edwin Lin, Todd Engineers

Person, Firm or Corporation

2490 Mariner Sq Loop, Ste, 215 Alameda CA 94501

Address City State Zip

Signed

C-57 Licensed Water Well Contractor Date Signed 988110 C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Confidential CA Water Code § 13.5

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0196322

Page 8 of 10

Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

Local Permit Agency Monterey County Health Department

Permit Number 13-12301 Permit Date 10/29/2013

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
362		(SP) 10YR 6/6 Yellowish brown medium coarse
		to coarse sand, dry
367		(SP) 10YR 6/6 Yellowish brown very fine sand, dry
369.5		(SP) 10YR 6/6 Yellowish brown very fine sand with
		trace medium coarse sand, dry
372		(SP) 10YR 6/6 Yellowish brown very fine sand, dry
389.5		(Sp) 10YR 6/6 Yellowish brown very fine silty sand
		(15/85), dry
391		(SM) 10YR 6/6 Yellowish brown very fine silty sand
		(30/70), dry
		(BOTTOM OF AROMAS SAND FORMATION)
392.5		(TOP OF PASO ROBLES FORMATION)
		(ML) 10YR 3/1 Very dark gray clayey silt, very
		dense, dry
393.5		(ML) 10YR 3/1 Very dark gray clayey silt, very
		dense, dry
407.5		(CL) 10YR 3/1 Very dark gray silty clay (50/50),
		very dense, dry
414		(ML) 10YR 4/3 Brown clayey silt, dry
415		(ML) 10YR 4/3 Brown fine to medium coarse sand
		silt (30/70), dry
417.5		(ML) 10YR 4/3 Brown fine to medium coarse
		sandy silt (40/60), dry
420		(ML) 10YR 4/3 Brown fine to medium coarse
		sandy silt (30/70), dry
420.5		ML 10YR 4/3 Brown clayey fine sandy silt
		(20/20/60), dense, moist
422		(SM) 10YR 4/3 brown silty fine sand, loose, moist
423		(SP) 10YR 4/4 Dark yellowish brown silty fine
		sand, loose, moist

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

Well Owner

Name Monterey Regional Water Pollution Control Agency

Mailing Address 5 Harris Court, Building D

City Monterey State CA Zip 93940

Well Location

Address Eucalyptus Road (1,800' east of Gen. Jim Moore Blvd)

City Seaside County Monterey

Latitude 36 Deg. 37 Min. 22 Sec. N Longitude 121 Deg. 48 Min. 43 Sec. W

Datum NAD83 Dec. Lat. 36.62269 Dec. Long. 121.8119

APN Book 031 Page 151 Parcel 048000

Township 15S Range 1E Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. **Please be accurate and complete.**

Activity

- ◉ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 405 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Edwin Lin, Todd Engineers
Person, Firm or Corporation

2490 Mariner Sq Loop, Ste, 215 Alameda CA 94501
Address City State Zip

Signed
C-57 Licensed Water Well Contractor

Date Signed C-57 License Number 988110

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

CA Water Code § 13751

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0196323

Page 9 of 10

Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

Local Permit Agency Monterey County Health Department

Permit Number 13-12301 Permit Date 10/29/2013

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
425.5		(SP) 10YR 4/4 Dark yellowish brown fine sand,
		loose, moist
433		(SP) 10YR 4/4 Dark yellowish brown silty fine
		sand, moist
435		(ML) 2.5YR 6/4 Light yellowish brown clayey silt,
		very dense
442.5		(SP) 10YR 5/4 Yellowish brown silty fine sand,
		moist
445		(ML) 5YR 5/2 Olive gray clayey silt, very dense
462.5		(ML) 5YR 5/2 Olive gray clayey silt, wet
464		(SM-SC) 5YR 5/3 Olive silty, clayey fine to medium
		coarse sand (30/10/60), wet
474		(SM) 5YR 5/3 Olive silty fine sand (40/60), wet
477		(SM-SC) 10YR 5/4 Yellowish brown silty, clayey
		fine sand (30/15/55)
478.5		(SM-SC) 10YR 5/4 Yellowish brown silty, clayey
		fine sand (20/20/60)
481		(SM-SC) 10YR 5/4 Yellowish brown silty, clayey
		fine to medium coarse sand (30/10/60), wet
482		(SM) 10YR 5/4 Yellowish brown silty fine to
		medium coarse sand (30/70), wet
488		(SM-SP) 10YR 5/4 Yellowish brown silty fine to
		medium coarse sand (20/80) with well-rounded
		chert cobbles up to 2 inches in diameter, wet
492		(SP) 10YR 5/4 Yellowish brown fine to medium
		coarse sand with trace silt
495.5		(SC) 10YR 5/4 Yellowish brown silty, clayey, fine
		to medium coarse sand (30/30/40)
497		(ML) 10YR 5/4 Yellowish brown fine sandy, clayey
		silt (20/20/60) with 3-5% rounded pebbles

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

Well Owner

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City Monterey State CA Zip 93940

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Township 15S Range 1E Section

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- ◉ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ○ Water Supply
  - ☐ Domestic ☐ Public
  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other

Water Level and Yield of Completed Well

Depth to first water 405 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

- ☐ Geologic Log
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Owner's Well Number MW-1

Date Work Began 12/16/2013 Date Work Ended 12/20/2013

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State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ○ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Drilling Fluid

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
497.5		(ML) 10YR 5/4 Yellowish brown fine sandy,
		clayey silt (40/10/50), dense
498.5		(ML) 10YR 5/4 Yellowish brown fine sandy, clayey
		silt (30/20/50), dense
501		(ML) 10YR 5/4 Yellowish brown clayey silt
		(30/20/50), dense
506		(SP) 10YR 5/4 Yellowish brown fine to medium
		coarse sand with trace silt
507		(SW)10YR5/4 Yellowish brown fine to coarse sand
		with well-rounded chert pebbles up to 0.5 inch dia.
509.5		(SW) 10YR 5/4 Yellowish brown fine to coarse
		sand with well-rounded chert pebbles up to 2 inch
		diameter
512		(SW) 10YR 5/4 Yellowish brown fine to coarse
		sand
516		(SP) 10YR 5/4 Yellowish brown fine to medium
		coarse sand (30/10/60), wet
517		(ML) 5YR 6/2 Light olive gray silt/siltstone, very
		dense, semi-consolidated to consolidated
518.5		(CL) 5YR 6/2 Light olive gray sandy, silty clay
		(30/30/40)
519		(CL) 5YR 6/2 Light olive gray sandy, silty clay
		(30/30/40) with grayish white deposits of volcanic
		ash (reactive to acid, indicating calcium carbonate)
519.5		(ML) 5YR 5/2 Olive gray fine sandy siltstone,
		semi-consolidated to consolidated
522	535	(ML) 5YR 5/2 Olive gray sandy, silty clay
		(30/30/40) with grayish white deposits of volcanic
		ash (reactive to acid,indicating calcium carbonate);
		fragments are large as 6-inch diameter (530-531.5)

Total Depth of Boring 535 Feet

Total Depth of Completed Well 521 Feet

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  - ☐ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ◉ Monitoring
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Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

- ☐ Geologic Log
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APPENDIX D

Cooper Testing Laboratory Reports and Chain-of-Custody Form

(Soil Hydraulic Analysis)

Total and Effective Porosity Report
(API RP40 and ASTM D6836m)

Job No: 148-012a **Project No.:** 60408
Client: Todd Engineers **Date:** 1/6/14
Project Name: Monterey Regional WPCA Monitoring Well **By:** PJ

Boring:	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1
Sample:								
Depth, ft:	27.5-30.0	58.0-60.5	98.5-101.0	124.5-127.0	139.5-142.0	174.5-177.0	197.0-200.0	223.0-225.5
Visual Description:	Yellow SAND, trace Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt
Total Porosity, %	46.3	47.0	46.0	44.6	42.6	46.2	44.3	44.7
Effective Porosity, %	39.8	36.7	39.9	37.5	29.5	40.3	36.4	31.1
Air-filled Porosity, %	37.9	39.3	39.1	37.6	33.4	40.8	40.4	39.7
Water-filled Porosity, %	8.3	7.7	6.9	7.0	9.2	5.4	3.9	5.0
Specific Gravity	2.64	2.65	2.64	2.65	2.64	2.64	2.64	2.67
Saturation, %	18.0	16.3	14.9	15.6	21.7	11.6	8.8	11.1
Moisture, %	5.9	5.5	4.8	4.7	6.1	3.8	2.6	3.4
Wet Unit wt, pcf	93.8	92.4	93.2	96.1	100.5	92.2	94.4	95.4
Dry Unit wt, pcf	88.6	87.6	89.0	91.8	94.8	88.9	91.9	92.3
Dry Unit wt, g/c	1.42	1.40	1.42	1.47	1.52	1.42	1.47	1.48
Series	1	2	3	4	5	6	7	8

Note: All reported values above are for the "as received" condition except for the effective porosity which is measured at a tension of 1/3 Bar.

The Zero Air-Voids curves represent the dry density at 100% saturation for each value of specific gravity

Total and Effective Porosity Report
(API RP40 and ASTM D6836m)

Job No: 148-012b **Project No.:** 60408
Client: Todd Engineers **Date:** 1/15/14
Project Name: Monterey Regional WPCA Monitoring Well **By:** PJ

Boring:	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	
Sample:								
Depth, ft:	259.5-262.0	274.5-277.0	298.5-301.0	324.5-327.0	349.5-352.0	357.0-359.5	377.0-379.5	
Visual Description:	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Light Gray Clayey SAND	Light Yellowish Brown Clayey SAND	Yellow SAND w/ Clay	Very Pale Brown SAND, trace Silt	Very Pale Brown Silty SAND	
Total Porosity, %	47.5	46.0	44.0	33.7	41.5	39.8	49.5	
Effective Porosity, %	35.3	34.6	4.1	13.1	26.0	27.7	24.3	
Air-filled Porosity, %	38.9	38.2	3.9	12.7	26.3	29.1	40.8	
Water-filled Porosity, %	8.6	7.7	40.2	21.1	15.2	10.7	8.7	
Specific Gravity	2.65	2.65	2.65	2.68	2.64	2.64	2.68	
Saturation, %	18.1	16.8	91.2	62.5	36.6	26.9	17.6	
Moisture, %	6.2	5.4	27.1	11.9	9.8	6.7	6.4	
Wet Unit wt, pcf	92.3	94.1	117.7	123.9	106.0	106.1	90.2	
Dry Unit wt, pcf	86.9	89.3	92.6	110.7	96.5	99.4	84.7	
Dry Unit wt, g/c	1.39	1.43	1.48	1.77	1.54	1.59	1.36	
Series	1	2	3	4	5	6	7	8

Note: All reported values above are for the "as received" condition except for the effective porosity which is measured at a tension of 1/3 Bar.

The Zero Air-Voids curves represent the dry density at 100% saturation for each value of specific gravity

Specific Gravity by Pycnometer
ASTM D 854

CTL Job#:	148-012a	**Project Name:**	Monterey Reginal Water Pollution Control	**Date:**	01/02/14
Client:	Todd Engineers	**Project No.:**	60408	**Run By:**	MD
				Checked	DC

Boring:	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1
Sample:								
Depth, ft.:	27.5-30.0	58.0-60.5	98.5-101.0	124.5-127.0	139.5-142.0	174.5-177.0	197.0-200.0	223.0-225.5
Pan No.:								
Soil Description (visual)	Yellow SAND, trace Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Yellow SAND w/ Silt
Pycnometer ID:	3	6	E	F	3	6	E	F
Mass of Clean, Dry Pycnometer (g):	166.26	164.22	171.63	173.67	166.25	164.22	171.63	173.67
Mass of Pycnometer, Soil, and Water (g):	746.78	740.94	742.94	765.38	750.56	793.53	768.08	753.83
Temperature of Slurry (°C):	20.1	20.1	20.1	20.1	20.9	20.9	20.9	20.9
Tare ID:								
Mass of Tare (g):	227.80	232.53	229.26	229.62	229.40	227.86	232.65	229.66
Mass of Dry Soil and Tare (g):	359.73	358.03	346.34	379.33	367.40	438.14	390.07	360.40
Mass of Dry Soil (g):	131.93	125.50	117.08	149.71	138.00	210.28	157.42	130.74
Mass of Pycnometer and Water at Test Temp (g):	664.86	662.89	670.28	672.14	664.77	662.80	670.19	672.05
Specific Gravity @ Test Temp:	2.638	2.645	2.636	2.651	2.643	2.643	2.644	2.670
Specific Gravity @ 20 °C:	**2.638**	**2.645**	**2.636**	**2.651**	**2.643**	**2.643**	**2.644**	**2.670**

Specific Gravity by Pycnometer
ASTM D 854

CTL Job#:	148-012b	**Project Name:**	Monterey Regional WPCA Monitoring Well	**Date:**	01/10/14
Client:	Todd Engineers	**Project No.:**	60408	**Run By:**	MD
				Checked	DC

Boring:	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	
Sample:								
Depth, ft.:	259.5-262.0	274.5-277.0	298.5-301.0	324.5-327.0	349.5-352.0	357.0-359.5	377.0-379.5	
Pan No.:								
Soil Description (visual)	Yellow SAND w/ Silt	Yellow SAND w/ Silt	Light Gray Clayey SAND	Light Yellowish Brown Clayey SAND	Yellow SAND w/ Clay	Very Pale Brown SAND, trace Silt	Very Pale Brown Silty SAND	
Pycnometer ID:	3	6	E	F	3	6	E	
Mass of Clean, Dry Pycnometer (g):	166.25	164.22	171.63	173.67	166.25	164.22	171.63	
Mass of Pycnometer, Soil, and Water (g):	761.03	741.28	735.79	770.73	757.92	746.50	743.28	
Temperature of Slurry (°C):	21.5	21.5	21.5	21.5	21.2	21.2	21.2	
Tare ID:								
Mass of Tare (g):	224.07	225.38	232.67	227.89	224.03	232.65	225.32	
Mass of Dry Soil and Tare (g):	378.78	351.62	338.16	385.54	374.03	367.36	341.85	
Mass of Dry Soil (g):	154.71	126.24	105.49	157.65	150.00	134.71	116.53	
Mass of Pycnometer and Water at Test Temp (g):	664.71	662.74	670.13	671.99	664.74	662.77	670.16	
Specific Gravity @ Test Temp:	2.650	2.647	2.649	2.676	2.640	2.643	2.685	
Specific Gravity @ 20 °C:	**2.649**	**2.646**	**2.648**	**2.675**	**2.639**	**2.642**	**2.684**	

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**	27.5-30	**By:**	PJ
Project Name:	Monterey Reginal WPCA	**Depth, ft:**			
Project No.:	60408				

Soil Description: Yellow SAND, trace Silt

Remolding Data: Undisturbed

		Constant Head Calculation, K=QL/thA				
Test #	**Elapsed Time t, (sec)**	**Volume Q, (cc)**	**Head Loss h (cm)**	**Water Temp (^oC)**	**Hydraulic Gradient**	**Coef. Of Permeability K, (cm/sec)**
1	250	38	1.1	19.7	0.14	0.0364
2	300	45	1.1	19.7	0.14	0.0359
3	300	46	1.1	19.7	0.14	0.0367
4	185	28	1.1	19.7	0.14	0.0362
5	120	28	1.6	19.7	0.21	0.0384

Average Permeability (cm/sec):	**4.E-02**
Average Permeability (in/hr):	**52**

Sample Data:		**Initial**	**Final**
Height, (L)	**in.:**	5.00	4.74
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.52	4.52
Volume,	**in^3:**	22.62	21.44
Total Volume.	**cc:**	371	351
Vol. of Solids,	**cc:**	209	209
Vol. of Voids,	**cc:**	162	143
Void Ratio	**e:**	0.77	0.68
Porosity,	**%:**	43.6	40.6
Saturation,	**%:**	25.6	100.0
Sp. Gravity:		2.64	2.64
Wet Weight,	**gm:**	592.4	693.6
Dry Weight	**gm:**	551.1	551.1
Moisture,	**%:**	7.5	25.9
Density,	**pcf:**	92.8	97.9

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	58-60.5		
Project No.:	60408				

Soil Description: Yellow SAND w/ Silt

Remolding Data: Undisturbed

Constant Head Calculation, K=QL/thA

Test #	Elapsed Time t, (sec)	Volume Q, (cc)	Head Loss h (cm)	Water Temp (^oC)	Hydraulic Gradient	Coef. Of Permeability K, (cm/sec)
1	190	9	0.9	20.2	0.12	0.0131
2	190	9	0.9	20.2	0.12	0.0134
3	270	12	0.8	20.2	0.10	0.0144
4	190	9	0.8	20.2	0.10	0.0152
5	195	9	0.8	20.2	0.10	0.0157
6	1260	80	1.1	20.2	0.14	0.0150

Average Permeability (cm/sec): 1.E-02

Average Permeability (in/hr): 20

Sample Data:		Initial	Final
Height, (L)	**in.:**	4.86	4.28
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.52	4.52
Volume,	**in^3:**	21.96	19.38
Total Volume.	**cc:**	360	318
Vol. of Solids,	**cc:**	181	181
Vol. of Voids,	**cc:**	178	136
Void Ratio	**e:**	0.98	0.75
Porosity,	**%:**	49.6	42.9
Saturation,	**%:**	24.1	100.0
Sp. Gravity:		2.65	2.65
Wet Weight,	**gm:**	523.0	616.0
Dry Weight	**gm:**	479.9	479.9
Moisture,	**%:**	9.0	28.4
Density,	**pcf:**	83.2	94.3

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	98.5-101.0		
Project No.:	60408				

Soil Description: Yellow SAND w/ Silt

Remolding Data: Undisturbed

		Constant Head Calculation, K=QL/thA				
Test #	**Elapsed Time t, (sec)**	**Volume Q, (cc)**	**Head Loss h (cm)**	**Water Temp (^oC)**	**Hydraulic Gradient**	**Coef. Of Permeability K, (cm/sec)**
1	330	29	1.1	20.1	0.14	0.0146
2	320	35	1.1	20.1	0.14	0.0181
3	310	30	0.9	20.1	0.12	0.0186
4	640	66	0.9	19.9	0.12	0.0199
5	500	55	1.0	19.8	0.13	0.0202
6	1260	72	0.5	19.7	0.07	0.0210
		Average Permeability (cm/sec):				**2.E-02**
		Average Permeability (in/hr):				**27**

Sample Data:		**Initial**	**Final**
Height, (L)	**in.:**	4.63	4.10
Diameter,	**in.:**	2.87	2.87
Area, (A)	**in^2:**	6.47	6.47
Volume,	**in^3:**	29.92	26.52
Total Volume.	**cc:**	490	435
Vol. of Solids,	**cc:**	177	177
Vol. of Voids,	**cc:**	313	258
Void Ratio	**e:**	1.77	1.45
Porosity,	**%:**	63.9	59.3
Saturation,	**%:**	9.4	54.8
Sp. Gravity:		2.64	2.64
Wet Weight,	**gm:**	496.2	608.0
Dry Weight	**gm:**	466.9	466.9
Moisture,	**%:**	6.3	30.2
Density,	**pcf:**	59.4	67.0

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	124.5-127		
Project No.:	60408				

Soil Description: Yellow SAND w/ Silt

Remolding Data: Undisturbed

Constant Head Calculation, K=QL/thA

Test #	Elapsed Time t, (sec)	Volume Q, (cc)	Head Loss h (cm)	Water Temp (^oC)	Hydraulic Gradient	Coef. Of Permeability K, (cm/sec)
1	361	57	1.2	21.3	0.19	0.0277
2	270	43	1.2	21.3	0.19	0.0280
3	400	63	1.2	21.3	0.19	0.0277
4	160	25	1.2	21.3	0.19	0.0275

Average Permeability (cm/sec): 3.E-02

Average Permeability (in/hr): 39

Sample Data:		Initial	Final
Height, (L)	**in.:**	5.35	5.09
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.52	4.52
Volume,	**in^3:**	24.20	23.03
Total Volume.	**cc:**	397	377
Vol. of Solids,	**cc:**	211	211
Vol. of Voids,	**cc:**	186	166
Void Ratio	**e:**	0.88	0.79
Porosity,	**%:**	46.8	44.1
Saturation,	**%:**	13.6	100.0
Sp. Gravity:		2.65	2.65
Wet Weight,	**gm:**	584.3	725.4
Dry Weight	**gm:**	559.0	559.0
Moisture,	**%:**	4.5	29.8
Density,	**pcf:**	87.9	92.4

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	139.5-142.0		
Project No.:	60408				

Soil Description: Yellow SAND w/ Silt

Remolding Data: Undisturbed

		Constant Head Calculation, K=QL/thA				
Test #	**Elapsed Time t, (sec)**	**Volume Q, (cc)**	**Head Loss h (cm)**	**Water Temp (^oC)**	**Hydraulic Gradient**	**Coef. Of Permeability K, (cm/sec)**
1	125	7	1.2	19.8	0.19	0.0108
2	125	8	1.2	19.8	0.19	0.0115
3	140	9	1.2	19.8	0.19	0.0117
4	126	8	1.2	19.8	0.19	0.0122
5	144	10	1.2	19.8	0.19	0.0127
6	156	11	1.2	19.8	0.19	0.0134
		Average Permeability (cm/sec):				**1.E-02**
		Average Permeability (in/hr):				**17**

Sample Data:		**Initial**	**Final**
Height, (L)	**in.:**	5.40	4.98
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.51	4.51
Volume,	**in^3:**	24.37	22.47
Total Volume.	**cc:**	399	368
Vol. of Solids,	**cc:**	217	217
Vol. of Voids,	**cc:**	182	151
Void Ratio	**e:**	0.84	0.69
Porosity,	**%:**	45.5	41.0
Saturation,	**%:**	18.9	100.0
Sp. Gravity:		2.64	2.64
Wet Weight,	**gm:**	609.1	725.5
Dry Weight	**gm:**	574.7	574.7
Moisture,	**%:**	6.0	26.2
Density,	**pcf:**	89.8	97.4

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	174.5-177.0		
Project No.:	60408				

Soil Description: Yellow SAND w/ Silt

Remolding Data: Undisturbed

		Constant Head Calculation, K=QL/thA				
Test #	**Elapsed Time t, (sec)**	**Volume Q, (cc)**	**Head Loss h (cm)**	**Water Temp (^oC)**	**Hydraulic Gradient**	**Coef. Of Permeability K, (cm/sec)**
1	90	4	0.4	20.3	0.06	0.0217
2	125	8	0.8	20.3	0.12	0.0176
3	120	7	0.7	20.3	0.11	0.0180
4	155	9	0.7	20.3	0.11	0.0184
5	155	9	0.7	20.3	0.11	0.0184
6	75	9	1.7	20.3	0.27	0.0160

Average Permeability (cm/sec): 2.E-02

Average Permeability (in/hr): 26

Sample Data:		**Initial**	**Final**
Height, (L)	**in.:**	5.17	4.85
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.51	4.51
Volume,	**in^3:**	23.33	21.88
Total Volume.	**cc:**	382	358
Vol. of Solids,	**cc:**	204	204
Vol. of Voids,	**cc:**	178	154
Void Ratio	**e:**	0.87	0.75
Porosity,	**%:**	46.6	43.0
Saturation,	**%:**	10.7	100.0
Sp. Gravity:		2.64	2.64
Wet Weight,	**gm:**	559.1	694.2
Dry Weight	**gm:**	540.0	540.0
Moisture,	**%:**	3.5	28.6
Density,	**pcf:**	88.1	94.0

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**		**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**	MW-1	**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	197.0-200.0		
Project No.:	60408				

Soil Description: Yellow SAND w/ Silt

Remolding Data: Undisturbed

		Constant Head Calculation, K=QL/thA				
Test #	**Elapsed Time t, (sec)**	**Volume Q, (cc)**	**Head Loss h (cm)**	**Water Temp (^oC)**	**Hydraulic Gradient**	**Coef. Of Permeability K, (cm/sec)**
1	200	36	0.8	18.7	0.13	0.0507
2	470	86	0.7	18.7	0.11	0.0589
3	440	81	0.7	18.7	0.11	0.0592
4	375	69	0.7	18.7	0.11	0.0592
5	585	107	0.7	18.7	0.11	0.0589

Average Permeability (cm/sec):	**6.E-02**
Average Permeability (in/hr):	**81**

Sample Data:		**Initial**	**Final**
Height, (L)	**in.:**	5.20	4.99
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.51	4.51
Volume,	**in^3:**	23.47	22.51
Total Volume.	**cc:**	385	369
Vol. of Solids,	**cc:**	210	210
Vol. of Voids,	**cc:**	175	159
Void Ratio	**e:**	0.84	0.76
Porosity,	**%:**	45.5	43.2
Saturation,	**%:**	6.5	100.0
Sp. Gravity:		2.64	2.64
Wet Weight,	**gm:**	565.4	713.4
Dry Weight	**gm:**	554.0	554.0
Moisture,	**%:**	2.1	28.8
Density,	**pcf:**	89.9	93.7

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**		**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**	MW-1	**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	223.0-225.5		
Project No.:	60408				

Soil Description: Yellow SAND W/ Silt

Remolding Data: Undisturbed

		Constant Head Calculation, K=QL/thA				
Test #	**Elapsed Time t, (sec)**	**Volume Q, (cc)**	**Head Loss h (cm)**	**Water Temp (^oC)**	**Hydraulic Gradient**	**Coef. Of Permeability K, (cm/sec)**
1	290	48	0.8	20.3	0.13	0.0448
2	90	15	0.9	20.3	0.14	0.0401
3	105	18	0.9	20.3	0.15	0.0391
4	160	26	0.9	20.3	0.14	0.0391
5	515	84	0.9	20.3	0.14	0.0393
6	90	15	0.9	20.3	0.14	0.0401
7	60	11	1.1	20.3	0.17	0.0361
8	60	11	1.2	20.3	0.19	0.0331
9	60	14	1.5	20.3	0.24	0.0337
		Average Permeability (cm/sec):				**4.E-02**
		Average Permeability (in/hr):				**54**

Sample Data:		**Initial**	**Final**
Height, (L)	**in.:**	5.29	5.17
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.51	4.51
Volume,	**in^3:**	23.89	23.33
Total Volume.	**cc:**	391	382
Vol. of Solids,	**cc:**	214	214
Vol. of Voids,	**cc:**	178	169
Void Ratio	**e:**	0.83	0.79
Porosity,	**%:**	45.4	44.1
Saturation,	**%:**	9.8	100.0
Sp. Gravity:		2.67	2.67
Wet Weight,	**gm:**	588.3	739.4
Dry Weight	**gm:**	570.9	570.9
Moisture,	**%:**	3.1	29.5
Density,	**pcf:**	91.0	93.2

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	259.5-262.0		
Project No.:	60408				

Soil Description: Yellow SAND w/ Silt

Remolding Data: Undisturbed

Constant Head Calculation, K=QL/thA

Test #	Elapsed Time t, (sec)	Volume Q, (cc)	Head Loss h (cm)	Water Temp (^oC)	Hydraulic Gradient	Coef. Of Permeability K, (cm/sec)
1	120	6	1.3	20.4	0.20	0.0080
2	120	6	1.2	20.4	0.19	0.0093
3	130	7	1.2	20.4	0.19	0.0098
4	130	7	1.2	20.4	0.19	0.0102
5	70	5	1.2	20.3	0.19	0.0124
6	65	7	1.8	20.3	0.28	0.0126
7	90	8	1.8	20.3	0.28	0.0104
8	80	7	1.8	20.3	0.28	0.0108

Average Permeability (cm/sec): 1.E-02

Average Permeability (in/hr): 15

Sample Data:		Initial	Final
Height, (L)	**in.:**	5.27	4.98
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.51	4.51
Volume,	**in^3:**	23.76	22.48
Total Volume.	**cc:**	389	368
Vol. of Solids,	**cc:**	212	212
Vol. of Voids,	**cc:**	178	157
Void Ratio	**e:**	0.84	0.74
Porosity,	**%:**	45.6	42.5
Saturation,	**%:**	18.4	100.0
Sp. Gravity:		2.65	2.65
Wet Weight,	**gm:**	593.4	717.5
Dry Weight	**gm:**	560.8	560.8
Moisture,	**%:**	5.8	27.9
Density,	**pcf:**	89.9	95.0

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	274.5-277		
Project No.:	60408				

Soil Description: Yellow SAND w/ Silt

Remolding Data: Undisturbed

		Constant Head Calculation, K=QL/thA				
Test #	**Elapsed Time t, (sec)**	**Volume Q, (cc)**	**Head Loss h (cm)**	**Water Temp (^oC)**	**Hydraulic Gradient**	**Coef. Of Permeability K, (cm/sec)**
1	120	9	1.2	19.7	0.19	0.0140
2	120	9	1.2	19.7	0.19	0.0140
3	125	10	1.2	19.7	0.19	0.0141
4	80	6	1.2	19.7	0.19	0.0147
				Average Permeability (cm/sec):		**1.E-02**
				Average Permeability (in/hr):		**20**

Sample Data:		**Initial**	**Final**
Height, (L)	**in.:**	5.07	4.45
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.51	4.51
Volume,	**in^3:**	22.87	20.09
Total Volume.	**cc:**	375	329
Vol. of Solids,	**cc:**	201	201
Vol. of Voids,	**cc:**	174	128
Void Ratio	**e:**	0.86	0.64
Porosity,	**%:**	46.4	38.9
Saturation,	**%:**	16.9	100.0
Sp. Gravity:		2.65	2.65
Wet Weight,	**gm:**	561.3	660.0
Dry Weight	**gm:**	531.9	531.9
Moisture,	**%:**	5.5	24.1
Density,	**pcf:**	88.6	100.8

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	148-012	**Boring:**	MW-1	**Date:**	01/21/14
Client:	Todd Engineers	**Sample:**		**By:**	MD/PJ
Project:	60408	**Depth, ft.:**	297-298.5	**Remolded:**	

Visual Classification: Pale Yellow Sandy CLAY/ Clayey SAND

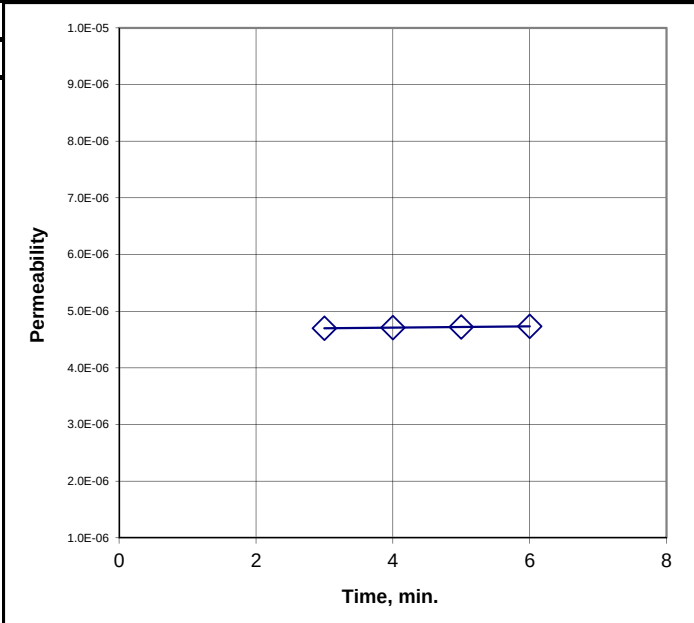
Max Sample Pressures, psi:

Cell:	Bottom	Top	Avg. Sigma3
64	59.5	58.5	5

B: = >0.95 **("B" is an indication of saturation)**

Max Hydraulic Gradient: = 21

Date	Minutes	Head, (in)	K,cm/sec
1/16/2014	0.00	42.69	**Start of Test**
1/16/2014	3.00	42.09	4.7E-06
1/16/2014	4.00	41.89	4.7E-06
1/16/2014	5.00	41.69	4.7E-06
1/16/2014	6.00	41.49	4.7E-06



Average Hydraulic Conductivity: 5.E-06 cm/sec

Sample Data:	Initial (As-Received)		Final (At-Test)
Height, in	2.00		2.01
Diameter, in	2.41		2.41
Area, in2	4.55		4.56
Volume in3	9.11		9.17
Total Volume, cc	149.3		150.3
Volume Solids, cc	59.7		59.7
Volume Voids, cc	89.6		90.6
Void Ratio	1.5		1.5
Total Porosity, %	60.0		60.3
Air-Filled Porosity (θa),%	17.3		2.6
Water-Filled Porosity (θw),%	42.8		57.7
Saturation, %	71.2		95.6
Specific Gravity	2.70	Assumed	2.70
Wet Weight, gm	224.9		247.7
Dry Weight, gm	161.1		161.1
Tare, gm	0.00		0.00
Moisture, %	39.6		53.8
Wet Bulk Density, pcf	94.0		102.9
Dry Bulk Density, pcf	67.3		66.9
Wet Bulk Dens.ρb, (g/cm^3)	1.51		1.65
Dry Bulk Dens.ρb, (g/cm^3)	1.08		1.07

Remarks: Moderate patching required during sample preparation. Fines apparently migrated within the sample during testing and were being trapped in the filter paper causing the measured permability to continue dropping. The data reported reflect the best estimate of this sample's permeability.

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	148-012	**Boring:**	MW-1	**Date:**	01/21/14
Client:	Todd Engineers	**Sample:**		**By:**	MD/PJ
Project:	60408	**Depth, ft.:**	298.5-301	**Remolded:**	

Visual Classification: Light Gray Clayey SAND

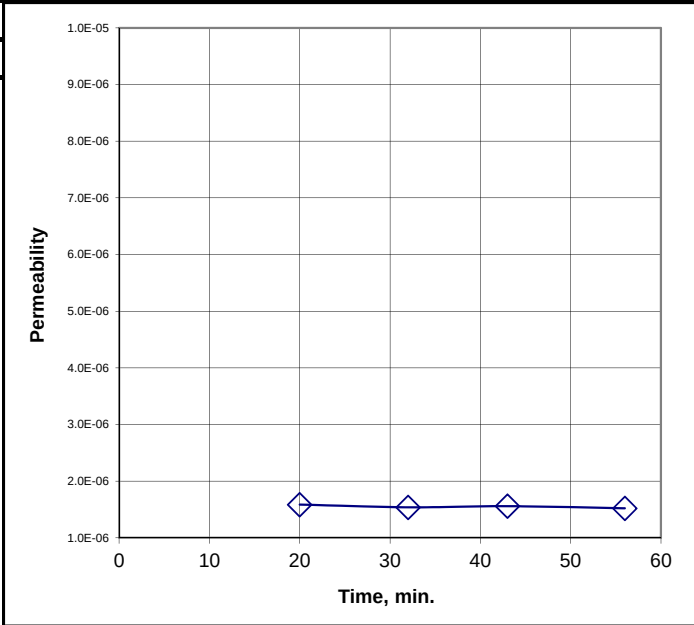
Max Sample Pressures, psi:

Cell:	Bottom	Top	Avg. Sigma3
64	59.5	58.5	5

B: = >0.95 **("B" is an indication of saturation)**

Max Hydraulic Gradient: = 21

Date	Minutes	Head, (in)	K,cm/sec
1/16/2014	0.00	42.69	**Start of Test**
1/16/2014	20.00	41.39	1.6E-06
1/16/2014	32.00	40.69	1.5E-06
1/16/2014	43.00	39.99	1.6E-06
1/16/2014	56.00	39.29	1.5E-06



Average Hydraulic Conductivity: 2.E-06 cm/sec

Sample Data:	Initial (As-Received)	Final (At-Test)
Height, in	2.00	2.01
Diameter, in	2.37	2.38
Area, in2	4.41	4.43
Volume in3	8.83	8.90
Total Volume, cc	144.7	145.9
Volume Solids, cc	77.7	77.7
Volume Voids, cc	67.1	68.3
Void Ratio	0.9	0.9
Total Porosity, %	46.3	46.8
Air-Filled Porosity (θa),%	5.6	1.9
Water-Filled Porosity (θw),%	40.7	44.9
Saturation, %	87.9	95.9
Specific Gravity	2.65	2.65
Wet Weight, gm	264.6	271.1
Dry Weight, gm	205.7	205.7
Tare, gm	0.00	0.00
Moisture, %	28.7	31.8
Wet Bulk Density, pcf	114.1	115.9
Dry Bulk Density, pcf	88.7	87.9
Wet Bulk Dens.ρb, (g/cm^3)	1.83	1.86
Dry Bulk Dens.ρb, (g/cm^3)	1.42	1.41

Remarks: Moderate patching required during sample preparation.

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	148-012	**Boring:**	MW-1	**Date:**	01/21/14
Client:	Todd Engineers	**Sample:**		**By:**	MD/PJ
Project:	60408	**Depth, ft.:**	324.5-327	**Remolded:**	

Visual Classification: Light Yellowish Brown Clayey SAND

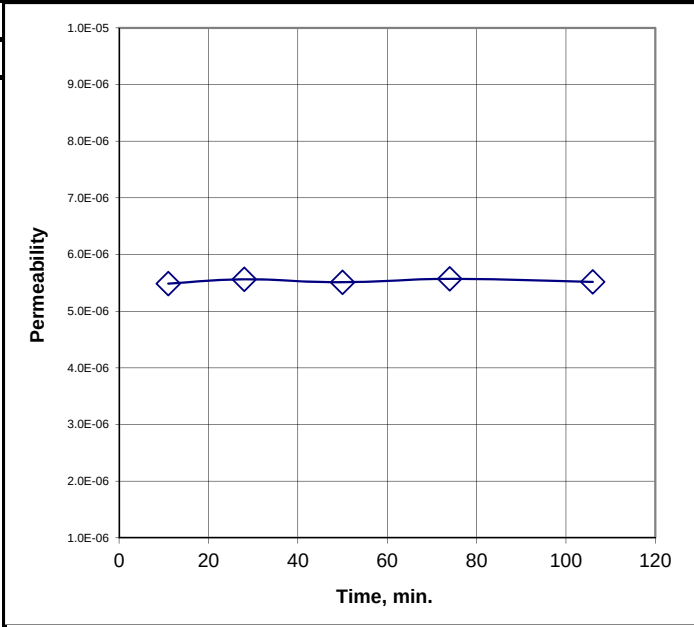
Max Sample Pressures, psi:

Cell:	Bottom	Top	Avg. Sigma3
73.5	68.5	68.5	5

B: = >0.95 **("B" is an indication of saturation)**

Max Hydraulic Gradient: = 5

Date	Minutes	Head, (in)	K,cm/sec
1/1/2014	0.00	15.00	**Start of Test**
1/1/2014	11.00	14.40	5.5E-06
1/1/2014	28.00	13.50	5.6E-06
1/1/2014	50.00	12.45	5.5E-06
1/1/2014	74.00	11.35	5.6E-06
1/1/2014	106.00	10.10	5.5E-06



Average Hydraulic Conductivity: 6.E-06 cm/sec

Sample Data:	Initial (As-Received)	Final (At-Test)
Height, in	2.84	2.78
Diameter, in	2.42	2.38
Area, in2	4.59	4.46
Volume in3	13.03	12.41
Total Volume, cc	213.5	203.4
Volume Solids, cc	132.7	132.7
Volume Voids, cc	80.7	70.6
Void Ratio	0.6	0.5
Total Porosity, %	37.8	34.7
Air-Filled Porosity (θa),%	15.0	0.9
Water-Filled Porosity (θw),%	22.8	33.8
Saturation, %	60.2	97.3
Specific Gravity	2.68	2.68
Wet Weight, gm	403.7	423.8
Dry Weight, gm	355.1	355.1
Tare, gm	0.00	0.00
Moisture, %	13.7	19.4
Wet Bulk Density, pcf	118.0	130.0
Dry Bulk Density, pcf	103.8	109.0
Wet Bulk Dens.ρb, (g/cm^3)	1.89	2.08
Dry Bulk Dens.ρb, (g/cm^3)	1.66	1.75

Remarks:

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	148-012	**Boring:**	MW-1	**Date:**	01/21/14
Client:	Todd Engineers	**Sample:**		**By:**	MD/PJ
Project:	60408	**Depth, ft.:**	337-339	**Remolded:**	

Visual Classification: Yellowish Brown Clayey SAND/ Sandy CLAY

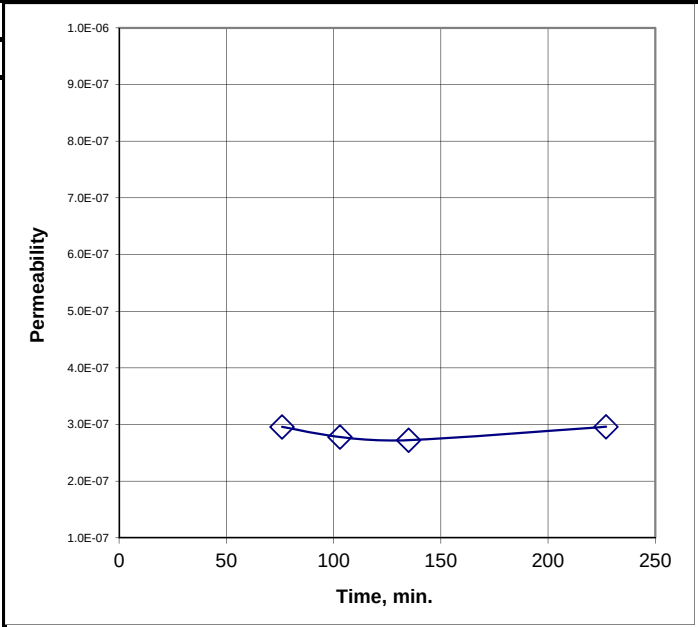
Max Sample Pressures, psi:

Cell:	Bottom	Top	Avg. Sigma3
73.5	69	68	5

B: = >0.95 **("B" is an indication of saturation)**

Max Hydraulic Gradient: = 26

Date	Minutes	Head, (in)	K,cm/sec
1/2/2014	0.00	51.69	**Start of Test**
1/2/2014	76.00	50.59	3.0E-07
1/2/2014	103.00	50.29	2.8E-07
1/2/2014	135.00	49.89	2.7E-07
1/2/2014	227.00	48.44	3.0E-07



Average Hydraulic Conductivity: 3.E-07 cm/sec

Sample Data:	Initial (As-Received)		Final (At-Test)
Height, in	2.00		2.02
Diameter, in	2.41		2.41
Area, in2	4.56		4.56
Volume in3	9.12		9.21
Total Volume, cc	149.5		150.8
Volume Solids, cc	99.1		99.1
Volume Voids, cc	50.5		51.8
Void Ratio	0.5		0.5
Total Porosity, %	33.7		34.3
Air-Filled Porosity (θa),%	11.0		0.5
Water-Filled Porosity (θw),%	22.7		33.8
Saturation, %	67.3		98.6
Specific Gravity	2.70	Assumed	2.70
Wet Weight, gm	301.4		318.5
Dry Weight, gm	267.4		267.4
Tare, gm	0.00		0.00
Moisture, %	12.7		19.1
Wet Bulk Density, pcf	125.8		131.7
Dry Bulk Density, pcf	111.6		110.6
Wet Bulk Dens.ρb, (g/cm^3)	2.02		2.11
Dry Bulk Dens.ρb, (g/cm^3)	1.79		1.77

Remarks:

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	349.5-352		
Project No.:	60408				

Soil Description: Yellow SAND w/ Clay

Remolding Data: Undisturbed

Constant Head Calculation, K=QL/thA

Test #	Elapsed Time t, (sec)	Volume Q, (cc)	Head Loss h (cm)	Water Temp (^oC)	Hydraulic Gradient	Coef. Of Permeability K, (cm/sec)
1	80	28	0.6	19.5	0.09	0.1288
2	90	30	0.6	19.5	0.09	0.1227
3	95	26	0.5	19.5	0.08	0.1209
4	90	25	0.5	19.5	0.08	0.1227

Average Permeability (cm/sec): 1.E-01

Average Permeability (in/hr): 175

Sample Data:		Initial	Final
Height, (L)	**in.:**	5.54	5.26
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.51	4.51
Volume,	**in^3:**	25.00	23.71
Total Volume.	**cc:**	410	389
Vol. of Solids,	**cc:**	236	236
Vol. of Voids,	**cc:**	174	153
Void Ratio	**e:**	0.74	0.65
Porosity,	**%:**	42.4	39.3
Saturation,	**%:**	37.8	100.0
Sp. Gravity:		2.64	2.64
Wet Weight,	**gm:**	688.2	775.2
Dry Weight	**gm:**	622.5	622.5
Moisture,	**%:**	10.6	24.5
Density,	**pcf:**	94.8	100.0

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	357-359.5		
Project No.:	60408				

Soil Description: Very Pale Brown Silty SAND

Remolding Data: Undisturbed

Constant Head Calculation, K=QL/thA

Test #	Elapsed Time t, (sec)	Volume Q, (cc)	Head Loss h (cm)	Water Temp (^oC)	Hydraulic Gradient	Coef. Of Permeability K, (cm/sec)
1	121	23	0.6	20.9	0.09	0.0676
2	210	40	0.6	20.9	0.09	0.0678
3	140	26	0.6	20.9	0.09	0.0661
4	120	23	0.6	20.9	0.09	0.0682
5	90	23	0.8	20.9	0.13	0.0682

Average Permeability (cm/sec): 7.E-02

Average Permeability (in/hr): 96

Sample Data:		Initial	Final
Height, (L)	**in.:**	5.36	5.23
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.51	4.51
Volume,	**in^3:**	24.20	23.59
Total Volume.	**cc:**	397	387
Vol. of Solids,	**cc:**	236	236
Vol. of Voids,	**cc:**	160	150
Void Ratio	**e:**	0.68	0.64
Porosity,	**%:**	40.4	38.9
Saturation,	**%:**	25.7	100.0
Sp. Gravity:		2.64	2.64
Wet Weight,	**gm:**	665.5	774.5
Dry Weight	**gm:**	624.2	624.2
Moisture,	**%:**	6.6	24.1
Density,	**pcf:**	98.2	100.8

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Constant Head Permeability Test
ASTM D 2434

CTL Job No:	148-012	**Boring:**	MW-1	**Date:**	1/21/2014
Client:	Todd Engineers	**Sample:**		**By:**	PJ
Project Name:	Monterey Regional WPCA	**Depth, ft:**	377-379.5		
Project No.:	60408				

Soil Description: Very Pale Brown Silty SAND

Remolding Data: Undisturbed

Constant Head Calculation, K=QL/thA

Test #	Elapsed Time t, (sec)	Volume Q, (cc)	Head Loss h (cm)	Water Temp (^oC)	Hydraulic Gradient	Coef. Of Permeability K, (cm/sec)
1	240	9	1.1	21.6	0.17	0.0070
2	240	9	1.1	21.6	0.17	0.0070
3	180	6	1.2	21.6	0.19	0.0062
4	180	6	1.2	21.6	0.19	0.0062
5	210	7	1.2	21.6	0.19	0.0056
6	90	6	2.6	21.6	0.41	0.0057

Average Permeability (cm/sec): 6.E-03

Average Permeability (in/hr): 9

Sample Data:		Initial	Final
Height, (L)	**in.:**	5.47	5.32
Diameter,	**in.:**	2.40	2.40
Area, (A)	**in^2:**	4.51	4.51
Volume,	**in^3:**	24.67	23.99
Total Volume.	**cc:**	404	393
Vol. of Solids,	**cc:**	201	201
Vol. of Voids,	**cc:**	203	192
Void Ratio	**e:**	1.01	0.95
Porosity,	**%:**	50.2	48.8
Saturation,	**%:**	21.3	100.0
Sp. Gravity:		2.68	2.68
Wet Weight,	**gm:**	583.3	731.9
Dry Weight	**gm:**	540.0	540.0
Moisture,	**%:**	8.0	35.5
Density,	**pcf:**	83.3	85.7

Remarks: A significant amount of fines migrated out of the sample during the saturation and testing phases. The migration of fines can have a significant impact on the permeability.

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	148-012	**Boring:**	MW-1	**Date:**	01/08/14
Client:	Todd Engineers	**Sample:**		**By:**	MD/PJ
Project:	60408	**Depth, ft.:**	405.0-407.5	**Remolded:**	

Visual Classification: Dark Gray Sandy SILT (slightly plastic)

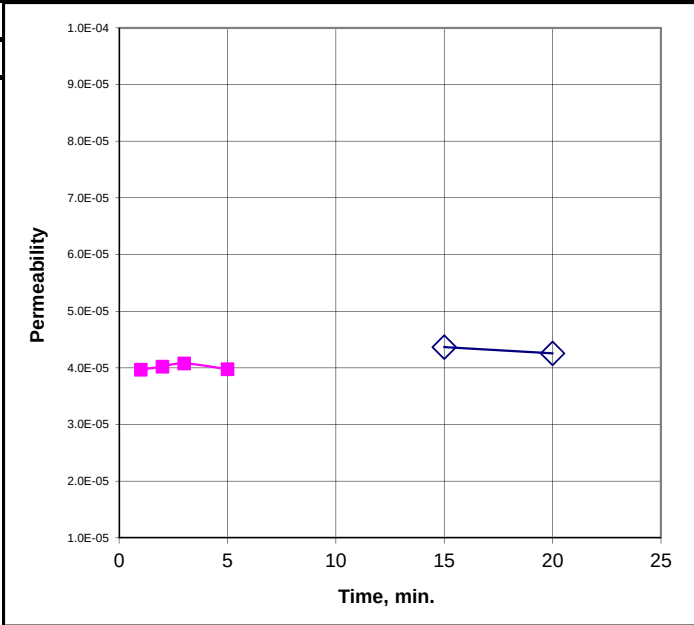
Max Sample Pressures, psi:

Cell:	Bottom	Top	Avg. Sigma3
73.5	68.5	68.5	5

B: = >0.95 **("B" is an indication of saturation)**

Max Hydraulic Gradient: = 5

Date	Minutes	Head, (in)	K,cm/sec
1/1/2014	0.00	15.00	**Start of Test**
1/1/2014	15.00	9.60	4.4E-05
1/1/2014	20.00	8.40	4.3E-05
1/1/2014	1.00	14.60	4.0E-05
1/1/2014	2.00	14.20	4.0E-05
1/1/2014	3.00	13.80	4.1E-05
1/1/2014	5.00	13.10	4.0E-05



Average Hydraulic Conductivity: 4.E-05 cm/sec

Sample Data:	Initial (As-Received)		Final (At-Test)
Height, in	2.84		2.82
Diameter, in	2.40		2.41
Area, in2	4.52		4.56
Volume in3	12.83		12.86
Total Volume, cc	210.2		210.8
Volume Solids, cc	99.4		99.4
Volume Voids, cc	110.8		111.4
Void Ratio	1.1		1.1
Total Porosity, %	52.7		52.8
Air-Filled Porosity (θa),%	9.0		0.2
Water-Filled Porosity (θw),%	43.7		52.7
Saturation, %	83.0		99.7
Specific Gravity	2.70	Assumed	2.70
Wet Weight, gm	360.3		379.4
Dry Weight, gm	268.4		268.4
Tare, gm	0.00		0.00
Moisture, %	34.2		41.4
Wet Bulk Density, pcf	107.0		112.3
Dry Bulk Density, pcf	79.7		79.4
Wet Bulk Dens.ρb, (g/cm^3)	1.71		1.80
Dry Bulk Dens.ρb, (g/cm^3)	1.28		1.27

Remarks:

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	148-012	**Boring:**	MW-1	**Date:**	01/17/14
Client:	Todd Engineers	**Sample:**		**By:**	MD/PJ
Project:	60408	**Depth, ft.:**	417.5-420	**Remolded:**	

Visual Classification: Light Gray Silty SAND near Sandy SILT

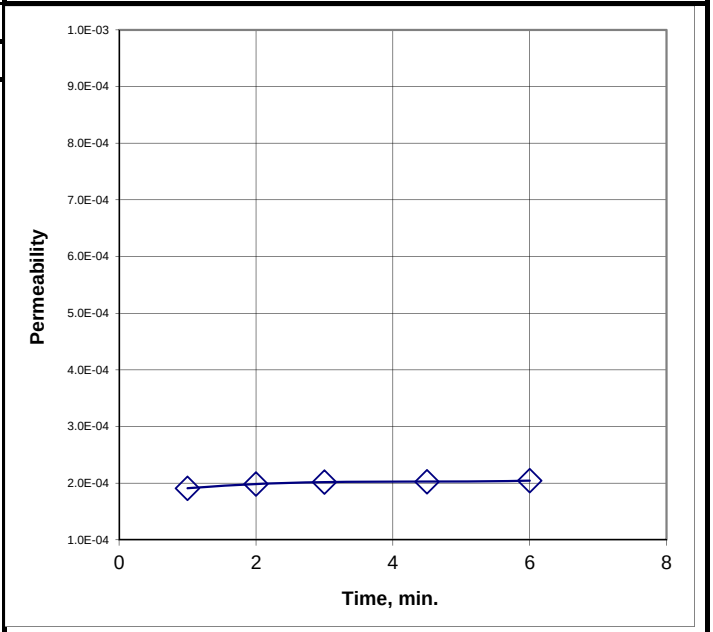
Max Sample Pressures, psi:

Cell:	Bottom	Top	Avg. Sigma3
53.5	48.5	48.5	5

B: = >0.95 **("B" is an indication of saturation)**

Max Hydraulic Gradient: = 5

Date	Minutes	Head, (in)	K,cm/sec
1/1/2014	0.00	15.00	**Start of Test**
1/1/2014	1.00	13.20	1.9E-04
1/1/2014	2.00	11.50	2.0E-04
1/1/2014	3.00	10.00	2.0E-04
1/1/2014	4.50	8.15	2.0E-04
1/1/2014	6.00	6.60	2.0E-04



Average Hydraulic Conductivity: 2.E-04 cm/sec

Sample Data:	Initial (As-Received)		Final (At-Test)
Height, in	2.84		2.80
Diameter, in	2.43		2.38
Area, in2	4.62		4.46
Volume in3	13.09		12.50
Total Volume, cc	214.6		204.8
Volume Solids, cc	106.8		106.8
Volume Voids, cc	107.8		98.0
Void Ratio	1.0		0.9
Total Porosity, %	50.2		47.8
Air-Filled Porosity (θa),%	13.7		0.0
Water-Filled Porosity (θw),%	36.5		47.8
Saturation, %	72.7		100.0
Specific Gravity	2.70	Assumed	2.70
Wet Weight, gm	366.7		386.3
Dry Weight, gm	288.4		288.4
Tare, gm	0.00		0.00
Moisture, %	27.2		34.0
Wet Bulk Density, pcf	106.6		117.7
Dry Bulk Density, pcf	83.9		87.9
Wet Bulk Dens.ρb, (g/cm^3)	1.71		1.89
Dry Bulk Dens.ρb, (g/cm^3)	1.34		1.41

Remarks:

APPENDIX E

McCampbell Analytical Laboratory Reports and Chain-of-Custody Form

(Core Mineralogical / Leaching Test Analyses)

and

Trussell Technologies Pilot Water Stabilization TM and Chain-of-Custody Form

MINERALOGY, INC.

Final Test Report

Client:	McCampbell Analytical, Inc.	MI#:	14122
Project:	1312545 (Follow-Up to MI# 14031)	Sample Type:	Sediments
Location:	N/A	Date:	May 5, 2014

Contact	Rosa Venegas
Address	McCampbell Analytical, Inc.
	1534 Willow Pass Road
	Plttsburg, CA 94565
E-mail	rosa@mccampbell.com
Phone	925.252.9262
Project ID:	1312545 (Follow-Up to MI# 14031)
Test Methods	EDX & TSD (x7)
Calibration Date	
MI Lab Supervisor	
	Timothy B. Murphy

CONDITIONS AND QUALIFICATIONS

Mineralogy, Inc. will endeavor to provide accurate and reliable laboratory measurements of the samples provided by the client. The results of any x-ray diffraction, petrographic or core analysis test are necessarily influenced by the condition and selection of the samples to be analyzed. It should be recognized that geological samples are commonly heterogeneous and lack uniform properties. Mineralogical, geochemical and/or petrographic data obtained for a specific sample provides compositional data pertinent to that specific sampling location. Such "site-specific data" may fail to provide adequate characterization of the range of compositional variability possible within a given project area, thus the "projection" of these laboratory findings and values to adjoining, "untested" areas of the formation or project area is inherently risky, and exceeds the scope of the laboratory work request. Hence, Mineralogy, Inc. shall not assume any liability risk or responsibility for any loss or potential failure associated with the application of "site or sample-specific laboratory data" to "untested" areas of the formation or project area. Unless otherwise directed, the samples selected for analysis will be chosen to reflect a visually representative portion of the bulk sample submitted for analysis. Where provided, the interpretation of x-ray diffraction, petrographic or core analysis results constitutes the best geological judgment of Mineralogy, Inc., and is subject to the sampling limitations described above, and the detection limits inherent to semi-quantitative and/or qualitative mineralogical and microscopic analysis. Mineralogy, Inc. assumes no responsibility nor offers any guarantee of the productivity, suitability or performance of any oil or gas well, hydrocarbon recovery process, dimension stone, and/or ore material based upon the data or conclusions presented in this report.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-001B
Mineralogy, Inc. Job No.: 14122-01

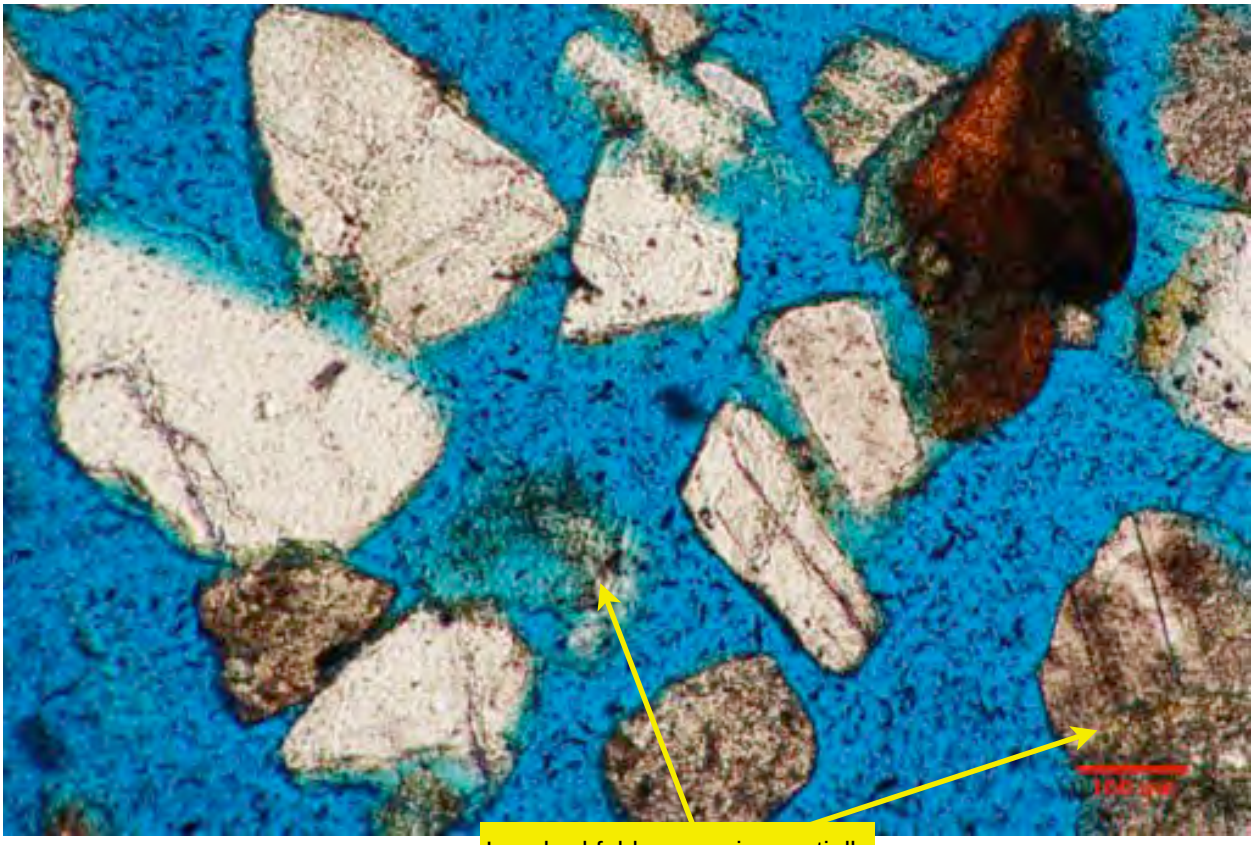
Lithologic Classification	Unconsolidated, Lithic Arkosic Sand
Textural Properties	Fine grained (fU), moderately sorted, and subangular.
Mean Grain Diameter	0.23 mm
Max Grain Diameter	1.14 mm
Fabric	Unconsolidated and disaggregated grain mount thin section
Detrital Mineralogy	Detrital grain constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and polycrystalline quartz varieties), 2) feldspar (plagioclase > k-feldspar), 3) igneous RFs (predominately fine to medium crystalline granodiorite and granite RFs), 4) chert RFs, 5) silty shale RFs, and trace amounts of augite, hornblende, biotite mica, carbonate apatite, spinel, zircon and epidote.
Cements & Matrix Constituents	Cement constituents include traces of authigenic quartz overgrowths, authigenic feldspar overgrowths, siderite, and traces of iron oxide cement. The quartz and feldspar cements occur as syntaxial rims of overgrowth cement flanking host quartz and feldspar grains. Clay matrix constituents include grain replacement and pore filling clay which likely include illite, mixed layered chlorite smectite, and chlorite. X-ray diffraction analysis will be required to precisely define the clay mineralogy if desired.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-001B
Mineralogy, Inc. Job No.: 14122-01

Weathering Properties	Authigenic grain replacement clay is associated with leached and altered feldspar grains.
Pore System	NA

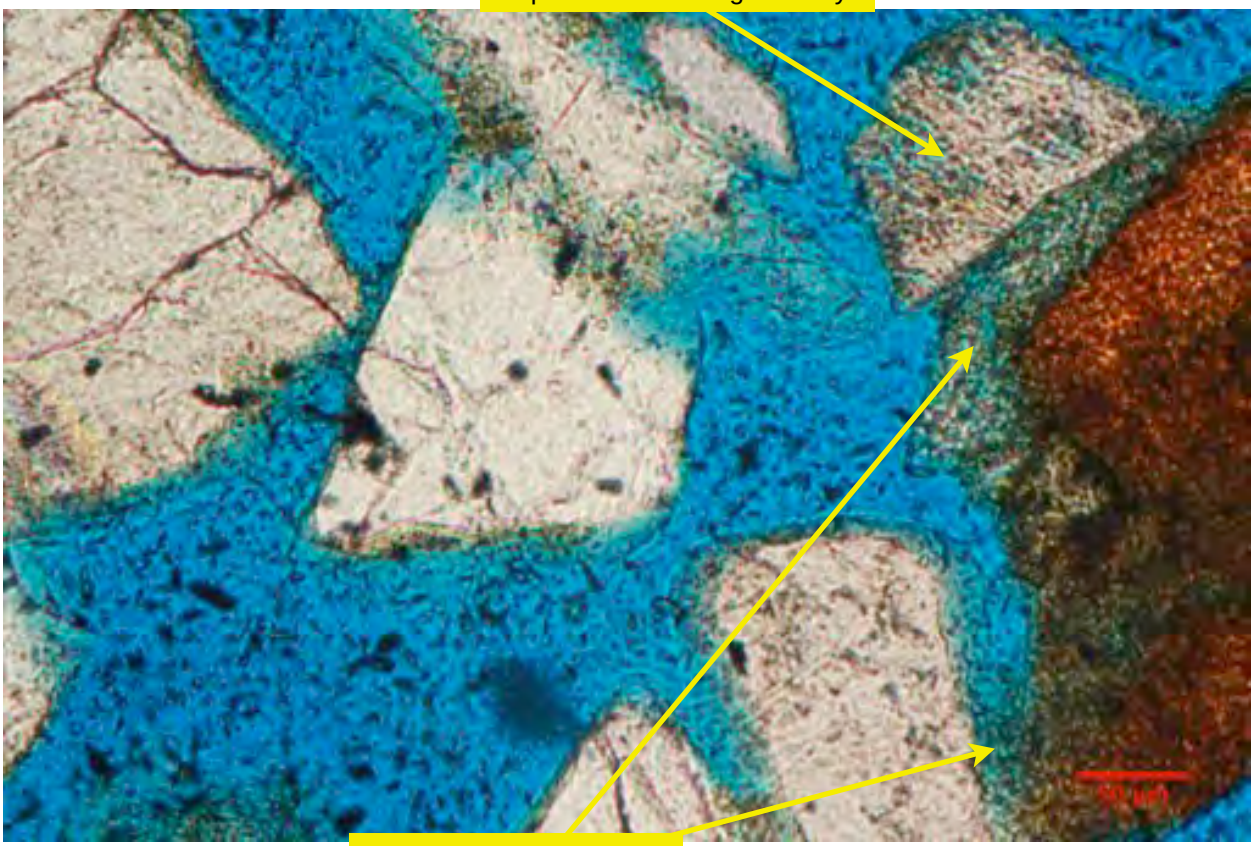
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-001B
Mineralogy, Inc. Job No.: 14122-01

14122-01A



Leached feldspar grains partially replaced with authigenic clay

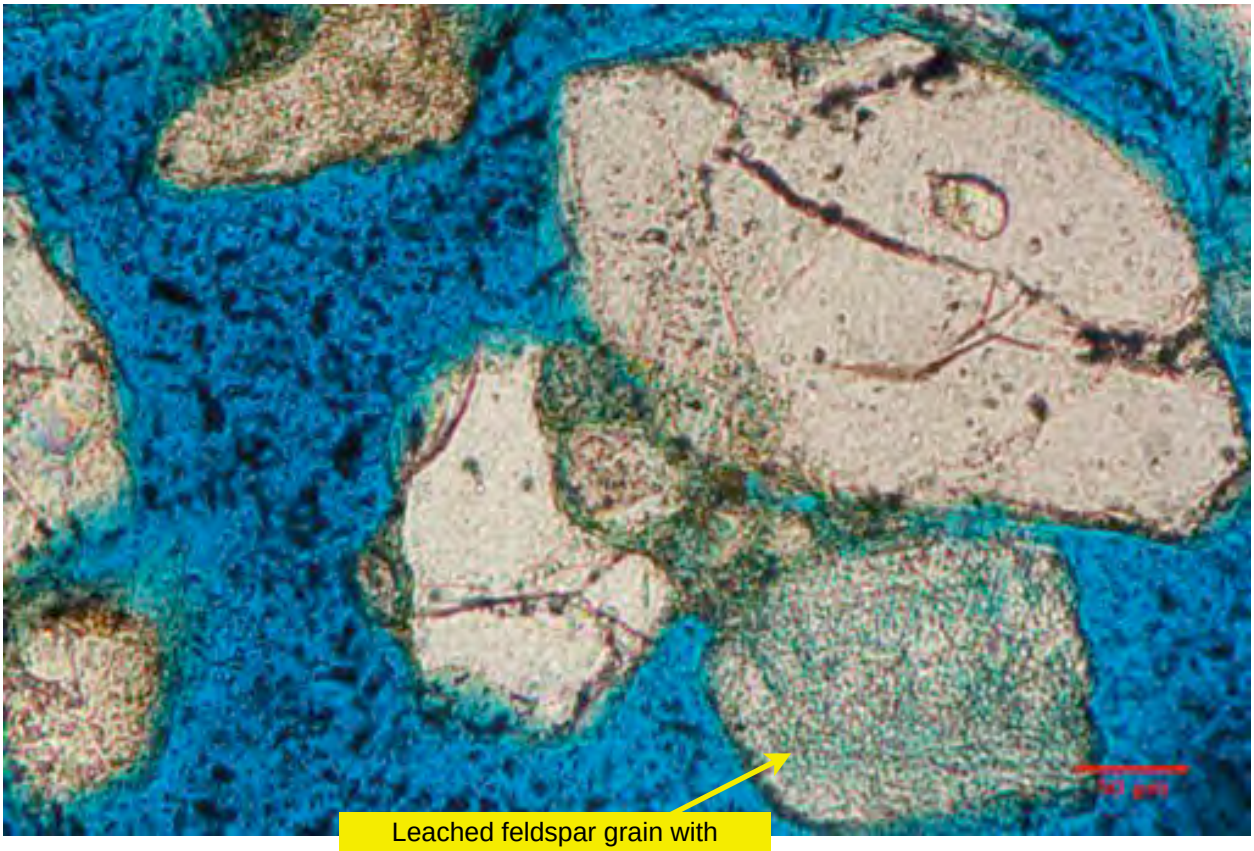
14122-01B



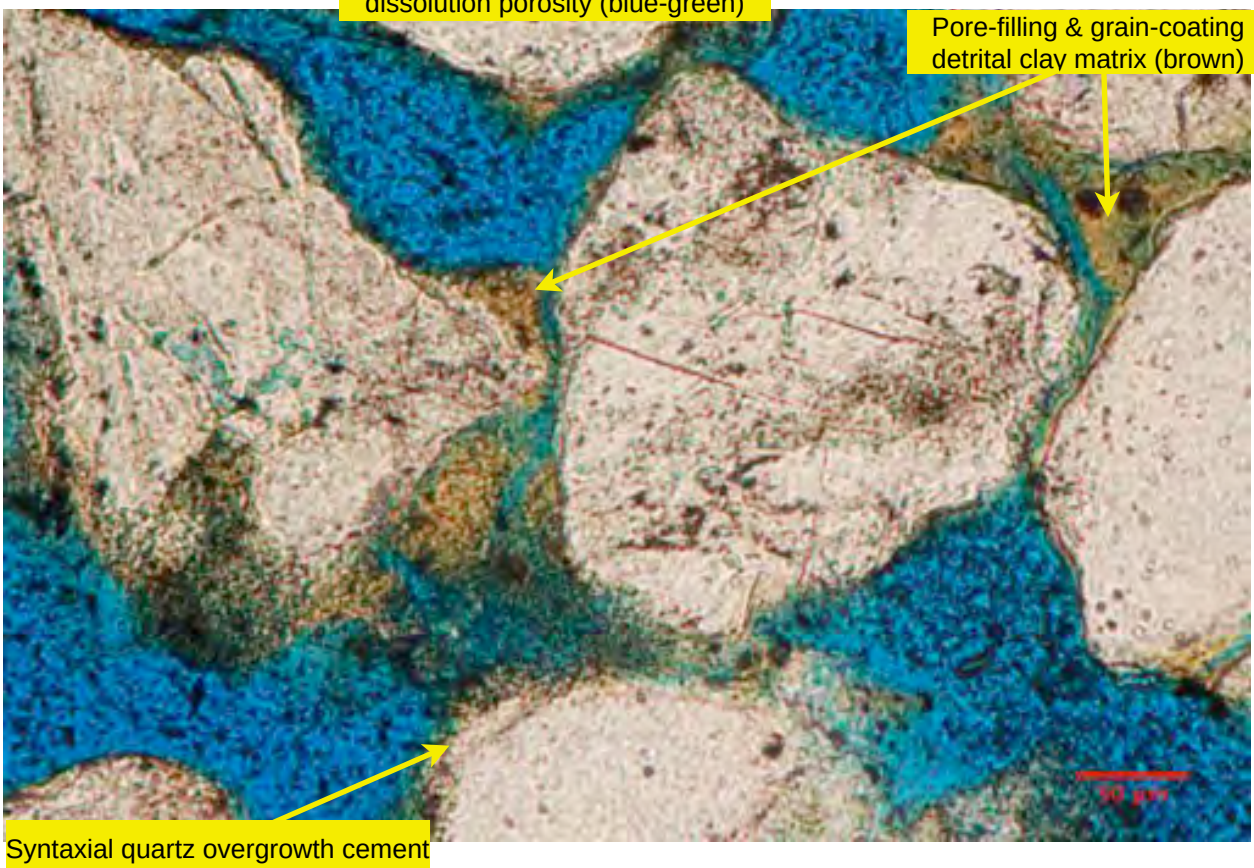
Microporous grain-coating clay matrix (green)

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-001B
Mineralogy, Inc. Job No.: 14122-01

14122-01C



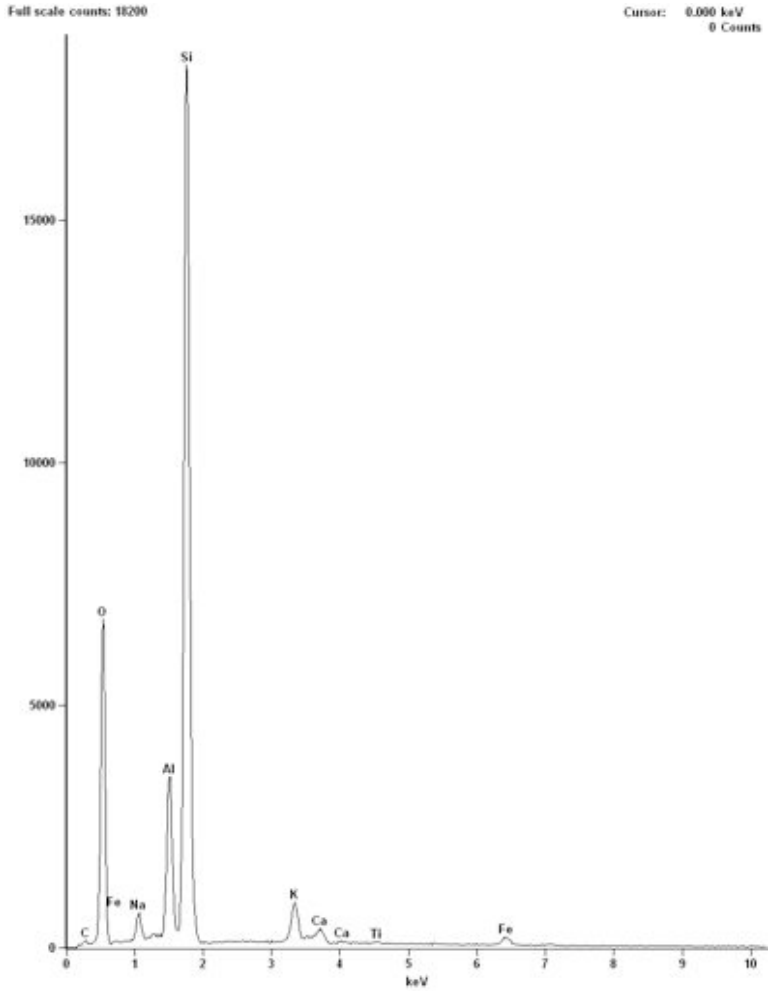
14122-01D



MINERALOGY, INC.

Figure I.
Energy Dispersive X-Ray Analysis

Client:	McCampbell Analytical, Inc.	MI#:	14122-01
Project:	1312545 (Follow-Up to MI#14031)	Location:	N/A



Energy Dispersive X-Ray Results

14122-01	1312545-001B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	3.9	+/-0.35	CO2	14.29
O K	53.24S	---		---
Na K	1.92	+/-0.07	Na2O	2.58
Al K	5.29	+/-0.06	Al2O3	9.99
Si K	31.84	+/-0.12	SiO2	68.12
K K	1.99	+/-0.05	K2O	2.39
Ca K	0.68	+/-0.05	CaO	0.95
Ti K	0.12	+/-0.02	TiO2	0.2
Fe K	1.03	+/-0.04	Fe2O3	1.47
	----------			----------
Total	100			100

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-002B
Mineralogy, Inc. Job No.: 14122-02

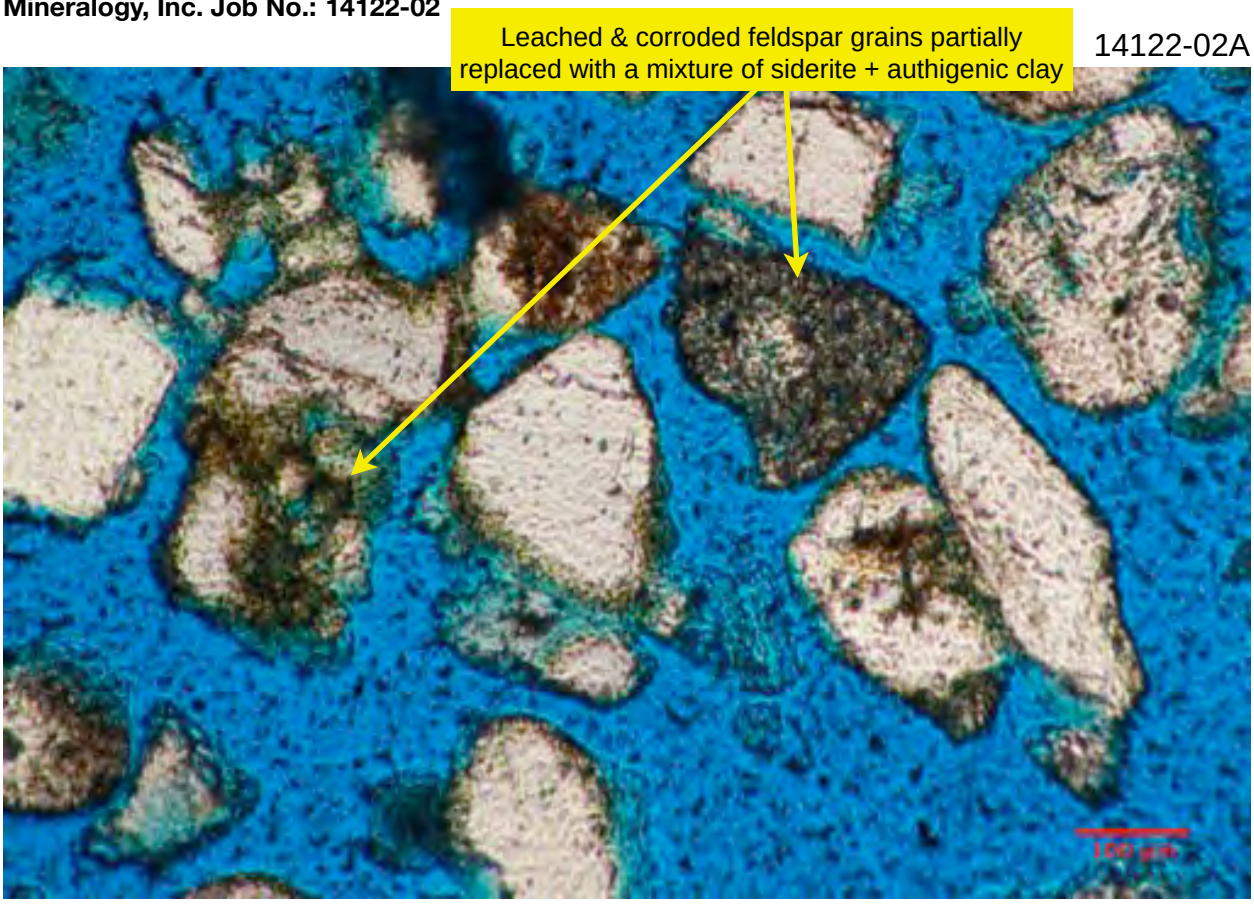
Lithologic Classification	Unconsolidated, Lithic Arkosic Sand
Textural Properties	Fine grained (fU), well sorted, and subangular. The thin section represents a grain mount of unconsolidated and disaggregated sand material.
Mean Grain Diameter	0.20 mm
Max Grain Diameter	1.51 mm
Fabric	Unconsolidated and disaggregated grain mount thin section
Detrital Mineralogy	Detrital grain constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and polycrystalline quartz varieties), 2) feldspar (plagioclase > k-feldspar), 3) igneous RFs (granodiorite, granite, and rhyolite RFs), 4) chert RFs, 5) biotite mica, 6) silty shale RFs with traces of hornblende, apatite, and zircon present as accessory phases.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-002B
Mineralogy, Inc. Job No.: 14122-02

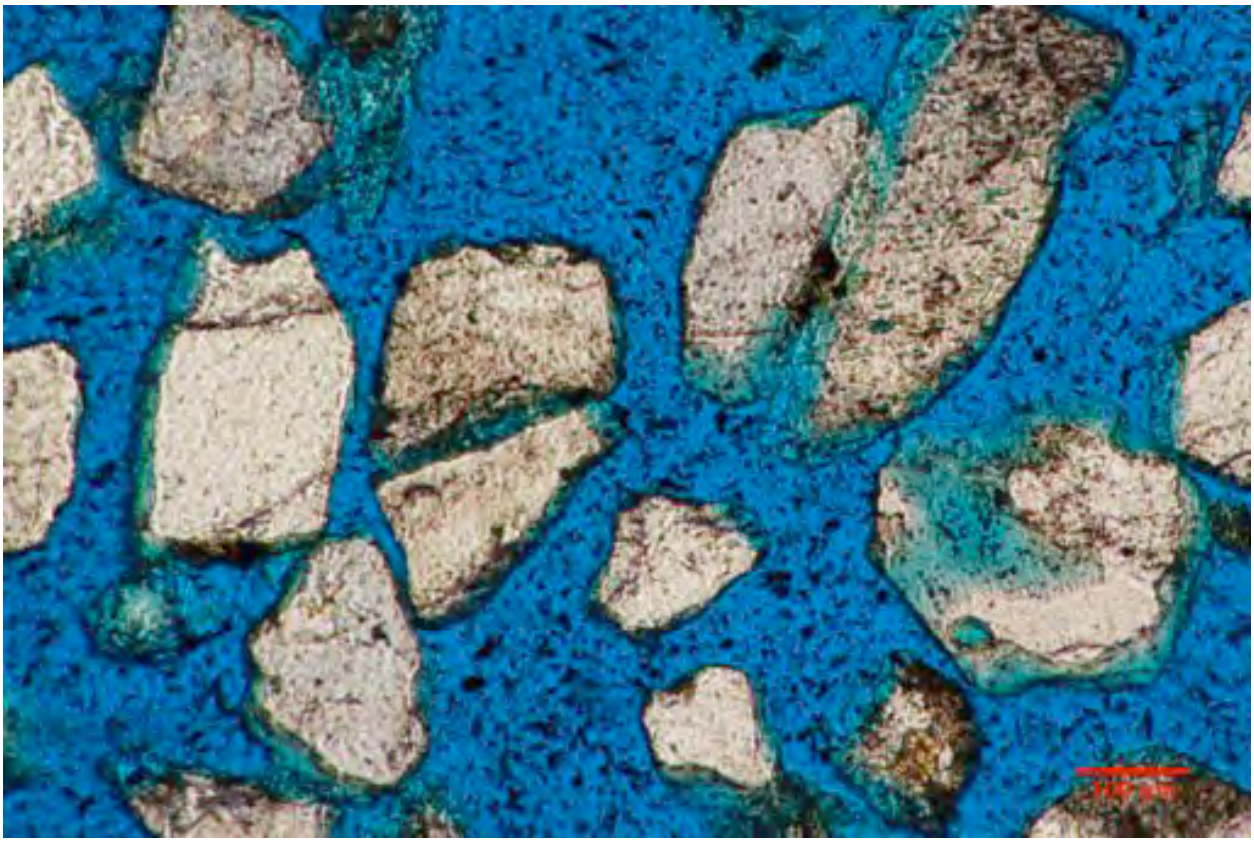
Cements & Matrix Constituents	Traces of quartz and feldspar cement are present as syntaxial overgrowths nucleated on the detrital quartz and feldspar grains. Traces of siderite cement are also locally present as a grain coating authigenic cement phase. Several of the clusters of clay matrix minerals encrusting the grain surfaces contain microcrystalline iron oxide +/- pyrite cement. Matrix constituents present within this sand sample are tentatively identified to include illite, chlorite, and mixed layered chlorite smectite. Detailed mineralogical analysis of the clay fraction will require x-ray diffraction analysis for this interval.
Weathering Properties	A significant percentage of the detrital feldspar population exhibits evidence of intraparticle corrosion and replacement with authigenic clay +/- iron oxide cement.
Pore System	This grain mount thin section is comprised of disaggregated and unconsolidated sand that exhibits small to minor amounts of intragranular dissolution porosity in association with the leached feldspar grains.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-002B
Mineralogy, Inc. Job No.: 14122-02

14122-02A

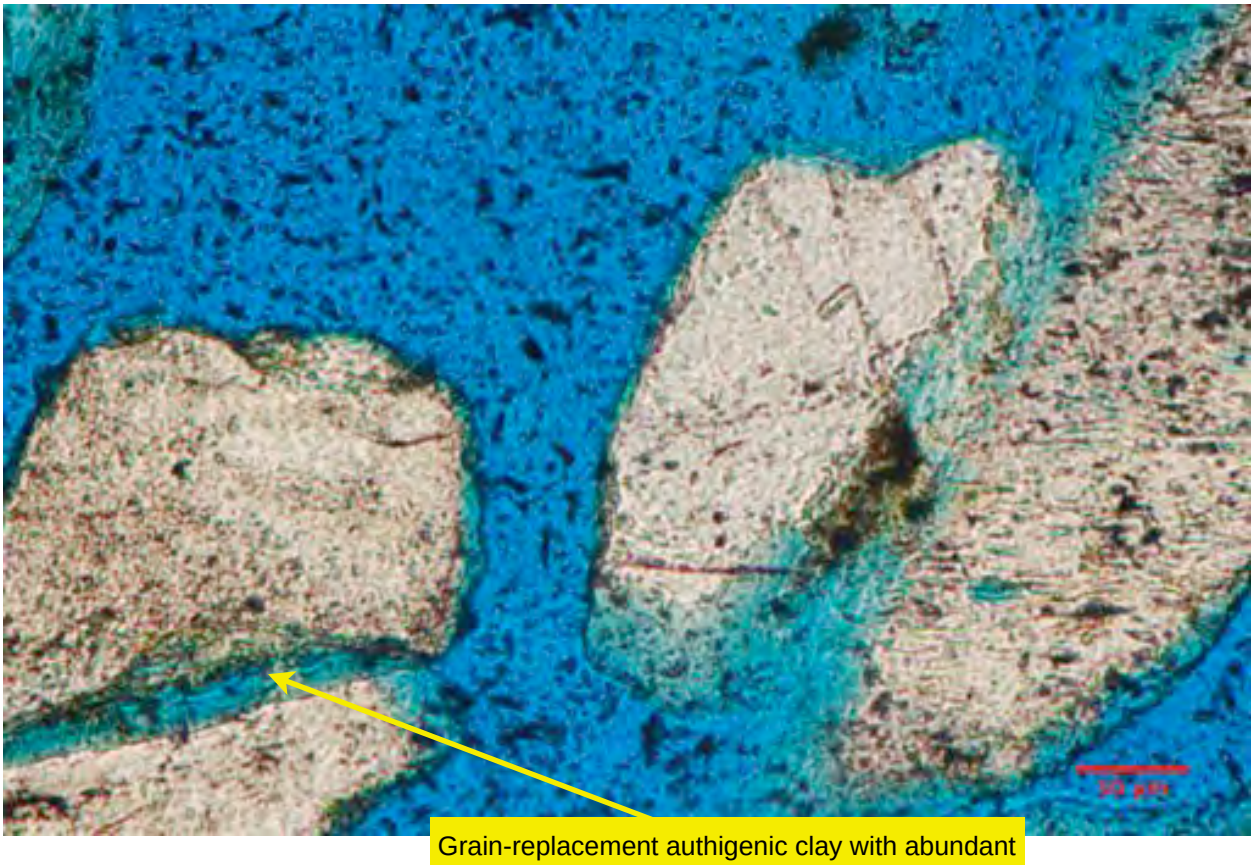


14122-02B



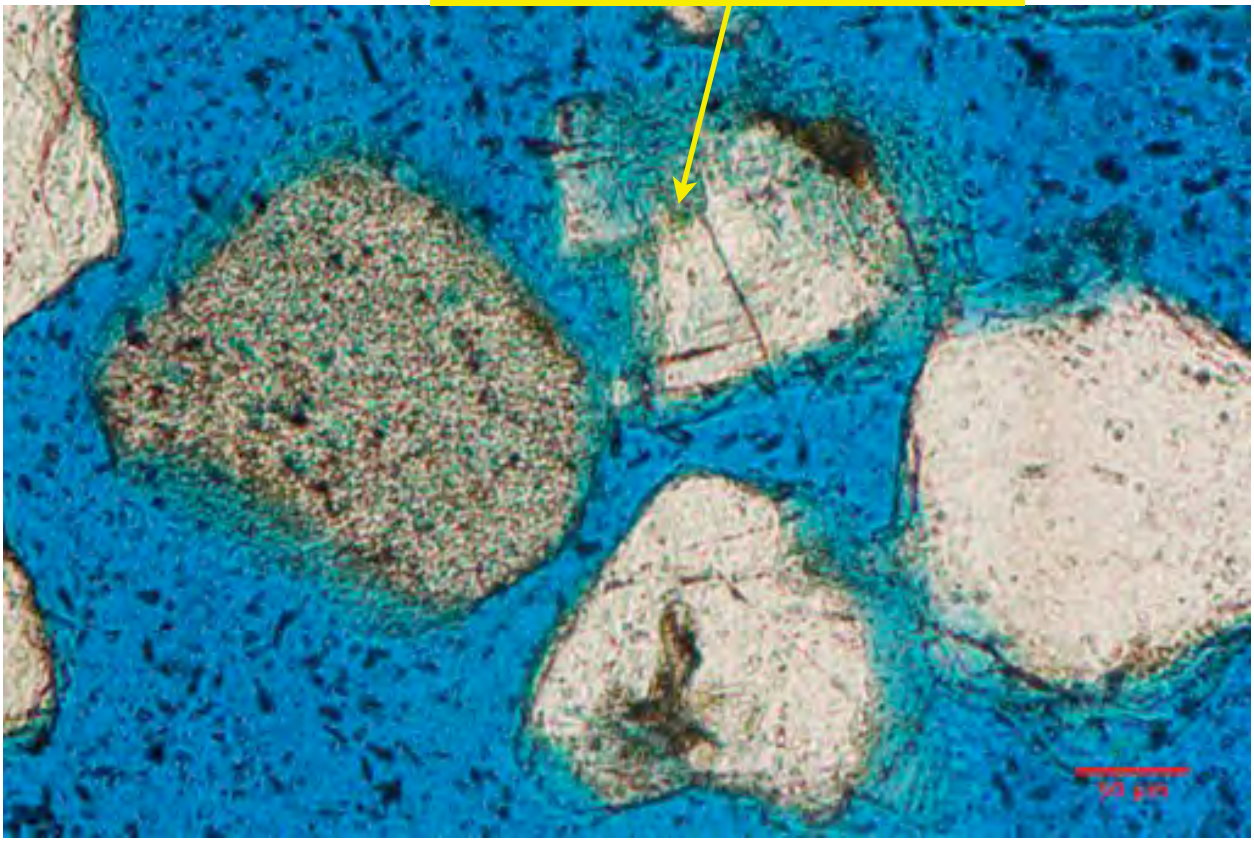
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-002B
Mineralogy, Inc. Job No.: 14122-02

14122-02C



Grain-replacement authigenic clay with abundant intercrystalline microporosity (blue-green)

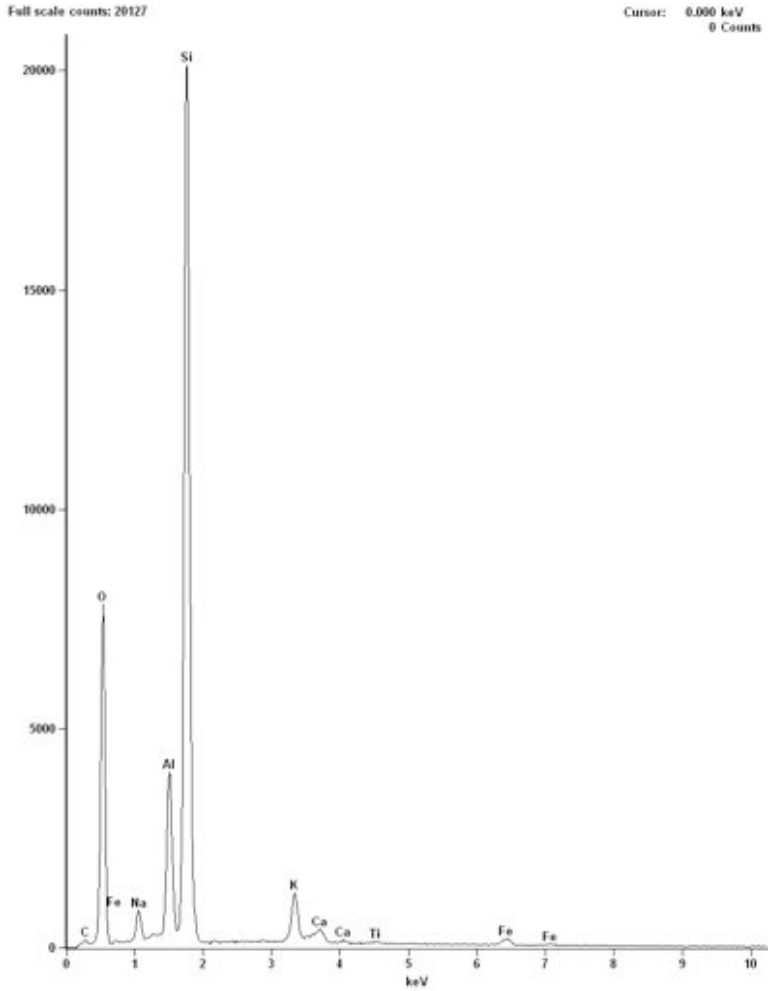
14122-02D



MINERALOGY, INC.

Figure II.
Energy Dispersive X-Ray Analysis

Client:	McCampbell Analytical, Inc.	MI#:	14122-02
Project:	1312545 (Follow-Up to MI#14031)	Location:	N/A



Energy Dispersive X-Ray Results

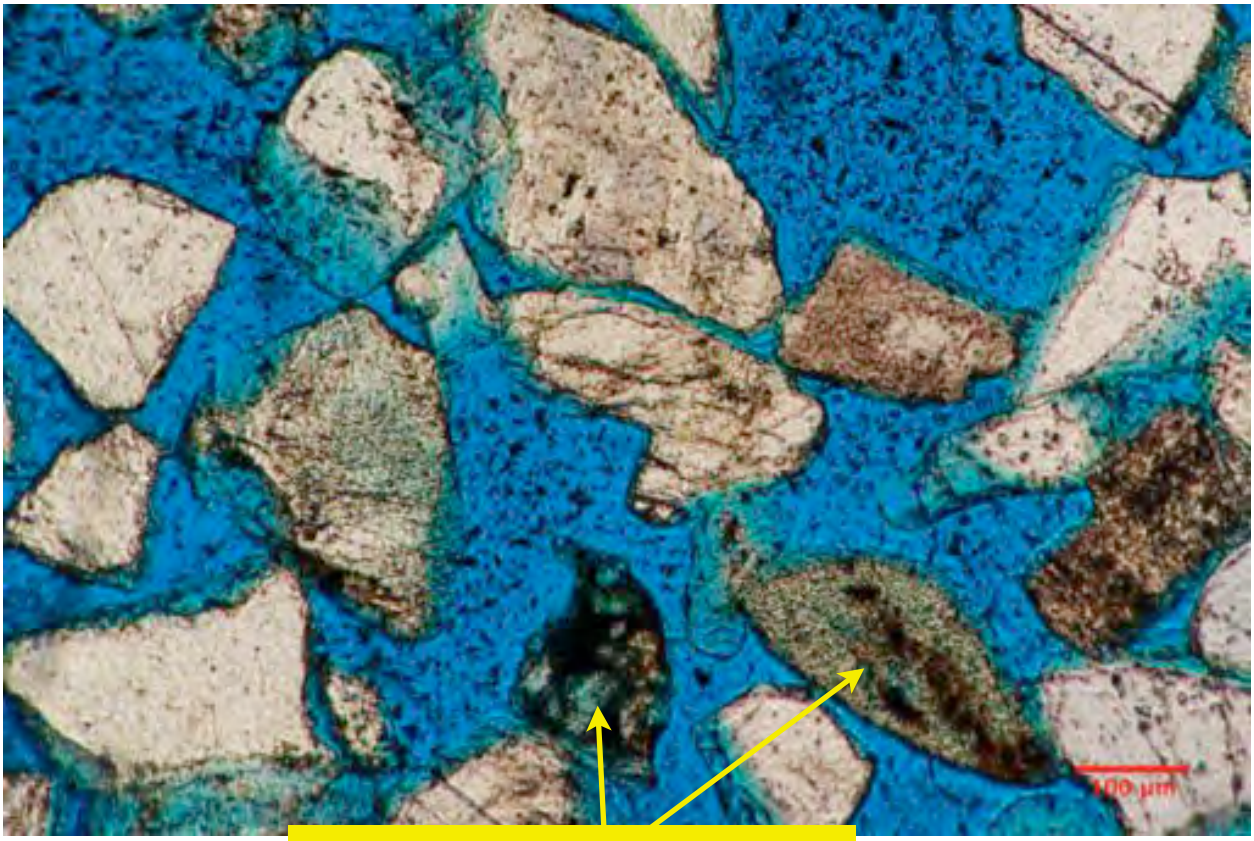
14122-02	1312545-002B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	3.91	+/-0.24	CO2	14.32
O K	53.08S	---		---
Na K	2.18	+/-0.07	Na2O	2.93
Al K	5.42	+/-0.06	Al2O3	10.24
Si K	31.54	+/-0.12	SiO2	67.47
K K	2.32	+/-0.05	K2O	2.8
Ca K	0.66	+/-0.05	CaO	0.92
Ti K	0.1	+/-0.02	TiO2	0.17
Fe K	0.8	+/-0.04	Fe2O3	1.15
	----------			----------
Total	100			100

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-003B
Mineralogy, Inc. Job No.: 14122-03

Lithologic Classification	Unconsolidated, Lithic Arkosic Sand
Textural Properties	Fine grained (fU), well sorted, and subangular to subrounded.
Mean Grain Diameter	~0.22 mm
Max Grain Diameter	0.75 mm
Fabric	Unconsolidated and disaggregated grain mount thin section
Detrital Mineralogy	Detrital grain constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and polycrystalline quartz varieties), 2) feldspar (plagioclase > k-feldspar), 3) igneous RFs (granodiorite, granite, and rhyolite RFs), 4) chert RFs, 5) biotite mica, 6) silty shale RFs with traces of magnetite, hornblende, and augite.
Cements & Matrix Constituents	Traces of authigenic quartz and feldspar cement are locally present as syntaxial overgrowths nucleated on the detrital sand grains. Authigenic clay is common within this sample as a grain replacement associated with leached feldspar and igneous RF material. Minor amounts of poorly crystallized detrital clay matrix is locally present as a grain coating matrix material. The clay mineralogy is dominated by illite coupled with traces of mixed layered chlorite/smectite and chlorite.
Pore System	NA

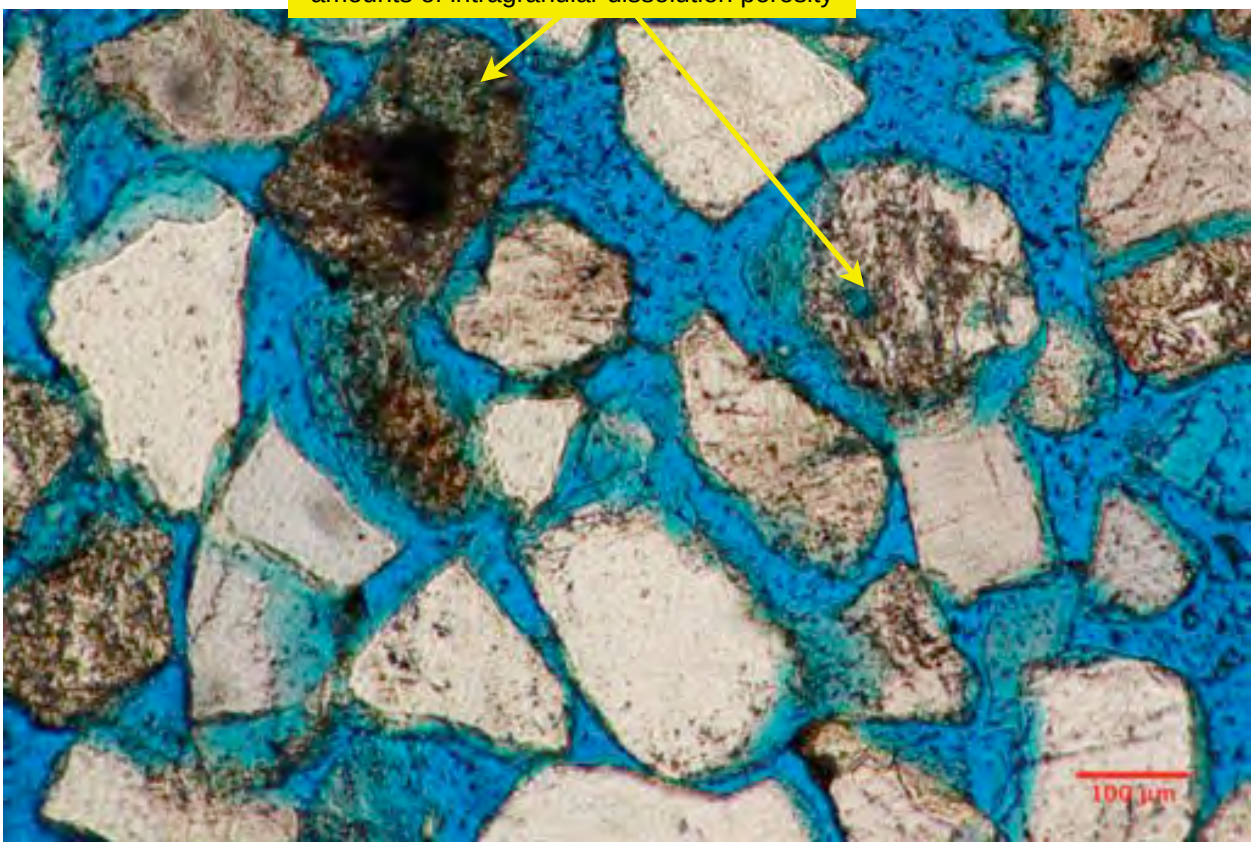
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-003B
Mineralogy, Inc. Job No.: 14122-03

14122-03A



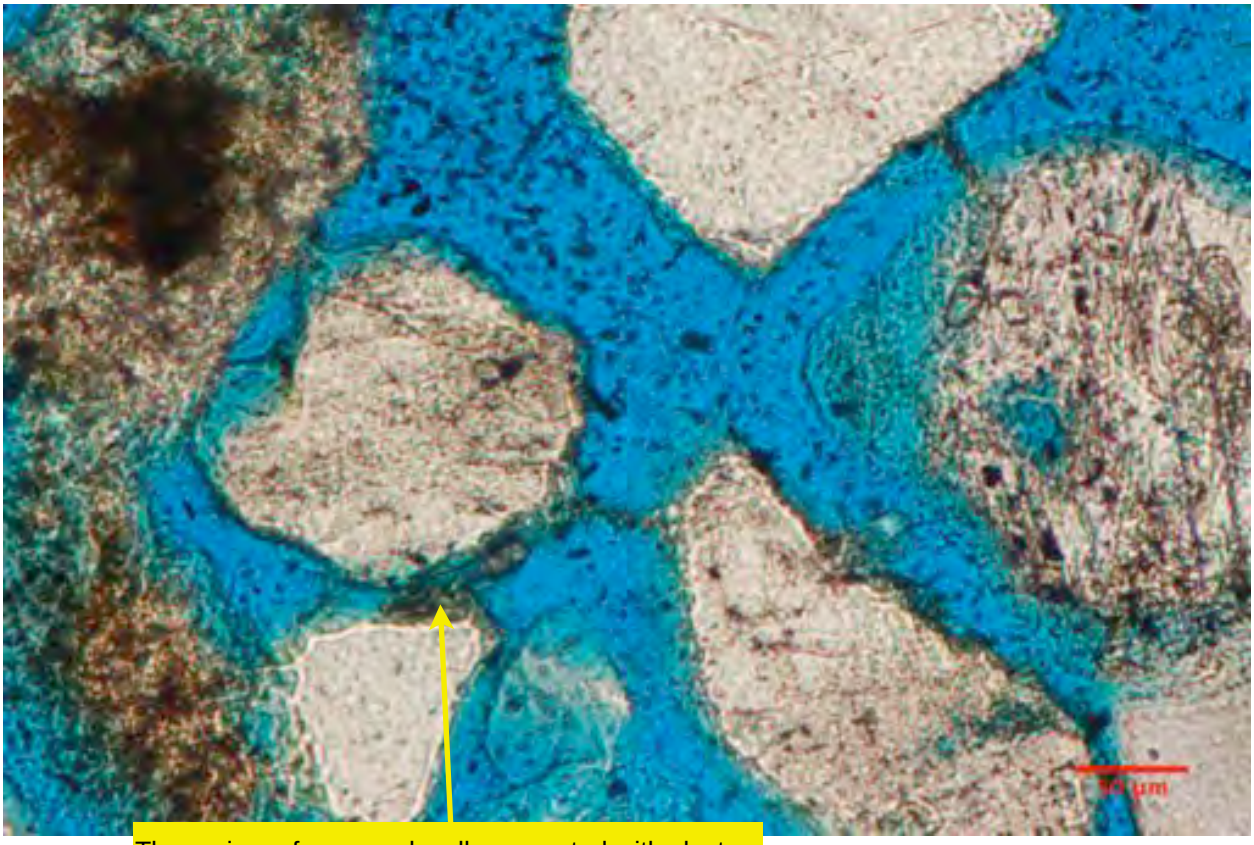
Leached feldspar grains with locally significant amounts of intragranular dissolution porosity

14122-03B



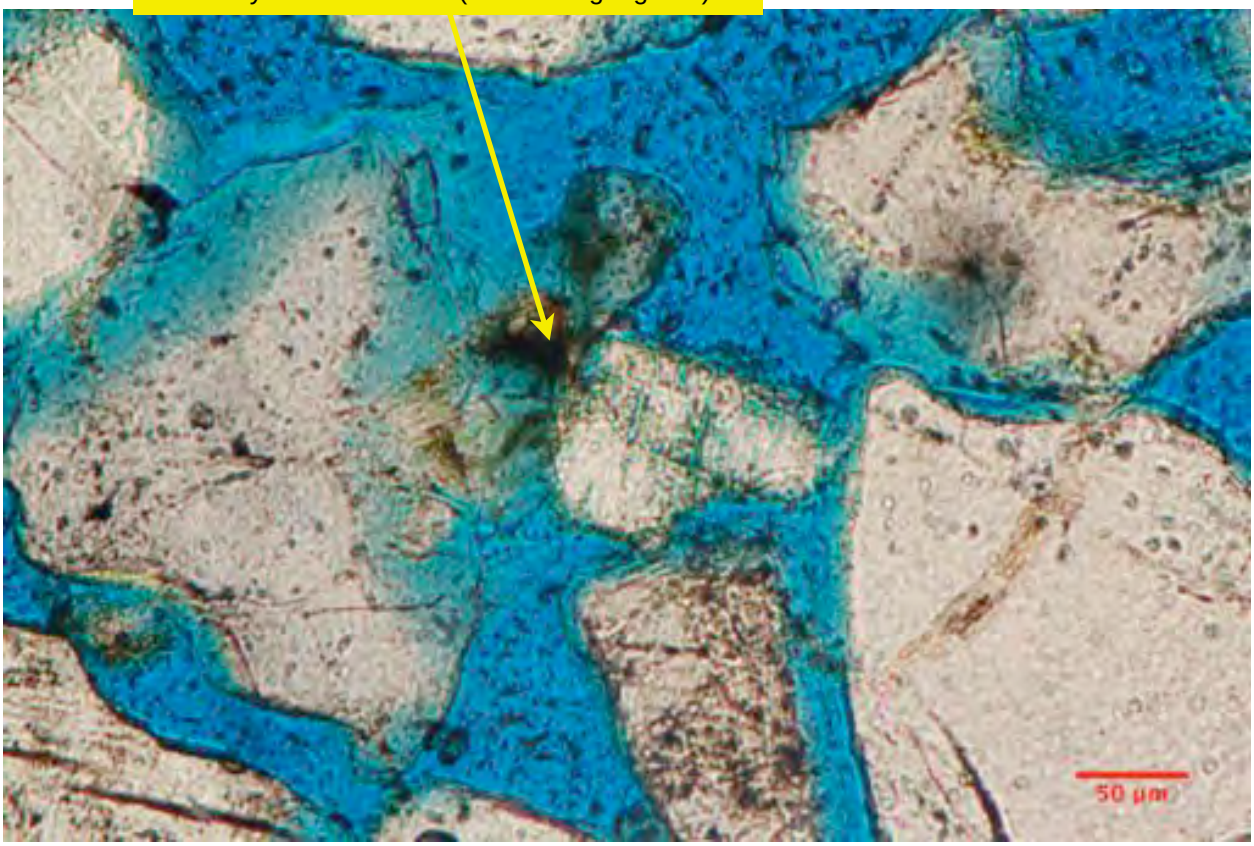
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-003B
Mineralogy, Inc. Job No.: 14122-03

14122-03C



The grain surfaces are locally encrusted with clusters of clay matrix minerals (brown to light green)

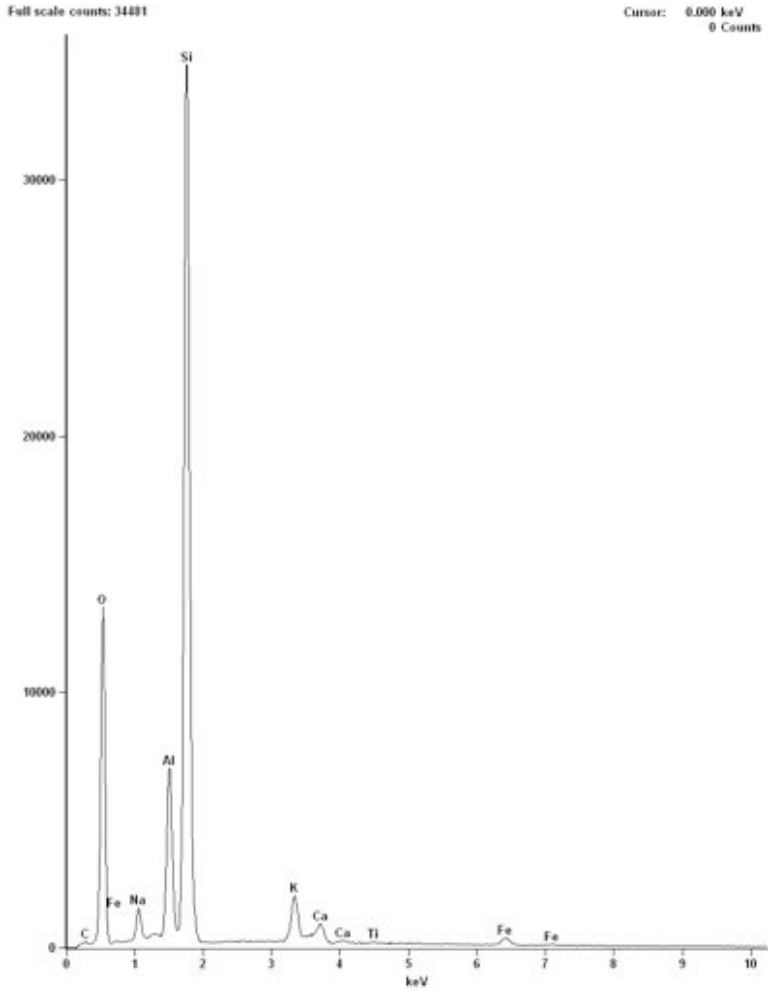
14122-03D



MINERALOGY, INC.

Figure III.
Energy Dispersive X-Ray Analysis

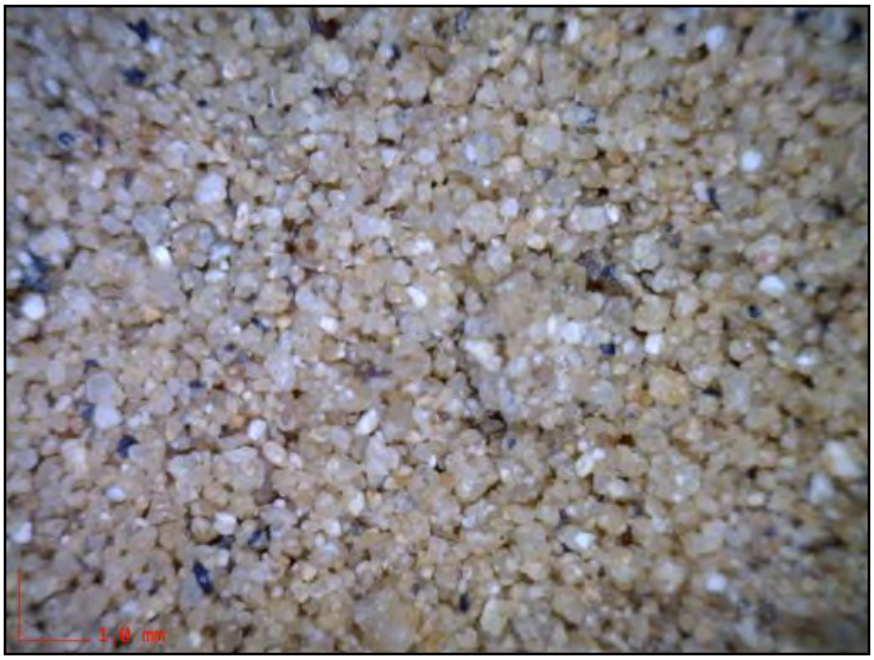
Client:	McCampbell Analytical, Inc.	MI#:	14122-03
Project:	1312545 (Follow-Up to MI#14031)	Location:	N/A



Energy Dispersive X-Ray Results

14122-03	1312545-003B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	2.67	+/-0.26	CO2	9.77
O K	51.97S	---		---
Na K	2.24	+/-0.06	Na2O	3.02
Al K	5.78	+/-0.05	Al2O3	10.91
Si K	33.03	+/-0.10	SiO2	70.65
K K	2.35	+/-0.04	K2O	2.83
Ca K	0.99	+/-0.04	CaO	1.38
Ti K	0.07	+/-0.02	TiO2	0.11
Fe K	0.93	+/-0.05	Fe2O3	1.32
	----------			----------
Total	100			100

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-004B
Mineralogy, Inc. Job No.: 14122-04



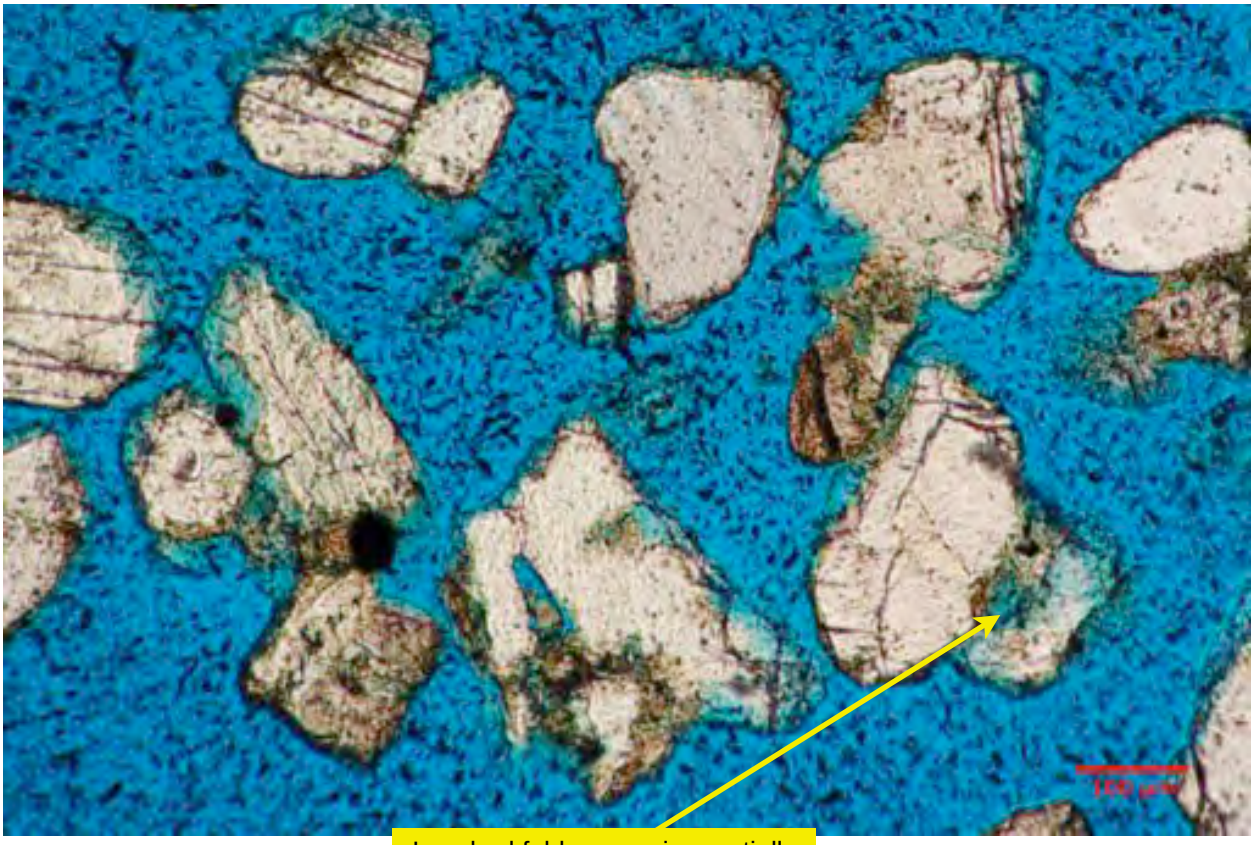
Lithologic Classification	Unconsolidated, Lithic Arkosic Sand
Textural Properties	Medium grained (mL), well sorted, and subangular to subrounded.
Mean Grain Diameter	~0.28 mm
Max Grain Diameter	1.11 mm
Fabric	Unconsolidated and disaggregated with scattered clusters of sand grains held together by weakly adhered grain coating clay matrix minerals.
Detrital Mineralogy	Detrital grain constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and polycrystalline quartz varieties), 2) feldspar (plagioclase > k-feldspar), 3) igneous RFs (granodiorite, granite, and rhyolite RFs), 4) chert RFs, 5) biotite mica, 6) silty shale RFs with traces of magnetite, hornblende, and augite.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-004B
Mineralogy, Inc. Job No.: 14122-04

Cements & Matrix Constituents	Cement constituents are limited to traces of quartz and feldspar overgrowths as well as irregular clusters of grain coating iron oxide cement. Authigenic clay matrix is common as a grain replacement associated with leached feldspar grains and igneous RFs. Clay minerals contained in this sample are dominated by illite coupled with traces of chlorite and mixed layered illite/smectite (see Table I). Minor amounts of iron oxide hydroxide cement are commingled with the grain coating clay within this sample.
Weathering Properties	Detrital feldspar grains within this sample are extensively leached and commonly corroded and partially replaced with authigenic clay matrix minerals. Iron oxide hydroxide cement is commonly present in association with the grain coating and grain replacement clay.
Pore System	Minor amounts of intragranular dissolution porosity are locally present in association with the leached feldspar and igneous RFs.

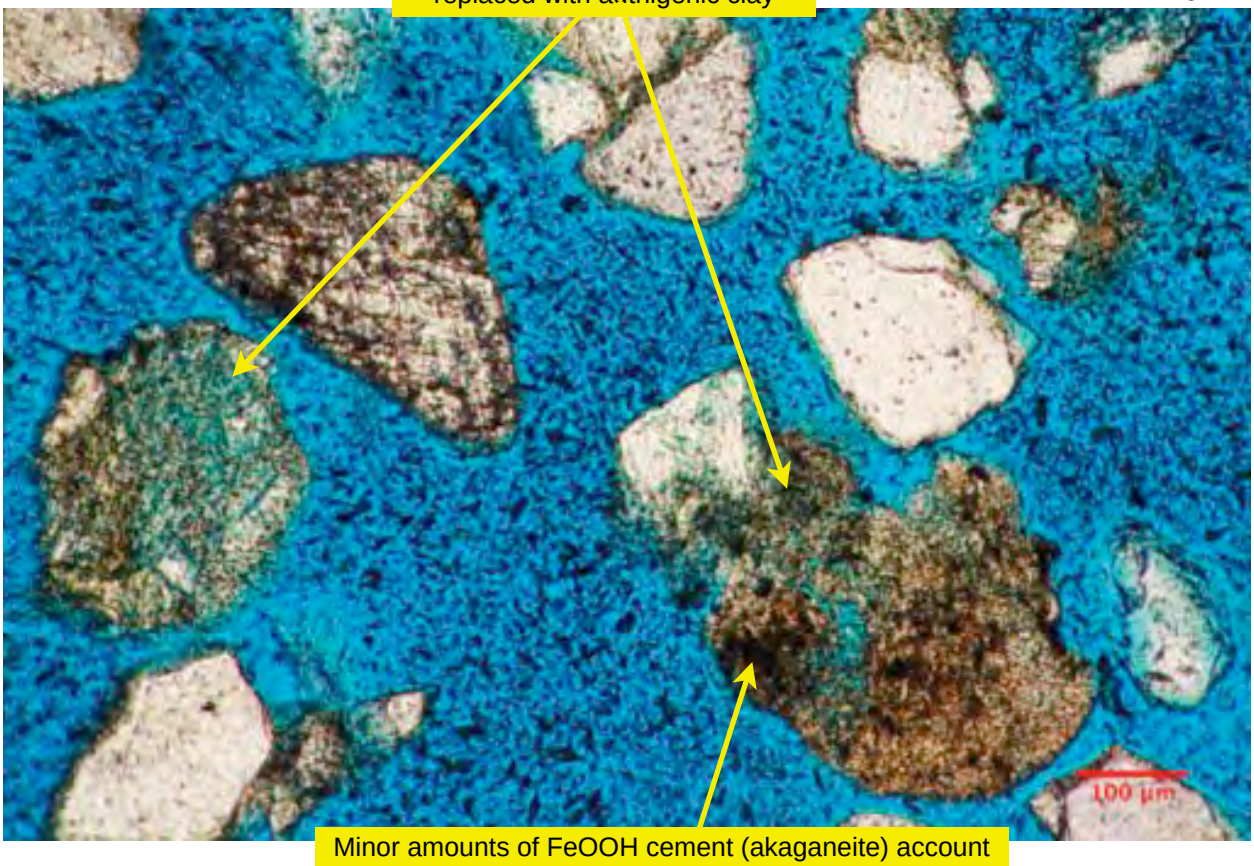
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-004B
Mineralogy, Inc. Job No.: 14122-04

14122-04A



Leached feldspar grains partially replaced with authigenic clay

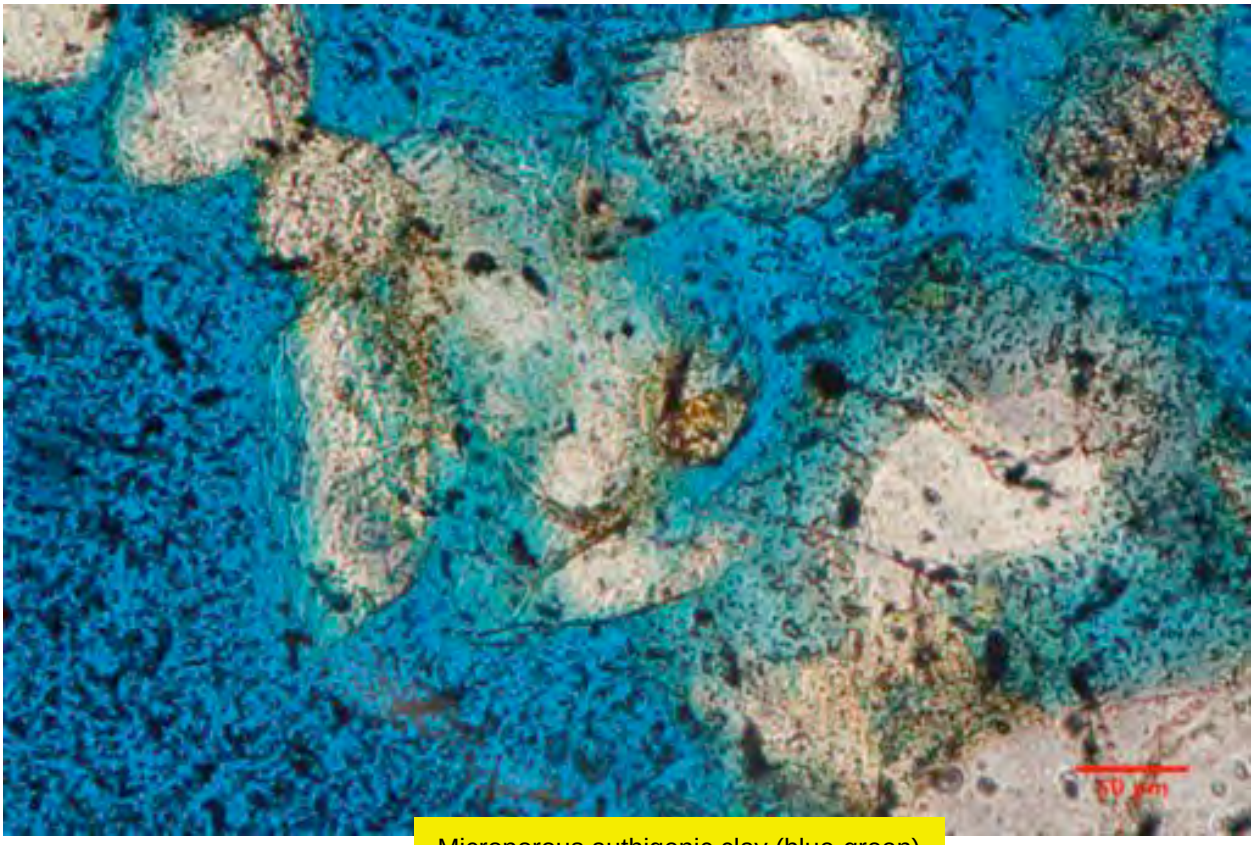
14122-04B



Minor amounts of FeOOH cement (akaganeite) account for the dark brown color of the weathered feldspar grains

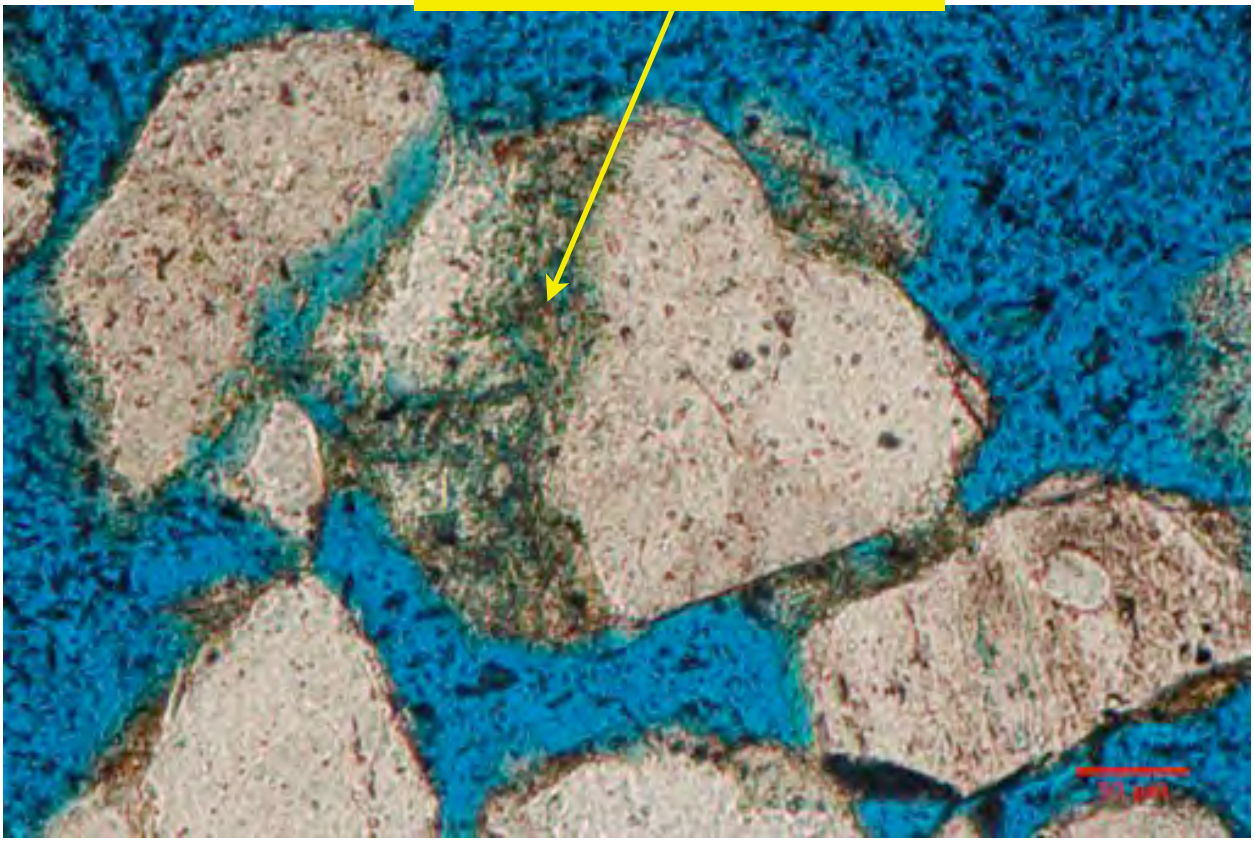
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-004B
Mineralogy, Inc. Job No.: 14122-04

14122-04C



Microporous authigenic clay (blue-green) partially replacing a leached feldspar grain

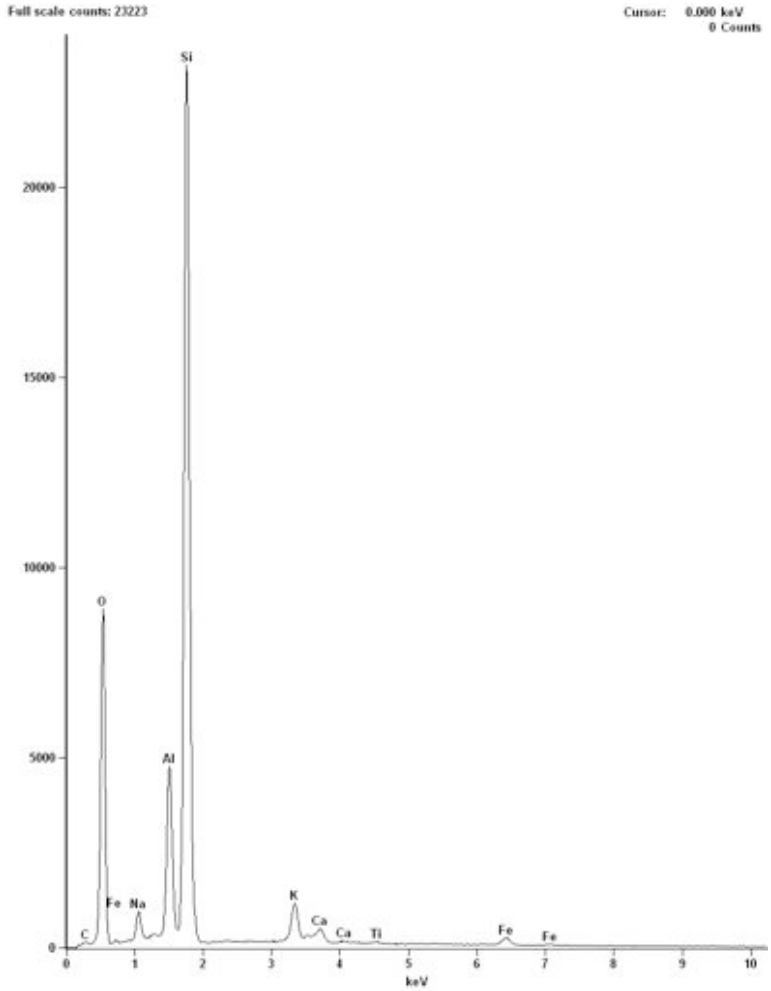
14122-04D



MINERALOGY, INC.

Figure IV.
Energy Dispersive X-Ray Analysis

Client:	McCampbell Analytical, Inc.	MI#:	14122-04
Project:	1312545 (Follow-Up to MI#14031)	Location:	N/A



Energy Dispersive X-Ray Results

14122-04	1312545-004B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	3.05	+/-0.22	CO2	11.17
O K	52.56S	---		---
Na K	2.04	+/-0.07	Na2O	2.76
Al K	5.83	+/-0.06	Al2O3	11.02
Si K	32.82	+/-0.12	SiO2	70.22
K K	1.99	+/-0.05	K2O	2.39
Ca K	0.65	+/-0.05	CaO	0.91
Ti K	0.13	+/-0.02	TiO2	0.21
Fe K	0.94	+/-0.07	Fe2O3	1.34
	----------			----------
Total	100			100

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-005B
Mineralogy, Inc. Job No.: 14122-05

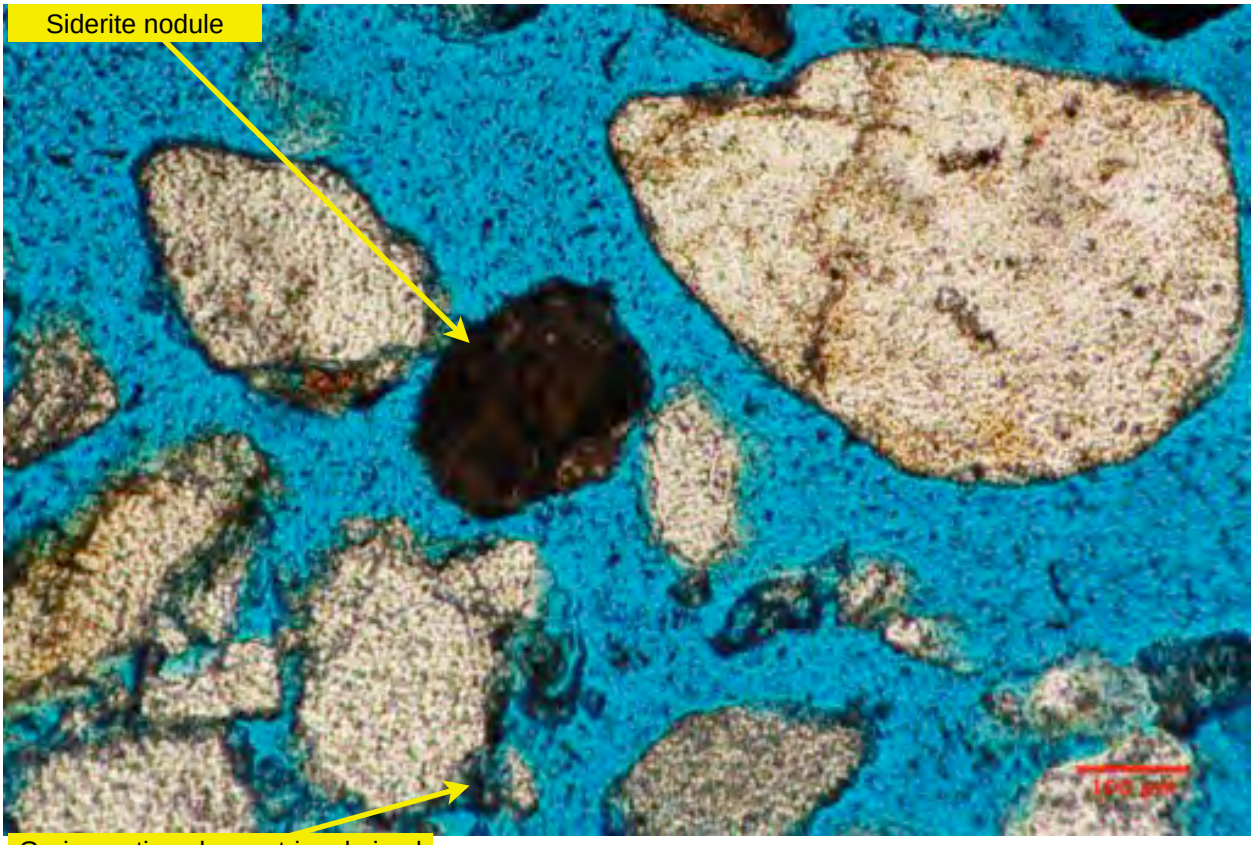
Lithologic Classification	Unconsolidated, Lithic Arkosic Sand
Textural Properties	Fine to medium grained (fU-mL), well sorted, and subangular to subrounded.
Mean Grain Diameter	~0.25 mm
Max Grain Diameter	1.14 mm
Fabric	Unconsolidated and disaggregated sand
Detrital Mineralogy	Detrital grain constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and polycrystalline quartz varieties), 2) feldspar (plagioclase > k-feldspar), 3) chert RFs, 4) igneous RFs (mostly granodiorite and rhyolite RFs), 5) biotite mica, and 6) shale RFs. Traces of magnetite, hornblende, and zircon occur as accessory detrital grain types.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-005B
Mineralogy, Inc. Job No.: 14122-05

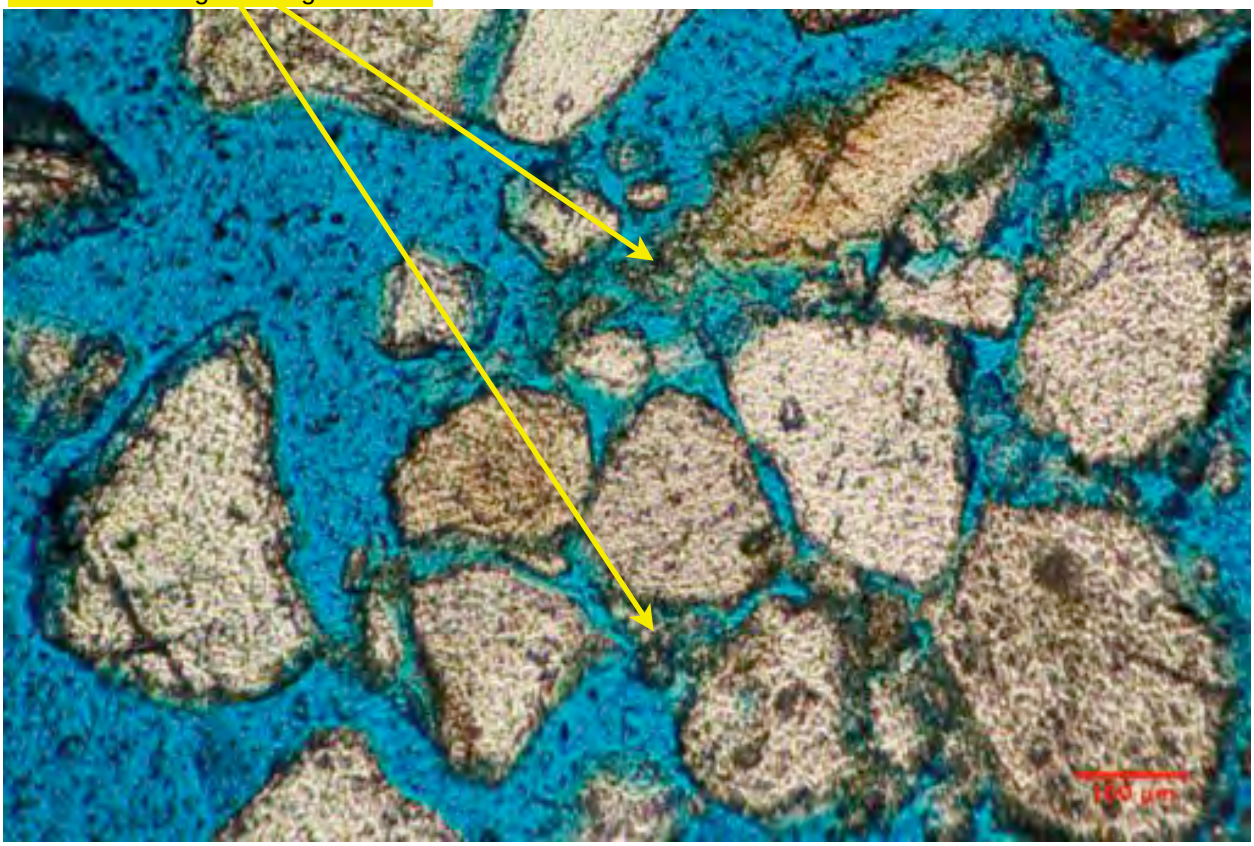
Cements & Matrix Constituents	Traces of quartz and feldspar cement occur as weakly developed, syntaxial overgrowths that are locally encrusted on detrital quartz and feldspar grains. Traces of siderite are also locally present as a weakly developed intergranular cement coating selected sand grains. Clay matrix minerals are common within this sand sample, occurring as grain replacements associated with leached feldspar grains, and as irregular clusters of grain coating clay. The x-ray diffraction analysis for this sample indicates the clay composition is dominated by illite coupled with mixed layered illite/smectite, and traces of chlorite and mixed layered chlorite smectite.
Weathering Properties	Feldspar grains contained within this sample are locally corroded and replaced with authigenic clay matrix minerals. Grain coating detrital clay is locally encrusted on the sand surfaces and is frequently commingled with traces of amorphous iron oxide cement.
Pore System	Minor amounts of intragranular dissolution porosity are present in association with the leached feldspar grains contained in this sample.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-005B
Mineralogy, Inc. Job No.: 14122-05

14122-05A

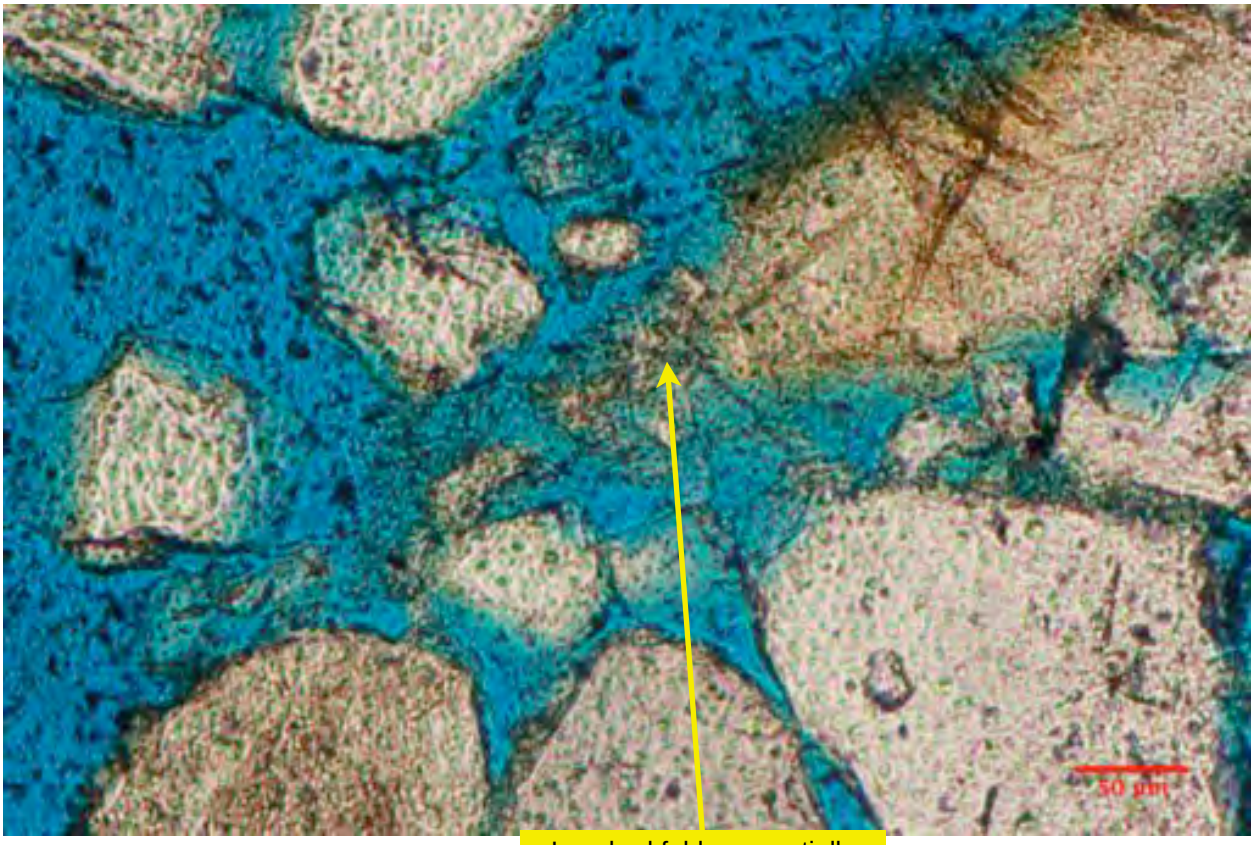


14122-05B



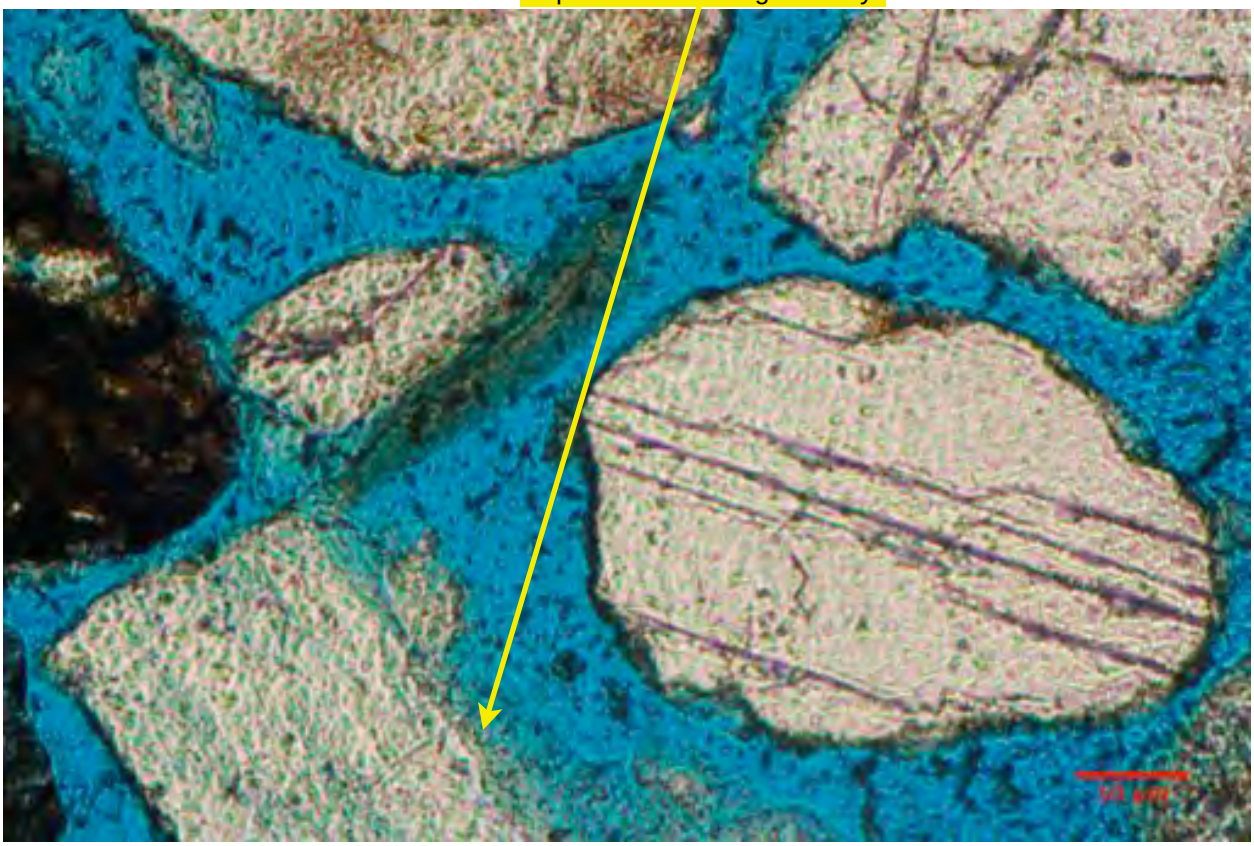
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-005B
Mineralogy, Inc. Job No.: 14122-05

14122-05C



Leached feldspar partially replaced with authigenic clay

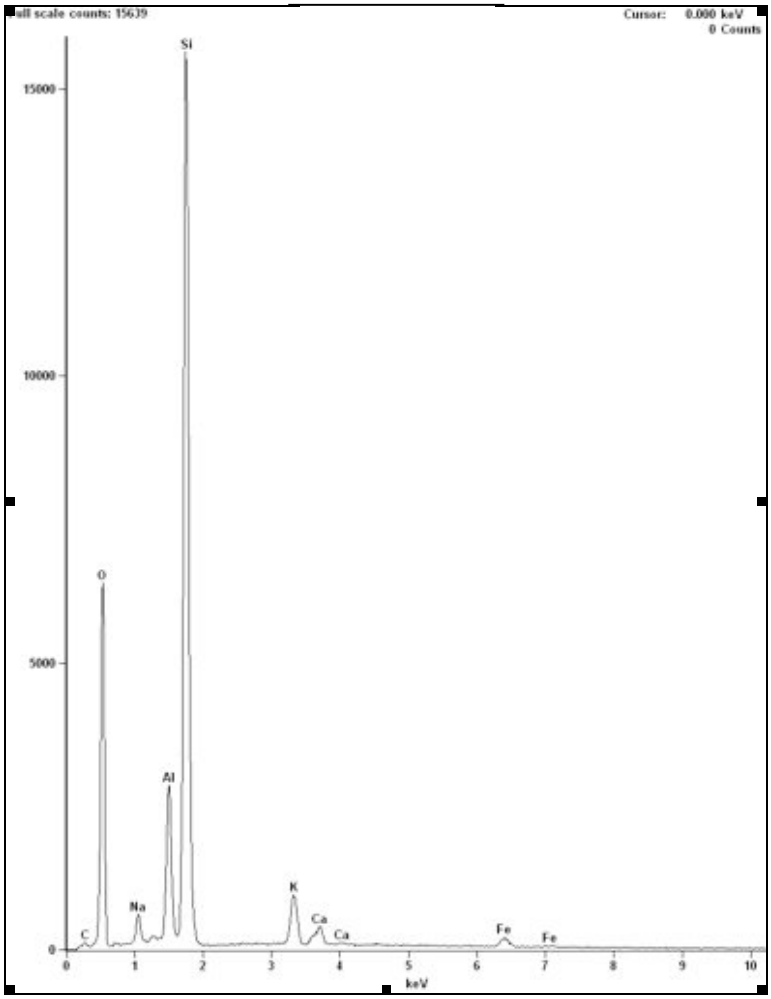
14122-05D



MINERALOGY, INC.

Figure V.
Energy Dispersive X-Ray Analysis

Client:	McCampbell Analytical, Inc.	MI#:	14122-05
Project:	1312545 (Follow-Up to MI#14031)	Location:	N/A



Energy Dispersive X-Ray Results

14122-05	1312545-005B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	3	+/-0.24	CO2	10.99
O K	51.88S	---		---
Na K	2.19	+/-0.08	Na2O	2.95
Al K	4.94	+/-0.08	Al2O3	9.34
Si K	32.58	+/-0.14	SiO2	69.69
K K	3.03	+/-0.06	K2O	3.65
Ca K	1.06	+/-0.06	CaO	1.49
Fe K	1.33	+/-0.10	Fe2O3	1.9
	----------			----------
Total	100			100

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-006B
Mineralogy, Inc. Job No.: 14122-06

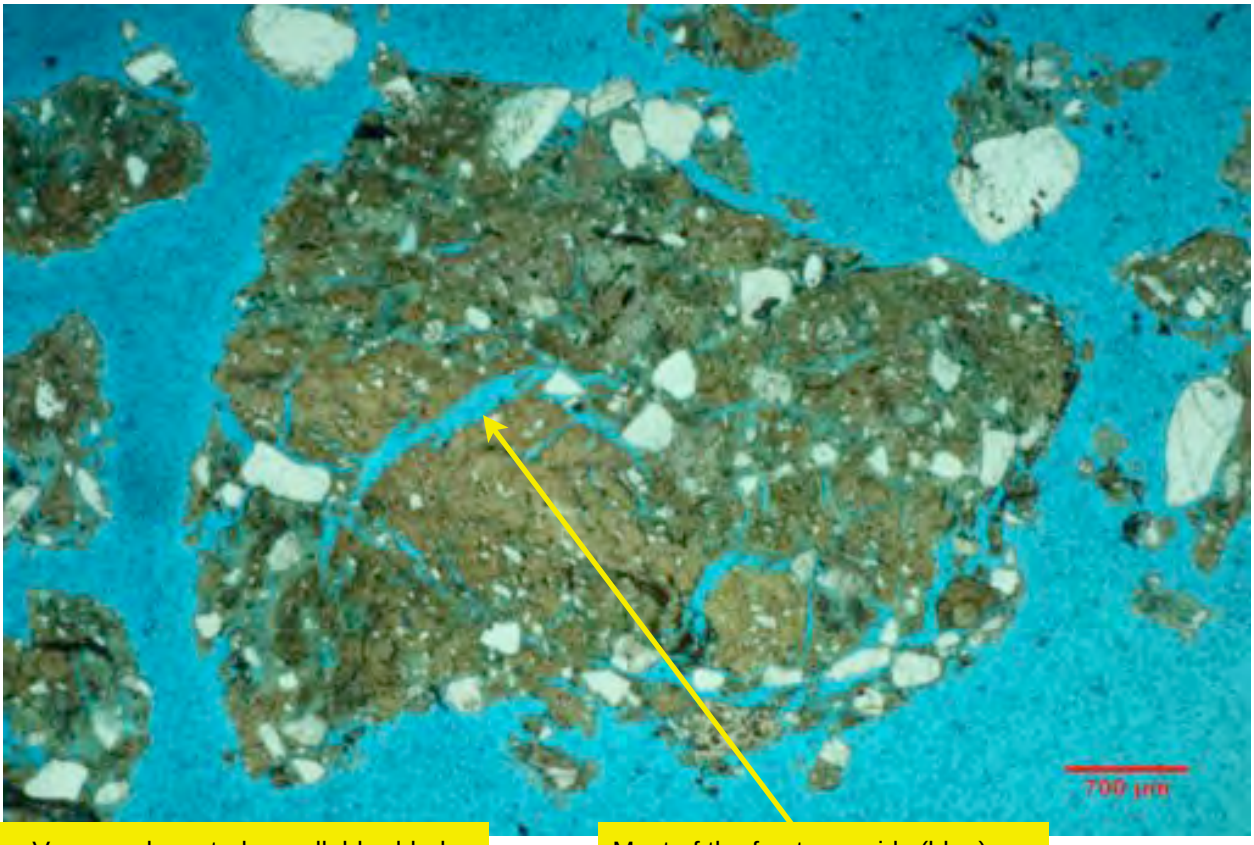
Lithologic Classification	Arkosic Silty and Sandy Shale
Textural Properties	Detrital grains are coarse silt-sized, very poorly sorted, subangular to subrounded, and bi-modally distributed. The clay-rich groundmass materials are microcrystalline and densely interlocked.
Mean Grain Diameter	~0.05 mm
Max Grain Diameter	1.30 mm
Fabric	Parallel bedded and matrix-supported with widely scattered quartz and feldspar-rich silt and sand grains irregularly distributed within the shale groundmass.
Detrital Mineralogy	Detrital grain constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and minor polycrystalline quartz varieties), 2) feldspar (plagioclase > k-feldspar), 3) chert RFs, 4) organic matter particles, 5) igneous RFs, 6) biotite mica. Accessory components include traces of hornblende, epidote, and sphene.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-006B
Mineralogy, Inc. Job No.: 14122-06

Cements & Matrix Constituents	The shale mineralogy is dominated by detrital clay matrix. X-ray diffraction mineralogical analysis of this sample indicates a mineralogy dominated by mixed layered illite/smectite coupled with subordinate amounts of illite and traces of chlorite. The mixed layered illite fraction is a hybrid clay that exhibits a predominance of randomly stacked layers of illite and montmorillonite, with montmorillonite comprising ~70% of the hybrid structure.
Weathering Properties	Scattered detrital feldspar grains exhibit localized evidence of intraparticle leaching and replacement with authigenic clay matrix minerals.
Pore System	The void volume of this sediment material consists of intercrystalline microporosity coupled with scattered interparticle macropores associated with localized clusters of detrital silt and sand grains. The interval exhibits significant amounts of fracture porosity; however, the fractures are regarded as artifacts of sample collection and preparation. Intercrystalline microporosity locally accounts for as much as 7-10% of the bulk volume within selected shale particles.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-006B
Mineralogy, Inc. Job No.: 14122-06

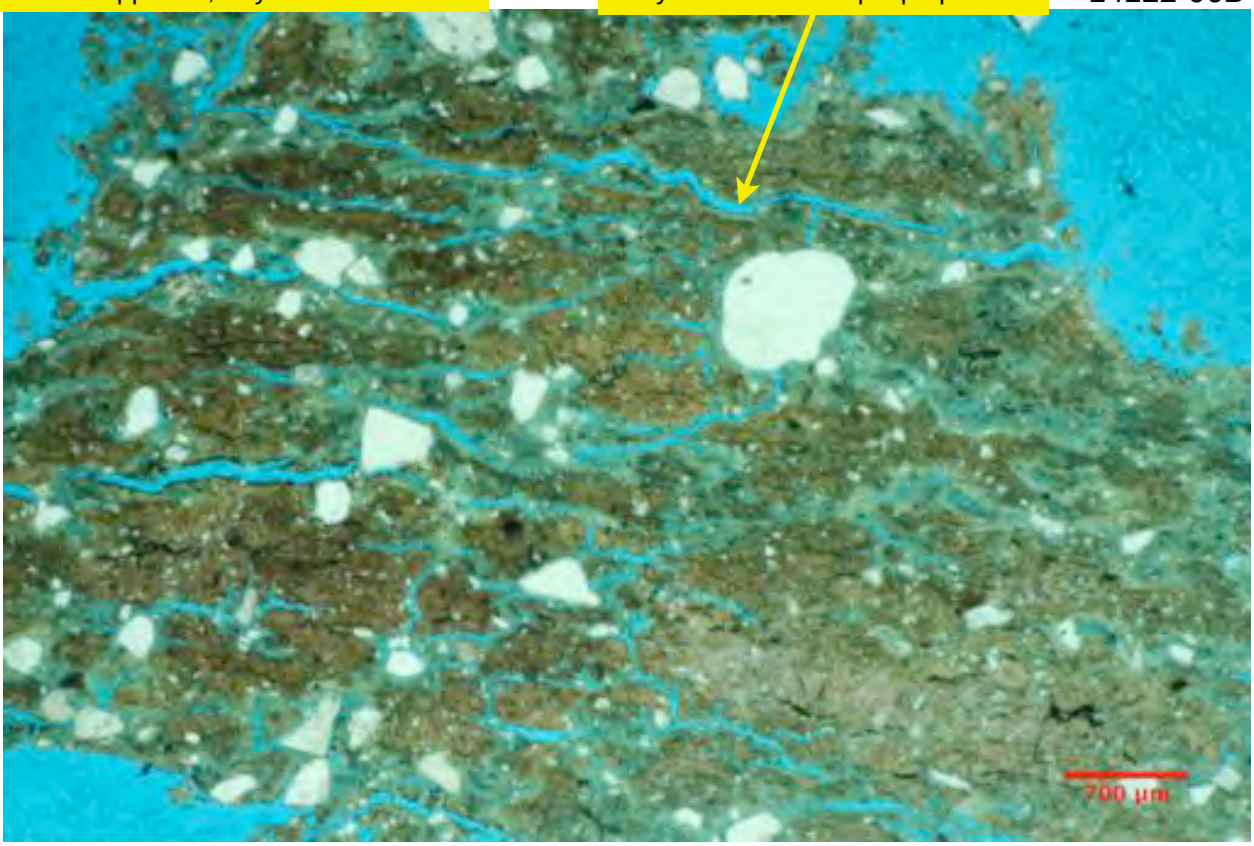
14122-06A



Very poorly sorted, parallel-bedded, matrix-supported, silty shale / mudstone

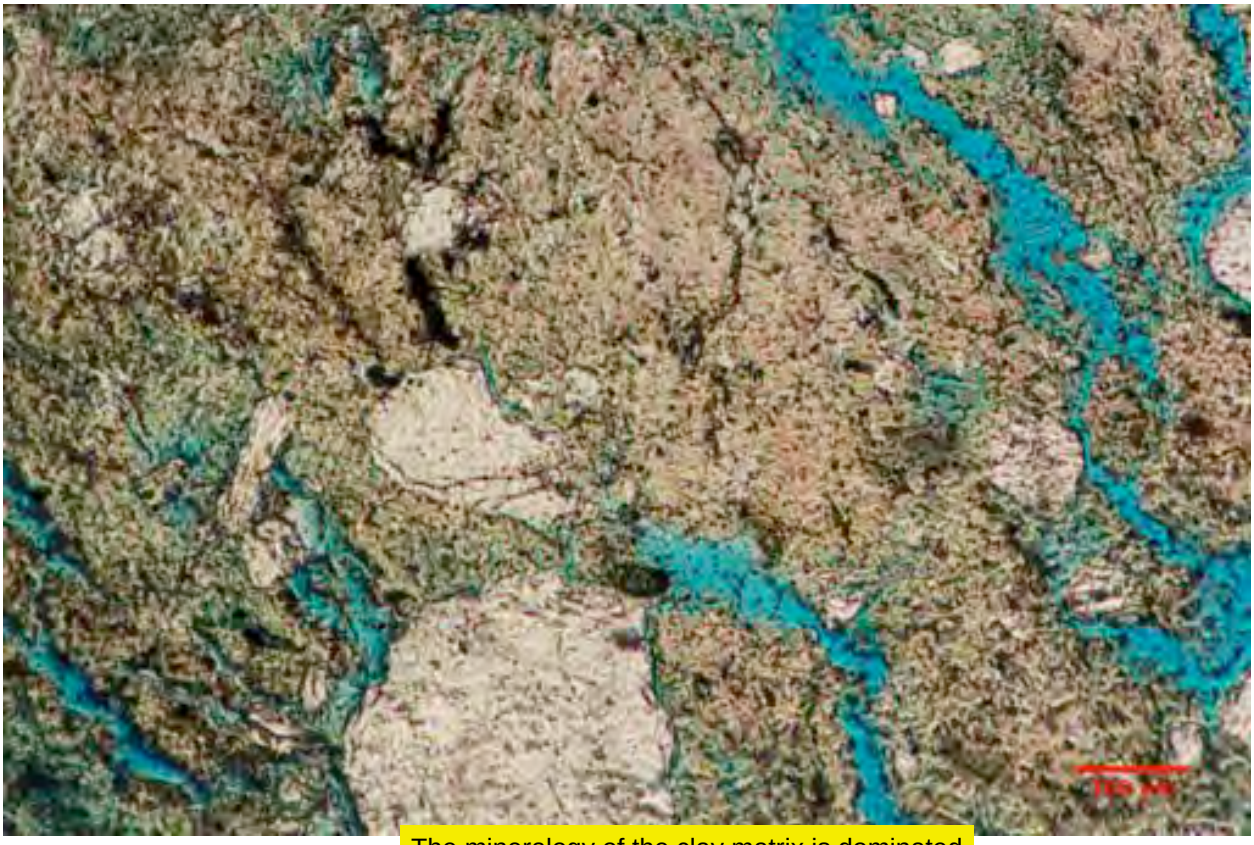
Most of the fracture voids (blue) are likely artifacts of sample preparation

14122-06B



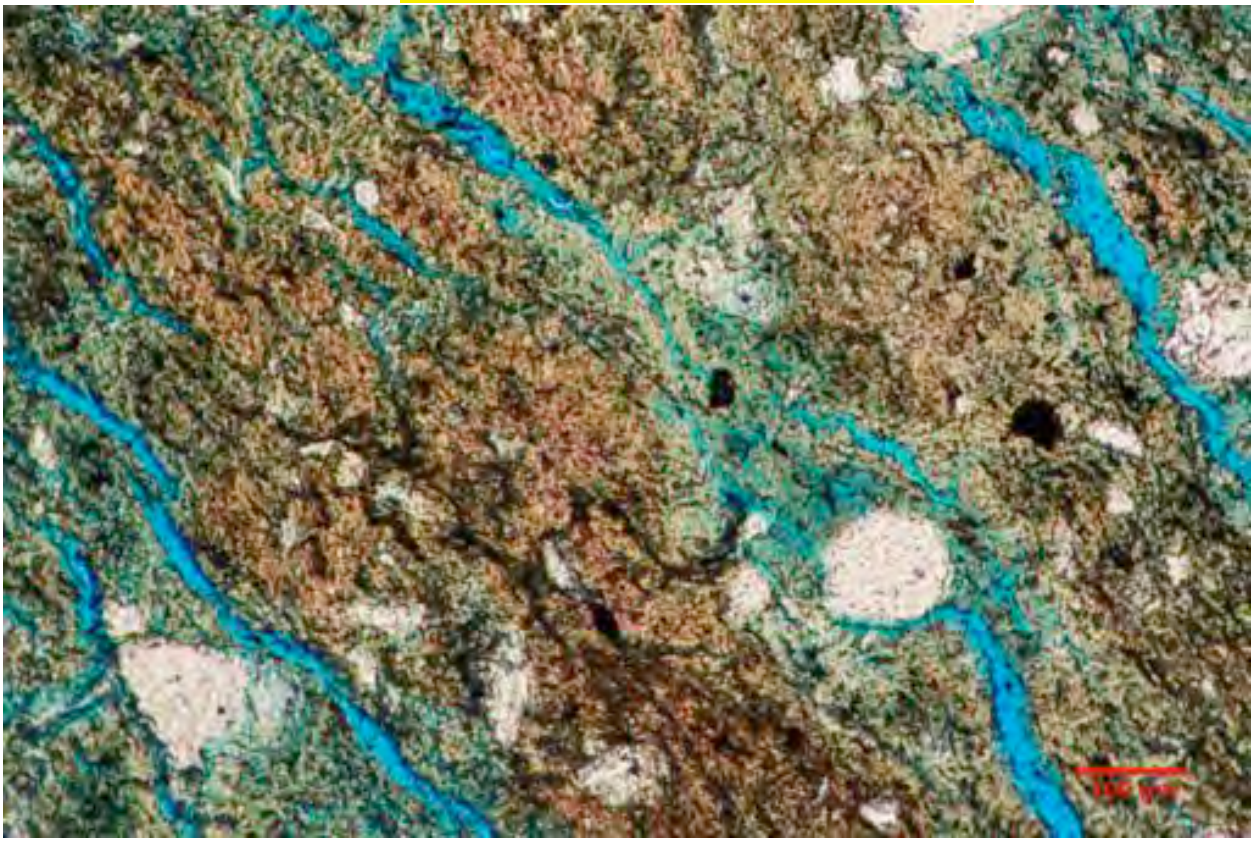
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-006B
Mineralogy, Inc. Job No.: 14122-06

14122-06C



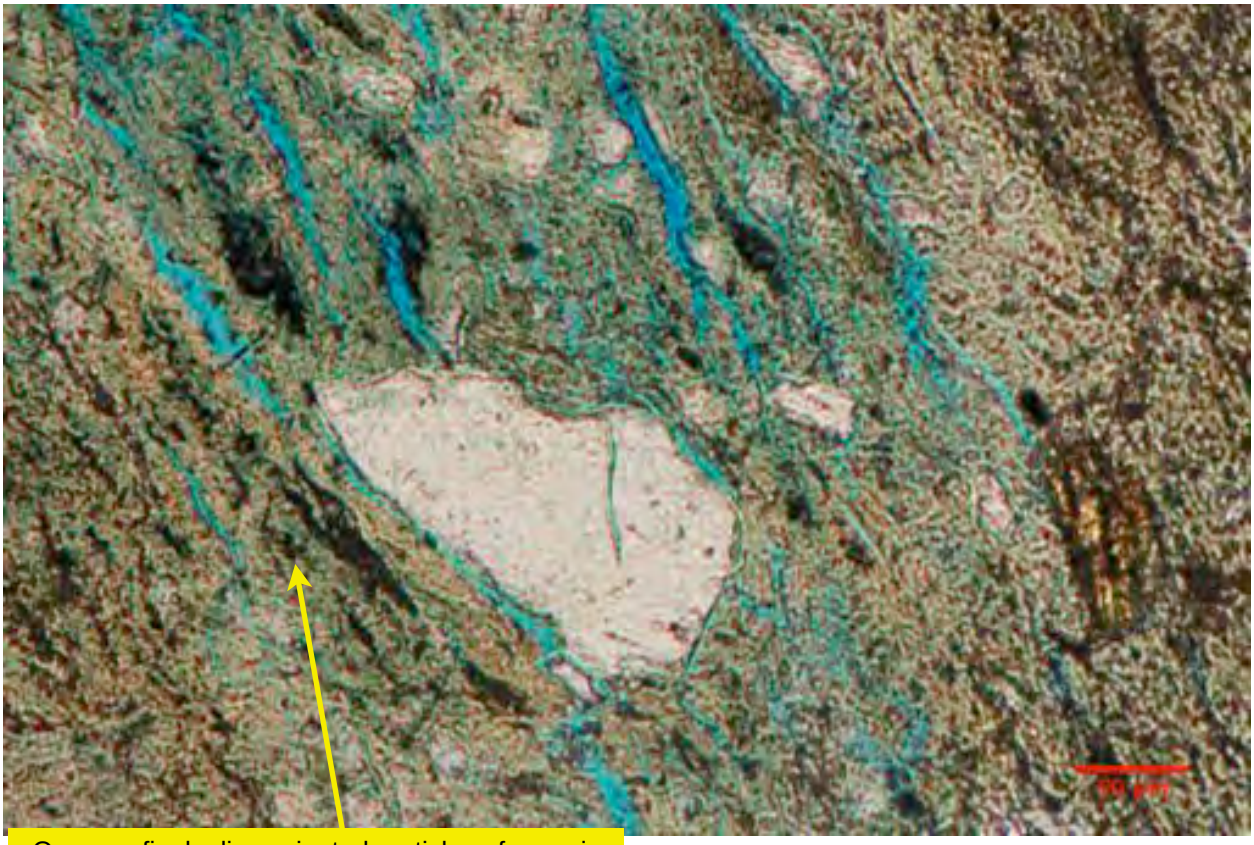
The mineralogy of the clay matrix is dominated by mixed-layered illite/smectite + illite

14122-06D



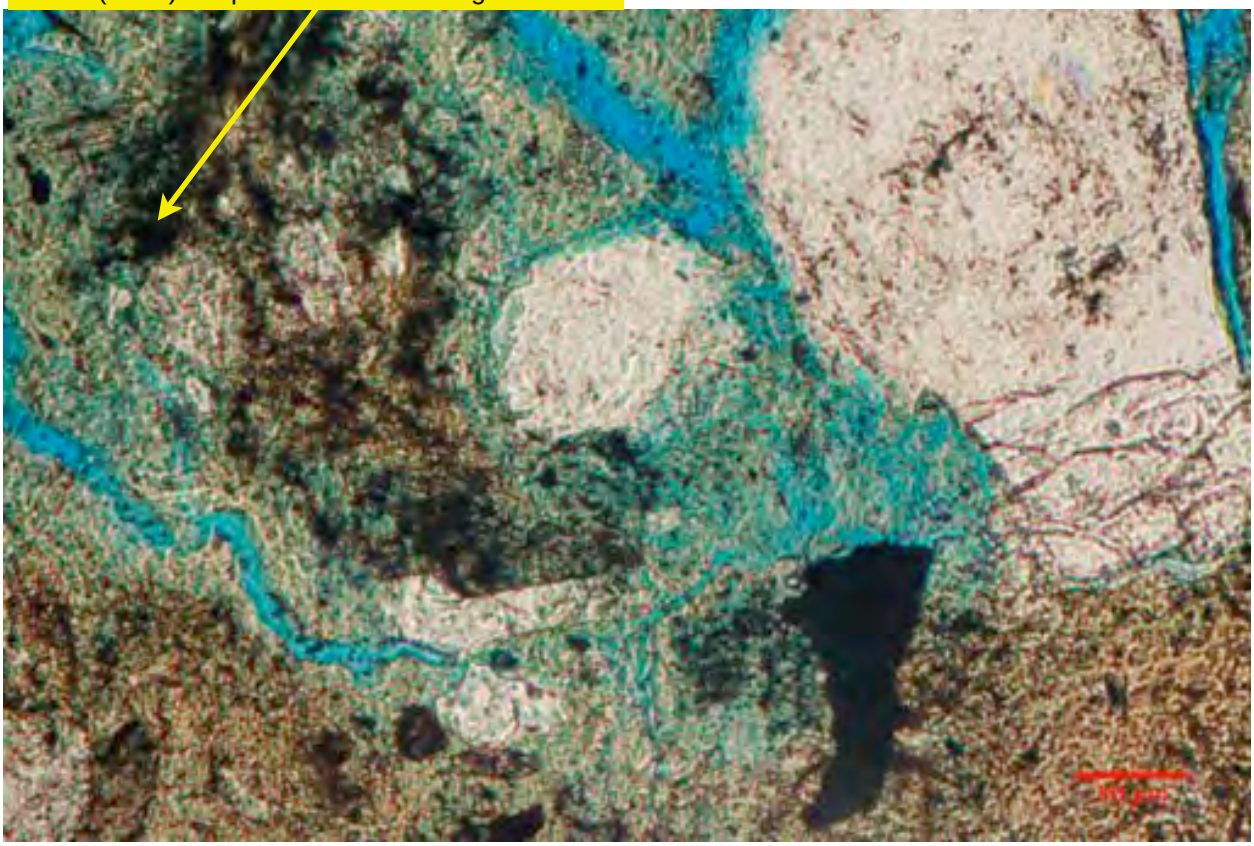
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-006B
Mineralogy, Inc. Job No.: 14122-06

14122-06E



Opaque, finely disseminated particles of organic matter (black) are present in the shale groundmass

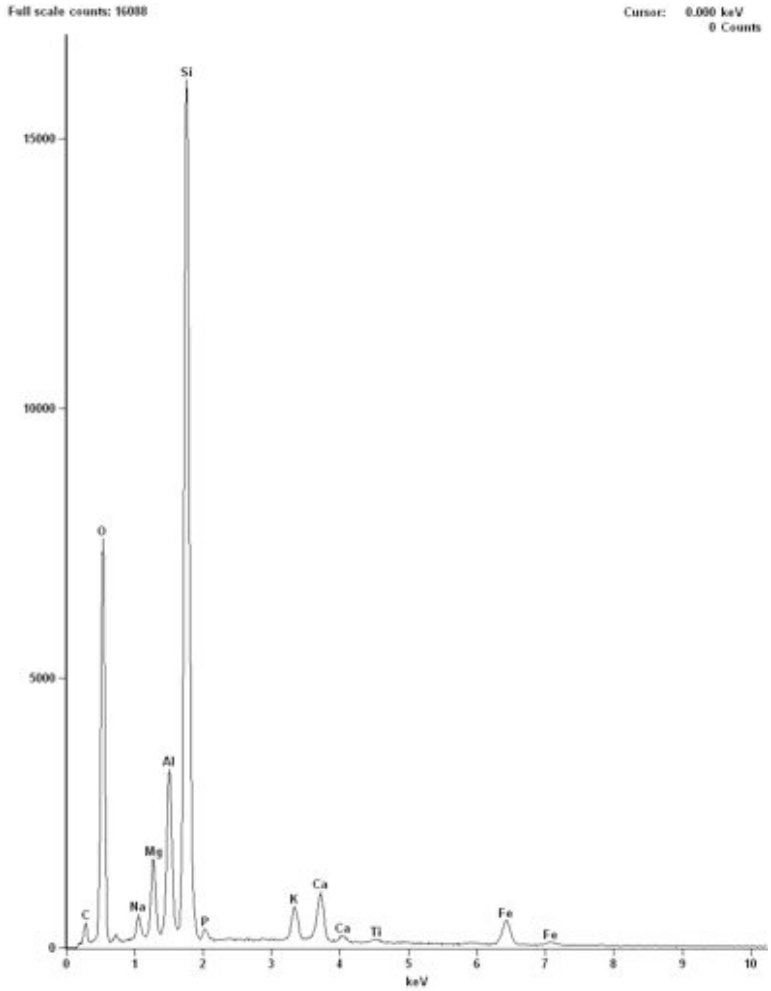
14122-06F



MINERALOGY, INC.

Figure VI.
Energy Dispersive X-Ray Analysis

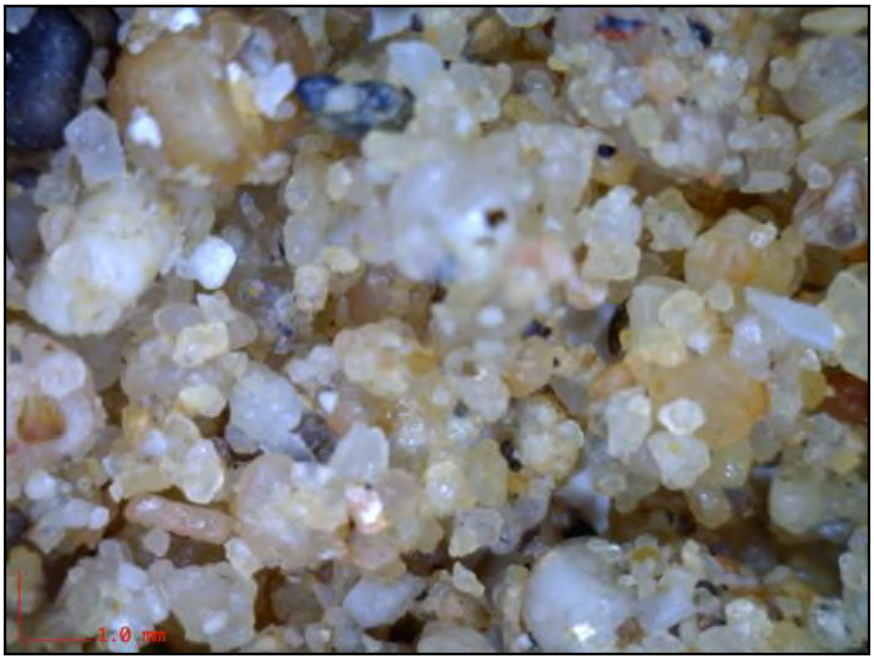
Client:	McCampbell Analytical, Inc.	MI#:	14122-06
Project:	1312545 (Follow-Up to MI#14031)	Location:	N/A



Energy Dispersive X-Ray Results

14122-06	1312545-006B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	8.67	+/-0.31	CO2	31.78
O K	56.18S	---		---
Na K	0.84	+/-0.08	Na2O	1.13
Mg K	2.18	+/-0.06	MgO	3.61
Al K	4.34	+/-0.07	Al2O3	8.19
Si K	21.57	+/-0.10	SiO2	46.14
P K	0.58	+/-0.05	P2O5	1.34
K K	1.16	+/-0.04	K2O	1.39
Ca K	1.93	+/-0.05	CaO	2.7
Ti K	0.23	+/-0.03	TiO2	0.38
Fe K	2.33	+/-0.07	Fe2O3	3.33
	----------			----------
Total	100			100

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-007B
Mineralogy, Inc. Job No.: 14122-07



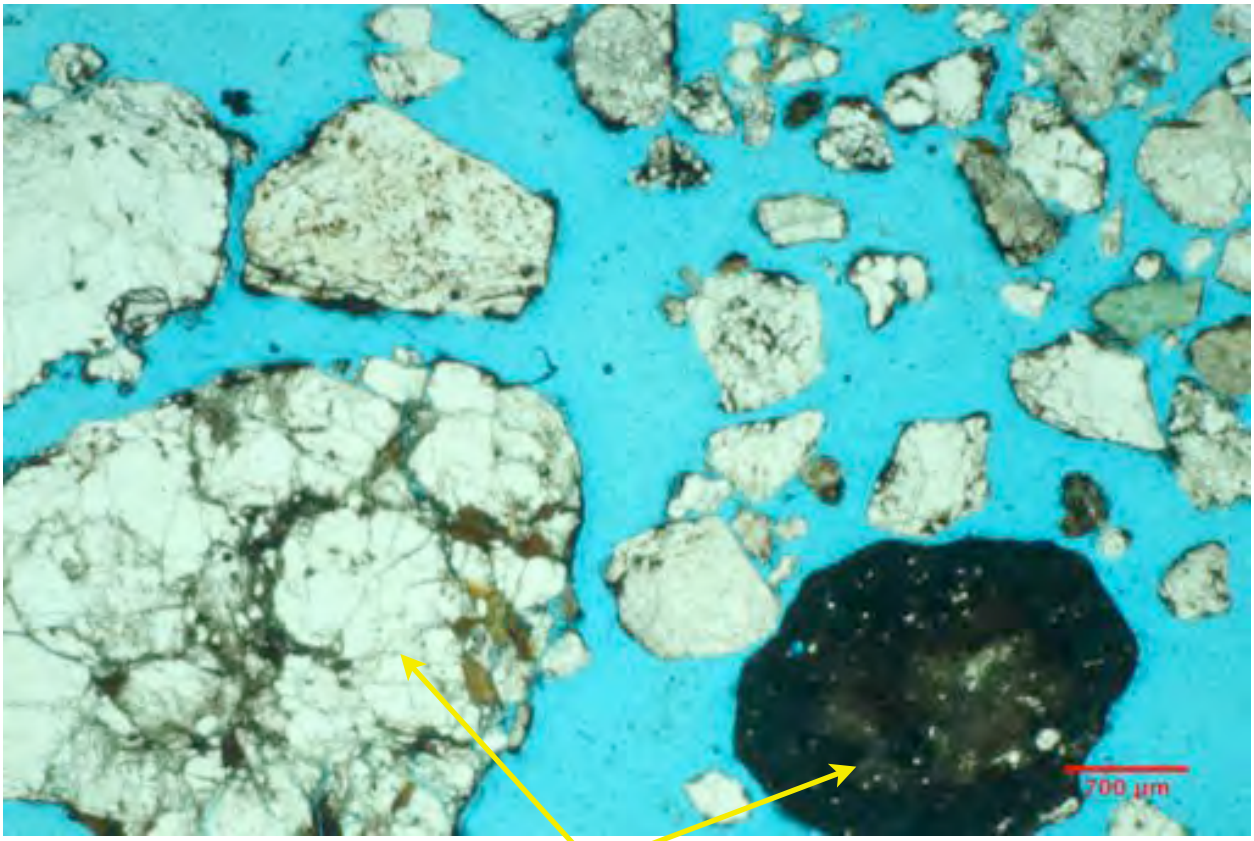
Lithologic Classification	Unconsolidated Lithic Arkosic Sand
Textural Properties	Medium grained (mU), moderately sorted, and subangular to subrounded.
Mean Grain Diameter	~0.46 mm
Max Grain Diameter	4.13 mm
Fabric	Unconsolidated and disaggregated
Detrital Mineralogy	Detrital grain constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and polycrystalline quartz varieties), 2) feldspar (plagioclase > k-feldspar), 3) igneous RFs (including granite and granodiorite RFs), 4) silty mudstone RFs, and 5) apatite.
Cements & Matrix Constituents	This unconsolidated sand sample exhibits evidence of common grain coating detrital clay matrix minerals (probably chloride-rich), + minor amounts of grain replacement authigenic clay associated with leached and partially replaced feldspar grains and igneous RFs. Localized concentrations of iron oxide cement are also present as a late stage cement phase associated with a few of the rock fragment particles in this interval.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545
Sample ID: 1312545-007B
Mineralogy, Inc. Job No.: 14122-07

Pore System	Traces of intraparticle dissolution porosity are also present in association with a few of the leached feldspar grains.

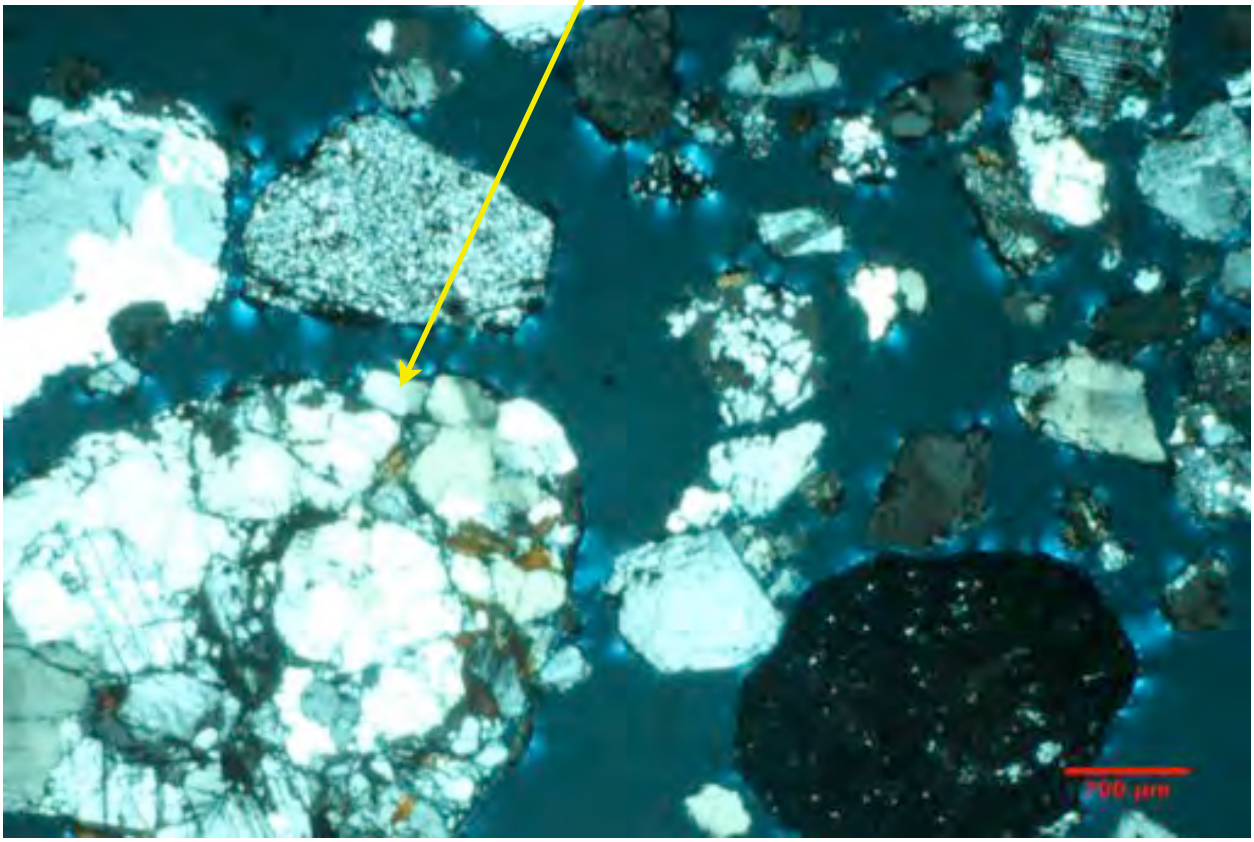
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-007B
Mineralogy, Inc. Job No.: 14122-07

14122-07A



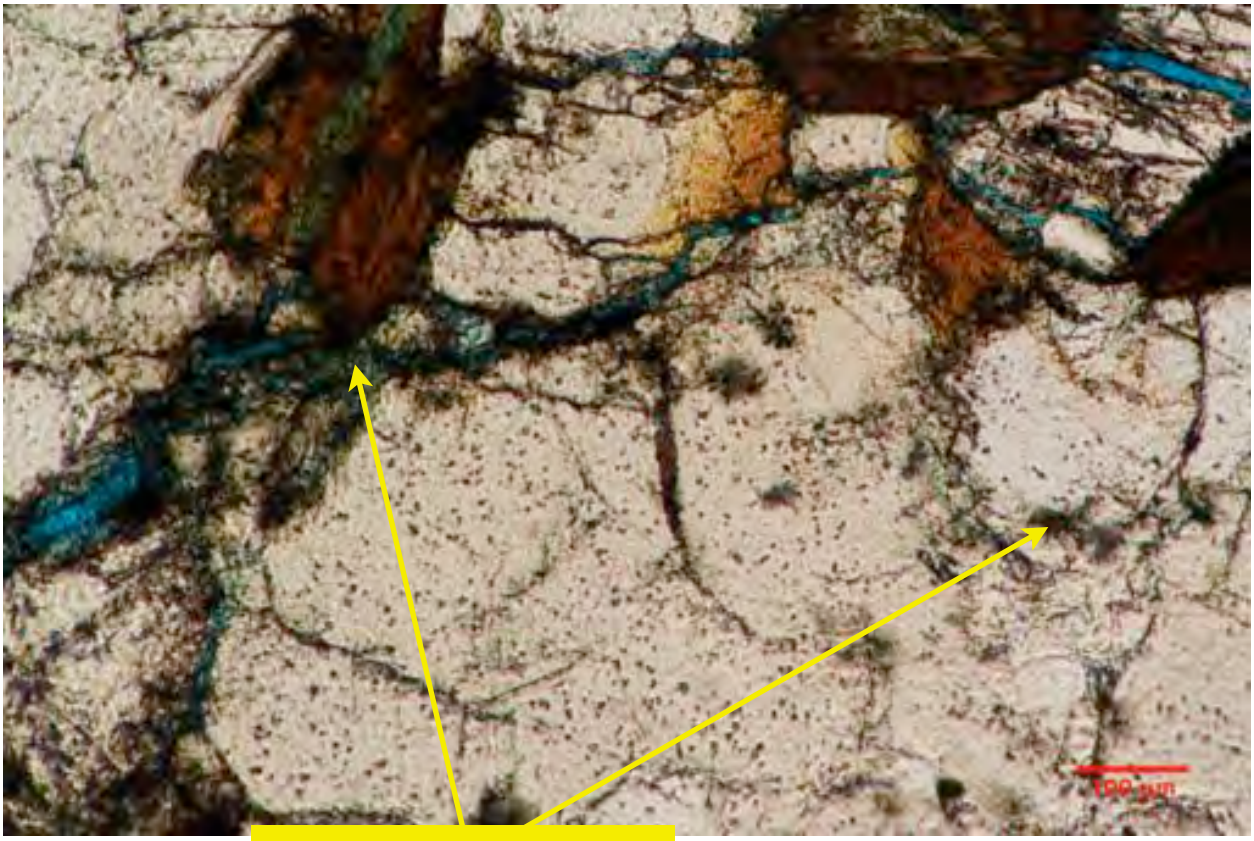
Igneous rock fragments (RFs)

14122-07B



Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-007B
Mineralogy, Inc. Job No.: 14122-07

14122-07C

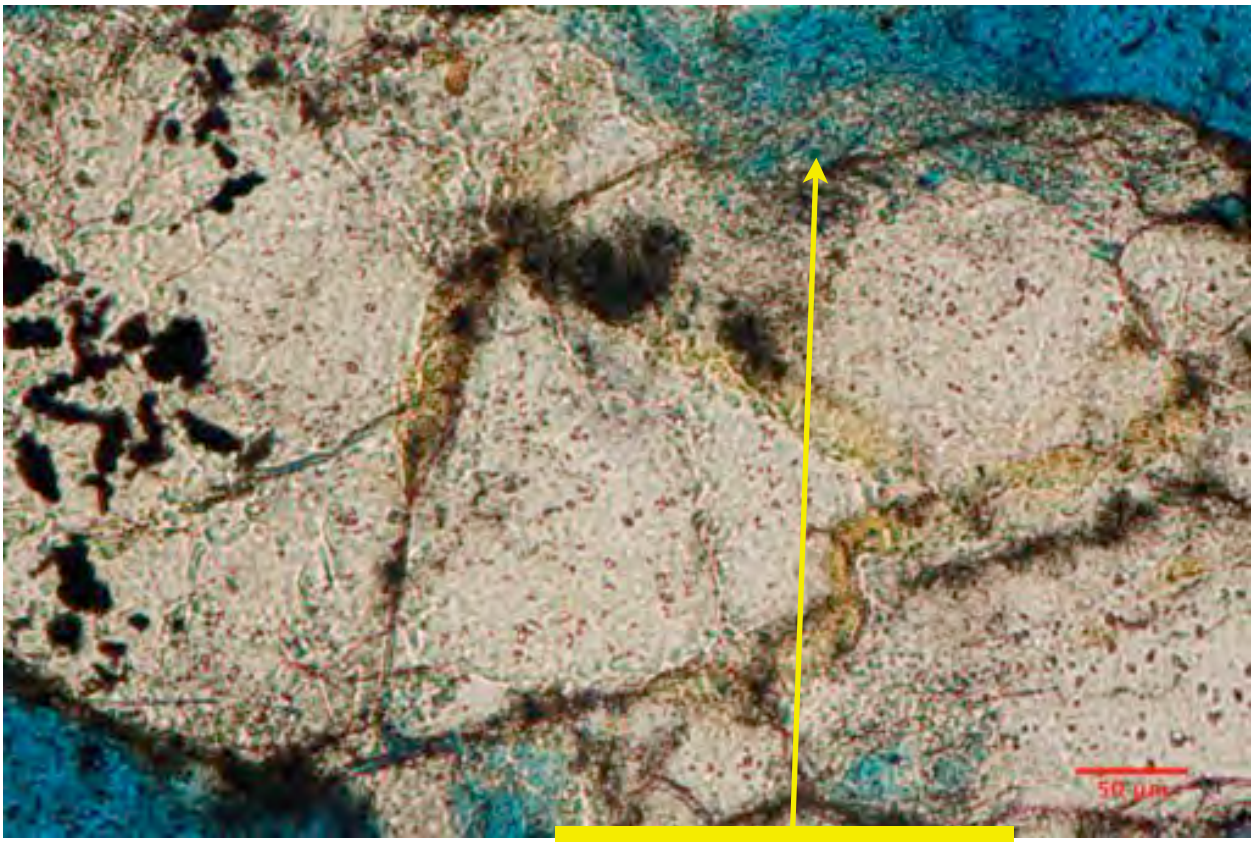


Authigenic grain-replacement clay within a leached granite RF

14122-07D

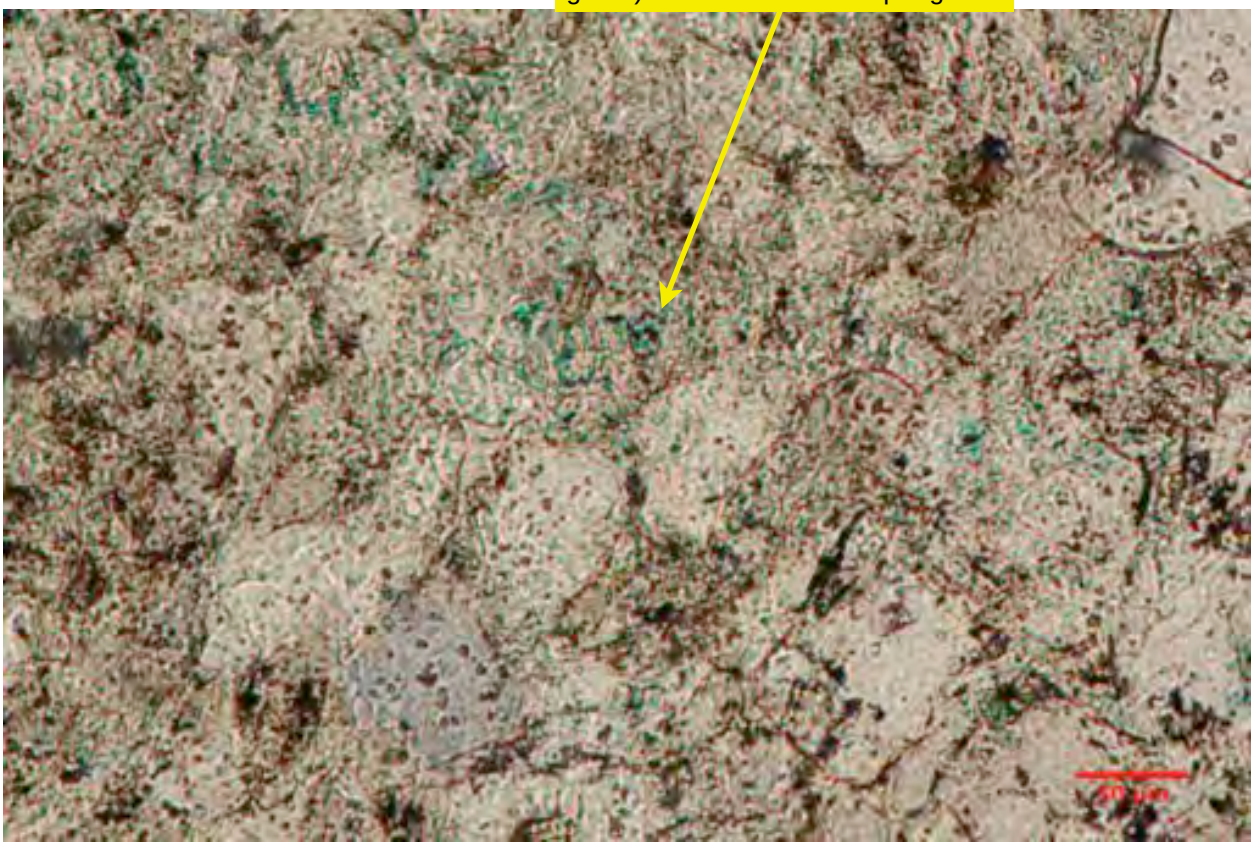
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312545; Sample ID: 1312545-007B
Mineralogy, Inc. Job No.: 14122-07

14122-07E



Cleavage plane dissolution (blue-green) within leached feldspar grains

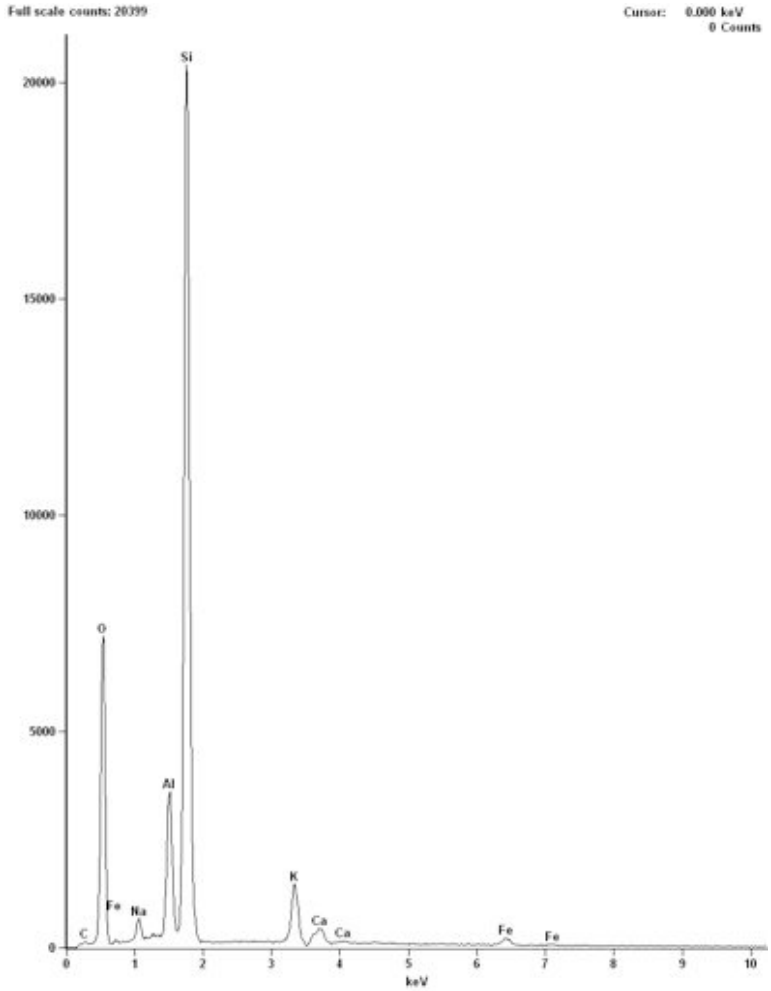
14122-07F



MINERALOGY, INC.

Figure VII.
Energy Dispersive X-Ray Analysis

Client:	McCampbell Analytical, Inc.	MI#:	14122-07
Project:	1312545 (Follow-Up to MI#14031)	Location:	N/A



Energy Dispersive X-Ray Results

14122-07	1312545-007B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	2.49	+/-0.26	CO2	9.13
O K	51.60S	---		---
Na K	1.57	+/-0.07	Na2O	2.11
Al K	5.2	+/-0.06	Al2O3	9.82
Si K	33.54	+/-0.13	SiO2	71.75
K K	3.56	+/-0.05	K2O	4.29
Ca K	1.09	+/-0.05	CaO	1.53
Fe K	0.96	+/-0.07	Fe2O3	1.37
	----------			----------
Total	100			100

MINERALOGY, INC.

Final Test Report

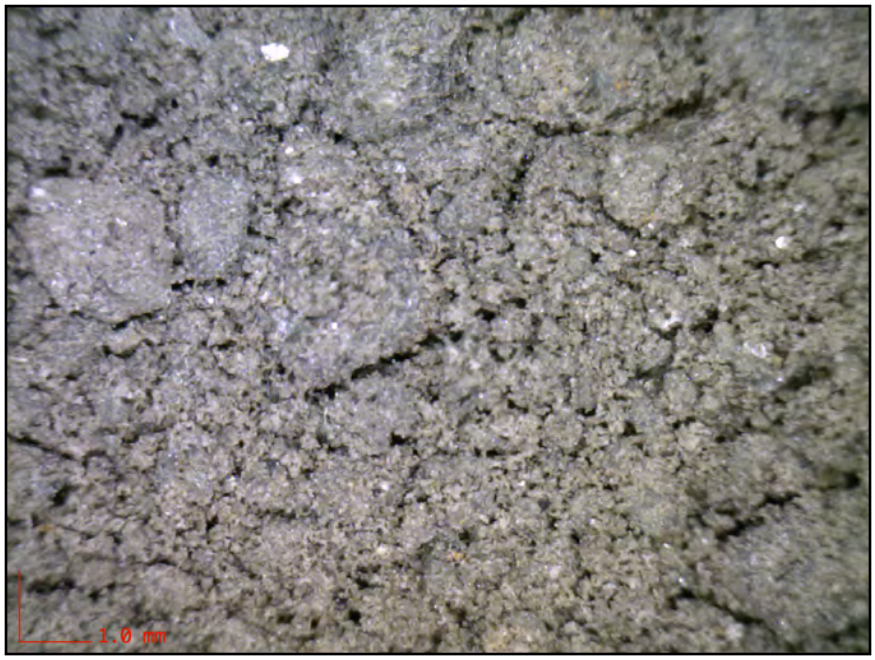
Client:	McCampbell Analytical, Inc.	MI#:	14123
Project:	1312650 (Follow-Up to MI# 14032)	Sample Type:	Sediments
Location:	N/A	Date:	05.05.14

Contact	Alan Santistevan
Address	McCampbell Analytical, Inc.
	1534 Willow Pass Road
	Plttsburg, CA 94565
E-mail	alan.santistevan@mccampbell.com
Phone	925.252.9262
Project ID:	1312650 (Follow-Up to MI# 14032)
Test Methods	EDX & TSD (x3)
Calibration Date	05.05.14
MI Lab Supervisor	
	Timothy B. Murphy

CONDITIONS AND QUALIFICATIONS

Mineralogy, Inc. will endeavor to provide accurate and reliable laboratory measurements of the samples provided by the client. The results of any x-ray diffraction, petrographic or core analysis test are necessarily influenced by the condition and selection of the samples to be analyzed. It should be recognized that geological samples are commonly heterogeneous and lack uniform properties. Mineralogical, geochemical and/or petrographic data obtained for a specific sample provides compositional data pertinent to that specific sampling location. Such "site-specific data" may fail to provide adequate characterization of the range of compositional variability possible within a given project area, thus the "projection" of these laboratory findings and values to adjoining, "untested" areas of the formation or project area is inherently risky, and exceeds the scope of the laboratory work request. Hence, Mineralogy, Inc. shall not assume any liability risk or responsibility for any loss or potential failure associated with the application of "site or sample-specific laboratory data" to "untested" areas of the formation or project area. Unless otherwise directed, the samples selected for analysis will be chosen to reflect a visually representative portion of the bulk sample submitted for analysis. Where provided, the interpretation of x-ray diffraction, petrographic or core analysis results constitutes the best geological judgment of Mineralogy, Inc., and is subject to the sampling limitations described above, and the detection limits inherent to semi-quantitative and/or qualitative mineralogical and microscopic analysis. Mineralogy, Inc. assumes no responsibility nor offers any guarantee of the productivity, suitability or performance of any oil or gas well, hydrocarbon recovery process, dimension stone, and/or ore material based upon the data or conclusions presented in this report.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650
Sample ID: 1312650-001B
Mineralogy, Inc. Job No.: 14123-01



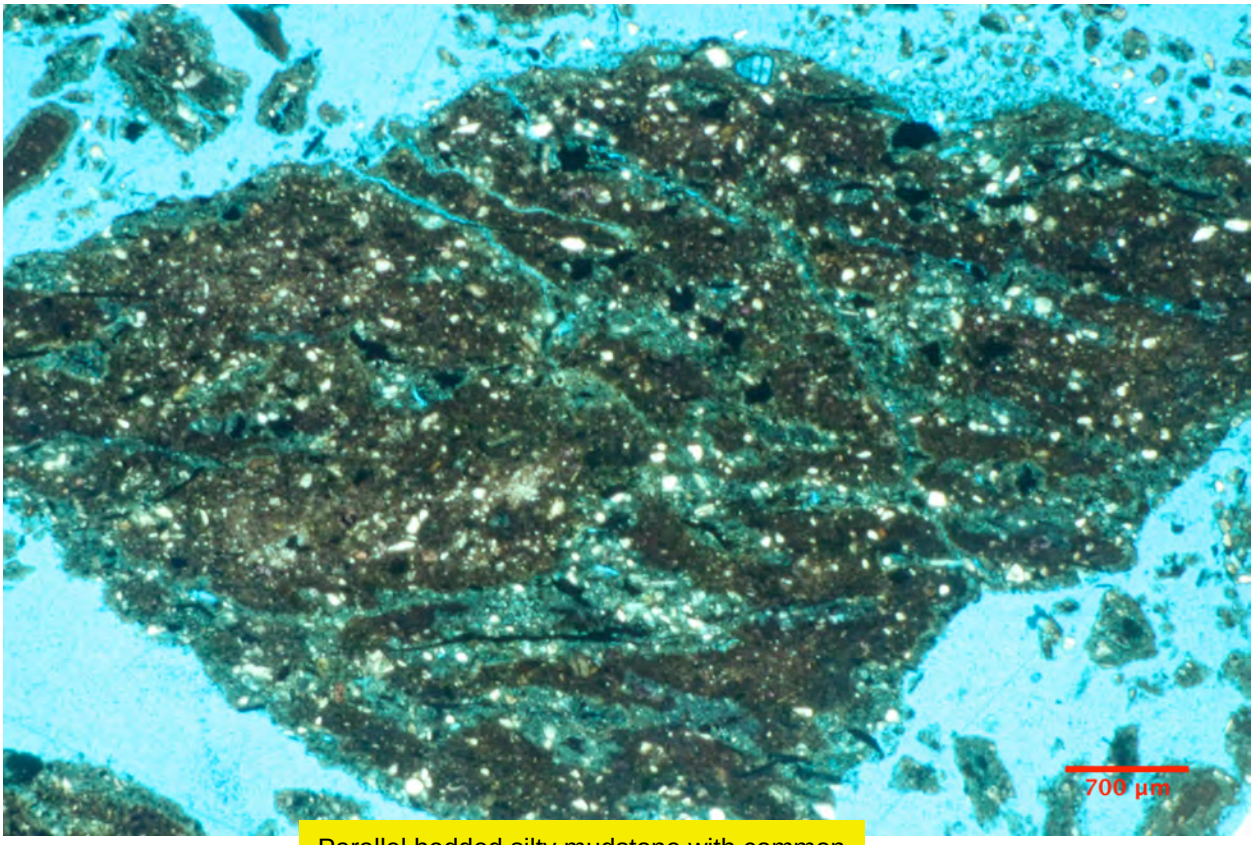
Lithologic Classification	Silty Mudstone
Textural Properties	Coarse silt-sized, very poorly sorted, and subangular. Scattered quartz-rich sand grains are also locally present within the fabric of the mudstone.
Mean Grain Diameter	~0.045 mm
Max Grain Diameter	0.33 mm
Fabric	The mudstone sample is matrix supported, massively to parallel bedded, and partially disaggregated. Individual fragments of silty mudstone exhibit evidence of fracture strain attributed to desiccation of the clay matrix during sample preparation. The detrital silt and sand grains are irregularly distributed within the groundmass.
Detrital Mineralogy	Detrital grain constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and minor polycrystalline quartz varieties), 2) irregular particles of organic matter, 3) feldspar (plagioclase > k-feldspar), 4) mudstone and shale RFs, 5) chert RFs, and 6) mica laths.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650
Sample ID: 1312650-001B
Mineralogy, Inc. Job No.: 14123-01

Cements & Matrix Constituents	The groundmass is clay-rich & dominated by mixed layered illite/smectite coupled with subordinate amounts of illite, chlorite, and kaolinite. The mixed layered clay is a randomly ordered clay hybrid with sub-equal amounts of montmorillonite and illite. Pyrite is common as a replacement associated with altered particles of organic matter contained in this sediment.
Weathering Properties	A few of the feldspar grains exhibit evidence of intraparticle dissolution and clay replacement. Pyrite cement is common as a replacement associated with organic particles.
Pore System	The void volume of this mudstone interval is dominated by intercrystalline microporosity coupled with minor amounts of sheltered intergranular porosity and intraparticle dissolution void space. Most of the sheltered void space is associated with clusters of silt and/or sand grains incorporated within the mudstone fabric. The total void volume is visually estimated to range from ~8-11% of the bulk volume.

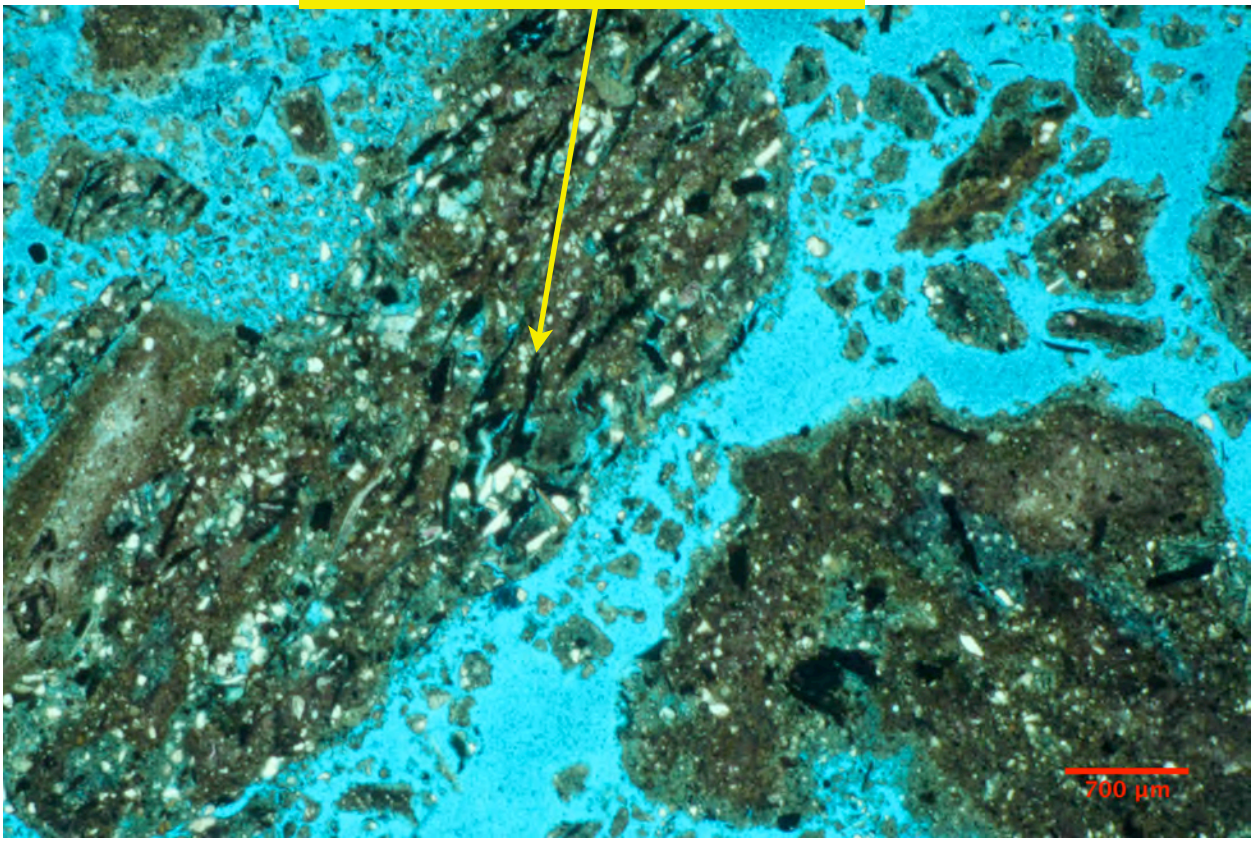
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650; Sample ID: 1312650-001B
Mineralogy, Inc. Job No.: 14123-01

14123-01A



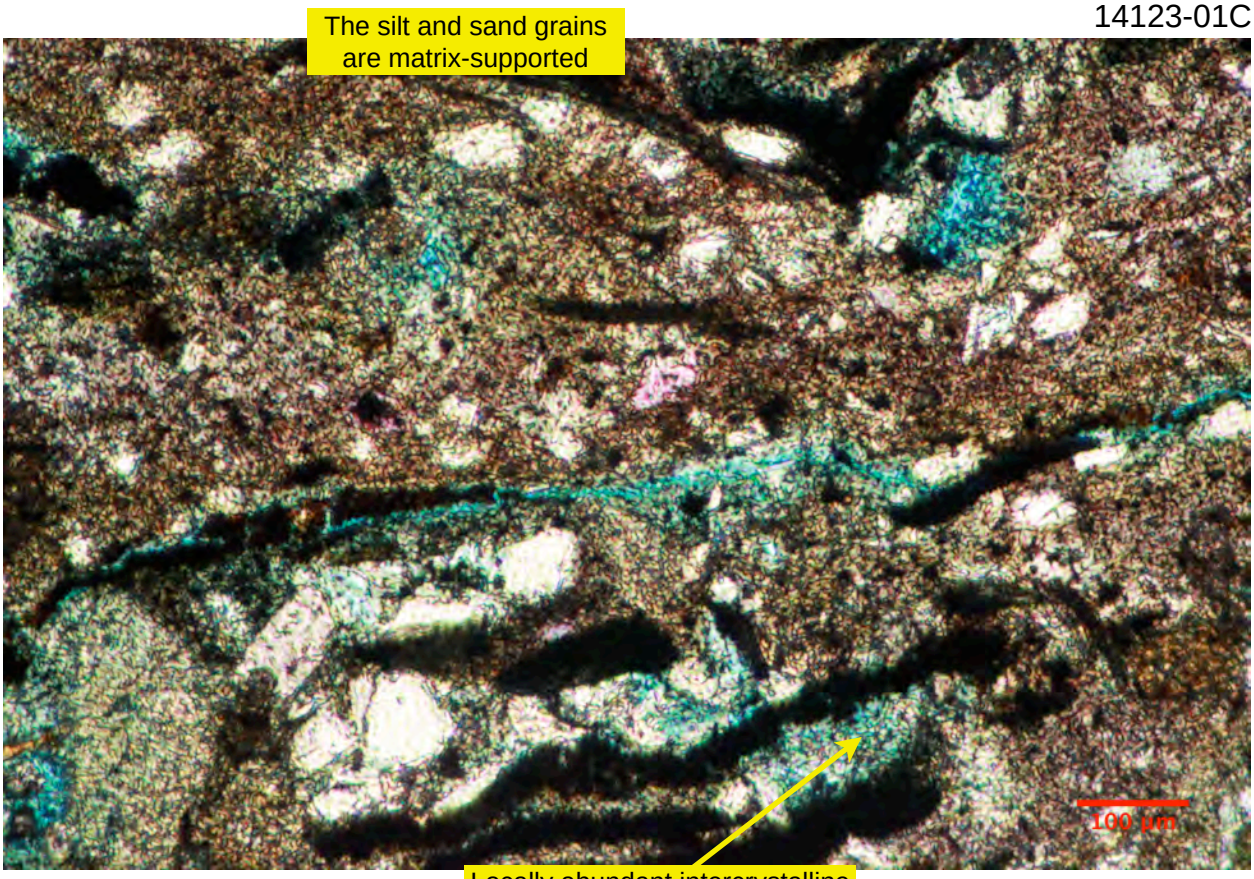
Parallel bedded silty mudstone with common lens-shaped particles of organic matter (black)

14123-01B

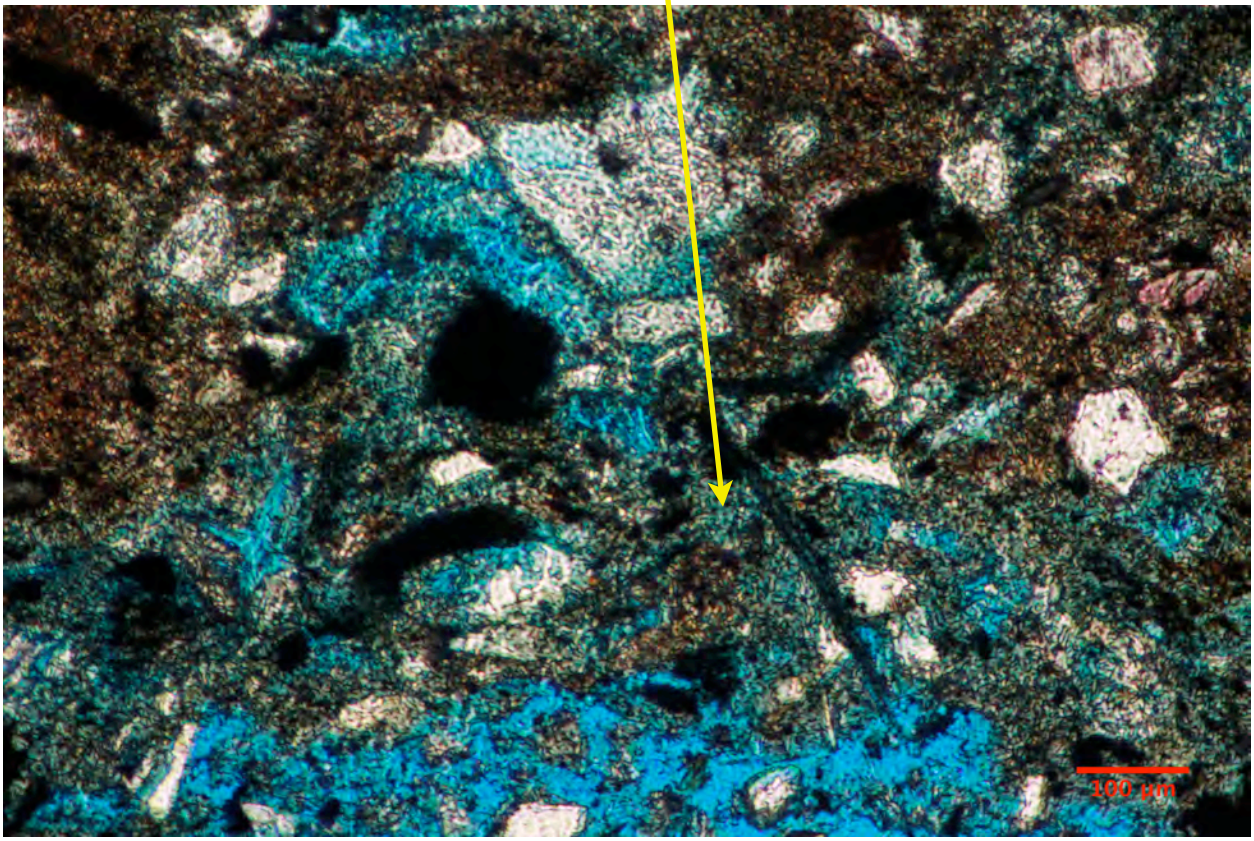


Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650; Sample ID: 1312650-001B
Mineralogy, Inc. Job No.: 14123-01

14123-01C

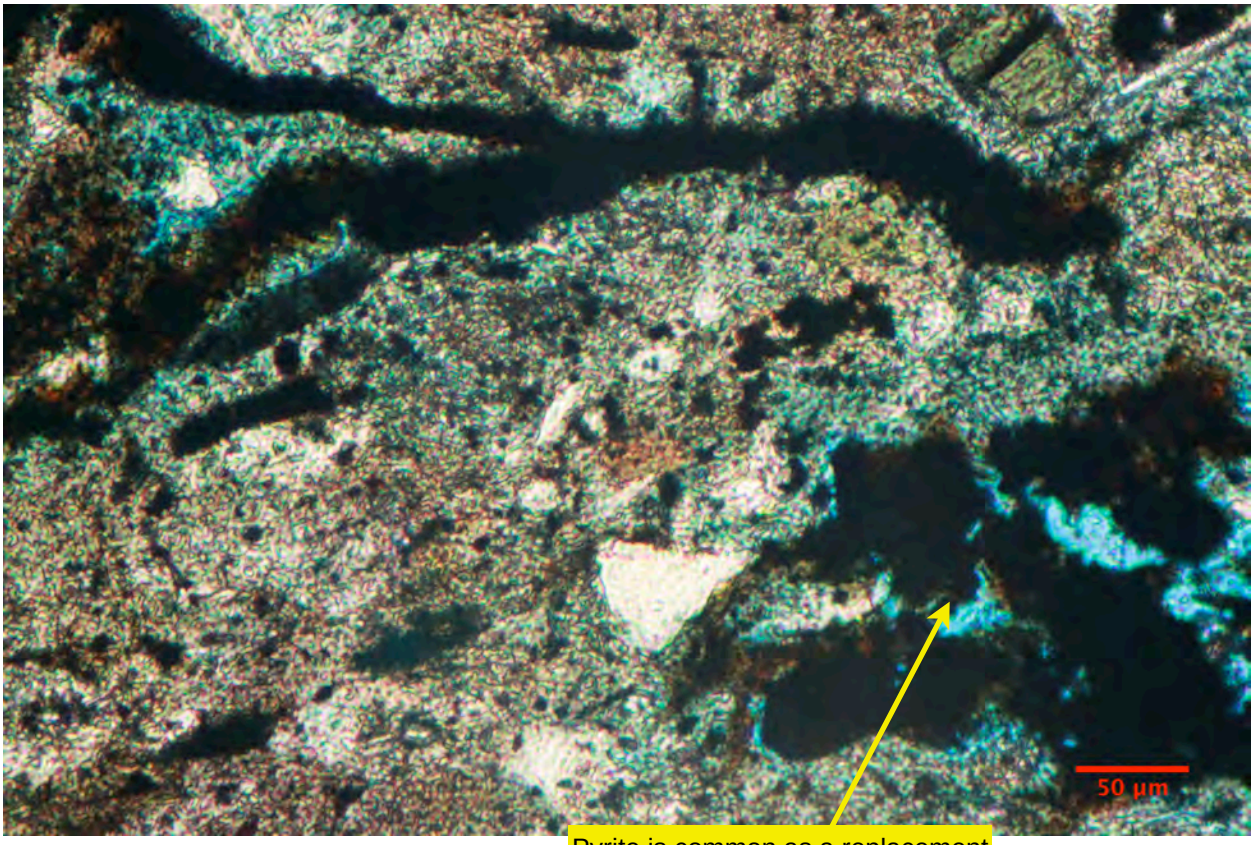


14123-01D



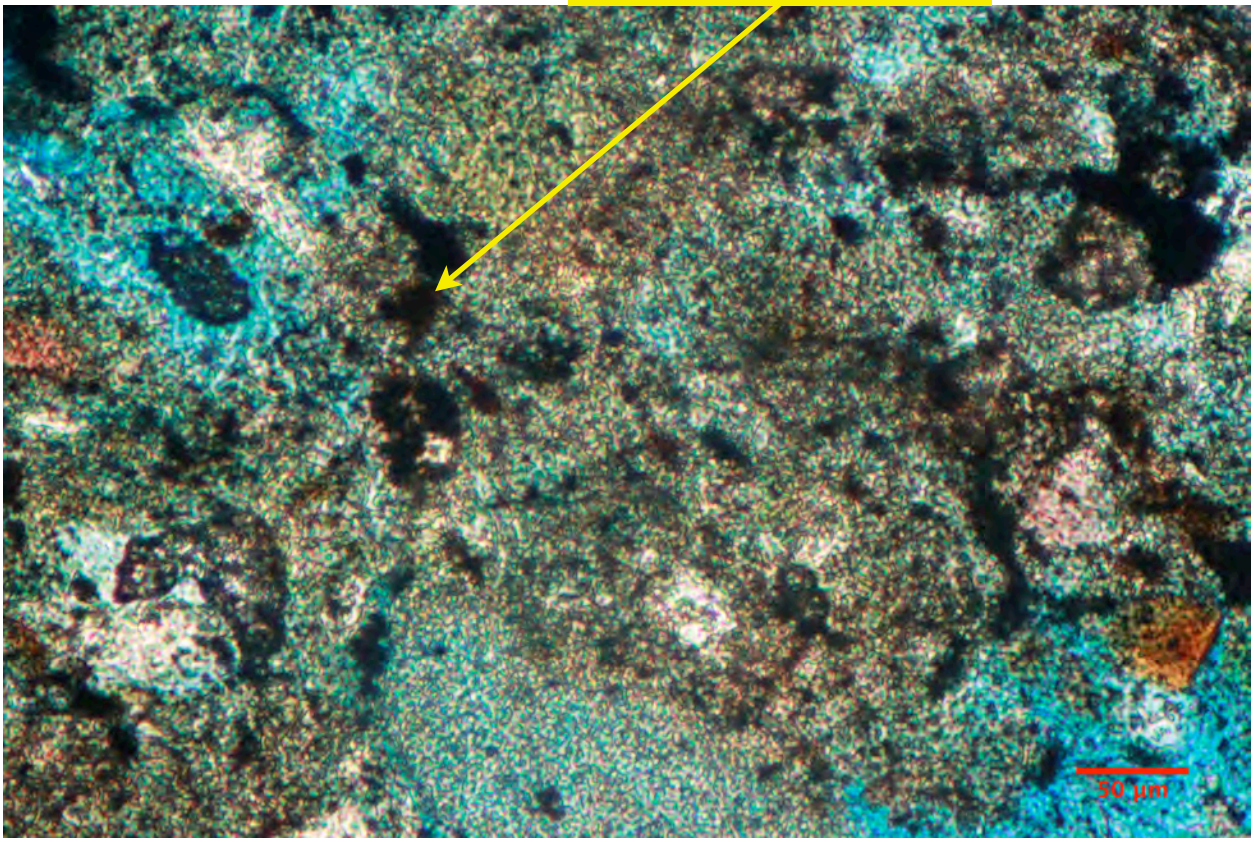
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650; Sample ID: 1312650-001B
Mineralogy, Inc. Job No.: 14123-01

14123-01E



Pyrite is common as a replacement for organic matter particles

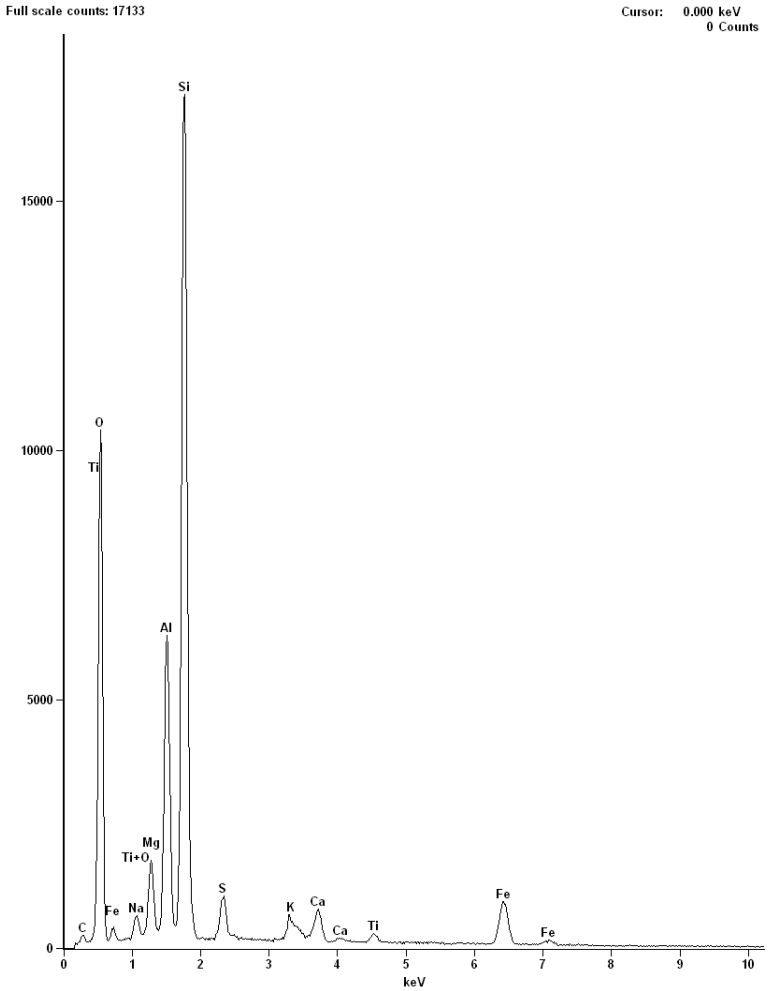
14123-01F



MINERALOGY, INC.

Figure I.
Energy Dispersive X-Ray Analysis

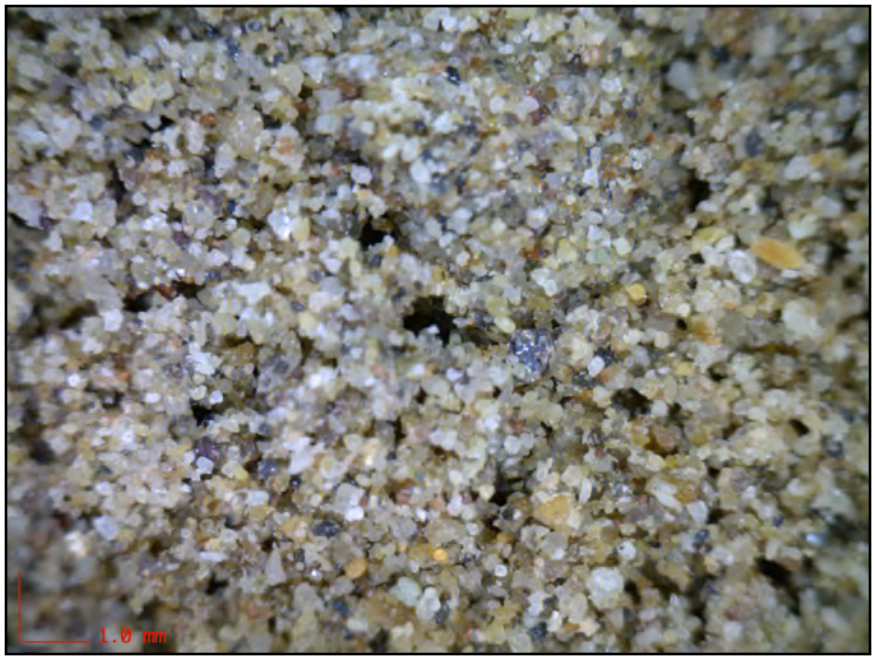
Client:	McCampbell Analytical, Inc.	MI#:	14123-01
Project:	1312650 (Follow-Up to MI# 14032)	Location:	N/A



Energy Dispersive X-Ray Results

14123-01	1312650-001B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	4.62	+/-0.31	CO2	16.93
O K	52.78S	---		---
Na K	0.92	+/-0.08	Na2O	1.24
Mg K	2.23	+/-0.06	MgO	3.7
Al K	8.03	+/-0.08	Al2O3	15.16
Si K	23.14	+/-0.10	SiO2	49.49
S K	1.64	+/-0.04	SO3	4.09
K K	0.88	+/-0.04	K2O	1.07
Ca K	1.15	+/-0.04	CaO	1.61
Ti K	0.44	+/-0.04	TiO2	0.74
Fe K	4.17	+/-0.08	Fe2O3	5.96
	----------			----------
Total	100			100

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650
Sample ID: 1312650-002B
Mineralogy, Inc. Job No.: 14123-02



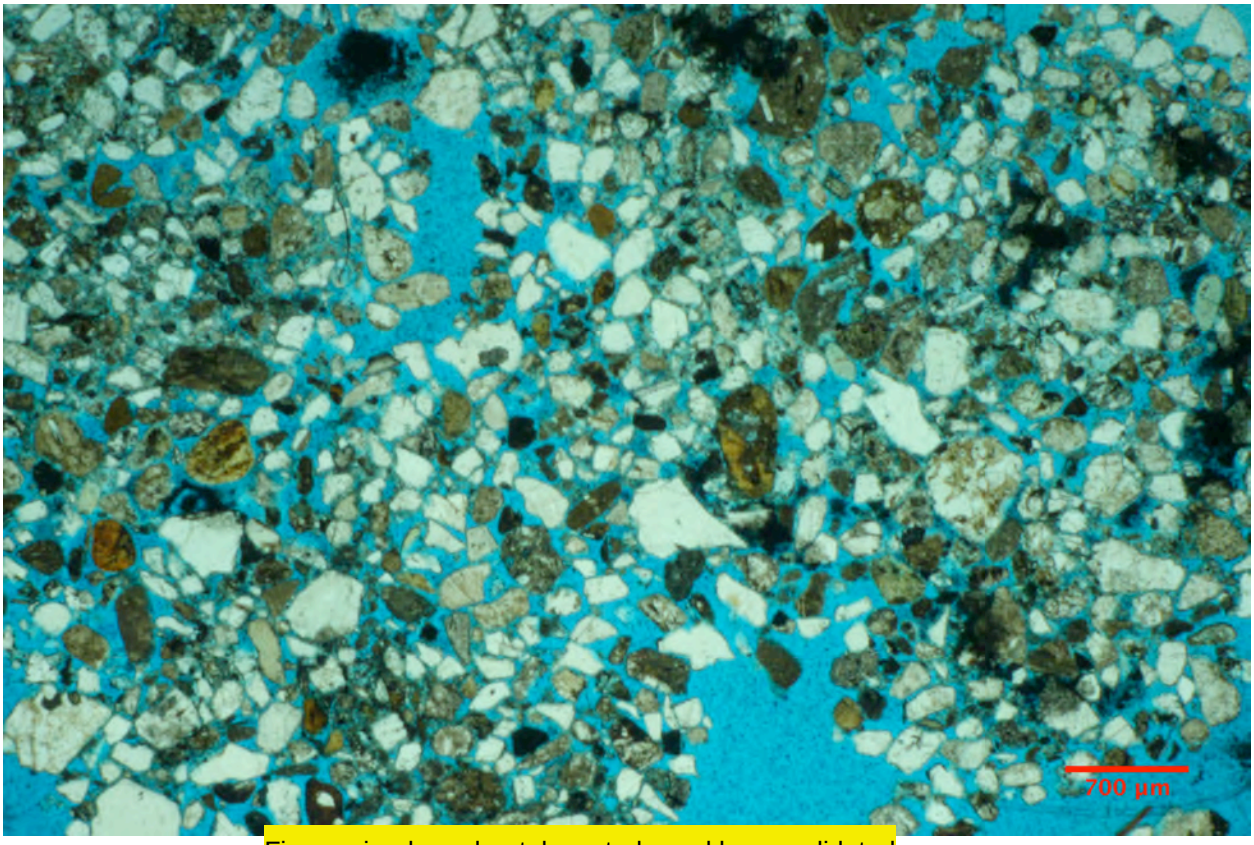
Lithologic Classification	Lithic Arkosic Sandstone
Textural Properties	Fine grained (fL-fU), moderately sorted, and subangular. Locally significant amounts of microcrystalline pore filling and grain coating clay are locally present throughout the pore system of this sand specimen.
Mean Grain Diameter	~0.16 mm
Max Grain Diameter	0.85 mm
Fabric	This sandstone sample is characterized as massively bedded, mildly compacted, and weakly consolidated. The sandstone is grain supported and exhibits common point-to-point and elongated intergranular contacts as well as trace indications of plastically deformed shale and mudstone RFs which locally grade into pseudomatrix.
Detrital Mineralogy	Detrital grain constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and polycrystalline quartz varieties), 2) silty shale and mudstone RFs, 3) igneous RFs (including common rhyolite RFs), 4) chert RFs, 5) feldspar (plagioclase > k-feldspar), 6) hornblende, 7) organic matter particles, 8) biotite mica, and 9) augite.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650
Sample ID: 1312650-002B
Mineralogy, Inc. Job No.: 14123-02

Cements & Matrix Constituents	Detrital clay matrix is common within this sand specimen occurring as microporous clusters of pore filling and grain coating matrix which are loosely adhered to the grain surfaces. The clay matrix exhibits a mineralogy that is dominated by mixed layered illite/smectite coupled with subordinate amounts of illite and chlorite. Minor amounts of authigenic clay are locally present as replacements associated with leached feldspar grains and RFs. Traces of pyrite cement are present as a common replacement associated with particles of organic matter.
Pore System	Void types contained within this specimen include common intergranular macropores, intercrystalline macroporosity, and minor amounts of intraparticle dissolution void space. The total void volume is visually estimated to range between ~19-21% of the bulk volume within the consolidated sandstone fragments from this interval.

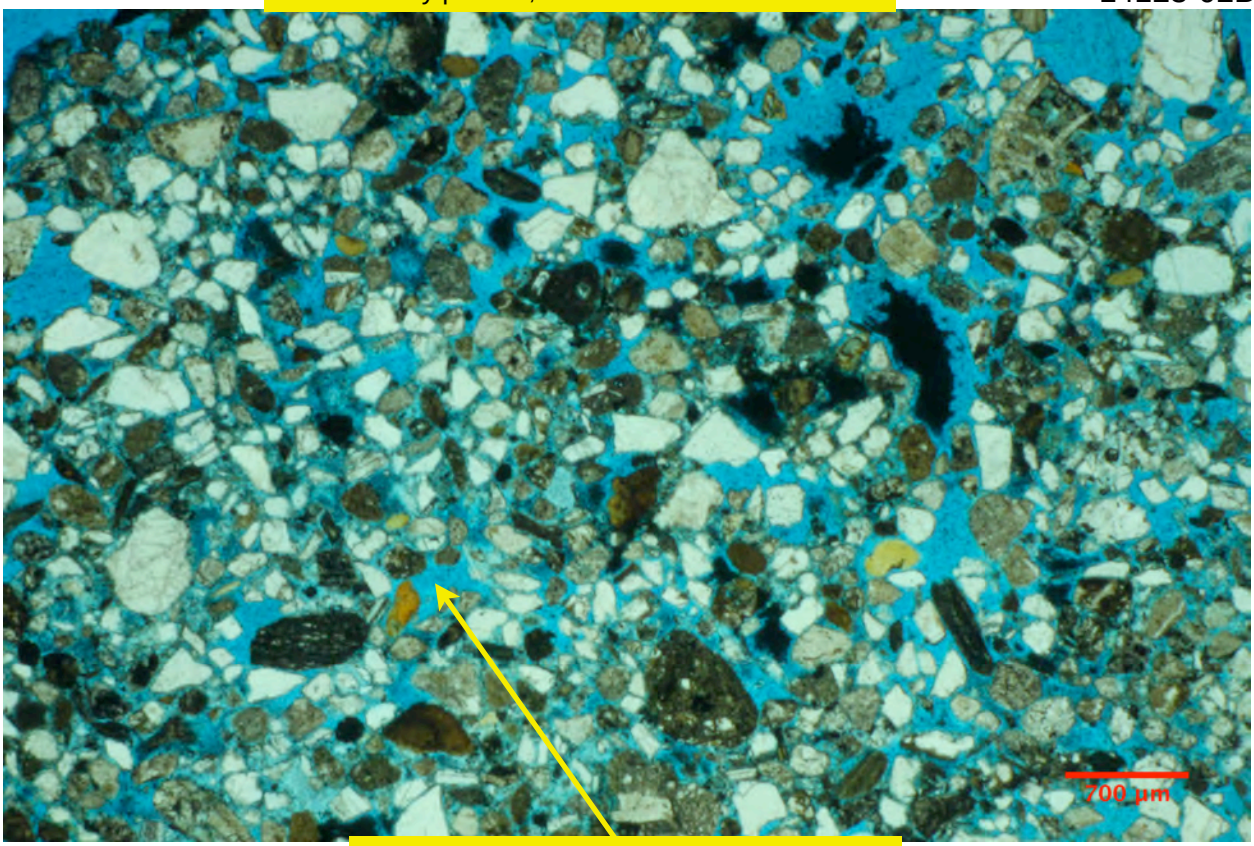
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650; Sample ID: 1312650-002B
Mineralogy, Inc. Job No.: 14123-02

14123-02A



Fine-grained, moderately sorted, weakly consolidated
& mildly packed, lithic arkosic sandstone

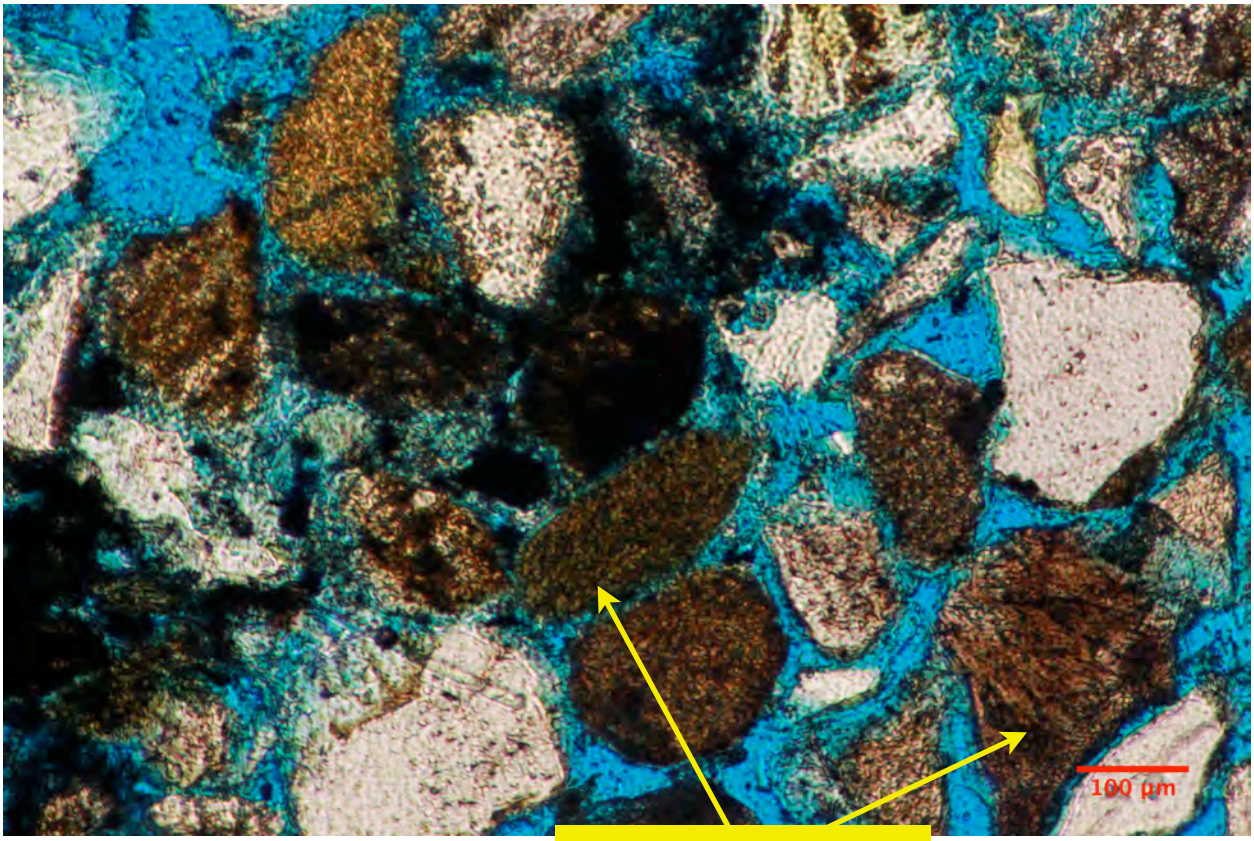
14123-02B



Abundant intergranular macroporosity (blue)

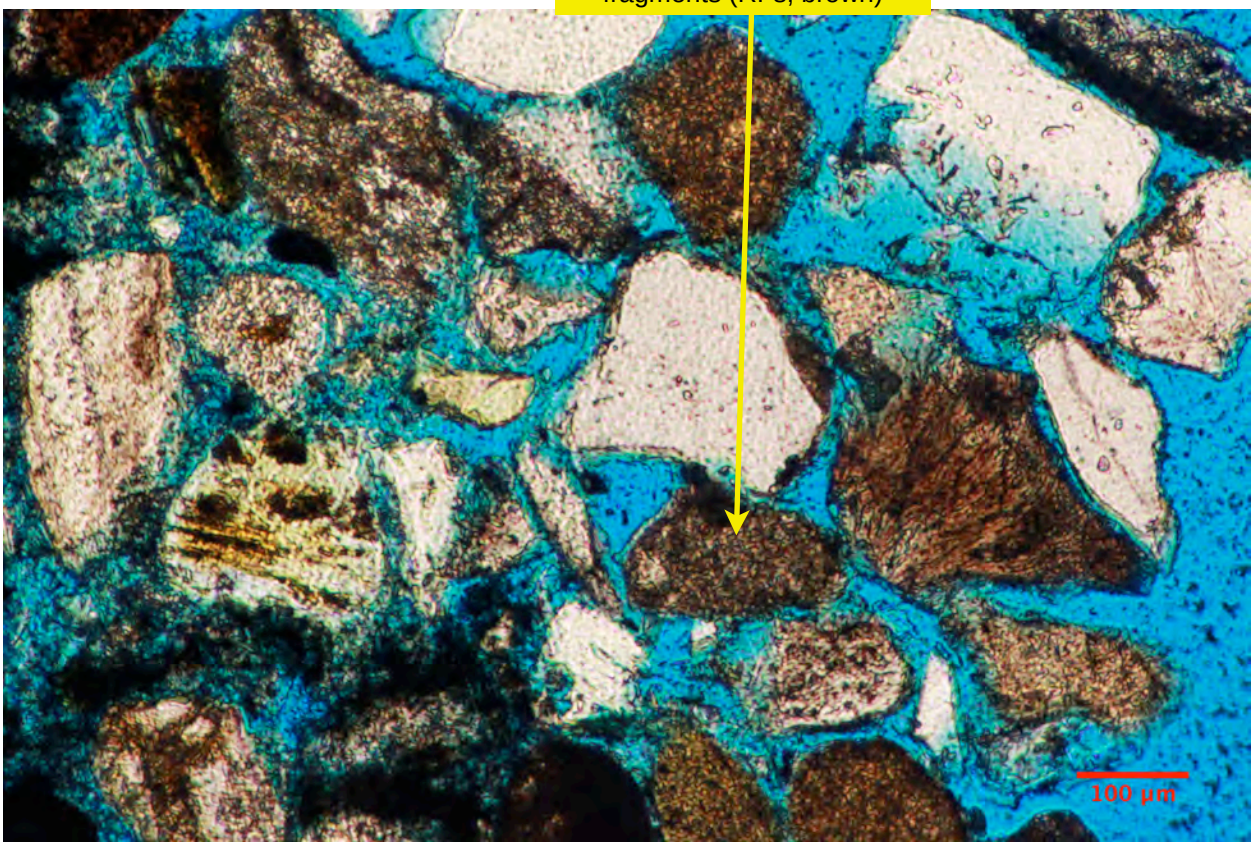
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650; Sample ID: 1312650-002B
Mineralogy, Inc. Job No.: 14123-02

14123-02C



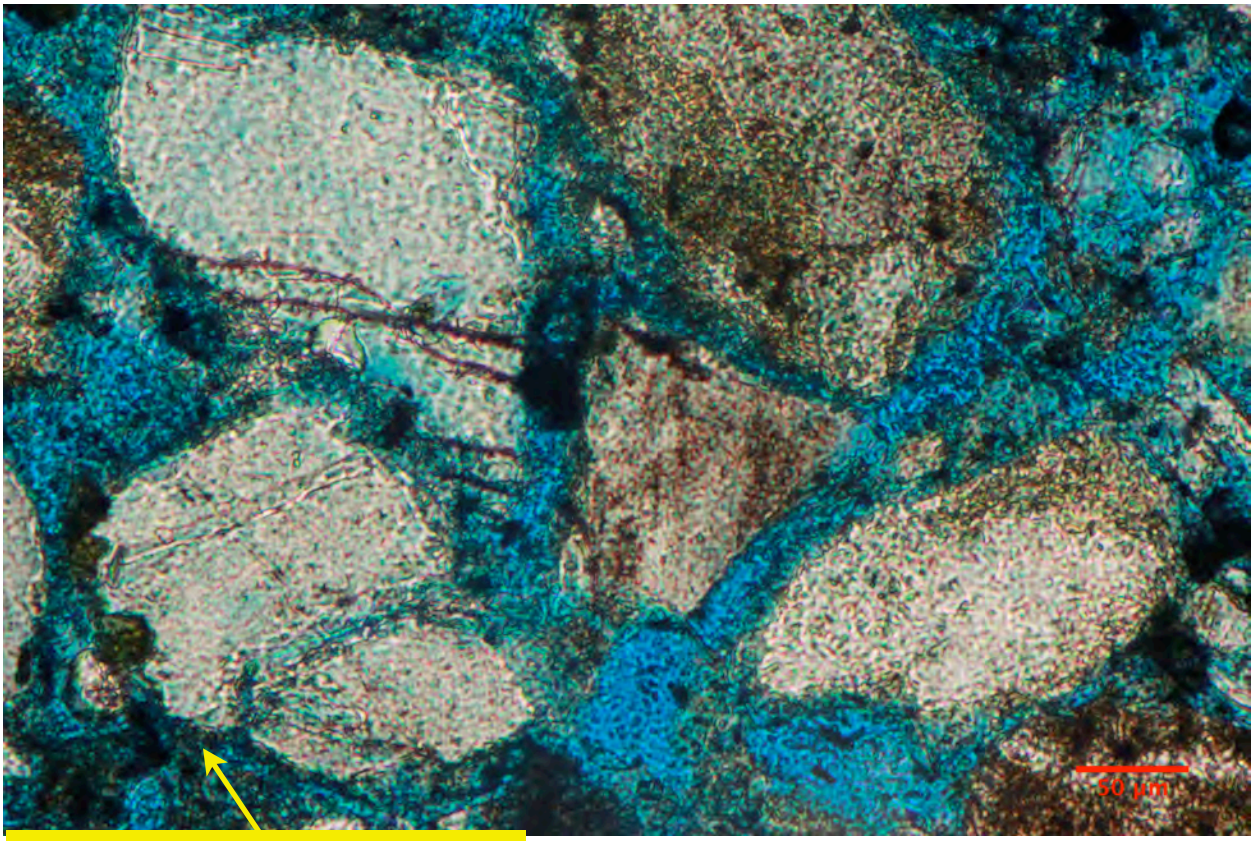
Silty shale and mudstone rock fragments (RFs; brown)

14123-02D



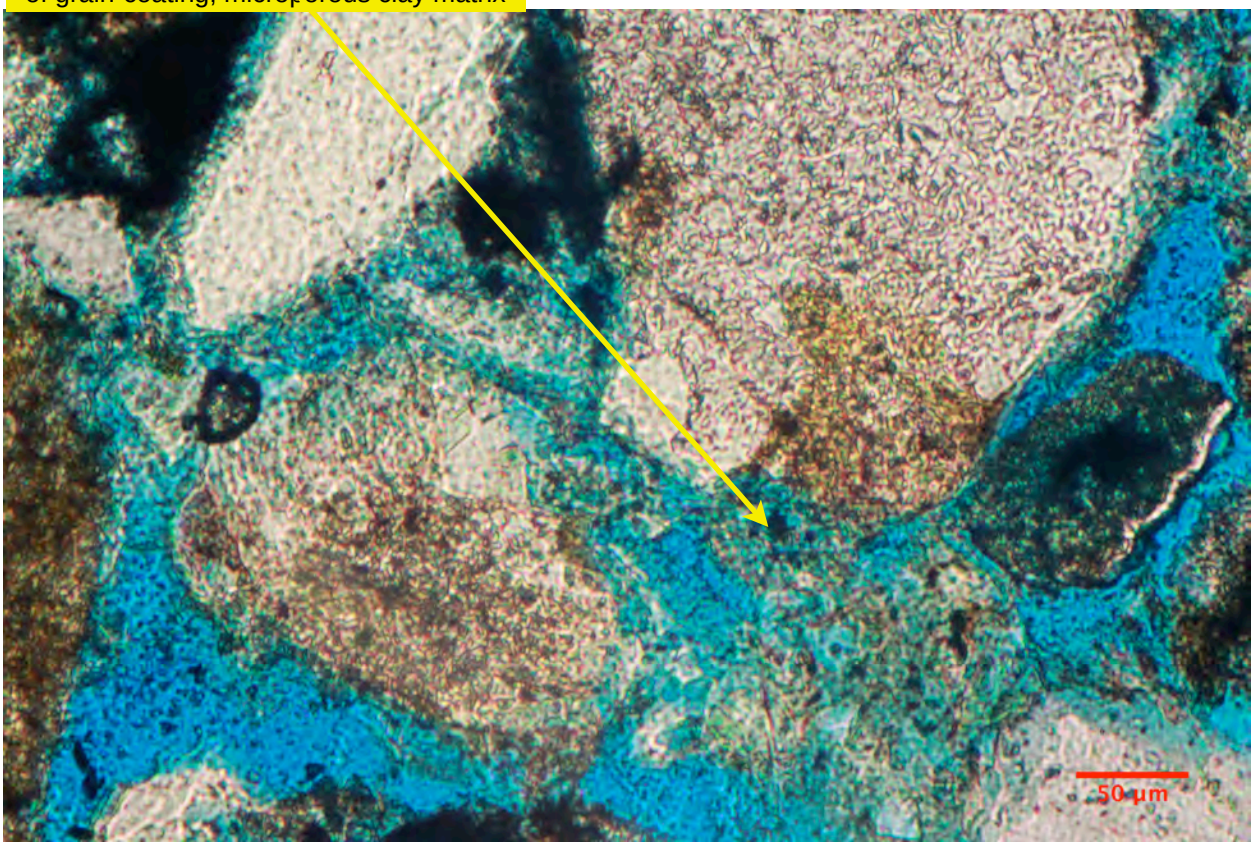
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650; Sample ID: 1312650-002B
Mineralogy, Inc. Job No.: 14123-02

14123-02E



The sandstone contains significant amounts of grain-coating, microporous clay matrix

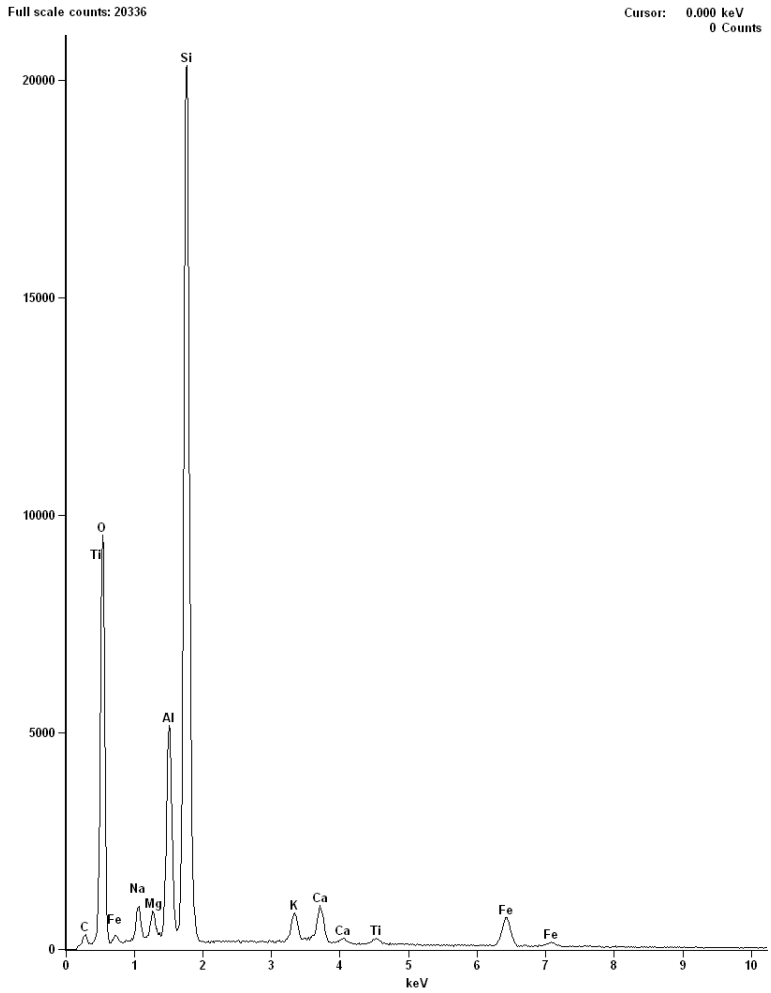
14123-02F



MINERALOGY, INC.

Figure II.
Energy Dispersive X-Ray Analysis

Client:	McCampbell Analytical, Inc.	MI#:	14123-02
Project:	1312650 (Follow-Up to MI# 14032)	Location:	N/A



Energy Dispersive X-Ray Results

14123-02	1312650-002B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	5.92	+/-0.29	CO2	21.69
O K	53.85S	---		---
Na K	1.86	+/-0.08	Na2O	2.51
Mg K	0.79	+/-0.05	MgO	1.31
Al K	6.09	+/-0.07	Al2O3	11.5
Si K	25.6	+/-0.10	SiO2	54.76
K K	1.06	+/-0.04	K2O	1.28
Ca K	1.47	+/-0.04	CaO	2.06
Ti K	0.37	+/-0.03	TiO2	0.62
Fe K	2.99	+/-0.07	Fe2O3	4.28
	----------			----------
Total	100			100

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650
Sample ID: 1312650-003B
Mineralogy, Inc. Job No.: 14123-03

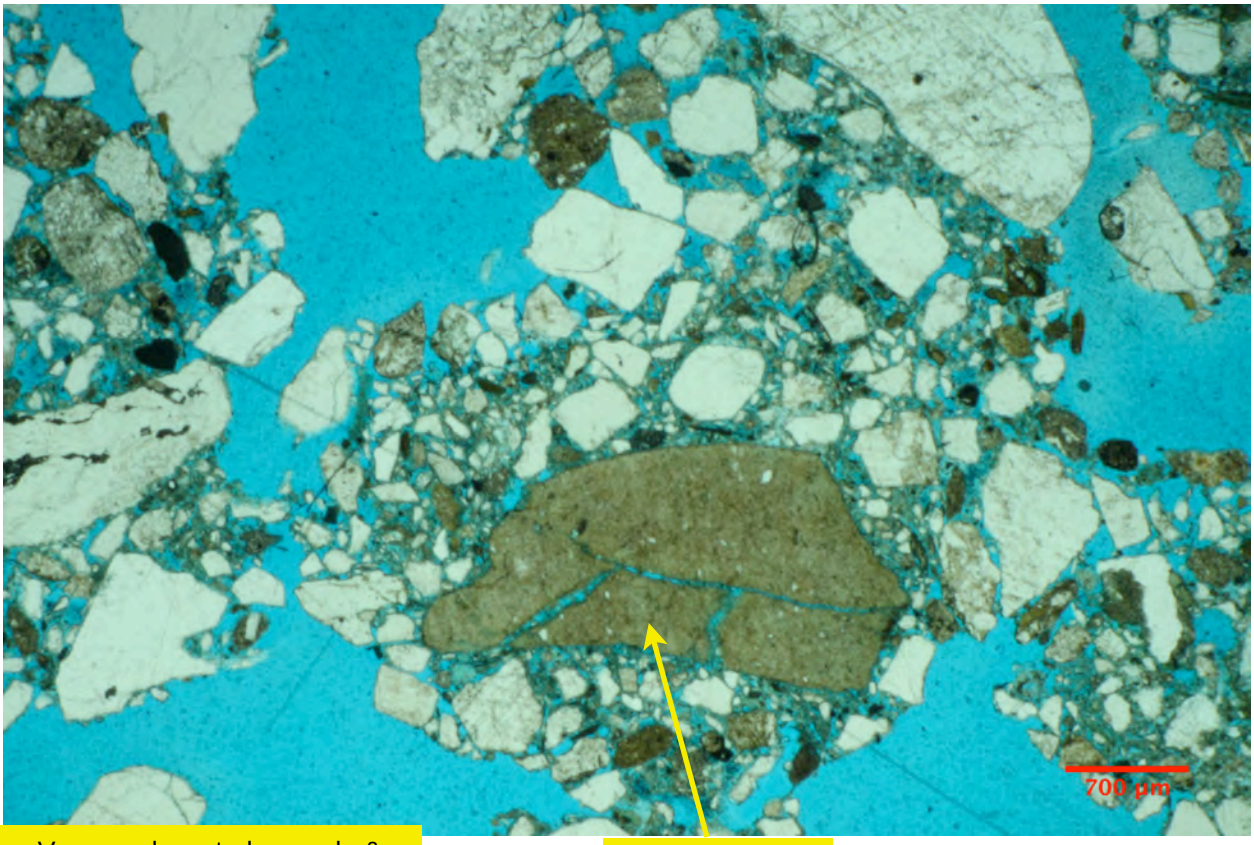
Lithologic Classification	Lithic Arkosic Sandstone
Textural Properties	Coarse grained (cL), very poorly sorted, granule and pebble-rich, well-graded, and subangular.
Mean Grain Diameter	~0.53 mm
Max Grain Diameter	4.94 mm
Fabric	This sandstone sample is mildly to moderately packed and displays a massively bedded fabric with common point-to-point and elongated intergranular contacts. Silt grains and clusters of pore filling and grain coating detrital clay are commonly present within the interparticle spaces of this sandstone.
Detrital Mineralogy	Detrital grains constituents are listed in descending order of relative abundance and include: 1) quartz (monocrystalline and polycrystalline quartz varieties), 2) feldspar (plagioclase > k-felspar), 3) igneous RFs (mostly granite and granodiorite RFs), 4) silty shale and mudstone RFs, 5) chert RFs, 6) organic matter particles, 7) hornblende, 8) mica, and 9) magnetite.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650
Sample ID: 1312650-003B
Mineralogy, Inc. Job No.: 14123-03

Cements & Matrix Constituents	Detrital clay matrix components are common within the pore system of this sandstone sample with the clay tentatively identified to include a mixture of illite smectite and illite. Precise characterization of the clay mineralogy will require XRD analysis of the sediment. Traces of pyrite cement are locally present as a replacement associated with leached particles of organic matter. Traces of authigenic clay matrix are also present in association with leached feldspar grains and igneous RFs.
Pore System	The void volume of this sandstone sample is comprised of a mixture of interparticle void space coupled with subordinate amounts of intercrystalline microporosity and intraparticle dissolution void space. The total void volume of this sandstone sample is visually estimated to account for ~10-13% of the bulk volume.

Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650; Sample ID: 1312650-003B
Mineralogy, Inc. Job No.: 14123-03

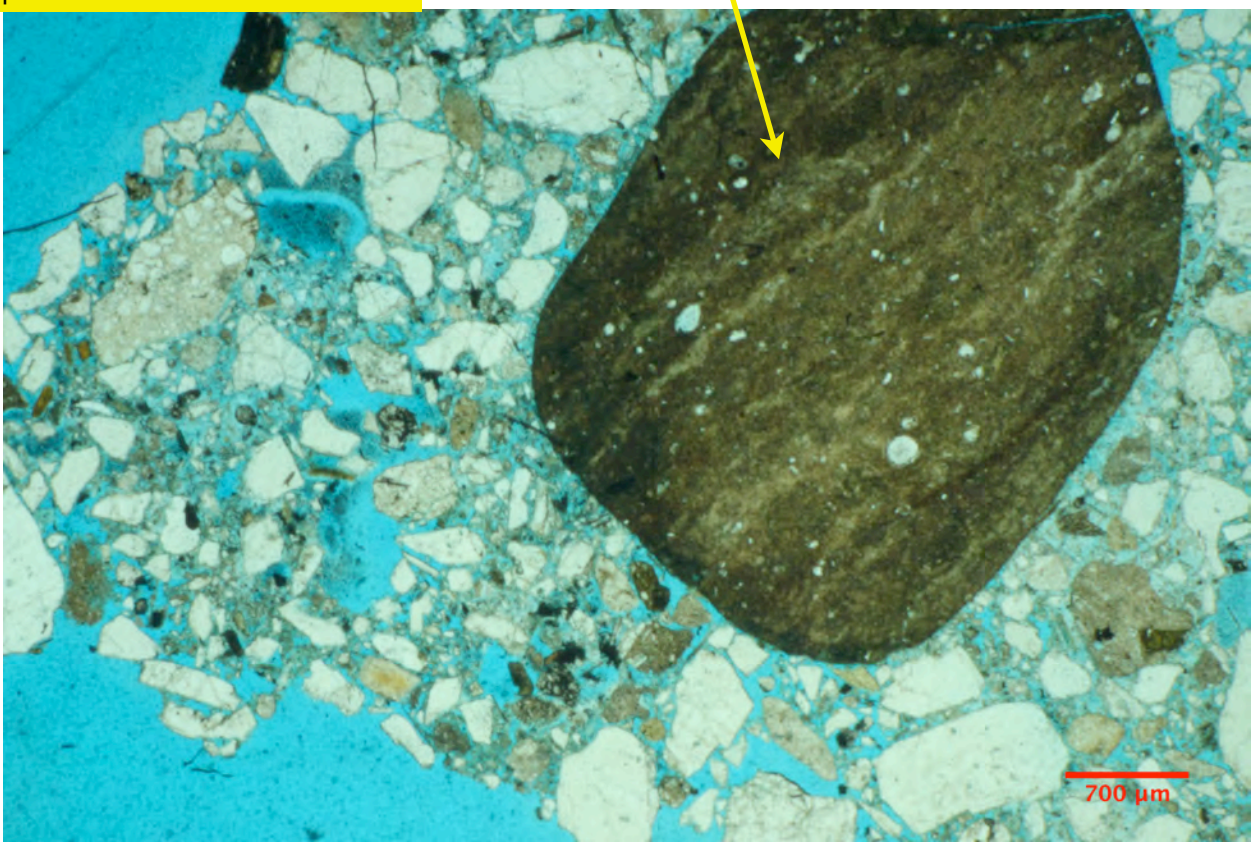
14123-03A



Very poorly sorted, granule & pebble-rich lithic arkosic sandstone

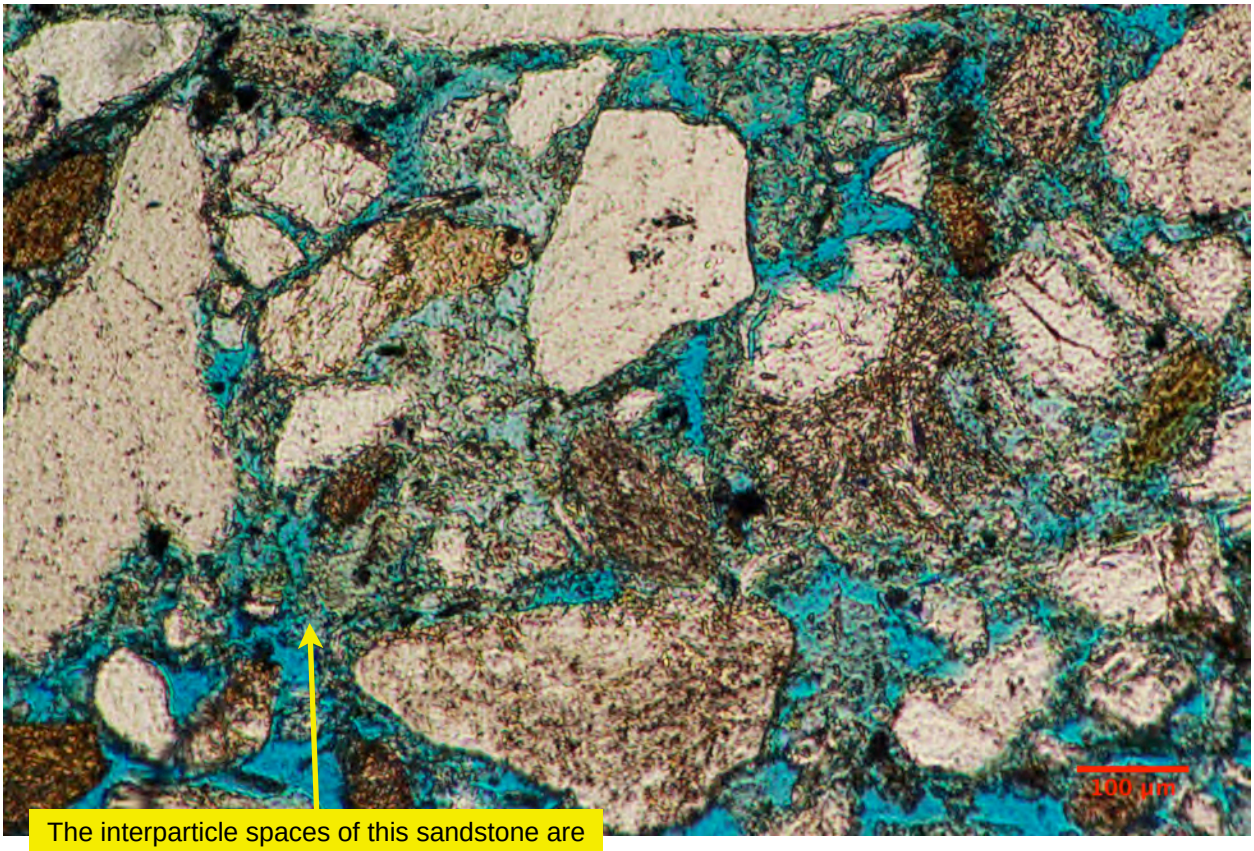
Silty shale RFs

14123-03B



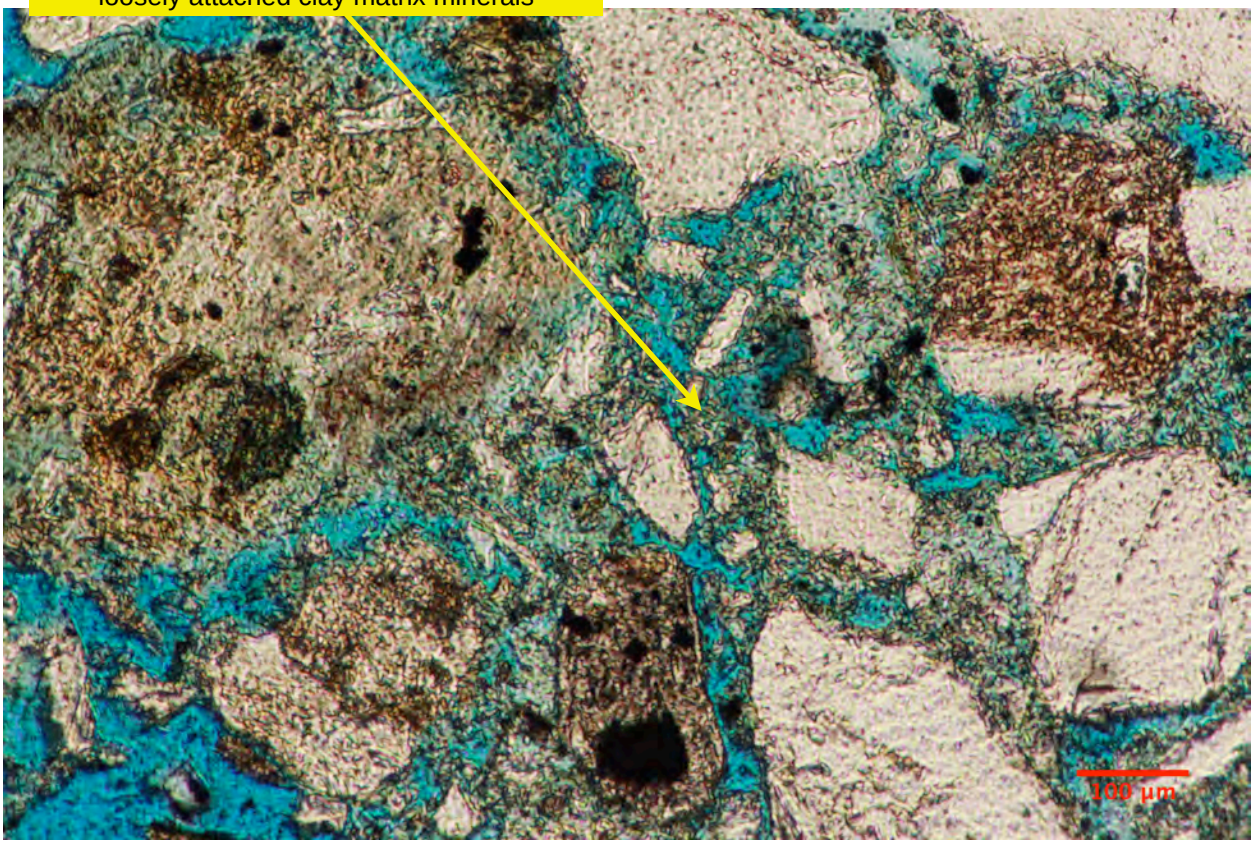
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650; Sample ID: 1312650-003B
Mineralogy, Inc. Job No.: 14123-03

14123-03C



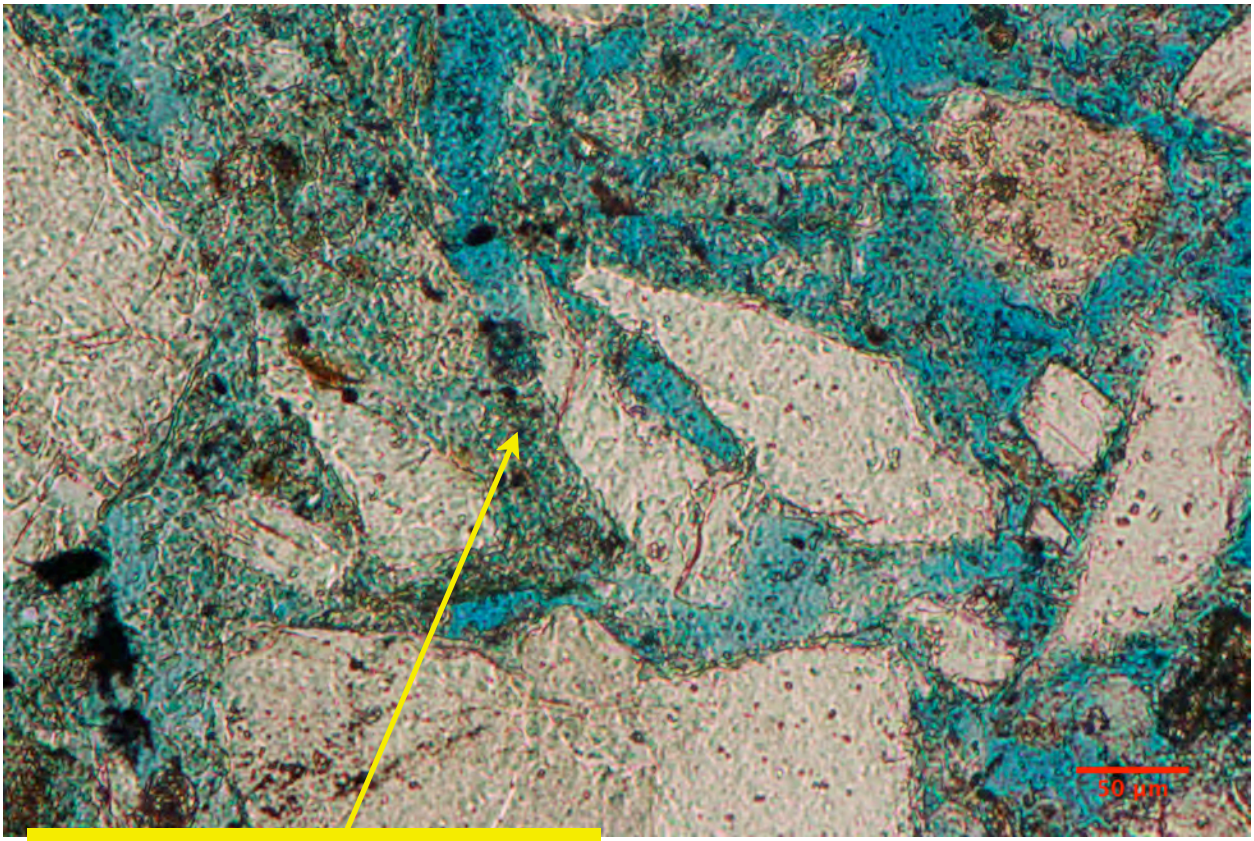
The interparticle spaces of this sandstone are commonly choked with clusters of microporous, loosely attached clay matrix minerals

14123-03D



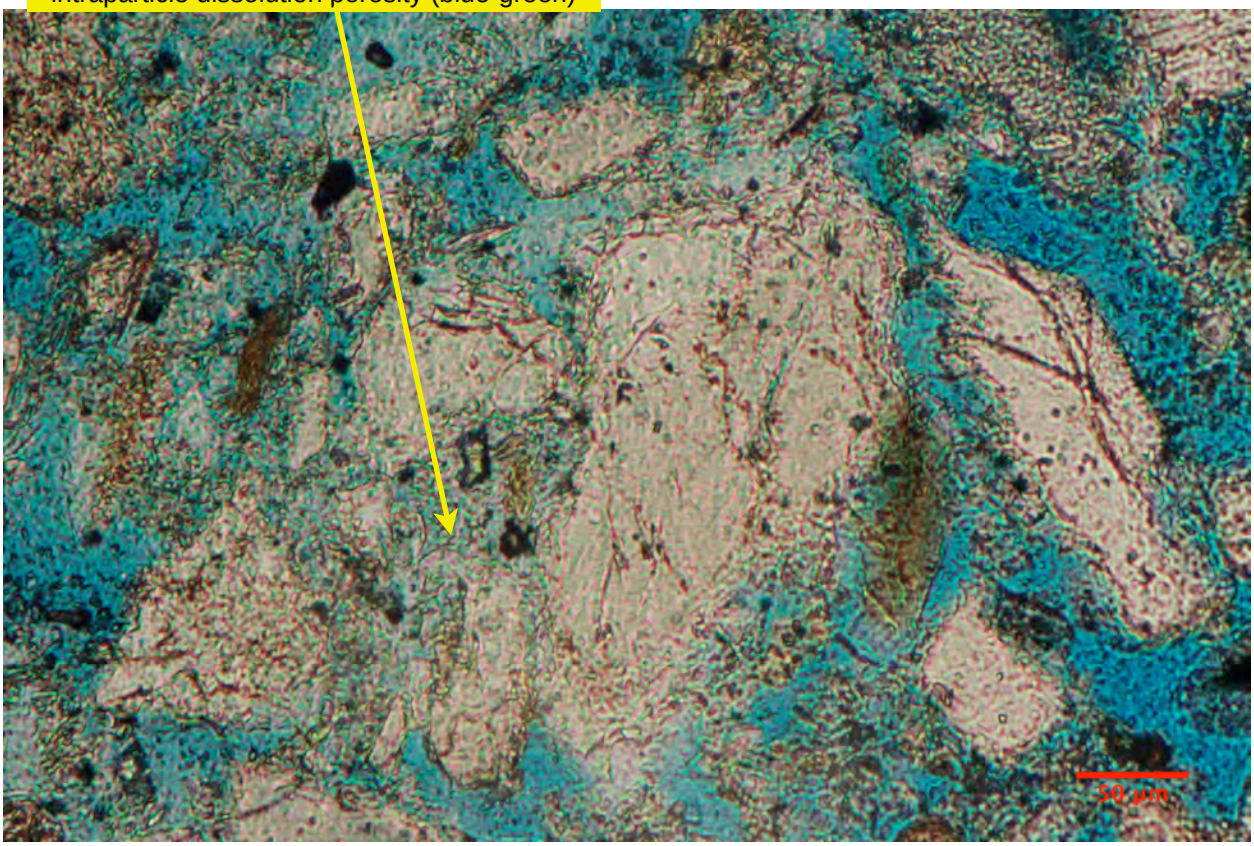
Thin Section Petrographic Analysis
McCampbell Analytical, Inc.
Project: 1312650; Sample ID: 1312650-003B
Mineralogy, Inc. Job No.: 14123-03

14123-03E



Leached feldspar grains with abundant intraparticle dissolution porosity (blue-green)

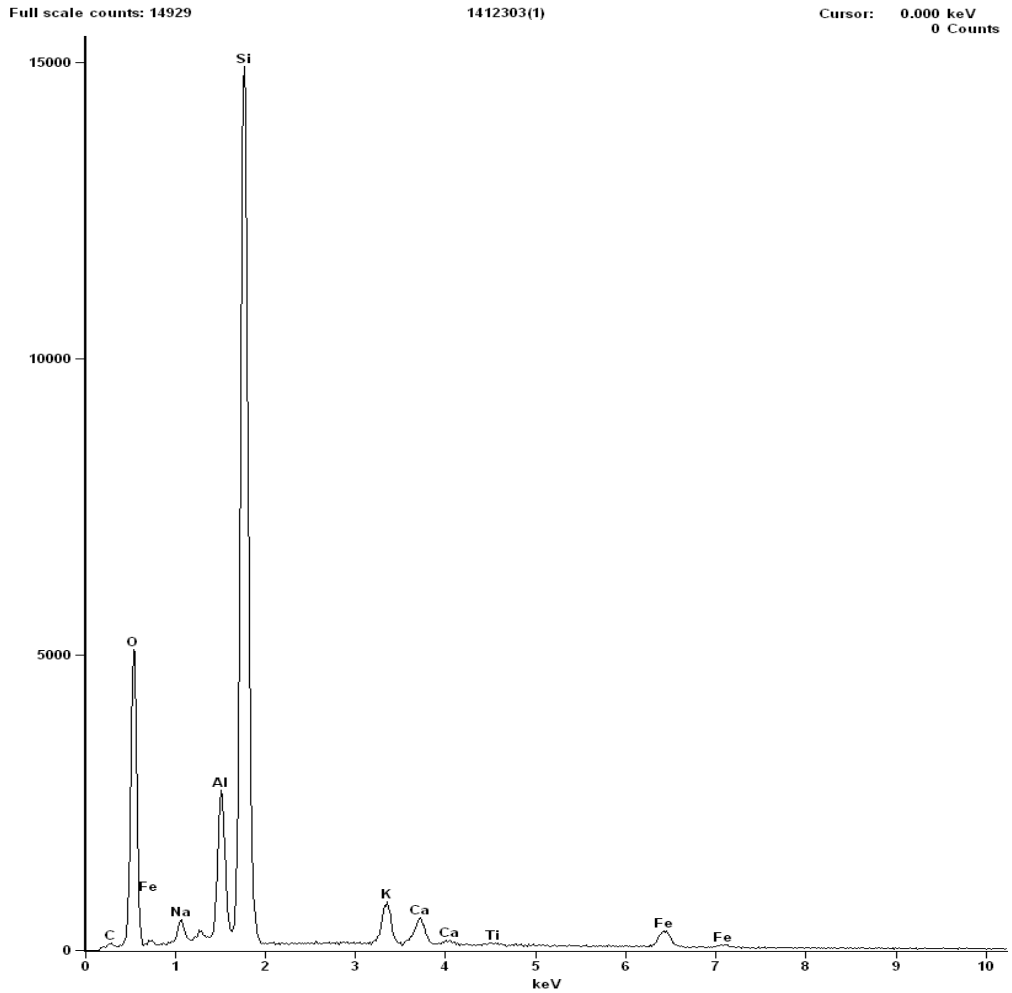
14123-03F



MINERALOGY, INC.

Figure III.
Energy Dispersive X-Ray Analysis

Client:	McCampbell Analytical, Inc.	MI#:	14123-03
Project:	1312650-003B (Follow-Up to MI# 14032)	Location:	N/A



Energy Dispersive X-Ray Results

14123-03	1312650-003B			
Element Line	Element Wt.%	Wt.% Error	Compound Formula	Compound Wt%
C K	4.2	+/-0.34	CO2	15.41
O K	52.94S	---		---
Na K	1.44	+/-0.08	Na2O	1.95
Al K	4.47	+/-0.04	Al2O3	8.45
Si K	30.84	+/-0.12	SiO2	65.98
K K	2.25	+/-0.05	K2O	2.71
Ca K	1.47	+/-0.03	CaO	2.06
Ti K	0.24	+/-0.05	TiO2	0.4
Fe K	2.13	+/-0.06	Fe2O3	3.05
	----------			----------
Total	100			100

McCampbell Analytical, Inc.

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Analytical Report

WorkOrder: 1312545

Report Created for: Todd Engineering
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501

Project Contact: Bill Motzer
Project P.O.:
Project Name: #60408; MRWPCA

Project Received: 12/18/2013

Analytical Report reviewed & approved for release on 05/16/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.

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Glossary of Terms & Qualifier Definitions

Client: Todd Engineering
Project: #60408; MRWPCA
WorkOrder: 1312545

Glossary Abbreviation

95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

Analytical Qualifier

B	analyte detected in the associated Method Blank
H	samples were analyzed out of holding time
S	spike recovery outside accepted recovery limits
a1	sample diluted due to matrix interference
a4	the reporting limits were raised due to the sample's matrix prohibiting a full volume extraction.
a7	reporting limit raised due to limited sample amount
a14	reporting limit raised due to the physical nature of the sample
c1	surrogate recovery outside of the control limits due to the dilution of the sample.
c2	low surrogate recovery caused by matrix interference.
c4	surrogate recovery outside of the control limits due to coelution with another peak(s) / cluttered chromatogram.
j1	see attached narrative

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Glossary of Terms & Qualifier Definitions

Client: Todd Engineering
Project: #60408; MRWPCA
WorkOrder: 1312545

Quality Control Qualifiers

F1	MS/MSD recovery and/or RPD was out of acceptance criteria; LCS validated the prep batch.
F2	LCS recovery for this compound is outside of acceptance limits.
F3	the surrogate standard recovery is outside of acceptance limits.

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6020
Date Prepared:	5/16/14	**Unit:**	wt %

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 27.5-30.0	**1312545-001B**	**Solid**	**12/16/2013 14:35**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**8.7**	0.28	100	05/19/2014 17:24
BaO	**0.10**	0.056	10	05/19/2014 11:21
CaO	**0.99**	0.35	10	05/19/2014 11:21
FeO	**0.70**	0.019	10	05/19/2014 11:21
K2O	**2.8**	0.15	10	05/19/2014 11:21
MgO	**0.18**	0.025	10	05/19/2014 11:21
MnO	ND	0.026	10	05/19/2014 11:21
Na2O	**2.0**	0.20	10	05/19/2014 11:21
SrO	**0.028**	0.024	10	05/19/2014 11:21
TiO2	**0.099**	0.025	10	05/19/2014 11:21

Analytical Comments: a1

MW-1: 74.0-75.5	**1312545-002B**	**Solid**	**12/17/2013 11:40**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**10**	0.28	100	05/19/2014 17:31
BaO	**0.10**	0.056	10	05/19/2014 11:27
CaO	**1.1**	0.35	10	05/19/2014 11:27
FeO	**0.62**	0.019	10	05/19/2014 11:27
K2O	**3.1**	0.15	10	05/19/2014 11:27
MgO	**0.17**	0.025	10	05/19/2014 11:27
MnO	ND	0.026	10	05/19/2014 11:27
Na2O	**2.2**	0.20	10	05/19/2014 11:27
SrO	**0.032**	0.024	10	05/19/2014 11:27
TiO2	**0.075**	0.025	10	05/19/2014 11:27

Analytical Comments: a1

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6020
Date Prepared:	5/16/14	**Unit:**	wt %

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003B**	**Solid**	**12/18/2013 15:02**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**10**	0.28	100	05/19/2014 17:37
BaO	**0.10**	0.056	10	05/19/2014 11:46
CaO	**1.1**	0.35	10	05/19/2014 11:46
FeO	**0.55**	0.019	10	05/19/2014 11:46
K2O	**3.0**	0.15	10	05/19/2014 11:46
MgO	**0.18**	0.025	10	05/19/2014 11:46
MnO	ND	0.026	10	05/19/2014 11:46
Na2O	**2.3**	0.20	10	05/19/2014 11:46
SrO	**0.032**	0.024	10	05/19/2014 11:46
TiO2	**0.068**	0.025	10	05/19/2014 11:46

Analytical Comments: a1

MW-1: 139.5-142.0	**1312545-004B**	**Solid**	**12/17/2013 12:00**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**9.8**	0.28	100	05/19/2014 17:43
BaO	**0.10**	0.056	10	05/19/2014 11:52
CaO	**0.98**	0.35	10	05/19/2014 11:52
FeO	**0.72**	0.019	10	05/19/2014 11:52
K2O	**2.9**	0.15	10	05/19/2014 11:52
MgO	**0.20**	0.025	10	05/19/2014 11:52
MnO	ND	0.026	10	05/19/2014 11:52
Na2O	**2.0**	0.20	10	05/19/2014 11:52
SrO	**0.029**	0.024	10	05/19/2014 11:52
TiO2	**0.094**	0.025	10	05/19/2014 11:52

Analytical Comments: a1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6020
Date Prepared:	5/16/14	**Unit:**	wt %

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005B**	**Solid**	**12/17/2013 12:20**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**10**	0.28	100	05/19/2014 17:50
BaO	**0.11**	0.056	10	05/19/2014 11:59
CaO	**1.3**	0.35	10	05/19/2014 11:59
FeO	**0.64**	0.019	10	05/19/2014 11:59
K2O	**3.2**	0.15	10	05/19/2014 11:59
MgO	**0.22**	0.025	10	05/19/2014 11:59
MnO	ND	0.026	10	05/19/2014 11:59
Na2O	**2.4**	0.20	10	05/19/2014 11:59
SrO	**0.034**	0.024	10	05/19/2014 11:59
TiO2	**0.083**	0.025	10	05/19/2014 11:59

Analytical Comments: a1

MW-1: 297-298.5	**1312545-006B**	**Solid**	**12/18/2013 08:20**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**6.6**	0.28	100	05/19/2014 17:56
BaO	**0.062**	0.056	10	05/19/2014 12:05
CaO	**2.2**	0.35	10	05/19/2014 12:05
FeO	**1.8**	0.019	10	05/19/2014 12:05
K2O	**1.4**	0.15	10	05/19/2014 12:05
MgO	**2.3**	0.025	10	05/19/2014 12:05
MnO	**0.11**	0.026	10	05/19/2014 12:05
Na2O	**1.2**	0.20	10	05/19/2014 12:05
SrO	**0.030**	0.024	10	05/19/2014 12:05
TiO2	ND	0.25	100	05/19/2014 17:56

Analytical Comments: a1

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6020
Date Prepared:	5/16/14	**Unit:**	wt %

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007B**	**Solid**	**12/18/2013 09:00**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**14**	0.28	100	05/19/2014 18:15
BaO	**0.10**	0.056	10	05/19/2014 12:11
CaO	**1.2**	0.35	10	05/19/2014 12:11
FeO	**0.68**	0.019	10	05/19/2014 12:11
K2O	**2.8**	0.15	10	05/19/2014 12:11
MgO	**0.22**	0.025	10	05/19/2014 12:11
MnO	ND	0.026	10	05/19/2014 12:11
Na2O	**2.1**	0.20	10	05/19/2014 12:11
SrO	**0.032**	0.024	10	05/19/2014 12:11
TiO2	**0.080**	0.025	10	05/19/2014 12:11

Analytical Comments: a1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6010B
Date Prepared:	12/19/14-12/20/14	**Unit:**	%

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 27.5-30.0	**1312545-001B**	**Solid**	**12/16/2013 14:35**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.020**	0.0035	1	05/06/2014 16:00
SiO2	**4.0**	0.032	10	05/20/2014 17:02

MW-1: 74.0-75.5	**1312545-002B**	**Solid**	**12/17/2013 11:40**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.027**	0.0035	1	05/06/2014 16:02
SiO2	**1.1**	0.032	10	05/20/2014 17:04

MW-1: 98.5-101	**1312545-003B**	**Solid**	**12/18/2013 15:02**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.026**	0.0035	1	05/06/2014 16:04
SiO2	**1.4**	0.032	10	05/20/2014 17:06

MW-1: 139.5-142.0	**1312545-004B**	**Solid**	**12/17/2013 12:00**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.024**	0.0035	1	05/06/2014 16:06
SiO2	**1.1**	0.032	10	05/20/2014 17:08

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6010B
Date Prepared:	12/19/14-12/20/14	**Unit:**	%

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005B**	**Solid**	**12/17/2013 12:20**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.035**	0.0035	1	05/06/2014 16:08
SiO2	**1.6**	0.032	10	05/20/2014 17:11

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006B**	**Solid**	**12/18/2013 08:20**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.93**	0.035	10	05/06/2014 16:52
SiO2	**1.4**	0.032	10	05/20/2014 17:17

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007B**	**Solid**	**12/18/2013 09:00**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.066**	0.0035	1	05/06/2014 16:12
SiO2	**0.64**	0.032	10	05/20/2014 17:19

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	HH/TM-7
Date Received:	12/18/13 15:02	**Analytical Method:**	HH/TM-7
Date Prepared:	12/19/13	**Unit:**	mg/kg

Major Elements by Hydroxylamine-Hydrochloride

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005B**	**Solid/TOTAL**	**12/17/2013 12:20**	**ICP-MS1**	**90683**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**2400**	50	1	05/20/2014 19:33
Arsenic	**1.8**	0.50	1	05/20/2014 19:33
Calcium	**810**	100	1	05/20/2014 19:33
Ferric Hydroxide as Iron	**3300**	20	1	05/20/2014 19:33
Hexachrome	ND	0.40	100	05/20/2014 19:33
Lead	**1.1**	0.50	1	05/20/2014 19:33
Magnesium	**770**	20	1	05/20/2014 19:33
Manganese	**37**	20	1	05/20/2014 19:33
Mercury	ND	0.050	1	05/20/2014 19:33
Selenium	ND	0.50	1	05/20/2014 19:33
Uranium	ND	0.50	1	05/20/2014 19:33

MW-1: 364.5-367.0	**1312545-007B**	**Solid/TOTAL**	**12/18/2013 09:00**	**ICP-MS1**	**90683**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**1800**	50	1	05/20/2014 19:40
Arsenic	**0.72**	0.50	1	05/20/2014 19:40
Calcium	**820**	100	1	05/20/2014 19:40
Ferric Hydroxide as Iron	**2500**	20	1	05/20/2014 19:40
Hexachrome	ND	0.40	100	05/20/2014 19:40
Lead	**0.73**	0.50	1	05/20/2014 19:40
Magnesium	**590**	20	1	05/20/2014 19:40
Manganese	**37**	20	1	05/20/2014 19:40
Mercury	ND	0.050	1	05/20/2014 19:40
Selenium	ND	0.50	1	05/20/2014 19:40
Uranium	ND	0.50	1	05/20/2014 19:40

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	HH/TM-7
Date Received:	12/18/13 15:02	**Analytical Method:**	HH/TM-7
Date Prepared:	12/19/14	**Unit:**	mg/kg

Silica for Iron Oxide by Hydroxylamine-Hydrochloride

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005B**	**Solid/TOTAL**	**12/17/2013 12:20**	**ICP-JY**	**90740**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Silica	**6500**	B	11	10	05/21/2014 16:33

MW-1: 364.5-367.0	**1312545-007B**	**Solid/TOTAL**	**12/18/2013 09:00**	**ICP-JY**	**90740**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Silica	**5200**	B	11	10	05/21/2014 16:36

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SSSA Part 3 Chapter 40
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6020
Date Prepared:	4/23/14	**Unit:**	mg/Kg

Exchangeable Cations using Ammonium Acetate

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 27.5-30.0	**1312545-001B**	**Solid/SSSA**	**12/16/2013 14:35**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**10**	B	0.50	1	05/12/2014 09:22
Calcium	**150**		10	1	05/12/2014 09:22
Lithium	ND		0.050	1	05/12/2014 09:22
Magnesium	**110**		2.0	1	05/12/2014 09:22
Potassium	**15**		5.0	1	05/12/2014 09:22
Sodium	**60**	B	10	1	05/12/2014 09:22
Strontium	**3.3**		2.0	1	05/12/2014 09:22

MW-1: 74.0-75.5	**1312545-002B**	**Solid/SSSA**	**12/17/2013 11:40**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**9.5**	B	0.50	1	04/29/2014 15:46
Calcium	**450**		10	1	04/29/2014 15:46
Lithium	ND		0.050	1	04/29/2014 15:46
Magnesium	**120**		2.0	1	04/29/2014 15:46
Potassium	**57**		5.0	1	04/29/2014 15:46
Sodium	**71**	B	10	1	04/29/2014 15:46
Strontium	**2.9**		2.0	1	04/29/2014 15:46

MW-1: 98.5-101	**1312545-003B**	**Solid/SSSA**	**12/18/2013 15:02**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**8.9**	B	0.50	1	04/29/2014 18:48
Calcium	**130**		10	1	04/29/2014 18:48
Lithium	ND		0.050	1	04/29/2014 18:48
Magnesium	**91**		2.0	1	04/29/2014 18:48
Potassium	**21**		5.0	1	04/29/2014 18:48
Sodium	**46**	B	10	1	04/29/2014 18:48
Strontium	**2.3**		2.0	1	04/29/2014 18:48

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SSSA Part 3 Chapter 40
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6020
Date Prepared:	4/23/14	**Unit:**	mg/Kg

Exchangeable Cations using Ammonium Acetate

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004B**	**Solid/SSSA**	**12/17/2013 12:00**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**20**	B	0.50	1	04/29/2014 18:54
Calcium	**180**		10	1	04/29/2014 18:54
Lithium	ND		0.050	1	04/29/2014 18:54
Magnesium	**110**		2.0	1	04/29/2014 18:54
Potassium	**32**		5.0	1	04/29/2014 18:54
Sodium	**64**	B	10	1	04/29/2014 18:54
Strontium	**4.3**		2.0	1	04/29/2014 18:54

MW-1: 200-202.5	**1312545-005B**	**Solid/SSSA**	**12/17/2013 12:20**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**9.9**	B	0.50	1	04/29/2014 19:01
Calcium	**180**		10	1	04/29/2014 19:01
Lithium	ND		0.050	1	04/29/2014 19:01
Magnesium	**80**		2.0	1	04/29/2014 19:01
Potassium	**36**		5.0	1	04/29/2014 19:01
Sodium	**52**	B	10	1	04/29/2014 19:01
Strontium	**3.1**		2.0	1	04/29/2014 19:01

MW-1: 297-298.5	**1312545-006B**	**Solid/SSSA**	**12/18/2013 08:20**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**17**	B	0.50	1	04/29/2014 19:07
Calcium	**2500**		100	10	05/07/2014 12:22
Lithium	ND		0.050	1	04/29/2014 19:07
Magnesium	**780**		2.0	1	04/29/2014 19:07
Potassium	**90**		5.0	1	04/29/2014 19:07
Sodium	**200**	B	10	1	04/29/2014 19:07
Strontium	**27**		2.0	1	04/29/2014 19:07

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SSSA Part 3 Chapter 40
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6020
Date Prepared:	4/23/14	**Unit:**	mg/Kg

Exchangeable Cations using Ammonium Acetate

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007B**	**Solid/SSSA**	**12/18/2013 09:00**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**8.3**	B	0.50	1	04/29/2014 19:13
Calcium	**220**		10	1	04/29/2014 19:13
Lithium	ND		0.050	1	04/29/2014 19:13
Magnesium	**52**		2.0	1	04/29/2014 19:13
Potassium	**22**		5.0	1	04/29/2014 19:13
Sodium	**52**	B	10	1	04/29/2014 19:13
Strontium	**2.3**		2.0	1	04/29/2014 19:13

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SW3050B
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6010B
Date Prepared:	12/19/14	**Unit:**	mg/kg

Silica for Iron Oxide

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005B**	**Solid/TOTAL**	**12/17/2013 12:20**	**ICP-JY**	**90740**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Silica	**6500**	B	11	10	05/21/2014 16:33

MW-1: 364.5-367.0	**1312545-007B**	**Solid/TOTAL**	**12/18/2013 09:00**	**ICP-JY**	**90740**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Silica	**5200**	B	11	10	05/21/2014 16:36

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	HH/TM-7
Date Received:	12/18/13 15:02	**Analytical Method:**	HH/TM-7
Date Prepared:	12/19/13	**Unit:**	mg/kg

Major Elements by Hydroxylamine- Hydrochloride

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005B**	**Solid/TOTAL**	**12/17/2013 12:20**	**ICP-MS1**	**90683**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**2400**	50	1	05/20/2014 19:33
Arsenic	**1.8**	0.50	1	05/20/2014 19:33
Calcium	**810**	100	1	05/20/2014 19:33
Ferric Oxides	**3300**	20	1	05/20/2014 19:33
Hexachrome	ND	0.40	100	05/20/2014 19:33
Lead	**1.1**	0.50	1	05/20/2014 19:33
Magnesium	**770**	20	1	05/20/2014 19:33
Manganese	**37**	20	1	05/20/2014 19:33
Mercury	ND	0.050	1	05/20/2014 19:33
Selenium	ND	0.50	1	05/20/2014 19:33
Uranium	ND	0.50	1	05/20/2014 19:33

MW-1: 364.5-367.0	**1312545-007B**	**Solid/TOTAL**	**12/18/2013 09:00**	**ICP-MS1**	**90683**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**1800**	50	1	05/20/2014 19:40
Arsenic	**0.72**	0.50	1	05/20/2014 19:40
Calcium	**820**	100	1	05/20/2014 19:40
Ferric Oxides	**2500**	20	1	05/20/2014 19:40
Hexachrome	ND	0.40	100	05/20/2014 19:40
Lead	**0.73**	0.50	1	05/20/2014 19:40
Magnesium	**590**	20	1	05/20/2014 19:40
Manganese	**37**	20	1	05/20/2014 19:40
Mercury	ND	0.050	1	05/20/2014 19:40
Selenium	ND	0.50	1	05/20/2014 19:40
Uranium	ND	0.50	1	05/20/2014 19:40

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SW3050B
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6010B
Date Prepared:	12/19/13	**Unit:**	mg/Kg

Phosphorus

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 27.5-30.0	**1312545-001A**	**Solid/TOTAL^**	**12/16/2013 14:35**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**88**	15	1	05/06/2014 16:00

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002A**	**Solid/TOTAL^**	**12/17/2013 11:40**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**120**	15	1	05/06/2014 16:02

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003A**	**Solid/TOTAL^**	**12/17/2013 11:50**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**110**	15	1	05/06/2014 16:04

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004A**	**Solid/TOTAL^**	**12/17/2013 12:00**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**110**	15	1	05/06/2014 16:06

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005A**	**Solid/TOTAL^**	**12/17/2013 12:20**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**150**	15	1	05/06/2014 16:08

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SW3050B
Date Received:	12/18/13 15:02	**Analytical Method:**	SW6010B
Date Prepared:	12/19/13	**Unit:**	mg/Kg

Phosphorus

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006A**	**Solid/TOTAL^**	**12/18/2013 08:20**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**4000**	150	10	05/06/2014 16:52

MW-1: 364.5-367.0	**1312545-007A**	**Solid/TOTAL^**	**12/18/2013 09:00**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**290**	15	1	05/06/2014 16:12

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method**	SW3060A
Date Received:	12/18/13 15:02	**Analytical Method:**	SW7199
Date Prepared:	12/20/13	**Unit:**	mg/Kg

TTLC Hexachrome by Alkaline Digestion and IC-UV Analysis

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 27.5-30.0	**1312545-001A**	**Solid/TOTAL**	**12/16/2013 14:35**	**IC2**	**85347**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/26/2013 18:22

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002A**	**Solid/TOTAL**	**12/17/2013 11:40**	**IC2**	**85347**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/26/2013 18:41

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003A**	**Solid/TOTAL**	**12/17/2013 11:50**	**IC2**	**85347**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/26/2013 19:01

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004A**	**Solid/TOTAL**	**12/17/2013 12:00**	**IC2**	**85347**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/26/2013 19:20

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005A**	**Solid/TOTAL**	**12/17/2013 12:20**	**IC2**	**85347**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/26/2013 19:39

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TD Analyst's Initial

Angela Rydelius, Lab Manager

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method**	SW3060A
Date Received:	12/18/13 15:02	**Analytical Method:**	SW7199
Date Prepared:	12/20/13	**Unit:**	mg/Kg

TTLC Hexachrome by Alkaline Digestion and IC-UV Analysis

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006A**	**Solid/TOTAL**	**12/18/2013 08:20**	**IC2**	**85347**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/26/2013 19:59

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007A**	**Solid/TOTAL**	**12/18/2013 09:00**	**IC2**	**85347**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/26/2013 20:18

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	MAI_LCMS
Date Received:	12/18/13 15:02	**Analytical Method:**	E6850
Date Prepared:	1/8/14	**Unit:**	µg/Kg

Perchlorate by LC-MS

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 27.5-30.0	**1312545-001A**	**Solid**	**12/16/2013 14:35**	**LC3Q-MS1**	**85896**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	10	1	01/10/2014 15:56

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002A**	**Solid**	**12/17/2013 11:40**	**LC3Q-MS1**	**85896**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	10	1	01/10/2014 16:01

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003A**	**Solid**	**12/17/2013 11:50**	**LC3Q-MS1**	**85896**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	10	1	01/10/2014 16:07

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004A**	**Solid**	**12/17/2013 12:00**	**LC3Q-MS1**	**85896**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	10	1	01/10/2014 16:13

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005A**	**Solid**	**12/17/2013 12:20**	**LC3Q-MS1**	**85896**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	10	1	01/10/2014 16:18

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	MAI_LCMS
Date Received:	12/18/13 15:02	**Analytical Method:**	E6850
Date Prepared:	1/8/14	**Unit:**	µg/Kg

Perchlorate by LC-MS

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006A**	**Solid**	**12/18/2013 08:20**	**LC3Q-MS1**	**85896**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	10	1	01/10/2014 16:24

MW-1: 364.5-367.0	**1312545-007A**	**Solid**	**12/18/2013 09:00**	**LC3Q-MS1**	**85896**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	10	1	01/10/2014 16:30

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/18/13 15:02	**Analytical Method:**	SW8330
Date Prepared:	12/20/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 27.5-30.0	**1312545-001A**	**Solid**	**12/16/2013 14:35**	**HPLC4**	**85379**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/21/2013 14:53
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/21/2013 14:53
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/21/2013 14:53
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/21/2013 14:53
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/21/2013 14:53
HMX	ND	0.080	1	12/21/2013 14:53
Nitrobenzene (NB)	ND	0.080	1	12/21/2013 14:53
2-Nitrotoluene (2-NT)	ND	0.080	1	12/21/2013 14:53
3-Nitrotoluene (3-NT)	ND	0.080	1	12/21/2013 14:53
4-Nitrotoluene (4-NT)	ND	0.080	1	12/21/2013 14:53
RDX	ND	0.080	1	12/21/2013 14:53
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/21/2013 14:53
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/21/2013 14:53
Tetryl	ND	0.080	1	12/21/2013 14:53

Surrogates	REC (%)	Limits	
3,4-DNT	118	70-130	12/21/2013 14:53

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 JS Analyst's Initial Angela Rydelius, Lab Manager

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/18/13 15:02	**Analytical Method:**	SW8330
Date Prepared:	12/20/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002A**	**Solid**	**12/17/2013 11:40**	**HPLC4**	**85379**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/21/2013 15:37
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/21/2013 15:37
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/21/2013 15:37
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/21/2013 15:37
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/21/2013 15:37
HMX	ND	0.080	1	12/21/2013 15:37
Nitrobenzene (NB)	ND	0.080	1	12/21/2013 15:37
2-Nitrotoluene (2-NT)	ND	0.080	1	12/21/2013 15:37
3-Nitrotoluene (3-NT)	ND	0.080	1	12/21/2013 15:37
4-Nitrotoluene (4-NT)	ND	0.080	1	12/21/2013 15:37
RDX	ND	0.080	1	12/21/2013 15:37
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/21/2013 15:37
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/21/2013 15:37
Tetryl	ND	0.080	1	12/21/2013 15:37

Surrogates	REC (%)	Limits	
3,4-DNT	117	70-130	12/21/2013 15:37

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/18/13 15:02	**Analytical Method:**	SW8330
Date Prepared:	12/20/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003A**	**Solid**	**12/17/2013 11:50**	**HPLC4**	**85379**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/21/2013 16:21
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/21/2013 16:21
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/21/2013 16:21
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/21/2013 16:21
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/21/2013 16:21
HMX	ND	0.080	1	12/21/2013 16:21
Nitrobenzene (NB)	ND	0.080	1	12/21/2013 16:21
2-Nitrotoluene (2-NT)	ND	0.080	1	12/21/2013 16:21
3-Nitrotoluene (3-NT)	ND	0.080	1	12/21/2013 16:21
4-Nitrotoluene (4-NT)	ND	0.080	1	12/21/2013 16:21
RDX	ND	0.080	1	12/21/2013 16:21
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/21/2013 16:21
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/21/2013 16:21
Tetryl	ND	0.080	1	12/21/2013 16:21

Surrogates	REC (%)	Limits	
3,4-DNT	116	70-130	12/21/2013 16:21

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/18/13 15:02	**Analytical Method:**	SW8330
Date Prepared:	12/20/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004A**	**Solid**	**12/17/2013 12:00**	**HPLC4**	**85379**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/21/2013 17:06
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/21/2013 17:06
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/21/2013 17:06
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/21/2013 17:06
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/21/2013 17:06
HMX	ND	0.080	1	12/21/2013 17:06
Nitrobenzene (NB)	ND	0.080	1	12/21/2013 17:06
2-Nitrotoluene (2-NT)	ND	0.080	1	12/21/2013 17:06
3-Nitrotoluene (3-NT)	ND	0.080	1	12/21/2013 17:06
4-Nitrotoluene (4-NT)	ND	0.080	1	12/21/2013 17:06
RDX	ND	0.080	1	12/21/2013 17:06
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/21/2013 17:06
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/21/2013 17:06
Tetryl	ND	0.080	1	12/21/2013 17:06

Surrogates	REC (%)	Limits	
3,4-DNT	115	70-130	12/21/2013 17:06

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/18/13 15:02	**Analytical Method:**	SW8330
Date Prepared:	12/20/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005A**	**Solid**	**12/17/2013 12:20**	**HPLC4**	**85379**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/21/2013 17:50
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/21/2013 17:50
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/21/2013 17:50
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/21/2013 17:50
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/21/2013 17:50
HMX	ND	0.080	1	12/21/2013 17:50
Nitrobenzene (NB)	ND	0.080	1	12/21/2013 17:50
2-Nitrotoluene (2-NT)	ND	0.080	1	12/21/2013 17:50
3-Nitrotoluene (3-NT)	ND	0.080	1	12/21/2013 17:50
4-Nitrotoluene (4-NT)	ND	0.080	1	12/21/2013 17:50
RDX	ND	0.080	1	12/21/2013 17:50
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/21/2013 17:50
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/21/2013 17:50
Tetryl	ND	0.080	1	12/21/2013 17:50

Surrogates	REC (%)	Limits	
3,4-DNT	115	70-130	12/21/2013 17:50

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/18/13 15:02	**Analytical Method:**	SW8330
Date Prepared:	12/20/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006A**	**Solid**	**12/18/2013 08:20**	**HPLC4**	**85379**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/21/2013 18:34
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/21/2013 18:34
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/21/2013 18:34
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/21/2013 18:34
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/21/2013 18:34
HMX	ND	0.080	1	12/21/2013 18:34
Nitrobenzene (NB)	ND	0.080	1	12/21/2013 18:34
2-Nitrotoluene (2-NT)	ND	0.080	1	12/21/2013 18:34
3-Nitrotoluene (3-NT)	ND	0.080	1	12/21/2013 18:34
4-Nitrotoluene (4-NT)	ND	0.080	1	12/21/2013 18:34
RDX	ND	0.080	1	12/21/2013 18:34
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/21/2013 18:34
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/21/2013 18:34
Tetryl	ND	0.080	1	12/21/2013 18:34

Surrogates	REC (%)	Limits	
3,4-DNT	114	70-130	12/21/2013 18:34

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/18/13 15:02	**Analytical Method:**	SW8330
Date Prepared:	12/20/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007A**	**Solid**	**12/18/2013 09:00**	**HPLC4**	**85379**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/21/2013 19:18
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/21/2013 19:18
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/21/2013 19:18
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/21/2013 19:18
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/21/2013 19:18
HMX	ND	0.080	1	12/21/2013 19:18
Nitrobenzene (NB)	ND	0.080	1	12/21/2013 19:18
2-Nitrotoluene (2-NT)	ND	0.080	1	12/21/2013 19:18
3-Nitrotoluene (3-NT)	ND	0.080	1	12/21/2013 19:18
4-Nitrotoluene (4-NT)	ND	0.080	1	12/21/2013 19:18
RDX	ND	0.080	1	12/21/2013 19:18
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/21/2013 19:18
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/21/2013 19:18
Tetryl	ND	0.080	1	12/21/2013 19:18

Surrogates	REC (%)	Limits	
3,4-DNT	114	70-130	12/21/2013 19:18

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E415.1m
Date Received:	12/18/13 15:02	**Analytical Method:**	E415.1m
Date Prepared:	5/5/14	**Unit:**	mg/Kg

Total Nitrogen

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 27.5-30.0	**1312545-001B**	**Solid**	**12/16/2013 14:35**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**310**	200	1	05/05/2014 19:24

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002B**	**Solid**	**12/17/2013 11:40**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**210**	200	1	05/05/2014 20:09

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003B**	**Solid**	**12/18/2013 15:02**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**420**	200	1	05/05/2014 20:20

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004B**	**Solid**	**12/17/2013 12:00**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**450**	200	1	05/05/2014 20:31

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005B**	**Solid**	**12/17/2013 12:20**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**380**	200	1	05/05/2014 20:43

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E415.1m
Date Received:	12/18/13 15:02	**Analytical Method:**	E415.1m
Date Prepared:	5/5/14	**Unit:**	mg/Kg

Total Nitrogen

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006B**	**Solid**	**12/18/2013 08:20**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**1500**	200	1	05/05/2014 21:08

MW-1: 364.5-367.0	**1312545-007B**	**Solid**	**12/18/2013 09:00**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**770**	200	1	05/05/2014 21:44

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM5310Bm
Date Received:	12/18/13 15:02	**Analytical Method:**	SM5310Bm
Date Prepared:	5/5/14	**Unit:**	mg/kg

Total Organic Carbon (TOC)

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 27.5-30.0	**1312545-001B**	**Solid**	**12/16/2013 14:35**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	ND	200	1	05/05/2014 19:24

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002B**	**Solid**	**12/17/2013 11:40**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	ND	200	1	05/05/2014 20:09

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003B**	**Solid**	**12/18/2013 15:02**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	ND	200	1	05/05/2014 20:20

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004B**	**Solid**	**12/17/2013 12:00**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	ND	200	1	05/05/2014 20:31

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005B**	**Solid**	**12/17/2013 12:20**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	ND	200	1	05/05/2014 20:43

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM5310Bm
Date Received:	12/18/13 15:02	**Analytical Method:**	SM5310Bm
Date Prepared:	5/5/14	**Unit:**	mg/kg

Total Organic Carbon (TOC)

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006B**	**Solid**	**12/18/2013 08:20**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	**19,000**	200	1	05/05/2014 21:08

MW-1: 364.5-367.0	**1312545-007B**	**Solid**	**12/18/2013 09:00**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	ND	200	1	05/05/2014 21:44

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	5/16/14	**BatchID:**	90512
Date Analyzed:	5/19/14	**Extraction Method:**	Methods for Geochemical Analysis
Instrument:	ICP-MS1	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-90512

QC Summary Report for SW6020

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Aluminum	ND	5290	50	5000	-	106	75-125
Barium	ND	5390	5.0	5000	-	108	75-125
Calcium	101	52,700	100	50000	-	105	75-125
Iron	ND	5360	20	5000	-	107	75-125
Magnesium	ND	5080	20	5000	-	102	75-125
Manganese	ND	5440	20	5000	-	109	75-125
Potassium	183	5580	50	5000	-	112	75-125
Sodium	301	49,300	100	50000	-	98.7	75-125
Strontium	ND	5280	20	5000	-	106	75-125
Titanium	37.9	581	0.50	500	-	116	75-125

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	12/19/13	**BatchID:**	90677
Date Analyzed:	5/6/14 - 5/20/14	**Extraction Method:**	Methods for Geochemical Analysis
Instrument:	ICP-JY	**Analytical Method:**	SW6010B
Matrix:	Soil	**Unit:**	mg/kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-90677

QC Summary Report for SW6010B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Phosphorous	ND	268	15	250	-	107	70-130
Silica	60.4	553	32	535	-	103	75-125

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	12/19/13	**BatchID:**	90683
Date Analyzed:	5/20/14	**Extraction Method:**	SW3050B
Instrument:	ICP-MS1	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-90683

QC Summary Report for SW6020

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Aluminum	ND	549	50	500	-	110	75-125
Arsenic	ND	55.5	0.50	50	-	111	75-125
Calcium	ND	5240	100	5000	-	105	75-125
Ferric Oxides	ND	531	20	500	-	106	75-125
Lead	ND	53.2	0.50	50	-	106	75-125
Magnesium	ND	546	20	500	-	109	75-125
Manganese	ND	552	20	500	-	110	75-125
Selenium	ND	54.5	0.50	50	-	109	75-125
Uranium	ND	49.5	0.50	50	-	99.1	75-125

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/23/14	**BatchID:**	89653
Date Analyzed:	4/29/14	**Extraction Method:**	SSSA Part 3 Chapter 40
Instrument:	ICP-MS1	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89653

QC SUMMARY REPORT FOR SW6020

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Barium	3.89	54.3	0.50	50	-	109	80-120
Calcium	ND	495	10	500	-	98.9	80-120
Lithium	ND	4.93	0.050	5	-	98.5	80-120
Magnesium	ND	53.7	2.0	50	-	107	80-120
Potassium	ND	52.2	5.0	50	-	104	80-120
Sodium	18.1	531	10	500	-	106	80-120
Strontium	ND	53.5	2.0	50	-	107	80-120

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	12/19/13	**BatchID:**	85317
Date Analyzed:	1/6/14 - 1/7/14	**Extraction Method:**	SW3050B
Instrument:	ICP-JY	**Analytical Method:**	SW6010B
Matrix:	Solid	**Unit:**	mg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-85317

QC Summary Report for SW6010B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Phosphorous	ND	543	15	500	-	109	70-130

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	12/19/14	**BatchID:**	90740
Date Analyzed:	5/21/14	**Extraction Method:**	SW3050B
Instrument:	ICP-JY	**Analytical Method:**	SW6010B
Matrix:	Soil	**Unit:**	mg/kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-90740

QC Summary Report for SW6010B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Silica	2.35	185	1.1	214	-	86.5	75-125

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	12/20/13	**BatchID:**	85347
Date Analyzed:	12/26/13	**Extraction Method:**	SW3060A
Instrument:	IC2	**Analytical Method:**	SW7199
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-85347 1312614-007AMS/MSD

QC Summary Report for SW7199 (Hexachrome)

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	ND	211	4.0	200	-	105	80-120

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	202	196	200	ND	101	97.9	70-130	3.22	20

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	12/20/13	**BatchID:**	85379
Date Analyzed:	12/21/13	**Extraction Method:**	SW8330
Instrument:	HPLC4	**Analytical Method:**	SW8330
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-85379 1312545-005AMS/MSD

QC Summary Report for SW8330

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	-	0.080	-	-	-	-
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	-	0.080	-	-	-	-
1,3-Dinitrobenzene (1,3-DNB)	ND	-	0.080	-	-	-	-
2,4-Dinitrotoluene (2,4-DNT)	ND	-	0.080	-	-	-	-
2,6-Dinitrotoluene (2,6-DNT)	ND	-	0.080	-	-	-	-
HMX	ND	0.728	0.080	0.80	-	91	80-120
Nitrobenzene (NB)	ND	-	0.080	-	-	-	-
2-Nitrotoluene (2-NT)	ND	0.769	0.080	0.80	-	96.1	80-120
3-Nitrotoluene (3-NT)	ND	0.758	0.080	0.80	-	94.7	80-120
4-Nitrotoluene (4-NT)	ND	0.769	0.080	0.80	-	96.2	80-120
RDX	ND	0.857	0.080	0.80	-	107	80-120
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.706	0.080	0.80	-	88.3	80-120
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	-	0.080	-	-	-	-
Tetryl	ND	-	0.080	-	-	-	-
Surrogate Recovery							
3,4-DNT	2.32	2.40		2	116	120	70-130

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
HMX	0.678	0.704	0.80	ND	84.7	88	70-130	3.76	30
2-Nitrotoluene (2-NT)	0.744	0.756	0.80	ND	92.9	94.6	70-130	1.72	30
3-Nitrotoluene (3-NT)	0.733	0.729	0.80	ND	91.6	91.1	70-130	0.497	30
4-Nitrotoluene (4-NT)	0.751	0.748	0.80	ND	93.9	93.6	70-130	0.359	30
RDX	0.811	0.622	0.80	ND	101	77.8	70-130	26.4	30
1,3,5-Trinitrobenzene (1,3,5-TNB)	0.792	0.790	0.80	ND	99	98.8	70-130	0.228	30
Surrogate Recovery									
3,4-DNT	2.30	2.31	2		115	115	70-130	0	30

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	1/8/14	**BatchID:**	85896
Date Analyzed:	1/10/14	**Extraction Method:**	MAI_LCMS
Instrument:	LC3Q-MS1	**Analytical Method:**	E6850
Matrix:	Soil	**Unit:**	mg/kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-85896 1312545-007AMS/MSD

QC Summary Report for E6850

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Perchlorate	ND	88.1	10	100	-	88.1	80-120

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Perchlorate	81.8	84.6	100	ND	81.8	84.6	70-130	3.37	20

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	5/5/14	**BatchID:**	90059
Date Analyzed:	5/5/14	**Extraction Method:**	SM5310Bm
Instrument:	TOC_CNS	**Analytical Method:**	SM5310Bm
Matrix:	Soil	**Unit:**	mg/kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-90059 1312545-001BMS/MSD

QC Summary Report for SM5310Bm

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TOC	ND	8200	200	8200	-	100	80-120
Total Nitrogen	ND	1930	200	1900	-	101	80-120

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
TOC	7940	7620	8200	ND	93.5	89.7	80-120	4.03	20
Total Nitrogen	2310	2340	1900	310	105	107	80-120	1.20	20

TODD ENGINEERS

2490 Mariner Square Loop, Suite 215, Alameda, CA 94501
510-747-6920 (voice) 510-747-6921(fax) bmotzer@toddengineers.com

Chain of Custody

Batch/Shipment No.:

Page: 1 of 1

Date: 12-18-2013

Lab Name: McCambell Analytical, Inc.

Address: 1534 Willow Pass Road
Pittsburg, CA 94565

Telephone: 925-252-9262; 877-252-9262

Samplers (Signatures) William E Motzer × Amber Ritchie

Analysis Request

	Sample Number	Matrix	Date	Time	Depth Interval	Cr(VI) - EPA 7199	Perchlorate by EPA 6860	DI TCLP Extraction by SW1311 w/ As, Cr analysis	CEC NH_4Ac Exchange Extraction with analysis for Ca, Na, Mg, K, Sr, Li Alkali & Alkaline earth metals	Nitroaromatics - EPA 8330	Mineral XRD w. quant. phase analysis	Mineral: resin impreg thin section prep and exam	SEM - EDA analysis for Ca & Na (SUB)	Na, K, Ca, Mg, Ba, Sr, Al, Fe Total Dissolution or XRF	TOC-TN by combustion	Total P on ash after combustion-E200.7	Number of Containers
1	MW-1: 27.5-30.0	Soil	12/16/13	1435	27.5-30.0'	✓	✓	✓	✓	✓				✓	✓	✓	2
2	MW-1: 74.0-75.5	Soil	12/17/13	1140	74.0-75.5'	✓	✓	✓	✓	✓				✓	✓	✓	2
3	MW-1: 98.5-101	Soil	12/17/13	1150	98.5-101'	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2
4	MW-1 129.5-142.0	Soil	12/17/13	1200	129.5-142.0'	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2
5	MW-1 200-202.5	Soil	12/17/13	1220	200.0-202.5'	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2
6	MW-1 297.-298.5	Soil	12/18/13	0820	297.0-298.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2
7	MW-1 364.5-367.0	Soil	12/18/13	0900	364.5-367.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2
8	MW-1	Soil															
9	MW-1	Soil															
10	MW-1	Soil															

Project Information

Project Name: MRWPCA
Project Manager: Edwin Lin, Senior Hydro.
Job No.: 60408
Shipping ID. No.:
Via:

Sample Receipt

Total No. of Containers: 22° wet ice
Chain of Custody Seals:
Rec'd Good Condition/Cold:
Conforms to Record:
Lab No.: 1312545

Special Instructions/Comments:

Relinquished By:
(Signature) William E Motzer (Time) 0920
(Date) 12/18/2013
(Printed Name) William E. Motzer
(Company) Todd Engineers

Received By:
× Amber Ritchie (Signature) 0920 (Time)
Amber Ritchie (Printed Name) 12-18-13 (Date)
(Company)

Relinquished By:
(Signature) Amber Ritchie (Time)
(Printed Name) (Date)
(Company)

Received By:
(Signature) Maria Venegas (Time)
(Printed Name) MAI (Date)
(Company) 12/18/13 1154

Relinquished By:
(Signature) (Time)
(Printed Name) (Date)
(Company)

Received By (Laboratory):
(Signature) (Time)
(Printed Name) (Date)
(Laboratory)

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Analytical Report

WorkOrder: 1312650

Report Created for: Todd Engineering
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501

Project Contact: Bill Motzer
Project P.O.:
Project Name: #60408; MRWPCA

Project Received: 12/20/2013

Analytical Report reviewed & approved for release on 05/16/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.

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Glossary of Terms & Qualifier Definitions

Client: Todd Engineering
Project: #60408; MRWPCA
WorkOrder: 1312650

Glossary Abbreviation

95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

Analytical Qualifier

B	analyte detected in the associated Method Blank
H	samples were analyzed out of holding time
S	spike recovery outside accepted recovery limits
a1	sample diluted due to matrix interference
a4	the reporting limits were raised due to the sample's matrix prohibiting a full volume extraction.
a7	reporting limit raised due to limited sample amount
a14	reporting limit raised due to the physical nature of the sample
a20	reporting limit raised due to matrix interference
c1	surrogate recovery outside of the control limits due to the dilution of the sample.
j1	see attached narrative

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Glossary of Terms & Qualifier Definitions

Client: Todd Engineering
Project: #60408; MRWPCA
WorkOrder: 1312650

Quality Control Qualifiers

F1	MS/MSD recovery was out of acceptance criteria; LCS validated the prep batch.
F2	LCS recovery for this compound is outside of acceptance limits.
F3	the surrogate standard recovery is outside of acceptance limits.

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/20/13 15:35	**Analytical Method:**	SW6020
Date Prepared:	5/16/14	**Unit:**	wt %

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001B**	**Solid**	**12/19/2013 14:00**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**12**	0.28	100	05/19/2014 16:41
BaO	ND	0.056	10	05/19/2014 11:03
CaO	**1.8**	0.35	10	05/19/2014 11:03
FeO	**5.0**	0.019	10	05/19/2014 11:03
K2O	**1.6**	0.15	10	05/19/2014 11:03
MgO	**2.7**	0.025	10	05/19/2014 11:03
MnO	**0.052**	0.026	10	05/19/2014 11:03
Na2O	**1.2**	0.20	10	05/19/2014 11:03
SrO	ND	0.024	10	05/19/2014 11:03
TiO2	**0.57**	0.25	100	05/19/2014 16:41

Analytical Comments: a1

MW-1: 433.0-435.0	**1312650-002B**	**Solid**	**12/19/2013 14:15**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**9.9**	0.28	100	05/19/2014 16:59
BaO	**0.064**	0.056	10	05/19/2014 11:09
CaO	**2.1**	0.35	10	05/19/2014 11:09
FeO	**2.8**	0.019	10	05/19/2014 11:09
K2O	**1.5**	0.15	10	05/19/2014 11:09
MgO	**1.0**	0.025	10	05/19/2014 11:09
MnO	**0.028**	0.026	10	05/19/2014 11:09
Na2O	**2.2**	0.20	10	05/19/2014 11:09
SrO	**0.035**	0.024	10	05/19/2014 11:09
TiO2	**0.27**	0.25	100	05/19/2014 16:59

Analytical Comments: a1

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/20/13 15:35	**Analytical Method:**	SW6020
Date Prepared:	5/16/14	**Unit:**	wt %

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 472.0-474.5	**1312650-003B**	**Solid**	**12/19/2013 14:30**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**8.0**	0.28	100	05/19/2014 17:06
BaO	**0.078**	0.056	10	05/19/2014 11:15
CaO	**1.9**	0.35	10	05/19/2014 11:15
FeO	**1.6**	0.019	10	05/19/2014 11:15
K2O	**1.7**	0.15	10	05/19/2014 11:15
MgO	**0.45**	0.025	10	05/19/2014 11:15
MnO	ND	0.026	10	05/19/2014 11:15
Na2O	**2.0**	0.20	10	05/19/2014 11:15
SrO	**0.036**	0.024	10	05/19/2014 11:15
TiO2	**0.14**	0.025	10	05/19/2014 11:15

Analytical Comments: a1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/20/13 15:35	**Analytical Method:**	SW6010B
Date Prepared:	12/20/14	**Unit:**	%

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001B**	**Solid**	**12/19/2013 14:00**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.13**	0.0035	1	05/06/2014 16:14
SiO2	**1.1**	0.032	10	05/20/2014 16:56

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 433.0-435.0	**1312650-002B**	**Solid**	**12/19/2013 14:15**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.094**	0.0035	1	05/06/2014 16:20
SiO2	**0.78**	0.032	10	05/20/2014 16:58

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 472.0-474.5	**1312650-003B**	**Solid**	**12/19/2013 14:30**	**ICP-JY**	**90677**

Analytes	Result	RL	DF	Date Analyzed
P2O5	**0.14**	0.0035	1	05/06/2014 16:22
SiO2	**1.1**	0.032	10	05/20/2014 17:00

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SSSA Part 3 Chapter 40
Date Received:	12/20/13 15:35	**Analytical Method:**	SW6020
Date Prepared:	4/23/14	**Unit:**	mg/Kg

Exchangeable Cations using Ammonium Acetate

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001B**	**Solid/SSSA**	**12/19/2013 14:00**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**12**	B	0.50	1	04/29/2014 15:34
Calcium	**3300**		100	10	05/07/2014 12:09
Lithium	**0.30**		0.050	1	04/29/2014 15:34
Magnesium	**840**		20	10	05/07/2014 12:09
Potassium	**180**		5.0	1	04/29/2014 15:34
Sodium	**160**	B	10	1	04/29/2014 15:34
Strontium	**31**		2.0	1	04/29/2014 15:34

MW-1: 433.0-435.0	**1312650-002B**	**Solid/SSSA**	**12/19/2013 14:15**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**9.2**	B	0.50	1	04/29/2014 15:40
Calcium	**2900**		100	10	05/07/2014 12:15
Lithium	**0.24**		0.050	1	04/29/2014 15:40
Magnesium	**750**		2.0	1	04/29/2014 15:40
Potassium	**140**		5.0	1	04/29/2014 15:40
Sodium	**160**	B	10	1	04/29/2014 15:40
Strontium	**24**		2.0	1	04/29/2014 15:40

MW-1: 472.0-474.5	**1312650-003B**	**Solid/SSSA**	**12/19/2013 14:30**	**ICP-MS1**	**89653**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Barium	**12**	B	0.50	1	05/12/2014 09:28
Calcium	**910**		100	10	05/12/2014 15:57
Lithium	ND		0.050	1	05/12/2014 09:28
Magnesium	**340**		2.0	1	05/12/2014 09:28
Potassium	**78**		5.0	1	05/12/2014 09:28
Sodium	**99**	B	10	1	05/12/2014 09:28
Strontium	**11**		2.0	1	05/12/2014 09:28

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SW3050B
Date Received:	12/20/13 15:35	**Analytical Method:**	SW6010B
Date Prepared:	12/20/13	**Unit:**	mg/Kg

Phosphorus

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001A**	**Solid/TOTAL^**	**12/19/2013 14:00**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**570**	15	1	05/06/2014 16:14

MW-1: 433.0-435.0	**1312650-002A**	**Solid/TOTAL^**	**12/19/2013 14:15**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**410**	15	1	05/06/2014 16:20

MW-1: 472.0-474.5	**1312650-003A**	**Solid/TOTAL^**	**12/19/2013 14:30**	**ICP-JY**	**85317**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**610**	15	1	05/06/2014 16:22

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	Methods for Geochemical Analysis
Date Received:	12/20/13 15:35	**Analytical Method:**	SW6020
Date Prepared:	5/16/14	**Unit:**	wt %

Major Elements as Oxides

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 472.0-474.5	**1312650-003B**	**Solid**	**12/19/2013 14:30**	**ICP-MS1**	**90512**

Analytes	Result	RL	DF	Date Analyzed
Al2O3	**8.0**	0.28	100	05/19/2014 17:06
BaO	**0.078**	0.056	10	05/19/2014 11:15
CaO	**1.9**	0.35	10	05/19/2014 11:15
FeO	**1.6**	0.019	10	05/19/2014 11:15
K2O	**1.7**	0.15	10	05/19/2014 11:15
MgO	**0.45**	0.025	10	05/19/2014 11:15
MnO	ND	0.026	10	05/19/2014 11:15
Na2O	**2.0**	0.20	10	05/19/2014 11:15
SrO	**0.036**	0.024	10	05/19/2014 11:15
TiO2	**0.14**	0.025	10	05/19/2014 11:15

Analytical Comments: a1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SW3060A
Date Received:	12/20/13 15:35	**Analytical Method:**	SW7199
Date Prepared:	12/26/13	**Unit:**	mg/Kg

TTLC Hexachrome by Alkaline Digestion and IC-UV Analysis

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001A**	**Solid/TOTAL**	**12/19/2013 14:00**	**IC2**	**85478**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/27/2013 18:19

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 433.0-435.0	**1312650-002A**	**Solid/TOTAL**	**12/19/2013 14:15**	**IC2**	**85478**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/27/2013 18:38

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 472.0-474.5	**1312650-003A**	**Solid/TOTAL**	**12/19/2013 14:30**	**IC2**	**85478**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	4.0	1	12/27/2013 18:57

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/20/13 15:35	**Analytical Method:**	SW8330
Date Prepared:	12/30/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001A**	**Solid**	**12/19/2013 14:00**	**HPLC4**	**85587**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/30/2013 17:58
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/30/2013 17:58
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/30/2013 17:58
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/30/2013 17:58
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/30/2013 17:58
HMX	ND	0.080	1	12/30/2013 17:58
Nitrobenzene (NB)	ND	0.080	1	12/30/2013 17:58
2-Nitrotoluene (2-NT)	ND	0.080	1	12/30/2013 17:58
3-Nitrotoluene (3-NT)	ND	0.080	1	12/30/2013 17:58
4-Nitrotoluene (4-NT)	ND	0.080	1	12/30/2013 17:58
RDX	ND	0.080	1	12/30/2013 17:58
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/30/2013 17:58
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/30/2013 17:58
Tetryl	ND	0.080	1	12/30/2013 17:58

Surrogates	REC (%)	Limits	
3,4-DNT	99	70-130	12/30/2013 17:58

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/20/13 15:35	**Analytical Method:**	SW8330
Date Prepared:	12/30/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 433.0-435.0	**1312650-002A**	**Solid**	**12/19/2013 14:15**	**HPLC4**	**85587**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/30/2013 18:42
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/30/2013 18:42
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/30/2013 18:42
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/30/2013 18:42
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/30/2013 18:42
HMX	ND	0.080	1	12/30/2013 18:42
Nitrobenzene (NB)	ND	0.080	1	12/30/2013 18:42
2-Nitrotoluene (2-NT)	ND	0.080	1	12/30/2013 18:42
3-Nitrotoluene (3-NT)	ND	0.080	1	12/30/2013 18:42
4-Nitrotoluene (4-NT)	ND	0.080	1	12/30/2013 18:42
RDX	ND	0.080	1	12/30/2013 18:42
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/30/2013 18:42
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/30/2013 18:42
Tetryl	ND	0.080	1	12/30/2013 18:42

Surrogates	REC (%)	Limits	
3,4-DNT	104	70-130	12/30/2013 18:42

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method**	SW8330
Date Received:	12/20/13 15:35	**Analytical Method:**	SW8330
Date Prepared:	12/30/13	**Unit:**	mg/Kg

Nitroaromatics and Nitroamines by HPLC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 472.0-474.5	**1312650-003A**	**Solid**	**12/19/2013 14:30**	**HPLC4**	**85587**

Analytes	Result	RL	DF	Date Analyzed
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	0.080	1	12/30/2013 20:55
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	0.080	1	12/30/2013 20:55
1,3-Dinitrobenzene (1,3-DNB)	ND	0.080	1	12/30/2013 20:55
2,4-Dinitrotoluene (2,4-DNT)	ND	0.080	1	12/30/2013 20:55
2,6-Dinitrotoluene (2,6-DNT)	ND	0.080	1	12/30/2013 20:55
HMX	ND	0.080	1	12/30/2013 20:55
Nitrobenzene (NB)	ND	0.080	1	12/30/2013 20:55
2-Nitrotoluene (2-NT)	ND	0.080	1	12/30/2013 20:55
3-Nitrotoluene (3-NT)	ND	0.080	1	12/30/2013 20:55
4-Nitrotoluene (4-NT)	ND	0.080	1	12/30/2013 20:55
RDX	ND	0.080	1	12/30/2013 20:55
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.080	1	12/30/2013 20:55
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	0.080	1	12/30/2013 20:55
Tetryl	ND	0.080	1	12/30/2013 20:55

Surrogates	REC (%)	Limits	
3,4-DNT	102	70-130	12/30/2013 20:55

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	MAI_LCMS
Date Received:	12/20/13 15:35	**Analytical Method:**	E6850
Date Prepared:	5/5/14	**Unit:**	µg/Kg

Perchlorate by LC-MS

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001A**	**Solid**	**12/19/2013 14:00**	**LC3Q-MS1**	**90061**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	0.10	10	05/06/2014 11:50

Analytical Comments: a1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 433.0-435.0	**1312650-002A**	**Solid**	**12/19/2013 14:15**	**LC3Q-MS1**	**90061**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	0.010	1	05/06/2014 11:15

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 472.0-474.5	**1312650-003A**	**Solid**	**12/19/2013 14:30**	**LC3Q-MS1**	**90061**

Analytes	Result	RL	DF	Date Analyzed
Perchlorate	ND	0.010	1	05/06/2014 11:21

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SM5310Bm
Date Received:	12/20/13 15:35	**Analytical Method:**	SM5310Bm
Date Prepared:	5/5/14	**Unit:**	mg/kg

Total Organic Carbon (TOC)

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001B**	**Solid**	**12/19/2013 14:00**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	**9300**	200	1	05/05/2014 22:08

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 433.0-435.0	**1312650-002B**	**Solid**	**12/19/2013 14:15**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	ND	200	1	05/05/2014 22:19

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 472.0-474.5	**1312650-003B**	**Solid**	**12/19/2013 14:30**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
TOC	**340**	200	1	05/05/2014 22:30

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E415.1m
Date Received:	12/20/13 15:35	**Analytical Method:**	E415.1m
Date Prepared:	5/5/14	**Unit:**	mg/Kg

Total Nitrogen

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001B**	**Solid**	**12/19/2013 14:00**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**1000**	200	1	05/05/2014 22:08

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 433.0-435.0	**1312650-002B**	**Solid**	**12/19/2013 14:15**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**560**	200	1	05/05/2014 22:19

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 472.0-474.5	**1312650-003B**	**Solid**	**12/19/2013 14:30**	**TOC_CNS**	**90059**

Analytes	Result	RL	DF	Date Analyzed
Total Nitrogen	**710**	200	1	05/05/2014 22:30

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/23/14	**BatchID:**	89653
Date Analyzed:	4/29/14	**Extraction Method:**	SSSA Part 3 Chapter 40
Instrument:	ICP-MS1	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89653

QC SUMMARY REPORT FOR SW6020

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Barium	3.89	54.3	0.50	50	-	109	80-120
Calcium	ND	495	10	500	-	98.9	80-120
Lithium	ND	4.93	0.050	5	-	98.5	80-120
Magnesium	ND	53.7	2.0	50	-	107	80-120
Potassium	ND	52.2	5.0	50	-	104	80-120
Sodium	18.1	531	10	500	-	106	80-120
Strontium	ND	53.5	2.0	50	-	107	80-120

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	12/19/13	**BatchID:**	85317
Date Analyzed:	1/6/14 - 1/7/14	**Extraction Method:**	SW3050B
Instrument:	ICP-JY	**Analytical Method:**	SW6010B
Matrix:	Solid	**Unit:**	mg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-85317

QC Summary Report for SW6010B

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Phosphorous	ND	543	15	500	-	109	70-130

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	12/24/13	**BatchID:**	85478
Date Analyzed:	12/27/13	**Extraction Method:**	SW3060A
Instrument:	IC2	**Analytical Method:**	SW7199
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-85478 1312649-136AMS/MSD

QC Summary Report for SW7199 (Hexachrome)

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	ND	209	4.0	200	-	104	80-120

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	213	196	200	5.600	104	95.2	70-130	8.50	20

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	12/30/13	**BatchID:**	85587
Date Analyzed:	12/30/13	**Extraction Method**	SW8330
Instrument:	HPLC4	**Analytical Method:**	SW8330
Matrix:	Soil	**Unit:**	mg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-85587 1312650-002AMS/MSD

QC Summary Report for SW8330

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	ND	-	0.080	-	-	-	-
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	ND	-	0.080	-	-	-	-
1,3-Dinitrobenzene (1,3-DNB)	ND	-	0.080	-	-	-	-
2,4-Dinitrotoluene (2,4-DNT)	ND	-	0.080	-	-	-	-
2,6-Dinitrotoluene (2,6-DNT)	ND	-	0.080	-	-	-	-
HMX	ND	0.7261	0.080	0.80	-	90.8	80-120
Nitrobenzene (NB)	ND	-	0.080	-	-	-	-
2-Nitrotoluene (2-NT)	ND	0.8786	0.080	0.80	-	110	80-120
3-Nitrotoluene (3-NT)	ND	0.8718	0.080	0.80	-	109	80-120
4-Nitrotoluene (4-NT)	ND	0.8589	0.080	0.80	-	107	80-120
RDX	ND	0.8069	0.080	0.80	-	101	80-120
1,3,5-Trinitrobenzene (1,3,5-TNB)	ND	0.8406	0.080	0.80	-	105	80-120
2,4,6-Trinitrotoluene (2,4,6-TNT)	ND	-	0.080	-	-	-	-
Tetryl	ND	-	0.080	-	-	-	-
Surrogate Recovery							
3,4-DNT	2.018	1.806		2	101	90	70-130

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
HMX	0.6506	0.6627	0.80	ND	81.3	82.8	70-130	1.83	30
2-Nitrotoluene (2-NT)	0.7956	0.7468	0.80	ND	99.5	93.3	70-130	6.33	30
3-Nitrotoluene (3-NT)	0.7695	0.7197	0.80	ND	96.2	90	70-130	6.69	30
4-Nitrotoluene (4-NT)	0.7689	0.7242	0.80	ND	96.1	90.5	70-130	5.99	30
RDX	0.7128	0.7659	0.80	ND	89.1	95.7	70-130	7.18	30
1,3,5-Trinitrobenzene (1,3,5-TNB)	0.7451	0.7512	0.80	ND	93.1	93.9	70-130	0.814	30
Surrogate Recovery									
3,4-DNT	2.042	2.033	2		102	102	70-130	0	30

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	5/5/14	**BatchID:**	90061
Date Analyzed:	5/6/14	**Extraction Method:**	MAI_LCMS
Instrument:	LC3Q-MS1	**Analytical Method:**	E6850
Matrix:	Soil	**Unit:**	µg/Kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-90061 1312650-001AMS/MSD

QC Summary Report for E6850

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Perchlorate	ND	0.0829	0.010	0.10	-	82.9	80-120

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Perchlorate	NR	NR	0.10	ND<0.10	NR	NR	70-130	NR	20

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	5/5/14	**BatchID:**	90059
Date Analyzed:	5/5/14	**Extraction Method:**	SM5310Bm
Instrument:	TOC_CNS	**Analytical Method:**	SM5310Bm
Matrix:	Soil	**Unit:**	mg/kg
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-90059 1312545-001BMS/MSD

QC Summary Report for SM5310Bm

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TOC	ND	8200	200	8200	-	100	80-120
Total Nitrogen	ND	1930	200	1900	-	101	80-120

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
TOC	7940	7620	8200	ND	93.5	89.7	80-120	4.03	20
Total Nitrogen	2310	2340	1900	310	105	107	80-120	1.20	20

SH QA/QC Officer

TODD ENGINEERS

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510-747-6920 (voice) 510-747-6921(fax) bmotzer@toddengineers.com

Chain of Custody

Batch/Shipment No.:

Page: 1 of 1

Date: 12/19/13

Lab Name: McCambell Analytical, Inc.
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Pittsburg, CA 94565
Telephone: 925-252-9262; 877-252-9262
Samplers (Signatures) William E. Motzer

Analysis Request

	Sample Number	Matrix	Date	Time	Depth Interval	Cr(VI) - EPA 7199	Perchlorate by EPA 6860	DI TCLP Extraction by SW1311 w/ As, Cr analysis	CEC NH_4Ac Exchange Extraction with analysis for Ca, Na, Mg, K, Sr, Li Alkali & Alkaline earth metals	Nitroaromatics - EPA 8330	Mineral XRD w. quant. phase analysis	Mineral: resin impreg thin section prep and exam	SEM - EDA analysis for Ca & Na (SUB)	Na, K, Ca, Mg, Ba, Sr, Al, Fe Total Dissolution or XRF	TOC-TN by combustion	Total P on ash after combustion-E200.7	Number of Containers
1	MW-1 398.5-401.0	Soil	12/19/13	1400	398.5'-401.0'	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2
2	MW-1 433.0-435.0	Soil	12/19/13	1415	433.0'-435.0'	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2
3	MW-1 472.0-474.5	Soil	12/19/13	1430	472.0'-474.5'	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2
4	MW-1	Soil															
5	MW-1	Soil															
6	MW-1	Soil															
7	MW-1	Soil															
8	MW-1	Soil															
9	MW-1	Soil															
10	MW-1	Soil															

Project Information

Project Name: MRWPCA
Project Manager: Edwin Lin, Senior Hydro.
Job No.: 60408
Shipping ID. No.:
Via:

Sample Receipt

Total No. of Containers: 1-2' 6
Chain of Custody Seals: N/a
Rec'd Good Condition/Cold: yes
Conforms to Record: yes
Lab No.: 1312650

Special Instructions/Comments:

Relinquished By:
(Signature) William E. Motzer (Time) 0850
(Printed Name) William E. Motzer (Date) 12/20/13
(Company) Todd Engineers

Received By:
(Signature) (Time) 350
(Printed Name) (Date) 12/20/13
(Company)

Relinquished By:
(Signature) (Time) 1,50pm
(Printed Name) (Date) 12/20/13
(Company)

Received By:
(Signature) Melissa Valles (Time) 1,50pm
(Printed Name) Melissa Valles (Date) 12/20/13
(Company) MAI

Relinquished By:
(Signature) (Time)
(Printed Name) (Date)
(Company)

Received By (Laboratory):
(Signature) (Time)
(Printed Name) (Date)
(Laboratory)

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Analytical Report

WorkOrder: 1402489

Report Created for: Todd Engineering
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501

Project Contact: Bill Motzer
Project P.O.:
Project Name: Pilot Water

Project Received: 02/12/2014

Analytical Report reviewed & approved for release on 02/26/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.

ACCREDITED IN ACCORDANCE WITH nelac

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Glossary of Terms & Qualifier Definitions

Client: Todd Engineering
Project: Pilot Water
WorkOrder: 1402489

Glossary Abbreviation

95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

Analytical Qualifier

B	analyte detected in the associated Method Blank
H	samples were analyzed out of holding time
S	spike recovery outside accepted recovery limits
F	The dissolved metals sample was not filtered within 15 minutes of collection as required by the Code of Federal Regulations Part 136.
a1	sample diluted due to matrix interference
a7	reporting limit raised due to limited sample amount
c1	surrogate recovery outside of the control limits due to the dilution of the sample.

Quality Control Qualifiers

F2	LCS recovery for this compound is outside of acceptance limits.

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Case Narrative

Client: Todd Engineering **Work Order:** 1402489
Project: Pilot Water May 16, 2014

McCampbell Analytical incorporated the following method for the extraction of the Pilot Water sample:

Sample was rotated for 7 days. Upon completion of rotation McCampbell Analytical centrifuged the Pilot water extract for 12hrs and filtered through a 0.45 micron filter.

_____ Angela Rydelius, Lab Manager

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	E200.8
Date Received:	2/12/14 16:30	**Analytical Method:**	E200.8
Date Prepared:	4/23/14	**Unit:**	µg/L

CAM / CCR 17 Metals + Misc. Elements

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water/DISS.**	**04/22/2014**	**ICP-MS1**	**89648**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Antimony	ND	F	5.0	10	04/26/2014 01:47
Arsenic	ND	F	5.0	10	04/26/2014 01:47
Barium	**140**	F	50	10	04/26/2014 01:47
Beryllium	ND	F	5.0	10	04/26/2014 01:47
Cadmium	ND	F	2.5	10	04/26/2014 01:47
Chromium	ND	F	5.0	10	04/26/2014 01:47
Cobalt	ND	F	5.0	10	04/26/2014 01:47
Copper	ND	F	5.0	10	04/26/2014 01:47
Lead	ND	F	5.0	10	04/26/2014 01:47
Mercury	ND	F	0.25	10	04/26/2014 01:47
Molybdenum	ND	F	5.0	10	04/26/2014 01:47
Nickel	ND	F	5.0	10	04/26/2014 01:47
Selenium	ND	F	5.0	10	04/26/2014 01:47
Silver	ND	F	1.9	10	04/26/2014 01:47
Thallium	ND	F	5.0	10	04/26/2014 01:47
Vanadium	ND	F	5.0	10	04/26/2014 01:47
Zinc	ND	F	50	10	04/26/2014 01:47
Aluminum	ND	F	500	10	04/26/2014 01:47
Calcium	**11,000**	F	1000	10	04/26/2014 01:47
Iron	ND	F	200	10	04/26/2014 01:47
Lithium	ND	F	50	10	04/26/2014 01:47
Magnesium	ND	F	200	10	04/26/2014 01:47
Manganese	ND	F	200	10	04/26/2014 01:47
Potassium	**2000**	F	500	10	04/26/2014 01:47
Sodium	**19,000**	F	1000	10	04/26/2014 01:47
Strontium	ND	F	200	10	04/26/2014 01:47
Uranium	ND	F	5.0	10	04/26/2014 01:47

Analytical Comments: a1,a7

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	E200.7
Date Received:	2/12/14 16:30	**Analytical Method:**	E200.7
Date Prepared:	4/23/14	**Unit:**	µg/L

Phosphorus

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water/DISS.**	**04/22/2014**	**ICP-JY**	**89607**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	ND	500	10	05/02/2014 14:02

Analytical Comments: a7

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	E200.7
Date Received:	2/12/14 16:30	**Analytical Method:**	200.7
Date Prepared:	4/23/14	**Unit:**	µg/L

Silicon

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water/DISS.**	**04/22/2014**	**ICP-JY**	**89609**

Analytes	Result	RL	DF	Date Analyzed
Silicon	**520**	500	10	05/02/2014 12:41

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	E415.3
Date Received:	2/12/14 16:30	**Analytical Method:**	E415.3
Date Prepared:	4/29/14	**Unit:**	mg/L

Dissolved Organic Carbon (DOC)

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**TOC_SHIMADZU**	**89604**

Analytes	Result	RL	DF	Date Analyzed
Dissolved Organic Carbon	**1.3**	0.70	1	04/29/2014 15:32

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	E218.6
Date Received:	2/12/14 16:30	**Analytical Method:**	E218.6
Date Prepared:	4/24/14	**Unit:**	µg/L

Hexachrome by IC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**IC2**	**89600**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Hexachrome	**0.21**	B	0.20	1	04/24/2014 15:09

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	E300.1
Date Received:	2/12/14 16:30	**Analytical Method:**	E300.1
Date Prepared:	4/24/14	**Unit:**	mg/L

Inorganic Anions by IC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**IC3**	**89601**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Bromide	ND		0.10	1	04/24/2014 14:46
Chloride	**2.0**	B	0.10	1	04/24/2014 15:27
Fluoride	ND		0.10	1	04/24/2014 14:46
Nitrate as N	**0.64**	B	0.10	1	04/24/2014 14:46
Nitrate as $NO3^{-}$	**2.8**	B	0.45	1	04/24/2014 14:46
Nitrite as N	ND		0.10	1	04/24/2014 14:46
Nitrite as $NO2^{-}$	ND		0.33	1	04/24/2014 14:46
Sulfate	**0.11**	B	0.10	1	04/24/2014 14:46

Surrogates	REC (%)	Limits	
Formate	105	90-115	04/24/2014 14:46

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	E350.1
Date Received:	2/12/14 16:30	**Analytical Method:**	E350.1
Date Prepared:	4/29/14	**Unit:**	mg/L

Ammonia as N

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water/TOTAL**	**04/22/2014**	**SKALAR**	**89603**

Analytes	Result	RL	DF	Date Analyzed
Total Ammonia as N	**1.3**	0.10	1	04/29/2014 15:40

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	SM2320B
Date Received:	2/12/14 16:30	**Analytical Method:**	SM2320B
Date Prepared:	4/29/14	**Unit:**	mg $CaCO_3$/L

Total & Speciated Alkalinity as Calcium Carbonate

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**Titrino**	**89602**

Analytes	Result	RL	DF	Date Analyzed
Total	**43.0**	1.00	1	04/29/2014 10:23
Carbonate	ND	1.00	1	04/29/2014 10:23
Bicarbonate	**43.0**	1.00	1	04/29/2014 10:23
Hydroxide	ND	1.00	1	04/29/2014 10:23

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	SM4500-Cl DE
Date Received:	2/12/14 16:30	**Analytical Method:**	SM4500-Cl DE
Date Prepared:	4/23/14	**Unit:**	mg/L

Chlorine, Total Residual

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**Titrino**	**89615**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Chlorine	**2.1**	BH	0.40	10	04/23/2014 16:19

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	SM4500 OG
Date Received:	2/12/14 16:30	**Analytical Method:**	SM4500OG
Date Prepared:	5/1/14	**Unit:**	mg DO/L @ °C

Dissolved Oxygen

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**WetChem**	**89612**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Dissolved Oxygen	**8.57 @ 23.1°C**	H	1.00	1	05/01/2014 18:40

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	E415.3
Date Received:	2/12/14 16:30	**Analytical Method:**	E415.3
Date Prepared:	4/30/14	**Unit:**	mg/L

Inorganic Carbon as Carbon Dioxide

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**TOC_CNS**	**89605**

Analytes	Result	RL	DF	Date Analyzed
IC as CO2	**40**	3.7	1	04/30/2014 15:06

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	SM2580Bm
Date Received:	2/12/14 16:30	**Analytical Method:**	SM2580B, MAI
Date Prepared:	4/24/14	**Unit:**	±, mV vs. NHE

Oxidation-Reduction Potential (ORP)

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**WetChem**	**89613**

Analytes	Result	Accuracy	DF	Date Analyzed
ORP	**636 @ 23.6°C**	10	1	04/24/2014 18:15

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	SM4500H+B
Date Received:	2/12/14 16:30	**Analytical Method:**	SM4500H+B
Date Prepared:	5/1/14	**Unit:**	±, pH units @ 25°C

pH

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**WetChem**	**89608**

Analytes	Result	Qualifiers	Accuracy	DF	Date Analyzed
pH	**7.70**	H	0.05	1	05/01/2014 20:49

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	SM2510B
Date Received:	2/12/14 16:30	**Analytical Method:**	SM2510B
Date Prepared:	5/1/14	**Unit:**	µmhos/cm @ 25°C

Specific Conductivity at 25°C

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**WetChem**	**89614**

Analytes	Result	RL	DF	Date Analyzed
Specific Conductivity	**139**	10.0	1	05/01/2014 20:25

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	SM4500 S-2 D
Date Received:	2/12/14 16:30	**Analytical Method:**	SM4500 S-2 D
Date Prepared:	5/1/14	**Unit:**	mg/L

Sulfide

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water**	**04/22/2014**	**SPECTROPHOTOMETER**	**89610**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Sulfide	ND	H	0.050	1	05/01/2014 14:40

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Project:	Pilot Water	**Extraction Method:**	E351.2
Date Received:	2/12/14 16:30	**Analytical Method:**	E351.2
Date Prepared:	4/29/14	**Unit:**	mg/L

Total Kjeldahl Nitrogen

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Pilot Water	**1402489-001B**	**Water/TOTAL**	**04/22/2014**	**SKALAR**	**89597**

Analytes	Result	RL	DF	Date Analyzed
TKN as N	**1.4**	0.30	1	04/30/2014 15:46

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89600
Date Analyzed:	4/23/14	**Extraction Method:**	E218.6
Instrument:	IC2	**Analytical Method:**	E218.6
Matrix:	Leachate	**Unit:**	µg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89600 1312545-003DMS/MSD

QC Summary Report for E218.6

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	0.210	23.3	0.20	25	-	93.2	90-110

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	24.7	24.6	25	1.620	92.5	92	90-110	0.446	10

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89601
Date Analyzed:	4/24/14 - 4/25/14	**Extraction Method:**	E300.1
Instrument:	IC3	**Analytical Method:**	E300.1
Matrix:	Leachate	**Unit:**	mg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89601 1312545-003DMS/MSD

QC Summary Report for E300.1

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Bromide	ND	0.964	0.10	1	-	96.4	85-115
Chloride	20.0	20.9	0.10	1	-	2090, F2	85-115
Fluoride	ND	1.10	0.10	1	-	110	85-115
Nitrate as N	0.647	1.62	0.10	1	-	162, F2	85-115
Nitrate as $NO3^{-}$	2.86	7.15	0.45	4.4	-	163, F2	85-115
Nitrite as N	ND	0.981	0.10	1	-	98.1	85-115
Nitrite as $NO2^{-}$	ND	3.24	0.33	3.3	-	98.1	85-115
Sulfate	0.121	1.10	0.10	1	-	110	85-115
Surrogate Recovery							
Formate	0.106	0.103		0.10	106	103	90-115

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Bromide	1.03	1.07	1	ND	103	107	85-115	3.31	15
Chloride	NR	NR	1	20.23	NR	NR	85-115	NR	15
Fluoride	1.32	1.34	1	0.2204	110	112	85-115	1.06	15
Nitrate as N	1.77	1.76	1	0.6401	113	112	85-115	0.298	15
Nitrate as $NO3^{-}$	7.83	7.81	4.4	2.834	114	113	85-115	0.298	15
Nitrite as N	1.07	1.07	1	ND	107	107	85-115	0	15
Nitrite as $NO2^{-}$	3.53	3.54	3.3	ND	107	107	85-115	0	15
Sulfate	1.53	1.53	1	0.4226	111	111	85-115	0	15
Surrogate Recovery									
Formate	0.104	0.104	0.10		104	104	90-115	0	10

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89603
Date Analyzed:	4/29/14	**Extraction Method:**	E350.1
Instrument:	SKALAR	**Analytical Method:**	E350.1
Matrix:	Water	**Unit:**	mg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89603

QC Summary Report for E350.1

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Total Ammonia as N	ND	3.80	0.10	4	-	95.1	90-110

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14 - 4/23/14	**BatchID:**	89602
Date Analyzed:	4/29/14	**Extraction Method:**	SM2320B
Instrument:	Titrino	**Analytical Method:**	SM2320B
Matrix:	Water	**Test Method:**	SM2320B (Alkalinity)
Project:	Pilot Water		

QC Summary Report for Alkalinity

Lab ID	Analyte	Reporting Units	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	RPD	Acceptance Criteria (%)
1402489-001B	Total	mg $CaCO_3$/L	43.0	1	43.0	1	0	<20

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/23/14	**BatchID:**	89648
Date Analyzed:	5/1/14	**Extraction Method:**	E200.8
Instrument:	ICP-MS1	**Analytical Method:**	E200.8
Matrix:	Water	**Unit:**	µg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89648

QC Summary Report for E200.8

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Aluminum	ND	468	50	500	-	93.6	85-115
Antimony	ND	47.4	0.50	50	-	94.8	85-115
Arsenic	ND	48.2	0.50	50	-	96.3	85-115
Barium	ND	453	5.0	500	-	90.6	85-115
Beryllium	ND	46.8	0.50	50	-	93.6	85-115
Cadmium	ND	46.9	0.25	50	-	93.8	85-115
Calcium	ND	4820	100	5000	-	96.4	85-115
Chromium	ND	45.5	0.50	50	-	91.1	85-115
Cobalt	ND	47.8	0.50	50	-	95.6	85-115
Copper	ND	47.2	0.50	50	-	94.5	85-115
Iron	ND	491	20	500	-	98.2	85-115
Lead	ND	47.6	0.50	50	-	95.3	85-115
Lithium	ND	47.8	5.0	50	-	95.5	85-115
Magnesium	ND	479	20	500	-	95.9	85-115
Manganese	ND	472	20	500	-	94.4	85-115
Mercury	ND	1.10	0.025	1.25	-	87.8	85-115
Molybdenum	ND	46.1	0.50	50	-	92.2	85-115
Nickel	ND	46.8	0.50	50	-	93.7	85-115
Potassium	ND	452	50	500	-	90.4	85-115
Selenium	ND	48.1	0.50	50	-	96.2	85-115
Silver	ND	46.9	0.19	50	-	93.7	85-115
Sodium	ND	4880	100	5000	-	97.6	85-115
Strontium	ND	477	20	500	-	95.3	85-115
Thallium	ND	47.4	0.50	50	-	94.9	85-115
Uranium	ND	45.9	0.50	50	-	91.8	85-115
Vanadium	ND	45.6	0.50	50	-	91.2	85-115
Zinc	ND	476	5.0	500	-	95.3	85-115

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89615
Date Analyzed:	4/23/14	**Extraction Method:**	SM4500-Cl DE
Instrument:	Titrino	**Analytical Method:**	SM4500-Cl DE
Matrix:	Water	**Unit:**	mg/L
Project:	Pilot Water	**Sample ID:**	MB-89615

QC Summary Report for SM4500-Cl DE

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Chlorine	2.13	-	0.40	-	-	-	-

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89604
Date Analyzed:	4/29/14	**Extraction Method:**	E415.3
Instrument:	TOC_SHIMADZU	**Analytical Method:**	E415.3
Matrix:	Water	**Unit:**	mg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89604

QC Summary Report for E415.3

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TOC	ND	49.6	0.30	50	-	99.2	80-120

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/23/14	**BatchID:**	89612
Date Analyzed:	5/1/14	**Extraction Method:**	SM4500 OG
Instrument:	WetChem	**Analytical Method:**	SM4500OG
Matrix:	Water	**Unit:**	mg DO/L @ °C
Project:	Pilot Water		

QC Summary Report for SM4500OG (Dissolved Oxygen)

SampID	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	Precision	Acceptance Criteria
1402489-001B	8.57 @ 23.1°C	1	8.56 @ 23.1°C	1	0.01	0.05

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89605
Date Analyzed:	4/30/14	**Extraction Method:**	E415.3
Instrument:	TOC_CNS	**Analytical Method:**	E415.3
Matrix:	Water	**Unit:**	mg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89605

QC Summary Report for E415.3

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
IC as CO2	ND	38.3	3.7	36.7	-	104	80-120

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/23/14	**BatchID:**	89712
Date Analyzed:	4/23/14	**Extraction Method:**	SM2580Bm
Instrument:	WetChem	**Analytical Method:**	SM2580B, MAI
Matrix:	Leachate	**Unit:**	±, mV vs. NHE
Project:	Pilot Water		

QC Summary Report for ORP (MAI)

SampID	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	RPD	Acceptance Criteria (%)
1312545-002D	577 @ 23.9°C	1	578 @ 24.0°C	1	0.27	<10

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89608
Date Analyzed:	4/23/14	**Extraction Method:**	SM4500H+B
Instrument:	WetChem	**Analytical Method:**	SM4500H+B
Matrix:	Leachate	**Unit:**	±, pH units @ 25°C
Project:	Pilot Water		

QC Summary Report for pH

SampID	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	Precision	Acceptance Criteria
1312545-002D	8.44	1	8.45	1	0.01	0.05

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89607
Date Analyzed:	5/2/14	**Extraction Method:**	E200.7
Instrument:	ICP-JY	**Analytical Method:**	E200.7
Matrix:	Water	**Unit:**	µg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89607

QC Summary Report for E200.7

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Phosphorous	ND	1020	100	1000	-	102	80-120

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/23/14	**BatchID:**	89614
Date Analyzed:	5/1/14	**Extraction Method:**	SM2510B
Instrument:	WetChem	**Analytical Method:**	SM2510B
Matrix:	Water	**Unit:**	µmhos/cm @ 25°C
Project:	Pilot Water		

QC Summary Report for Specific Conductivity

SampID	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	RPD	Acceptance Criteria (%)
1402489-001B	139	1	139	1	0.0719	<2

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89609
Date Analyzed:	5/2/14	**Extraction Method:**	E200.7
Instrument:	ICP-JY	**Analytical Method:**	200.7
Matrix:	Water	**Unit:**	µg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89609

QC Summary Report for E200.7

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Silicon	ND	913	50	1000	-	91.3	80-120

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89610
Date Analyzed:	5/1/14	**Extraction Method:**	SM4500 S-2 D
Instrument:	SPECTROPHOTOMETER	**Analytical Method:**	SM4500 S-2 D
Matrix:	Water	**Unit:**	mg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89610 1402489-001BMS/MSD

QC Summary Report For SM4500S2D

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Sulfide	ND	2.36	0.050	2.5	-	94.5	80-120

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Sulfide	2.03	2.03	2.5	ND	81.3	81.4	75-125	0.0975	20

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1402489
Date Prepared:	4/22/14	**BatchID:**	89597
Date Analyzed:	4/30/14	**Extraction Method:**	E351.2
Instrument:	SKALAR	**Analytical Method:**	E351.2
Matrix:	Water	**Unit:**	mg/L
Project:	Pilot Water	**Sample ID:**	MB/LCS-89597

QC Summary Report for E351.2 (TKN as N)

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TKN as N	ND	11.3	0.30	12	-	93.9	90-110

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Pittsburg, CA 94565-1701
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CHAIN-OF-CUSTODY RECORD

WorkOrder: 1402489 **ClientCode: TEAC**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☒ EQuIS ☐ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
Bill Motzer
Todd Engineering
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
(510) 747-6920 FAX: (510) 747-6921

Email: bmotzer@toddengineers.com
cc/3rd Party:
PO:
ProjectNo: Pilot Water

Bill to:
Bill Motzer/ Accounts Payable
Todd Engineering
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501

Requested TAT: 5 days
Date Received: 02/12/2014
Date Printed: 05/01/2014

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1402489-001	Pilot Water	Water	2/12/2014	☑		A	A	A	A	A	A			A		A
1402489-001	Pilot Water	Water	4/22/2014	☐	B	B	B	B	B	B	B	B	B	B	B	B

Test Legend:

1	218_6_W	2	300_1_W	3	Alka(spe)_W	4	AMMONIA_W	5	CAMMET(T)MS_W
6	CHLORINE1_W	7	DO_W	8	DOC_W	9	IC(CO2)_W	10	ORP_W
11	P_W	12	PH_W						

The following SampIDs: 001A, 001B contain testgroup.

Prepared by: Rosa Venegas

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

McCampbell Analytical, Inc.
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Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1402489 **ClientCode: TEAC**

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Report to:
Bill Motzer
Todd Engineering
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
(510) 747-6920 FAX: (510) 747-6921

Email: bmotzer@toddengineers.com
cc/3rd Party:
PO:
ProjectNo: Pilot Water

Bill to:
Bill Motzer/ Accounts Payable
Todd Engineering
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501

Requested TAT: 5 days
Date Received: 02/12/2014
Date Printed: 05/01/2014

Lab ID	Client ID	Matrix	Collection Date	Hold	13	14	15	16	17	18	19	20	21	22	23	24
					Requested Tests (See legend below)											
1402489-001	Pilot Water	Water	2/12/2014	☑	A	A			A		A					
1402489-001	Pilot Water	Water	4/22/2014	☐	B	B	B	B		B	B					

Test Legend:

13	PRCALCULATION	14	SC_W	15	SI_W	16	SULFIDE_W	17	TDS_W
18	TKN_W	19	TOC_W	20		21		22	
23		24							

The following SampIDs: 001A, 001B contain testgroup.

Prepared by: Rosa Venegas

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

1402489

Batch/Shipment No.:

TODD GROUNDWATER

Chain of Custody

2490 Mariner Square Loop, Suite 215, Alameda, CA 94501
510-747-6920 (voice) 510-747-6921(fax) bmotzer@toddengineers.com

Page: 1 of 1

Date: February 12, 2014

Lab Name: McCambell Analytical, Inc.

Address: 1534 Willow Pass Road, Pittsburg, CA 94565

Telephone: 925-252-9262; 877-252-9262

Samplers (Signatures): NA

Analysis Request

	Sample Number	Matrix	Depth Interval	See attached analyte list	Number of Containers
1	RO Permeate Stabilized (Pilot Water)	Water	NA	X	8
2					
3					
4					
5					
6					
7					
8					
9					
10					

Project Information

Project Name: MRWPCA

Project Manager: Edwin Lin, Senior Hydro.

Job No.: 60408

Shipping ID. No.:

Via:

Sample Receipt

Total No. of Containers:

Chain of Custody Seals:

Rec'd Good Condition/Cold:

Conforms to Record:

Lab No.: 1402489

Special Instructions/Comments:

save-hold excess pilot water 19.3°

Relinquished By:

Gordon Williams

(Signature) (Time) 940

Trussell Technologies, Inc. (Date) 02-12-14

Relinquished By:

William E. Motzer 1130

(Signature) (Time)

William E. Motzer

(Printed Name) (Date)

Todd Groundwater 02-12-14

(Company)

Relinquished By:

(Signature) (Time)

(Printed Name) (Date)

(Company)

Received By:

William E. Motzer 940

(Signature) (Time)

(Printed Name) (Date)

William E. Motzer 02-12-14

(Company)

Todd Groundwater

Received By:

(Signature) (Time)

(Printed Name) (Date)

(Company)

Received By (Laboratory):

11:30

(Signature) (Time)

Rosa Vercegas 2/12

(Printed Name) (Date)

McCampbell Analytical Inc

(Laboratory)

Mineralogy – XRD, SEM-EDS, Thin section

Currently – 5 of 7 samples being analyzed from WO1312545; 3 of 3 samples from WO1312650 are scheduled for analysis

Please continue mineralogy analyses on the following samples:

5 of 7 samples from WO1312545 (do not analyze 27.5 – 30.0 or 74.0 – 75.5 samples)

2 of 3 samples from WO1312650 (do not analyze 472.0 – 474.5 sample)

Pilot Water Analysis

Measure and analyze for the following parameters of the pilot water prior to leaching tests:

Title 22 metals (CAM 17 plus Fe and Mn)
TOC
Oxidation Reduction Potential
pH
Electrical conductivity
Dissolved oxygen
Total alkalinity
Calcium
Chloride
Sodium
Langelier Saturation Index (LSI)

Leaching Analyses

Currently – 7 of 7 samples analyzed from WO1312545; 3 of 3 samples from WO1312650 are scheduled for analysis

Please perform TCLP (pilot water) extraction on the following samples:

6 of 7 samples from WO1312545 (do not analyze 27.5 – 30.0 sample)

2 of 3 samples from WO1312650 (do not analyze 472.0 – 474.5 sample)

Questions for Ed Hamilton:

Can we do the extraction based on a lower than 20:1 rock to water ratio (e.g., 10:1 or 5:1)?

Can we extend the extraction period to 1 week?

Please perform the following analyses on the pilot water leachate on the 8 samples identified above (6 from WO1312545 and 2 from WO1312650):

Title 22 metals (CAM 17 plus Fe and Mn)
Major cations and alkali(ne) earth metals (Ca, Na, Mg, K, Sr, and Li)

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Sample Receipt Checklist

Client Name:	**Todd Engineering**	Date and Time Received:	**2/12/2014 4:30:34 PM**
Project Name:	**Pilot Water**	LogIn Reviewed by:	Rosa Venegas
WorkOrder N°:	**1402489** Matrix: Water	Carrier:	Client Drop-In

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☑	No ☐

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp: 19.3°C		NA ☐
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	NA ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
Metal - pH acceptable upon receipt (pH<2)?	Yes ☑	No ☐	NA ☐
Samples Received on Ice?	Yes ☐	No ☑	

** NOTE: If the "No" box is checked, see comments below.*

Comments:

McCampbell Analytical, Inc.

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Analytical Report

WorkOrder: 1312545

Report Created for: Todd Engineering
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501

Project Contact: Bill Motzer
Project P.O.:
Project Name: #60408; MRWPCA

Project Received: 12/18/2013

Analytical Report reviewed & approved for release on 05/16/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.

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Glossary of Terms & Qualifier Definitions

Client: Todd Engineering
Project: #60408; MRWPCA
WorkOrder: 1312545

Glossary Abbreviation

95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

Analytical Qualifier

B	analyte detected in the associated Method Blank
H	samples were analyzed out of holding time
S	spike recovery outside accepted recovery limits
a1	sample diluted due to matrix interference
a4	the reporting limits were raised due to the sample's matrix prohibiting a full volume extraction.
a7	reporting limit raised due to limited sample amount
a14	reporting limit raised due to the physical nature of the sample
c1	surrogate recovery outside of the control limits due to the dilution of the sample.
c2	low surrogate recovery caused by matrix interference.
c4	surrogate recovery outside of the control limits due to coelution with another peak(s) / cluttered chromatogram.
j1	see attached narrative

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Glossary of Terms & Qualifier Definitions

Client: Todd Engineering
Project: #60408; MRWPCA
WorkOrder: 1312545

Quality Control Qualifiers

F1	MS/MSD recovery and/or RPD was out of acceptance criteria; LCS validated the prep batch.
F2	LCS recovery for this compound is outside of acceptance limits.
F3	the surrogate standard recovery is outside of acceptance limits.

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Case Narrative

Client: Todd Engineering **Work Order:** 1312545
Project: #60408; MRWPCA May 16, 2014

McCampbell Analytical incorporated the following method for the extraction of all Leachate samples:

All Leachate samples were extracted at 1:5 ratio and rotated for 7 days using client-provided water as TCLP solution. Upon completion of rotation McCampbell Analytical centrifuged each extract for 12hrs and filtered through a 0.45 micron filter.

_____ Angela Rydelius, Lab Manager

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.8
Date Received:	12/18/13 15:02	**Analytical Method:**	E200.8
Date Prepared:	4/23/14	**Unit:**	µg/L

Leachate Metals - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water/Dissolved**	**12/17/2013 11:40**	**ICP-MS1**	**89648**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	ND	500	10	04/26/2014 02:31
Antimony	ND	5.0	10	04/26/2014 02:31
Arsenic	**5.5**	5.0	10	04/26/2014 02:31
Barium	**81**	50	10	04/26/2014 02:31
Beryllium	ND	5.0	10	04/26/2014 02:31
Cadmium	ND	2.5	10	04/26/2014 02:31
Calcium	**14,000**	1000	10	04/26/2014 02:31
Chromium	ND	5.0	10	04/26/2014 02:31
Cobalt	ND	5.0	10	04/26/2014 02:31
Copper	ND	5.0	10	04/26/2014 02:31
Iron	ND	200	10	04/26/2014 02:31
Lead	ND	5.0	10	04/26/2014 02:31
Lithium	ND	50	10	04/26/2014 02:31
Magnesium	**4700**	200	10	04/26/2014 02:31
Manganese	ND	200	10	04/26/2014 02:31
Mercury	ND	0.25	10	04/26/2014 02:31
Molybdenum	**16**	5.0	10	04/26/2014 02:31
Nickel	ND	5.0	10	04/26/2014 02:31
Potassium	**4600**	500	10	04/26/2014 02:31
Selenium	ND	5.0	10	04/26/2014 02:31
Silver	ND	1.9	10	04/26/2014 02:31
Sodium	**26,000**	1000	10	04/26/2014 02:31
Strontium	ND	200	10	04/26/2014 02:31
Thallium	ND	5.0	10	04/26/2014 02:31
Uranium	ND	5.0	10	04/26/2014 02:31
Vanadium	**6.5**	5.0	10	04/26/2014 02:31
Zinc	ND	50	10	04/26/2014 02:31

Analytical Comments: a1,a7,j1

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.8
Date Received:	12/18/13 15:02	**Analytical Method:**	E200.8
Date Prepared:	4/23/14	**Unit:**	µg/L

Leachate Metals - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003D**	**Water/Dissolved**	**12/17/2013 11:50**	**ICP-MS1**	**89648**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	ND	500	10	04/26/2014 02:37
Antimony	ND	5.0	10	04/26/2014 02:37
Arsenic	ND	5.0	10	04/26/2014 02:37
Barium	**180**	50	10	04/26/2014 02:37
Beryllium	ND	5.0	10	04/26/2014 02:37
Cadmium	ND	2.5	10	04/26/2014 02:37
Calcium	**5200**	1000	10	04/26/2014 02:37
Chromium	ND	5.0	10	04/26/2014 02:37
Cobalt	ND	5.0	10	04/26/2014 02:37
Copper	ND	5.0	10	04/26/2014 02:37
Iron	ND	200	10	04/26/2014 02:37
Lead	ND	5.0	10	04/26/2014 02:37
Lithium	ND	50	10	04/26/2014 02:37
Magnesium	**2300**	200	10	04/26/2014 02:37
Manganese	ND	200	10	04/26/2014 02:37
Mercury	ND	0.25	10	04/26/2014 02:37
Molybdenum	ND	5.0	10	04/26/2014 02:37
Nickel	ND	5.0	10	04/26/2014 02:37
Potassium	**2600**	500	10	04/26/2014 02:37
Selenium	ND	5.0	10	04/26/2014 02:37
Silver	ND	1.9	10	04/26/2014 02:37
Sodium	**22,000**	1000	10	04/26/2014 02:37
Strontium	ND	200	10	04/26/2014 02:37
Thallium	ND	5.0	10	04/26/2014 02:37
Uranium	ND	5.0	10	04/26/2014 02:37
Vanadium	ND	5.0	10	04/26/2014 02:37
Zinc	ND	50	10	04/26/2014 02:37

Analytical Comments: a1,a7,j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.8
Date Received:	12/18/13 15:02	**Analytical Method:**	E200.8
Date Prepared:	4/23/14	**Unit:**	µg/L

Leachate Metals - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004D**	**Water/Dissolved**	**12/17/2013 12:00**	**ICP-MS1**	**89648**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	ND	500	10	04/26/2014 02:44
Antimony	ND	5.0	10	04/26/2014 02:44
Arsenic	ND	5.0	10	04/26/2014 02:44
Barium	**140**	50	10	04/26/2014 02:44
Beryllium	ND	5.0	10	04/26/2014 02:44
Cadmium	ND	2.5	10	04/26/2014 02:44
Calcium	**4300**	1000	10	04/26/2014 02:44
Chromium	ND	5.0	10	04/26/2014 02:44
Cobalt	ND	5.0	10	04/26/2014 02:44
Copper	ND	5.0	10	04/26/2014 02:44
Iron	ND	200	10	04/26/2014 02:44
Lead	ND	5.0	10	04/26/2014 02:44
Lithium	ND	50	10	04/26/2014 02:44
Magnesium	**1900**	200	10	04/26/2014 02:44
Manganese	ND	200	10	04/26/2014 02:44
Mercury	ND	0.25	10	04/26/2014 02:44
Molybdenum	ND	5.0	10	04/26/2014 02:44
Nickel	ND	5.0	10	04/26/2014 02:44
Potassium	**2400**	500	10	04/26/2014 02:44
Selenium	ND	5.0	10	04/26/2014 02:44
Silver	ND	1.9	10	04/26/2014 02:44
Sodium	**22,000**	1000	10	04/26/2014 02:44
Strontium	ND	200	10	04/26/2014 02:44
Thallium	ND	5.0	10	04/26/2014 02:44
Uranium	ND	5.0	10	04/26/2014 02:44
Vanadium	ND	5.0	10	04/26/2014 02:44
Zinc	ND	50	10	04/26/2014 02:44

Analytical Comments: a1,a7,j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.8
Date Received:	12/18/13 15:02	**Analytical Method:**	E200.8
Date Prepared:	4/23/14	**Unit:**	µg/L

Leachate Metals - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005D**	**Water/Dissolved**	**12/17/2013 12:20**	**ICP-MS1**	**89648**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**900**	500	10	04/26/2014 02:50
Antimony	ND	5.0	10	04/26/2014 02:50
Arsenic	ND	5.0	10	04/26/2014 02:50
Barium	**330**	50	10	04/26/2014 02:50
Beryllium	ND	5.0	10	04/26/2014 02:50
Cadmium	ND	2.5	10	04/26/2014 02:50
Calcium	**6200**	1000	10	04/26/2014 02:50
Chromium	ND	5.0	10	04/26/2014 02:50
Cobalt	ND	5.0	10	04/26/2014 02:50
Copper	ND	5.0	10	04/26/2014 02:50
Iron	**1100**	200	10	04/26/2014 02:50
Lead	ND	5.0	10	04/26/2014 02:50
Lithium	ND	50	10	04/26/2014 02:50
Magnesium	**2000**	200	10	04/26/2014 02:50
Manganese	ND	200	10	04/26/2014 02:50
Mercury	ND	0.25	10	04/26/2014 02:50
Molybdenum	ND	5.0	10	04/26/2014 02:50
Nickel	ND	5.0	10	04/26/2014 02:50
Potassium	**3600**	500	10	04/26/2014 02:50
Selenium	ND	5.0	10	04/26/2014 02:50
Silver	ND	1.9	10	04/26/2014 02:50
Sodium	**26,000**	1000	10	04/26/2014 02:50
Strontium	ND	200	10	04/26/2014 02:50
Thallium	ND	5.0	10	04/26/2014 02:50
Uranium	ND	5.0	10	04/26/2014 02:50
Vanadium	**8.3**	5.0	10	04/26/2014 02:50
Zinc	**59**	50	10	04/26/2014 02:50

Analytical Comments: a1,a7,j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.8
Date Received:	12/18/13 15:02	**Analytical Method:**	E200.8
Date Prepared:	4/23/14	**Unit:**	µg/L

Leachate Metals - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006D**	**Water/Dissolved**	**12/18/2013 08:20**	**ICP-MS1**	**89648**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**4300**	500	10	04/26/2014 02:56
Antimony	ND	5.0	10	04/26/2014 02:56
Arsenic	ND	5.0	10	04/26/2014 02:56
Barium	**930**	50	10	04/26/2014 02:56
Beryllium	ND	5.0	10	04/26/2014 02:56
Cadmium	**6.0**	2.5	10	04/26/2014 02:56
Calcium	**71,000**	1000	10	04/26/2014 02:56
Chromium	**24**	5.0	10	04/26/2014 02:56
Cobalt	ND	5.0	10	04/26/2014 02:56
Copper	**33**	5.0	10	04/26/2014 02:56
Iron	**8700**	200	10	04/26/2014 02:56
Lead	**11**	5.0	10	04/26/2014 02:56
Lithium	ND	50	10	04/26/2014 02:56
Magnesium	**18,000**	200	10	04/26/2014 02:56
Manganese	**360**	200	10	04/26/2014 02:56
Mercury	ND	0.25	10	04/26/2014 02:56
Molybdenum	ND	5.0	10	04/26/2014 02:56
Nickel	**30**	5.0	10	04/26/2014 02:56
Potassium	**2600**	500	10	04/26/2014 02:56
Selenium	ND	5.0	10	04/26/2014 02:56
Silver	ND	1.9	10	04/26/2014 02:56
Sodium	**42,000**	1000	10	04/26/2014 02:56
Strontium	**680**	200	10	04/26/2014 02:56
Thallium	ND	5.0	10	04/26/2014 02:56
Uranium	ND	5.0	10	04/26/2014 02:56
Vanadium	**31**	5.0	10	04/26/2014 02:56
Zinc	**550**	50	10	04/26/2014 02:56

Analytical Comments: a1,a7,j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.8
Date Received:	12/18/13 15:02	**Analytical Method:**	E200.8
Date Prepared:	4/23/14	**Unit:**	µg/L

Leachate Metals - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water/Dissolved**	**12/18/2013 09:00**	**ICP-MS1**	**89648**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**4800**	500	10	04/26/2014 03:03
Antimony	ND	5.0	10	04/26/2014 03:03
Arsenic	**7.6**	5.0	10	04/26/2014 03:03
Barium	**490**	50	10	04/26/2014 03:03
Beryllium	ND	5.0	10	04/26/2014 03:03
Cadmium	ND	2.5	10	04/26/2014 03:03
Calcium	**9400**	1000	10	04/26/2014 03:03
Chromium	**6.2**	5.0	10	04/26/2014 03:03
Cobalt	ND	5.0	10	04/26/2014 03:03
Copper	ND	5.0	10	04/26/2014 03:03
Iron	**1500**	200	10	04/26/2014 03:03
Lead	ND	5.0	10	04/26/2014 03:03
Lithium	ND	50	10	04/26/2014 03:03
Magnesium	**1600**	200	10	04/26/2014 03:03
Manganese	ND	200	10	04/26/2014 03:03
Mercury	ND	0.25	10	04/26/2014 03:03
Molybdenum	ND	5.0	10	04/26/2014 03:03
Nickel	**5.5**	5.0	10	04/26/2014 03:03
Potassium	**5400**	500	10	04/26/2014 03:03
Selenium	ND	5.0	10	04/26/2014 03:03
Silver	ND	1.9	10	04/26/2014 03:03
Sodium	**36,000**	1000	10	04/26/2014 03:03
Strontium	ND	200	10	04/26/2014 03:03
Thallium	ND	5.0	10	04/26/2014 03:03
Uranium	ND	5.0	10	04/26/2014 03:03
Vanadium	**17**	5.0	10	04/26/2014 03:03
Zinc	**62**	50	10	04/26/2014 03:03

Analytical Comments: a1,a7,j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.7
Date Received:	12/18/13 15:02	**Analytical Method:**	E200.7
Date Prepared:	4/22/14	**Unit:**	µg/L

Leachate Phosphorus - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water/Dissolved**	**12/17/2013 11:40**	**ICP-JY**	**89607**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	ND	500	10	05/02/2014 14:08

Analytical Comments: a7,j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003D**	**Water/Dissolved**	**12/17/2013 11:50**	**ICP-JY**	**89607**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	ND	500	10	05/02/2014 14:10

Analytical Comments: a7,j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 129.5-142.0	**1312545-004D**	**Water/Dissolved**	**12/17/2013 12:00**	**ICP-JY**	**89607**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	ND	500	10	05/02/2014 14:12

Analytical Comments: a7,j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005D**	**Water/Dissolved**	**12/17/2013 12:20**	**ICP-JY**	**89607**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	ND	500	10	05/02/2014 14:14

Analytical Comments: a7,j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006D**	**Water/Dissolved**	**12/18/2013 08:20**	**ICP-JY**	**89607**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**22,000**	500	10	05/02/2014 14:16

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.7
Date Received:	12/18/13 15:02	**Analytical Method:**	E200.7
Date Prepared:	4/22/14	**Unit:**	µg/L

Leachate Phosphorus - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water/Dissolved**	**12/18/2013 09:00**	**ICP-JY**	**89607**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	**1000**	500	10	05/02/2014 14:22

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.7
Date Received:	12/18/13 15:02	**Analytical Method:**	200.7
Date Prepared:	4/22/14	**Unit:**	µg/L

Leachate Silicon - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water/Dissolved**	**12/17/2013 11:40**	**ICP-JY**	**89609**

Analytes	Result	RL	DF	Date Analyzed
Silicon	**7400**	500	10	05/02/2014 12:47

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003D**	**Water/Dissolved**	**12/17/2013 11:50**	**ICP-JY**	**89609**

Analytes	Result	RL	DF	Date Analyzed
Silicon	**8900**	500	10	05/02/2014 12:49

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 129.5-142.0	**1312545-004D**	**Water/Dissolved**	**12/17/2013 12:00**	**ICP-JY**	**89609**

Analytes	Result	RL	DF	Date Analyzed
Silicon	**11,000**	500	10	05/02/2014 12:51

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005D**	**Water/Dissolved**	**12/17/2013 12:20**	**ICP-JY**	**89609**

Analytes	Result	RL	DF	Date Analyzed
Silicon	**12,000**	500	10	05/02/2014 12:53

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006D**	**Water/Dissolved**	**12/18/2013 08:20**	**ICP-JY**	**89609**

Analytes	Result	RL	DF	Date Analyzed
Silicon	**110,000**	500	10	05/02/2014 12:55

Analytical Comments: j1

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E200.7
Date Received:	12/18/13 15:02	**Analytical Method:**	200.7
Date Prepared:	4/22/14	**Unit:**	µg/L

Leachate Silicon - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water/Dissolved**	**12/18/2013 09:00**	**ICP-JY**	**89609**

Analytes	Result	RL	DF	Date Analyzed
Silicon	**28,000**	500	10	05/02/2014 13:05

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E218.6
Date Received:	12/18/13 15:02	**Analytical Method:**	E218.6
Date Prepared:	4/22/14	**Unit:**	µg/L

Leachate Hexachrome by IC - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**IC2**	**89600**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Hexachrome	**0.86**	BH	0.20	1	04/23/2014 17:26

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**IC2**	**89600**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Hexachrome	**1.6**	BH	0.20	1	04/23/2014 16:28

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 129.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**IC2**	**89600**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Hexachrome	**2.4**	BH	0.20	1	04/23/2014 17:45

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**IC2**	**89600**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Hexachrome	**0.61**	BH	0.20	1	04/23/2014 18:04

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**IC2**	**89600**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Hexachrome	**1.6**	BH	0.20	1	04/24/2014 16:46

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E218.6
Date Received:	12/18/13 15:02	**Analytical Method:**	E218.6
Date Prepared:	4/22/14	**Unit:**	µg/L

Leachate Hexachrome by IC - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**IC2**	**89600**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Hexachrome	**0.77**	BH	0.20	1	04/24/2014 16:07

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E300.1
Date Received:	12/18/13 15:02	**Analytical Method:**	E300.1
Date Prepared:	4/22/14	**Unit:**	mg/L

Leachate Inorganic Anions by IC - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**IC3**	**89601**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Bromide	ND	H	0.10	1	04/25/2014 01:49
Chloride	**20**	BH	1.0	10	04/25/2014 05:57
Fluoride	**0.31**	H	0.10	1	04/25/2014 01:49
Nitrate as N	**0.64**	BH	0.10	1	04/25/2014 01:49
Nitrate as $NO3^-$	**2.8**	BH	0.45	1	04/25/2014 01:49
Nitrite as N	ND	H	0.10	1	04/25/2014 01:49
Nitrite as $NO2^-$	ND	H	0.33	1	04/25/2014 01:49
Sulfate	**11**	BH	1.0	10	04/25/2014 05:57

Surrogates	REC (%)	Qualifiers	Limits	Analytical Comments: j1	
Formate	104	H	90-115		04/25/2014 01:49

MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**IC3**	**89601**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Bromide	ND	H	0.10	1	04/25/2014 02:30
Chloride	**20**	BH	1.0	10	04/25/2014 06:39
Fluoride	**0.22**	H	0.10	1	04/25/2014 02:30
Nitrate as N	**0.64**	BH	0.10	1	04/25/2014 02:30
Nitrate as $NO3^-$	**2.8**	BH	0.45	1	04/25/2014 02:30
Nitrite as N	ND	H	0.10	1	04/25/2014 02:30
Nitrite as $NO2^-$	ND	H	0.33	1	04/25/2014 02:30
Sulfate	**0.42**	BH	0.10	1	04/25/2014 02:30

Surrogates	REC (%)	Qualifiers	Limits	Analytical Comments: j1	
Formate	104	H	90-115		04/25/2014 02:30

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E300.1
Date Received:	12/18/13 15:02	**Analytical Method:**	E300.1
Date Prepared:	4/22/14	**Unit:**	mg/L

Leachate Inorganic Anions by IC - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**IC3**	**89601**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Bromide	ND	H	0.10	1	04/25/2014 04:34
Chloride	**20**	BH	1.0	10	04/25/2014 07:20
Fluoride	**0.26**	H	0.10	1	04/25/2014 04:34
Nitrate as N	**0.65**	BH	0.10	1	04/25/2014 04:34
Nitrate as $NO3^-$	**2.9**	BH	0.45	1	04/25/2014 04:34
Nitrite as N	ND	H	0.10	1	04/25/2014 04:34
Nitrite as $NO2^-$	ND	H	0.33	1	04/25/2014 04:34
Sulfate	**0.93**	BH	0.10	1	04/25/2014 04:34

Surrogates	REC (%)	Qualifiers	Limits	Analytical Comments: j1
Formate	104	H	90-115	04/25/2014 04:34

MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**IC3**	**89601**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Bromide	ND	H	0.10	1	04/25/2014 05:16
Chloride	**20**	BH	1.0	10	04/25/2014 08:02
Fluoride	**0.28**	H	0.10	1	04/25/2014 05:16
Nitrate as N	**0.64**	BH	0.10	1	04/25/2014 05:16
Nitrate as $NO3^-$	**2.8**	BH	0.45	1	04/25/2014 05:16
Nitrite as N	ND	H	0.10	1	04/25/2014 05:16
Nitrite as $NO2^-$	ND	H	0.33	1	04/25/2014 05:16
Sulfate	**0.34**	BH	0.10	1	04/25/2014 05:16

Surrogates	REC (%)	Qualifiers	Limits	Analytical Comments: j1
Formate	105	H	90-115	04/25/2014 05:16

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E300.1
Date Received:	12/18/13 15:02	**Analytical Method:**	E300.1
Date Prepared:	4/22/14	**Unit:**	mg/L

Leachate Inorganic Anions by IC - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**IC3**	**89601**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Bromide	ND	H	0.10	1	04/24/2014 19:36
Chloride	**26**	BH	1.0	10	04/25/2014 08:43
Fluoride	**0.32**	H	0.10	1	04/24/2014 19:36
Nitrate as N	**0.67**	BH	0.10	1	04/24/2014 19:36
Nitrate as $NO3^-$	**3.0**	BH	0.45	1	04/24/2014 19:36
Nitrite as N	ND	H	0.10	1	04/24/2014 19:36
Nitrite as $NO2^-$	ND	H	0.33	1	04/24/2014 19:36
Sulfate	**20**	BH	1.0	10	04/25/2014 08:43

Surrogates	REC (%)	Qualifiers	Limits	Analytical Comments: j1	
Formate	110	H	90-115		04/24/2014 19:36

MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**IC3**	**89601**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Bromide	ND	H	0.10	1	04/24/2014 20:18
Chloride	**21**	BH	1.0	10	04/24/2014 23:03
Fluoride	**0.48**	H	0.10	1	04/24/2014 20:18
Nitrate as N	**0.65**	BH	0.10	1	04/24/2014 20:18
Nitrate as $NO3^-$	**2.9**	BH	0.45	1	04/24/2014 20:18
Nitrite as N	ND	H	0.10	1	04/24/2014 20:18
Nitrite as $NO2^-$	ND	H	0.33	1	04/24/2014 20:18
Sulfate	**8.5**	BH	1.0	10	04/24/2014 23:03

Surrogates	REC (%)	Qualifiers	Limits	Analytical Comments: j1	
Formate	108	H	90-115		04/24/2014 20:18

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM2320B
Date Received:	12/18/13 15:02	**Analytical Method:**	SM2320B
Date Prepared:	4/29/14	**Unit:**	mg $CaCO_3$/L

Total & Speciated Alkalinity as CaCO3 (Leachate) - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**Titrino**	**89602**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total	**73.0**	H	1.00	1	04/29/2014 10:31
Carbonate	ND	H	1.00	1	04/29/2014 10:31
Bicarbonate	**73.0**	H	1.00	1	04/29/2014 10:31
Hydroxide	ND	H	1.00	1	04/29/2014 10:31

Analytical Comments: j1

MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**Titrino**	**89602**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total	**40.0**	H	1.00	1	04/29/2014 10:34
Carbonate	ND	H	1.00	1	04/29/2014 10:34
Bicarbonate	**40.0**	H	1.00	1	04/29/2014 10:34
Hydroxide	ND	H	1.00	1	04/29/2014 10:34

Analytical Comments: j1

MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**Titrino**	**89602**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total	**37.0**	H	1.00	1	04/29/2014 10:37
Carbonate	ND	H	1.00	1	04/29/2014 10:37
Bicarbonate	**37.0**	H	1.00	1	04/29/2014 10:37
Hydroxide	ND	H	1.00	1	04/29/2014 10:37

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM2320B
Date Received:	12/18/13 15:02	**Analytical Method:**	SM2320B
Date Prepared:	4/29/14	**Unit:**	mg $CaCO_3$/L

Total & Speciated Alkalinity as CaCO3 (Leachate) - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**Titrino**	**89602**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total	**46.0**	H	1.00	1	04/29/2014 10:40
Carbonate	ND	H	1.00	1	04/29/2014 10:40
Bicarbonate	**46.0**	H	1.00	1	04/29/2014 10:40
Hydroxide	ND	H	1.00	1	04/29/2014 10:40

Analytical Comments: j1

MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**Titrino**	**89602**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total	**170**	H	1.00	1	04/29/2014 10:46
Carbonate	ND	H	1.00	1	04/29/2014 10:46
Bicarbonate	**170**	H	1.00	1	04/29/2014 10:46
Hydroxide	ND	H	1.00	1	04/29/2014 10:46

Analytical Comments: j1

MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**Titrino**	**89602**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total	**59.0**	H	1.00	1	04/29/2014 10:51
Carbonate	ND	H	1.00	1	04/29/2014 10:51
Bicarbonate	**59.0**	H	1.00	1	04/29/2014 10:51
Hydroxide	ND	H	1.00	1	04/29/2014 10:51

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E350.1
Date Received:	12/18/13 15:02	**Analytical Method:**	E350.1
Date Prepared:	4/22/14	**Unit:**	mg/L

Leachate Ammonia as N - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**SKALAR**	**89603**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total Ammonia as N	**0.72**	H	0.10	1	04/29/2014 16:10

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**SKALAR**	**89603**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total Ammonia as N	**0.58**	H	0.10	1	04/29/2014 16:14

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**SKALAR**	**89603**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total Ammonia as N	**0.44**	H	0.10	1	04/29/2014 16:18

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**SKALAR**	**89603**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total Ammonia as N	**0.50**	H	0.10	1	04/29/2014 16:21

Analytical Comments: j1

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**SKALAR**	**89603**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total Ammonia as N	ND	H	0.10	1	04/29/2014 19:06

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E350.1
Date Received:	12/18/13 15:02	**Analytical Method:**	E350.1
Date Prepared:	4/22/14	**Unit:**	mg/L

Leachate Ammonia as N - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**SKALAR**	**89603**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total Ammonia as N	**0.42**	H	0.10	1	04/29/2014 19:10

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM4500-Cl DE
Date Received:	12/18/13 15:02	**Analytical Method:**	SM4500-Cl DE
Date Prepared:	4/23/14-4/24/14	**Unit:**	mg/L

Chlorine, Total Residual [Leachate] - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**Titrino**	**89615**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Chlorine	**1.5**	BH	0.40	10	04/23/2014 16:00

Analytical Comments: j1

MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**Titrino**	**89615**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Chlorine	**1.6**	BH	0.40	10	04/23/2014 16:04

Analytical Comments: j1

MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**Titrino**	**89615**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Chlorine	**1.3**	BH	0.40	10	04/23/2014 16:08

Analytical Comments: j1

MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**Titrino**	**89615**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Chlorine	**1.6**	BH	0.40	10	04/23/2014 16:13

Analytical Comments: j1

MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**Titrino**	**89615**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Chlorine	ND	BH	0.40	10	04/24/2014 15:49

Analytical Comments: a7,j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM4500-Cl DE
Date Received:	12/18/13 15:02	**Analytical Method:**	SM4500-Cl DE
Date Prepared:	4/23/14-4/24/14	**Unit:**	mg/L

Chlorine, Total Residual [Leachate] - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**Titrino**	**89615**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Chlorine	**1.7**	BH	0.40	10	04/24/2014 15:29

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E415.3
Date Received:	12/18/13 15:02	**Analytical Method:**	E415.3
Date Prepared:	4/22/14	**Unit:**	mg/L

Dissolved Organic Carbon (DOC) [Leachate] - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**TOC_SHIMADZU**	**89604**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Dissolved Organic Carbon	**1.4**	H	0.70	1	04/29/2014 15:46

Analytical Comments: j1

MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**TOC_SHIMADZU**	**89604**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Dissolved Organic Carbon	**1.2**	H	0.70	1	04/29/2014 16:00

Analytical Comments: j1

MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**TOC_SHIMADZU**	**89604**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Dissolved Organic Carbon	**1.1**	H	0.70	1	04/29/2014 16:14

Analytical Comments: j1

MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**TOC_SHIMADZU**	**89604**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Dissolved Organic Carbon	**2.2**	H	0.70	1	04/29/2014 16:54

Analytical Comments: j1

MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**TOC_SHIMADZU**	**89604**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Dissolved Organic Carbon	**16**	H	0.70	1	04/29/2014 18:01

Analytical Comments: j1

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E415.3
Date Received:	12/18/13 15:02	**Analytical Method:**	E415.3
Date Prepared:	4/22/14	**Unit:**	mg/L

Dissolved Organic Carbon (DOC) [Leachate] - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**TOC_SHIMADZU**	**89604**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Dissolved Organic Carbon	**3**	H	0.70	1	04/29/2014 17:21

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E415.3
Date Received:	12/18/13 15:02	**Analytical Method:**	E415.3
Date Prepared:	4/22/14	**Unit:**	mg/L

Inorganic Carbon as Carbon Dioxide [Leachate] - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**TOC_CNS**	**89605**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
IC as CO2	**67**	H	3.7	1	04/30/2014 14:16

Analytical Comments: j1

MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**TOC_CNS**	**89605**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
IC as CO2	**37**	H	3.7	1	04/30/2014 14:24

Analytical Comments: j1

MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**TOC_CNS**	**89605**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
IC as CO2	**34**	H	3.7	1	04/30/2014 14:31

Analytical Comments: j1

MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**TOC_CNS**	**89605**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
IC as CO2	**40**	H	3.7	1	04/30/2014 14:38

Analytical Comments: j1

MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**TOC_CNS**	**89605**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
IC as CO2	**56**	H	3.7	1	04/30/2014 15:37

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E415.3
Date Received:	12/18/13 15:02	**Analytical Method:**	E415.3
Date Prepared:	4/22/14	**Unit:**	mg/L

Inorganic Carbon as Carbon Dioxide [Leachate] - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**TOC_CNS**	**89605**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
IC as CO2	**43**	H	3.7	1	04/30/2014 14:45

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM4500 S-2 D
Date Received:	12/18/13 15:02	**Analytical Method:**	SM4500 S-2 D
Date Prepared:	4/23/14-4/29/14	**Unit:**	mg/L

Leachate Sulfide - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**SPECTROPHOTOMETER**	**89610**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Sulfide	ND	H	0.050	1	04/23/2014 19:40

Analytical Comments: j1

MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**SPECTROPHOTOMETER**	**89610**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Sulfide	ND	H	0.050	1	04/23/2014 19:55

Analytical Comments: j1

MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**SPECTROPHOTOMETER**	**89610**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Sulfide	ND	H	0.050	1	04/23/2014 20:00

Analytical Comments: j1

MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**SPECTROPHOTOMETER**	**89610**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Sulfide	ND	H	0.050	1	04/23/2014 20:05

Analytical Comments: j1

MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**SPECTROPHOTOMETER**	**89610**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Sulfide	ND	H	0.050	1	04/29/2014 19:50

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM4500 S-2 D
Date Received:	12/18/13 15:02	**Analytical Method:**	SM4500 S-2 D
Date Prepared:	4/23/14-4/29/14	**Unit:**	mg/L

Leachate Sulfide - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**SPECTROPHOTOMETER**	**89610**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Sulfide	ND	H	0.050	1	04/24/2014 21:05

Analytical Comments: j1

CDPH ELAP 1644 ♦ NELAP 4033ORELAP

RB Analyst's Initial

Angela Rydelius, Lab Manager

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E351.2
Date Received:	12/18/13 15:02	**Analytical Method:**	E351.2
Date Prepared:	4/29/14	**Unit:**	mg/L

Total Kjeldahl Nitrogen (Leachate) - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**SKALAR**	**89597**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
TKN as N	**0.82**	H	0.30	1	04/30/2014 14:54

Analytical Comments: j1

MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**SKALAR**	**89597**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
TKN as N	**1.4**	H	0.30	1	04/30/2014 14:58

Analytical Comments: j1

MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**SKALAR**	**89597**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
TKN as N	**0.55**	H	0.30	1	04/30/2014 15:02

Analytical Comments: j1

MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**SKALAR**	**89597**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
TKN as N	**0.73**	H	0.30	1	04/30/2014 15:06

Analytical Comments: j1

MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**SKALAR**	**89597**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
TKN as N	**3.1**	H	0.30	1	04/30/2014 15:09

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	E351.2
Date Received:	12/18/13 15:02	**Analytical Method:**	E351.2
Date Prepared:	4/29/14	**Unit:**	mg/L

Total Kjeldahl Nitrogen (Leachate) - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**SKALAR**	**89597**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
TKN as N	**0.73**	H	0.30	1	04/30/2014 15:13

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM2580Bm
Date Received:	12/18/13 15:02	**Analytical Method:**	SM2580B, MAI
Date Prepared:	4/23/14-4/24/14	**Unit:**	±, mV vs. NHE

Oxidation-Reduction Potential (ORP) (Leachate) - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**WetChem**	**89712**

Analytes	Result	Accuracy	DF	Date Analyzed
ORP	**577 @ 23.9°C**	10	1	04/23/2014 20:15

Analytical Comments: j1

MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**WetChem**	**89712**

Analytes	Result	Accuracy	DF	Date Analyzed
ORP	**663 @ 23.6°C**	10	1	04/23/2014 20:25

Analytical Comments: j1

MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**WetChem**	**89712**

Analytes	Result	Accuracy	DF	Date Analyzed
ORP	**665 @ 23.4°C**	10	1	04/23/2014 20:30

Analytical Comments: j1

MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**WetChem**	**89712**

Analytes	Result	Accuracy	DF	Date Analyzed
ORP	**650 @ 23.9°C**	10	1	04/23/2014 20:35

Analytical Comments: j1

MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**WetChem**	**89743**

Analytes	Result	Accuracy	DF	Date Analyzed
ORP	**479 @ 25.3°C**	10	1	04/24/2014 17:05

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM2580Bm
Date Received:	12/18/13 15:02	**Analytical Method:**	SM2580B, MAI
Date Prepared:	4/23/14-4/24/14	**Unit:**	±, mV vs. NHE

Oxidation-Reduction Potential (ORP) (Leachate) - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**WetChem**	**89743**

Analytes	Result	Accuracy	DF	Date Analyzed
ORP	**666 @ 24.3°C**	10	1	04/24/2014 17:00

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM4500H+B
Date Received:	12/18/13 15:02	**Analytical Method:**	SM4500H+B
Date Prepared:	4/23/14-4/24/14	**Unit:**	±, pH units @ 25°C

Leachate pH - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 74.0-75.5	**1312545-002D**	**Water**	**12/17/2013 11:40**	**WetChem**	**89608**

Analytes	Result	Qualifiers	Accuracy	DF	Date Analyzed
pH	**8.44**	H	0.05	1	04/23/2014 17:01

Analytical Comments: j1

MW-1: 98.5-101	**1312545-003D**	**Water**	**12/17/2013 11:50**	**WetChem**	**89608**

Analytes	Result	Qualifiers	Accuracy	DF	Date Analyzed
pH	**7.65**	H	0.05	1	04/23/2014 17:07

Analytical Comments: j1

MW-1: 139.5-142.0	**1312545-004D**	**Water**	**12/17/2013 12:00**	**WetChem**	**89608**

Analytes	Result	Qualifiers	Accuracy	DF	Date Analyzed
pH	**7.44**	H	0.05	1	04/23/2014 17:10

Analytical Comments: j1

MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**WetChem**	**89608**

Analytes	Result	Qualifiers	Accuracy	DF	Date Analyzed
pH	**7.83**	H	0.05	1	04/23/2014 17:13

Analytical Comments: j1

MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**WetChem**	**89608**

Analytes	Result	Qualifiers	Accuracy	DF	Date Analyzed
pH	**7.95**	H	0.05	1	04/24/2014 16:36

Analytical Comments: j1

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Project:	#60408; MRWPCA	**Extraction Method:**	SM4500H+B
Date Received:	12/18/13 15:02	**Analytical Method:**	SM4500H+B
Date Prepared:	4/23/14-4/24/14	**Unit:**	±, pH units @ 25°C

Leachate pH - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**WetChem**	**89608**

Analytes	Result	Qualifiers	Accuracy	DF	Date Analyzed
pH	**8.11**	H	0.05	1	04/24/2014 16:39

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SM2130B
Date Received:	12/20/13 15:35	**Analytical Method:**	SM2130B
Date Prepared:	5/27/14	**Unit:**	NTU

Turbidity

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 200-202.5	**1312545-005D**	**Water**	**12/17/2013 12:20**	**WetChem**	**91343**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Turbidity	**5.74**	H	0.100	1	05/27/2014 14:30

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 297-298.5	**1312545-006D**	**Water**	**12/18/2013 08:20**	**WetChem**	**91343**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Turbidity	**67.0**	H	0.100	1	05/27/2014 15:05

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 364.5-367.0	**1312545-007D**	**Water**	**12/18/2013 09:00**	**WetChem**	**91343**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Turbidity	**7.69**	H	0.100	1	05/27/2014 14:40

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/23/14	**BatchID:**	89648
Date Analyzed:	5/1/14	**Extraction Method:**	E200.8
Instrument:	ICP-MS1	**Analytical Method:**	E200.8
Matrix:	Water	**Unit:**	µg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89648

QC Summary Report for E200.8

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Aluminum	ND	468	50	500	-	93.6	85-115
Antimony	ND	47.4	0.50	50	-	94.8	85-115
Arsenic	ND	48.2	0.50	50	-	96.3	85-115
Barium	ND	453	5.0	500	-	90.6	85-115
Beryllium	ND	46.8	0.50	50	-	93.6	85-115
Cadmium	ND	46.9	0.25	50	-	93.8	85-115
Calcium	ND	4820	100	5000	-	96.4	85-115
Chromium	ND	45.5	0.50	50	-	91.1	85-115
Cobalt	ND	47.8	0.50	50	-	95.6	85-115
Copper	ND	47.2	0.50	50	-	94.5	85-115
Iron	ND	491	20	500	-	98.2	85-115
Lead	ND	47.6	0.50	50	-	95.3	85-115
Lithium	ND	47.8	5.0	50	-	95.5	85-115
Magnesium	ND	479	20	500	-	95.9	85-115
Manganese	ND	472	20	500	-	94.4	85-115
Mercury	ND	1.10	0.025	1.25	-	87.8	85-115
Molybdenum	ND	46.1	0.50	50	-	92.2	85-115
Nickel	ND	46.8	0.50	50	-	93.7	85-115
Potassium	ND	452	50	500	-	90.4	85-115
Selenium	ND	48.1	0.50	50	-	96.2	85-115
Silver	ND	46.9	0.19	50	-	93.7	85-115
Sodium	ND	4880	100	5000	-	97.6	85-115
Strontium	ND	477	20	500	-	95.3	85-115
Thallium	ND	47.4	0.50	50	-	94.9	85-115
Uranium	ND	45.9	0.50	50	-	91.8	85-115
Vanadium	ND	45.6	0.50	50	-	91.2	85-115
Zinc	ND	476	5.0	500	-	95.3	85-115

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89607
Date Analyzed:	5/2/14	**Extraction Method:**	E200.7
Instrument:	ICP-JY	**Analytical Method:**	E200.7
Matrix:	Water	**Unit:**	µg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89607

QC Summary Report for E200.7

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Phosphorous	ND	1020	100	1000	-	102	80-120

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89609
Date Analyzed:	5/2/14	**Extraction Method:**	E200.7
Instrument:	ICP-JY	**Analytical Method:**	200.7
Matrix:	Water	**Unit:**	µg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89609

QC Summary Report for E200.7

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Silicon	ND	913	50	1000	-	91.3	80-120

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89600
Date Analyzed:	4/23/14	**Extraction Method:**	E218.6
Instrument:	IC2	**Analytical Method:**	E218.6
Matrix:	Leachate	**Unit:**	µg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89600 1312545-003DMS/MSD

QC Summary Report for E218.6

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	0.210	23.3	0.20	25	-	93.2	90-110

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	24.7	24.6	25	1.620	92.5	92	90-110	0.446	10

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89601
Date Analyzed:	4/24/14 - 4/25/14	**Extraction Method:**	E300.1
Instrument:	IC3	**Analytical Method:**	E300.1
Matrix:	Leachate	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89601 1312545-003DMS/MSD

QC Summary Report for E300.1

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Bromide	ND	0.964	0.10	1	-	96.4	85-115
Chloride	20.0	20.9	0.10	1	-	2090, F2	85-115
Fluoride	ND	1.10	0.10	1	-	110	85-115
Nitrate as N	0.647	1.62	0.10	1	-	162, F2	85-115
Nitrate as $NO3^{-}$	2.86	7.15	0.45	4.4	-	163, F2	85-115
Nitrite as N	ND	0.981	0.10	1	-	98.1	85-115
Nitrite as $NO2^{-}$	ND	3.24	0.33	3.3	-	98.1	85-115
Sulfate	0.121	1.10	0.10	1	-	110	85-115
Surrogate Recovery							
Formate	0.106	0.103		0.10	106	103	90-115

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Bromide	1.03	1.07	1	ND	103	107	85-115	3.31	15
Chloride	NR	NR	1	20.23	NR	NR	85-115	NR	15
Fluoride	1.32	1.34	1	0.2204	110	112	85-115	1.06	15
Nitrate as N	1.77	1.76	1	0.6401	113	112	85-115	0.298	15
Nitrate as $NO3^{-}$	7.83	7.81	4.4	2.834	114	113	85-115	0.298	15
Nitrite as N	1.07	1.07	1	ND	107	107	85-115	0	15
Nitrite as $NO2^{-}$	3.53	3.54	3.3	ND	107	107	85-115	0	15
Sulfate	1.53	1.53	1	0.4226	111	111	85-115	0	15
Surrogate Recovery									
Formate	0.104	0.104	0.10		104	104	90-115	0	10

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14 - 4/23/14	**BatchID:**	89602
Date Analyzed:	4/29/14	**Extraction Method:**	SM2320B
Instrument:	Titrino	**Analytical Method:**	SM2320B
Matrix:	Leachate	**Test Method:**	SM2320B (Alkalinity)
Project:	#60408; MRWPCA		

QC Summary Report for SM2320B (Alkalinity)

Lab ID	Analyte	Reporting Units	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	RPD	Acceptance Criteria (%)
1312545-002D	Total	mg $CaCO_3$/L	73.0	1	72.0	1	1.38	<20
1312545-003D	Total	mg $CaCO_3$/L	40.0	1	40.0	1	0	<20
1312545-004D	Total	mg $CaCO_3$/L	37.0	1	36.0	1	2.74	<20
1312545-005D	Total	mg $CaCO_3$/L	46.0	1	45.0	1	2.2	<20
1312545-006D	Total	mg $CaCO_3$/L	170	1	169	1	0.395	<20
1312545-007D	Total	mg $CaCO_3$/L	59.0	1	58.5	1	0.851	<20

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89603
Date Analyzed:	4/29/14	**Extraction Method:**	E350.1
Instrument:	SKALAR	**Analytical Method:**	E350.1
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89603

QC Summary Report for E350.1

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Total Ammonia as N	ND	3.80	0.10	4	-	95.1	90-110

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89615
Date Analyzed:	4/23/14	**Extraction Method:**	SM4500-Cl DE
Instrument:	Titrino	**Analytical Method:**	SM4500-Cl DE
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB-89615

QC Summary Report for Chlorine

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Chlorine	2.13	-	0.40	-	-	-	-

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89604
Date Analyzed:	4/29/14	**Extraction Method:**	E415.3
Instrument:	TOC_SHIMADZU	**Analytical Method:**	E415.3
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89604

QC Summary Report for E415.3

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TOC	ND	49.6	0.30	50	-	99.2	80-120

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89605
Date Analyzed:	4/30/14	**Extraction Method:**	E415.3
Instrument:	TOC_CNS	**Analytical Method:**	E415.3
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89605

QC Summary Report for E415.3

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
IC as CO2	ND	38.3	3.7	36.7	-	104	80-120

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89610
Date Analyzed:	5/1/14	**Extraction Method:**	SM4500 S-2 D
Instrument:	SPECTROPHOTOMETER	**Analytical Method:**	SM4500 S-2 D
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89610 1402489-001BMS/MSD

QC Summary Report For SM4500S2D

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Sulfide	ND	2.36	0.050	2.5	-	94.5	80-120

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Sulfide	2.03	2.03	2.5	ND	81.3	81.4	75-125	0.0975	20

(Cont.)

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89597
Date Analyzed:	4/30/14	**Extraction Method:**	E351.2
Instrument:	SKALAR	**Analytical Method:**	E351.2
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89597

QC Summary Report for E351.2 (TKN as N)

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TKN as N	ND	11.3	0.30	12	-	93.9	90-110

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Quality Control Report

Client: Todd Engineering
Date Prepared: 4/23/14
Date Analyzed: 4/23/14
Instrument: WetChem
Matrix: Leachate
Project: #60408; MRWPCA

WorkOrder: 1312545
BatchID: 89712
Extraction Method: SM2580Bm
Analytical Method: SM2580B, MAI
Unit: ±, mV vs. NHE

QC Summary Report for ORP (MAI)

SampID	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	RPD	Acceptance Criteria (%)
1312545-002D	577 @ 23.9°C	1	578 @ 24.0°C	1	0.27	<10

Client: Todd Engineering
Date Prepared: 4/24/14
Date Analyzed: 4/24/14
Instrument: WetChem
Matrix: Leachate
Project: #60408; MRWPCA

WorkOrder: 1312545
BatchID: 89743
Extraction Method: SM2580Bm
Analytical Method: SM2580B, MAI
Unit: ±, mV vs. NHE

QC Summary Report for ORP (MAI)

SampID	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	RPD	Acceptance Criteria (%)
1312650-001D	438 @ 24.3°C	1	439 @ 24.2°C	1	0.566	<10

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312545
Date Prepared:	4/22/14	**BatchID:**	89608
Date Analyzed:	4/23/14	**Extraction Method:**	SM4500H+B
Instrument:	WetChem	**Analytical Method:**	SM4500H+B
Matrix:	Leachate	**Unit:**	±, pH units @ 25°C
Project:	#60408; MRWPCA		

QC Summary Report for pH

SampID	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	Precision	Acceptance Criteria
1312545-002D	8.44	1	8.45	1	0.01	0.05

SH QA/QC Officer

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Analytical Report

WorkOrder: 1312650

Report Created for: Todd Engineering
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501

Project Contact: Bill Motzer
Project P.O.:
Project Name: #60408; MRWPCA

Project Received: 12/20/2013

Analytical Report reviewed & approved for release on 05/16/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.

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Glossary of Terms & Qualifier Definitions

Client: Todd Engineering
Project: #60408; MRWPCA
WorkOrder: 1312650

Glossary Abbreviation

95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

Analytical Qualifier

B	analyte detected in the associated Method Blank
H	samples were analyzed out of holding time
S	spike recovery outside accepted recovery limits
a1	sample diluted due to matrix interference
a4	the reporting limits were raised due to the sample's matrix prohibiting a full volume extraction.
a7	reporting limit raised due to limited sample amount
a14	reporting limit raised due to the physical nature of the sample
a20	reporting limit raised due to matrix interference
c1	surrogate recovery outside of the control limits due to the dilution of the sample.
j1	see attached narrative

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Glossary of Terms & Qualifier Definitions

Client: Todd Engineering
Project: #60408; MRWPCA
WorkOrder: 1312650

Quality Control Qualifiers

F1	MS/MSD recovery was out of acceptance criteria; LCS validated the prep batch.
F2	LCS recovery for this compound is outside of acceptance limits.
F3	the surrogate standard recovery is outside of acceptance limits.

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Case Narrative

Client: Todd Engineering
Project: #60408; MRWPCA

Work Order: 1312650
May 16, 2014

McCampbell Analytical incorporated the following method for the extraction of all Leachate samples:

All Leachate samples were extracted at 1:5 ratio and rotated for 7 days using client-provided water as TCLP solution. Upon completion of rotation McCampbell Analytical centrifuged each extract for 12hrs and filtered through a 0.45 micron filter.

_____ Angela Rydelius, Lab Manager

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E200.8
Date Received:	12/20/13 15:35	**Analytical Method:**	E200.8
Date Prepared:	4/23/14	**Unit:**	µg/L

Leachate Metals - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water/Dissolved**	**12/19/2013 14:00**	**ICP-MS1**	**89648**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**970**	500	10	04/26/2014 01:54
Antimony	ND	5.0	10	04/26/2014 01:54
Arsenic	ND	5.0	10	04/26/2014 01:54
Barium	**50**	50	10	04/26/2014 01:54
Beryllium	ND	5.0	10	04/26/2014 01:54
Cadmium	**24**	2.5	10	04/26/2014 01:54
Calcium	**540,000**	10,000	100	05/01/2014 12:34
Chromium	ND	5.0	10	04/26/2014 01:54
Cobalt	**240**	5.0	10	04/26/2014 01:54
Copper	ND	5.0	10	04/26/2014 01:54
Iron	**48,000**	200	10	04/26/2014 01:54
Lead	ND	5.0	10	04/26/2014 01:54
Lithium	**140**	50	10	04/26/2014 01:54
Magnesium	**150,000**	1000	50	04/29/2014 01:40
Manganese	**4300**	200	10	04/26/2014 01:54
Mercury	ND	0.25	10	04/26/2014 01:54
Molybdenum	ND	5.0	10	04/26/2014 01:54
Nickel	**1800**	25	50	04/29/2014 01:40
Potassium	**20,000**	500	10	04/26/2014 01:54
Selenium	ND	5.0	10	04/26/2014 01:54
Silver	ND	1.9	10	04/26/2014 01:54
Sodium	**48,000**	1000	10	04/26/2014 01:54
Strontium	**3300**	200	10	04/26/2014 01:54
Thallium	ND	5.0	10	04/26/2014 01:54
Uranium	ND	5.0	10	04/26/2014 01:54
Vanadium	ND	5.0	10	04/26/2014 01:54
Zinc	**500**	50	10	04/26/2014 01:54

Analytical Comments: a1,a7,j1

(Cont.)

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E200.8
Date Received:	12/20/13 15:35	**Analytical Method:**	E200.8
Date Prepared:	4/23/14	**Unit:**	µg/L

Leachate Metals - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 433.0-435.0	**1312650-002D**	**Water/Dissolved**	**12/19/2013 14:15**	**ICP-MS1**	**89648**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	ND	500	10	04/26/2014 02:00
Antimony	ND	5.0	10	04/26/2014 02:00
Arsenic	ND	5.0	10	04/26/2014 02:00
Barium	**200**	50	10	04/26/2014 02:00
Beryllium	ND	5.0	10	04/26/2014 02:00
Cadmium	ND	2.5	10	04/26/2014 02:00
Calcium	**6700**	1000	10	04/26/2014 02:00
Chromium	ND	5.0	10	04/26/2014 02:00
Cobalt	ND	5.0	10	04/26/2014 02:00
Copper	ND	5.0	10	04/26/2014 02:00
Iron	ND	200	10	04/26/2014 02:00
Lead	ND	5.0	10	04/26/2014 02:00
Lithium	ND	50	10	04/26/2014 02:00
Magnesium	**1900**	200	10	04/26/2014 02:00
Manganese	ND	200	10	04/26/2014 02:00
Mercury	ND	0.25	10	04/26/2014 02:00
Molybdenum	**14**	5.0	10	04/26/2014 02:00
Nickel	ND	5.0	10	04/26/2014 02:00
Potassium	**2500**	500	10	04/26/2014 02:00
Selenium	ND	5.0	10	04/26/2014 02:00
Silver	ND	1.9	10	04/26/2014 02:00
Sodium	**25,000**	1000	10	04/26/2014 02:00
Strontium	ND	200	10	04/26/2014 02:00
Thallium	ND	5.0	10	04/26/2014 02:00
Uranium	ND	5.0	10	04/26/2014 02:00
Vanadium	ND	5.0	10	04/26/2014 02:00
Zinc	ND	50	10	04/26/2014 02:00

Analytical Comments: a1,a7,j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E200.7
Date Received:	12/20/13 15:35	**Analytical Method:**	E200.7
Date Prepared:	4/22/14	**Unit:**	µg/L

Leachate Phosphorus - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water/Dissolved**	**12/19/2013 14:00**	**ICP-JY**	**89607**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	ND	500	10	05/02/2014 14:04

Analytical Comments: a7,j1

MW-1: 433.0-435.0	**1312650-002D**	**Water/Dissolved**	**12/19/2013 14:15**	**ICP-JY**	**89607**

Analytes	Result	RL	DF	Date Analyzed
Phosphorous	ND	500	10	05/02/2014 14:06

Analytical Comments: a7,j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E200.7
Date Received:	12/20/13 15:35	**Analytical Method:**	200.7
Date Prepared:	4/22/14	**Unit:**	µg/L

Leachate Silicon - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water/Dissolved**	**12/19/2013 14:00**	**ICP-JY**	**89609**

Analytes	Result	RL	DF	Date Analyzed
Silicon	**24,000**	500	10	05/02/2014 12:43

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water/Dissolved**	**12/19/2013 14:15**	**ICP-JY**	**89609**

Analytes	Result	RL	DF	Date Analyzed
Silicon	**10,000**	500	10	05/02/2014 12:45

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E218.6
Date Received:	12/20/13 15:35	**Analytical Method:**	E218.6
Date Prepared:	4/22/14	**Unit:**	µg/L

Leachate Hexachrome by IC - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**IC2**	**89600**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Hexachrome	ND	BH	0.20	1	04/24/2014 15:28

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**IC2**	**89600**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Hexachrome	ND	BH	0.20	1	04/24/2014 15:48

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E300.1
Date Received:	12/20/13 15:35	**Analytical Method:**	E300.1
Date Prepared:	4/22/14	**Unit:**	mg/L

Leachate Inorganic Anions by IC - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**IC3**	**89601**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Bromide	ND	H	0.10	1	04/24/2014 18:13
Chloride	**22**	BH	1.0	10	04/25/2014 14:39
Fluoride	**1.1**	H	0.10	1	04/24/2014 18:13
Nitrate as N	**0.61**	BH	0.10	1	04/24/2014 18:13
Nitrate as $NO3^{-}$	**2.7**	BH	0.45	1	04/24/2014 18:13
Nitrite as N	ND	H	0.10	1	04/24/2014 18:13
Nitrite as $NO2^{-}$	ND	H	0.33	1	04/24/2014 18:13
Sulfate	**2000**	BH	100	1000	04/24/2014 20:59

Surrogates	REC (%)	Qualifiers	Limits	Analytical Comments: j1	
Formate	99	H	90-115		04/25/2014 14:39

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**IC3**	**89601**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Bromide	ND	H	0.10	1	04/24/2014 18:55
Chloride	**22**	BH	1.0	10	04/24/2014 21:40
Fluoride	**0.14**	H	0.10	1	04/24/2014 18:55
Nitrate as N	**0.67**	BH	0.10	1	04/24/2014 18:55
Nitrate as $NO3^{-}$	**3.0**	BH	0.45	1	04/24/2014 18:55
Nitrite as N	ND	H	0.10	1	04/24/2014 18:55
Nitrite as $NO2^{-}$	ND	H	0.33	1	04/24/2014 18:55
Sulfate	**0.88**	BH	0.10	1	04/24/2014 18:55

Surrogates	REC (%)	Qualifiers	Limits	Analytical Comments: j1	
Formate	107	H	90-115		04/24/2014 18:55

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SM2320B
Date Received:	12/20/13 15:35	**Analytical Method:**	SM2320B
Date Prepared:	4/29/14	**Unit:**	mg $CaCO_3$/L

Total & Speciated Alkalinity as CaCO3 (Leachate) - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**Titrino**	**89602**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total	**1.07**	H	1.00	1	04/29/2014 11:06
Carbonate	ND	H	1.00	1	04/29/2014 11:06
Bicarbonate	**1.07**	H	1.00	1	04/29/2014 11:06
Hydroxide	ND	H	1.00	1	04/29/2014 11:06

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**Titrino**	**89602**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total	**44.7**	H	1.00	1	04/29/2014 10:59
Carbonate	ND	H	1.00	1	04/29/2014 10:59
Bicarbonate	**44.7**	H	1.00	1	04/29/2014 10:59
Hydroxide	ND	H	1.00	1	04/29/2014 10:59

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E350.1
Date Received:	12/20/13 15:35	**Analytical Method:**	E350.1
Date Prepared:	4/22/14	**Unit:**	mg/L

Leachate Ammonia as N - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**SKALAR**	**89603**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total Ammonia as N	**1.8**	H	0.10	1	04/29/2014 16:32

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**SKALAR**	**89603**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Total Ammonia as N	**0.27**	H	0.10	1	04/29/2014 16:36

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SM4500-Cl DE
Date Received:	12/20/13 15:35	**Analytical Method:**	SM4500-Cl DE
Date Prepared:	4/24/14	**Unit:**	mg/L

Chlorine, Total Residual [Leachate] - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**Titrino**	**89615**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Chlorine	ND	BH	0.40	10	04/24/2014 15:34

Analytical Comments: a7,j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**Titrino**	**89615**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Chlorine	**0.74**	BH	0.40	10	04/24/2014 15:38

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E415.3
Date Received:	12/20/13 15:35	**Analytical Method:**	E415.3
Date Prepared:	4/22/14	**Unit:**	mg/L

Inorganic Carbon as Carbon Dioxide [Leachate] - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**TOC_CNS**	**89605**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
IC as CO2	**10**	H	3.7	1	04/30/2014 14:52

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**TOC_CNS**	**89605**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
IC as CO2	**41**	H	3.7	1	04/30/2014 14:59

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E415.3
Date Received:	12/20/13 15:35	**Analytical Method:**	E415.3
Date Prepared:	4/22/14	**Unit:**	mg/L

Dissolved Organic Carbon (DOC) [Leachate] - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**TOC_SHIMADZU**	**89604**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Dissolved Organic Carbon	**6.4**	H	0.70	1	04/29/2014 17:35

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**TOC_SHIMADZU**	**89604**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Dissolved Organic Carbon	**1.2**	H	0.70	1	04/29/2014 17:47

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SM4500 S-2 D
Date Received:	12/20/13 15:35	**Analytical Method:**	SM4500 S-2 D
Date Prepared:	4/24/14	**Unit:**	mg/L

Leachate Sulfide - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**SPECTROPHOTOMETER**	**89610**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Sulfide	ND	H	0.050	1	04/24/2014 20:50

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**SPECTROPHOTOMETER**	**89610**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Sulfide	ND	H	0.050	1	04/24/2014 21:10

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	E351.2
Date Received:	12/20/13 15:35	**Analytical Method:**	E351.2
Date Prepared:	4/29/14	**Unit:**	mg/L

Total Kjeldahl Nitrogen (Leachate) - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**SKALAR**	**89597**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
TKN as N	**2.3**	H	0.30	1	04/30/2014 15:17

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**SKALAR**	**89597**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
TKN as N	**0.39**	H	0.30	1	04/30/2014 15:20

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SM2580Bm
Date Received:	12/20/13 15:35	**Analytical Method:**	SM2580B, MAI
Date Prepared:	4/24/14	**Unit:**	±, mV vs. NHE

Oxidation-Reduction Potential (ORP) (Leachate) - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**WetChem**	**89743**

Analytes	Result	Accuracy	DF	Date Analyzed
ORP	**438 @ 24.3°C**	10	1	04/24/2014 16:45

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**WetChem**	**89743**

Analytes	Result	Accuracy	DF	Date Analyzed
ORP	**649 @ 26.4°C**	10	1	04/24/2014 16:55

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SM4500H+B
Date Received:	12/20/13 15:35	**Analytical Method:**	SM4500H+B
Date Prepared:	4/24/14	**Unit:**	±, pH units @ 25°C

Leachate pH - Using Client-Provided Water as TCLP Solution

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**WetChem**	**89725**

Analytes	Result	Qualifiers	Accuracy	DF	Date Analyzed
pH	**5.04**	H	0.05	1	04/24/2014 16:27

Analytical Comments: j1

MW-1: 433.0-435.0	**1312650-002D**	**Water**	**12/19/2013 14:15**	**WetChem**	**89725**

Analytes	Result	Qualifiers	Accuracy	DF	Date Analyzed
pH	**7.84**	H	0.05	1	04/24/2014 16:33

Analytical Comments: j1

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Analytical Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Project:	#60408; MRWPCA	**Extraction Method:**	SM2130B
Date Received:	12/20/13 15:35	**Analytical Method:**	SM2130B
Date Prepared:	5/27/14	**Unit:**	NTU

Turbidity

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MW-1: 398.5-401.0	**1312650-001D**	**Water**	**12/19/2013 14:00**	**WetChem**	**91343**

Analytes	Result	Qualifiers	RL	DF	Date Analyzed
Turbidity	**6.97**	H	0.100	1	05/27/2014 14:45

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/23/14	**BatchID:**	89648
Date Analyzed:	5/1/14	**Extraction Method:**	E200.8
Instrument:	ICP-MS1	**Analytical Method:**	E200.8
Matrix:	Water	**Unit:**	µg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89648

QC Summary Report for E200.8

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Aluminum	ND	468	50	500	-	93.6	85-115
Antimony	ND	47.4	0.50	50	-	94.8	85-115
Arsenic	ND	48.2	0.50	50	-	96.3	85-115
Barium	ND	453	5.0	500	-	90.6	85-115
Beryllium	ND	46.8	0.50	50	-	93.6	85-115
Cadmium	ND	46.9	0.25	50	-	93.8	85-115
Calcium	ND	4820	100	5000	-	96.4	85-115
Chromium	ND	45.5	0.50	50	-	91.1	85-115
Cobalt	ND	47.8	0.50	50	-	95.6	85-115
Copper	ND	47.2	0.50	50	-	94.5	85-115
Iron	ND	491	20	500	-	98.2	85-115
Lead	ND	47.6	0.50	50	-	95.3	85-115
Lithium	ND	47.8	5.0	50	-	95.5	85-115
Magnesium	ND	479	20	500	-	95.9	85-115
Manganese	ND	472	20	500	-	94.4	85-115
Mercury	ND	1.10	0.025	1.25	-	87.8	85-115
Molybdenum	ND	46.1	0.50	50	-	92.2	85-115
Nickel	ND	46.8	0.50	50	-	93.7	85-115
Potassium	ND	452	50	500	-	90.4	85-115
Selenium	ND	48.1	0.50	50	-	96.2	85-115
Silver	ND	46.9	0.19	50	-	93.7	85-115
Sodium	ND	4880	100	5000	-	97.6	85-115
Strontium	ND	477	20	500	-	95.3	85-115
Thallium	ND	47.4	0.50	50	-	94.9	85-115
Uranium	ND	45.9	0.50	50	-	91.8	85-115
Vanadium	ND	45.6	0.50	50	-	91.2	85-115
Zinc	ND	476	5.0	500	-	95.3	85-115

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89607
Date Analyzed:	5/2/14	**Extraction Method:**	E200.7
Instrument:	ICP-JY	**Analytical Method:**	E200.7
Matrix:	Water	**Unit:**	µg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89607

QC Summary Report for E200.7

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Phosphorous	ND	1020	100	1000	-	102	80-120

QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89609
Date Analyzed:	5/2/14	**Extraction Method:**	E200.7
Instrument:	ICP-JY	**Analytical Method:**	200.7
Matrix:	Water	**Unit:**	µg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89609

QC Summary Report for E200.7

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Silicon	ND	913	50	1000	-	91.3	80-120

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89600
Date Analyzed:	4/23/14	**Extraction Method:**	E218.6
Instrument:	IC2	**Analytical Method:**	E218.6
Matrix:	Leachate	**Unit:**	µg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89600 1312545-003DMS/MSD

QC Summary Report for E218.6

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	0.210	23.3	0.20	25	-	93.2	90-110

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	24.7	24.6	25	1.620	92.5	92	90-110	0.446	10

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89601
Date Analyzed:	4/24/14 - 4/25/14	**Extraction Method:**	E300.1
Instrument:	IC3	**Analytical Method:**	E300.1
Matrix:	Leachate	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89601 1312545-003DMS/MSD

QC Summary Report for E300.1

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Bromide	ND	0.964	0.10	1	-	96.4	85-115
Chloride	20.0	20.9	0.10	1	-	2090, F2	85-115
Fluoride	ND	1.10	0.10	1	-	110	85-115
Nitrate as N	0.647	1.62	0.10	1	-	162, F2	85-115
Nitrate as $NO3^{-}$	2.86	7.15	0.45	4.4	-	163, F2	85-115
Nitrite as N	ND	0.981	0.10	1	-	98.1	85-115
Nitrite as $NO2^{-}$	ND	3.24	0.33	3.3	-	98.1	85-115
Sulfate	0.121	1.10	0.10	1	-	110	85-115
Surrogate Recovery							
Formate	0.106	0.103		0.10	106	103	90-115

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Bromide	1.03	1.07	1	ND	103	107	85-115	3.31	15
Chloride	NR	NR	1	20.23	NR	NR	85-115	NR	15
Fluoride	1.32	1.34	1	0.2204	110	112	85-115	1.06	15
Nitrate as N	1.77	1.76	1	0.6401	113	112	85-115	0.298	15
Nitrate as $NO3^{-}$	7.83	7.81	4.4	2.834	114	113	85-115	0.298	15
Nitrite as N	1.07	1.07	1	ND	107	107	85-115	0	15
Nitrite as $NO2^{-}$	3.53	3.54	3.3	ND	107	107	85-115	0	15
Sulfate	1.53	1.53	1	0.4226	111	111	85-115	0	15
Surrogate Recovery									
Formate	0.104	0.104	0.10		104	104	90-115	0	10

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14 - 4/23/14	**BatchID:**	89602
Date Analyzed:	4/29/14	**Extraction Method:**	SM2320B
Instrument:	Titrino	**Analytical Method:**	SM2320B
Matrix:	Leachate	**Test Method:**	SM2320B (Alkalinity)
Project:	#60408; MRWPCA		

QC Summary Report for SM2320B (Alkalinity)

Lab ID	Analyte	Reporting Units	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	RPD	Acceptance Criteria (%)
1312650-001D	Total	mg $CaCO_3$/L	1.07	1	ND	1	N/A	<20
1312650-002D	Total	mg $CaCO_3$/L	44.7	1	46.0	1	2.93	<20

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89603
Date Analyzed:	4/29/14	**Extraction Method:**	E350.1
Instrument:	SKALAR	**Analytical Method:**	E350.1
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89603

QC Summary Report for E350.1

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Total Ammonia as N	ND	3.80	0.10	4	-	95.1	90-110

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89615
Date Analyzed:	4/23/14	**Extraction Method:**	SM4500-Cl DE
Instrument:	Titrino	**Analytical Method:**	SM4500-Cl DE
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB-89615

QC Summary Report for Chlorine

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Chlorine	2.13	-	0.40	-	-	-	-

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89605
Date Analyzed:	4/30/14	**Extraction Method:**	E415.3
Instrument:	TOC_CNS	**Analytical Method:**	E415.3
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89605

QC Summary Report for E415.3

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
IC as CO2	ND	38.3	3.7	36.7	-	104	80-120

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89604
Date Analyzed:	4/29/14	**Extraction Method:**	E415.3
Instrument:	TOC_SHIMADZU	**Analytical Method:**	E415.3
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89604

QC Summary Report for E415.3

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TOC	ND	49.6	0.30	50	-	99.2	80-120

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89610
Date Analyzed:	5/1/14	**Extraction Method:**	SM4500 S-2 D
Instrument:	SPECTROPHOTOMETER	**Analytical Method:**	SM4500 S-2 D
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89610 1402489-001BMS/MSD

QC Summary Report For SM4500S2D

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Sulfide	ND	2.36	0.050	2.5	-	94.5	80-120

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Sulfide	2.03	2.03	2.5	ND	81.3	81.4	75-125	0.0975	20

SH QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/22/14	**BatchID:**	89597
Date Analyzed:	4/30/14	**Extraction Method:**	E351.2
Instrument:	SKALAR	**Analytical Method:**	E351.2
Matrix:	Water	**Unit:**	mg/L
Project:	#60408; MRWPCA	**Sample ID:**	MB/LCS-89597

QC Summary Report for E351.2 (TKN as N)

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
TKN as N	ND	11.3	0.30	12	-	93.9	90-110

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/24/14	**BatchID:**	89743
Date Analyzed:	4/24/14	**Extraction Method:**	SM2580Bm
Instrument:	WetChem	**Analytical Method:**	SM2580B, MAI
Matrix:	Leachate	**Unit:**	±, mV vs. NHE
Project:	#60408; MRWPCA		

QC Summary Report for ORP (MAI)

SampID	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	RPD	Acceptance Criteria (%)
1312650-001D	438 @ 24.3°C	1	439 @ 24.2°C	1	0.566	<10

QA/QC Officer

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Quality Control Report

Client:	Todd Engineering	**WorkOrder:**	1312650
Date Prepared:	4/24/14	**BatchID:**	89725
Date Analyzed:	4/24/14	**Extraction Method:**	SM4500H+B
Instrument:	WetChem	**Analytical Method:**	SM4500H+B
Matrix:	Leachate	**Unit:**	±, pH units @ 25°C
Project:	#60408; MRWPCA		

QC Summary Report for pH

SampID	Sample Result	Sample DF	Dup / Serial Dilution Result	Dup / Serial Dilution DF	Precision	Acceptance Criteria
1312650-001D	5.04	1	5.05	1	0.01	0.05

SH QA/QC Officer

Case Narrative

Client: Todd Engineering **Work Order:** 1312545
Project: #60408; MRWPCA May 16, 2014

Leaching Procedure

For the leaching procedure, 160 grams of sample and 800 milliliters of pilot water (1g:5ml ratio) solution were rotated for 7 days (Associated Design & Manufacturing TCLP Rotator Model 3740-12BRE-11). Immediately following rotation, the leachate was poured into 60 milliliter vials and centrifuged for 12 hours at 2,500 RPMs, with the exception for #1312545-006 (297.0 - 298.5 feet) which was centrifuged for 16 hours to address residual elevated turbidity following 12 hours of centrifuging. Leachate from each vial was filtered through 0.45 micron filter prior to analysis of selected constituents.

Case Narrative: Turbidity study, results and recommendations for WO 1312545, 1312650 & 1402489

Initial leachate extracts that were obtained at a 2:1 water:sediment ratio and rotated for 7 days, then filtered through 0.7um glass fiber filters. They contained copious sediment, high turbidity, and 100-300mg/L Al, and were deemed to be unusable to evaluate trace and minor element leaching of the sediment by the pilot water.

To determine the most appropriate extraction procedure, two of the samples were mixed in 1:5 wt ratio with the pilot water by vortexing for 30 minutes, then centrifuged for 6, 12 and 24 hours at 2,500 rpms. Turbidity and CAM17+ metals were measured on each including the pilot water. All sample were filtered thru a 0.45um filter prior to measurements and the metals samples were preserved with standard 2% HNO3 after filtration.

The results are broadly similar for the various centrifugation times for the sediments. Although Al shows differences, all of its values are reasonably small (<1ppm). There is some loss of Fe & Mn, & occasional other elements as centrifuge times are increased. Turbidity results are noted below followed by metals data.

We selected 12 hours as the best compromise, based on retention of trace elements, and our extraction supervisor's observation that it filtered much more easily than the 6hr centrifuged equivalent. We have limited centrifuge capacity available for this size sample container so 12hr is helpful relative to 24hr for more reasonable turn around time.

Turbidity Results (NTU):

- 6hr, centrifuge, MB-before filtration= 0.075
- 6hr, centrifuge, MB-after filtration = 0.075

- 12hr, centrifuge, MB-before filtration= 0.075
- 12hr, centrifuge, MB-after filtration= 0.075

- 24hr, centrifuge, MB-before filtration= 0.075
- 24hr, centrifuge, MB-after filtration= 0.075

- 6hr, centrifuge, 1312545-004A before filtration= 141
- 6hr, centrifuge, 1312545-004A after filtered= 12

- 12hr, centrifuge, 1312545-004A before filtration= 84
- 12hr, centrifuge, 1312545-004A after filtered= 12

- 24hr, centrifuge, 1312545-004A before filtration= 4.0 - Aberrant
- 24hr, centrifuge, 1312545-004A after filtration= 0.9 – Aberrant

- 6hr, centrifuge, 1312545-006A before filtration= 506
- 6hr, centrifuge, 1312545-006A after filtered= 25

- 12hr, centrifuge, 1312545-006A before filtration= 685
- 12hr, centrifuge, 1312545-006A after filtered= 31

- 24hr, centrifuge, 1312545-006A before filtration= 153

- 24hr, centrifuge, 1312545-006A after filtration= 95

Vortage for 30min + Centrifuge 6hr/12hr/24hr

1402489 = PILOT WATER

Vortex 30 minutes, Centrifuge 6hrs

Turbidity = 0.075NTU

MB - 6hr

Sample QC Report

Data File:	C:\ICPCHEM\1\DATA\041414_A.B\204SMPL.D\204SMPL.D#
Date Acquired:	Apr 15 2014 05:33 am
Operator:	
Sample Name:	mb cam di w
Misc Info:	6hr cent. filter with 0.45uM
Current Method:	C:\ICPCHEM\1\METHODS\5point_Z.M
Calibration File:	C:\ICPCHEM\1\CALIB\5point_Z.C
Last Cal Update:	Apr 12 2014 10:36 pm
Vial Number:	3105
Sample Type:	Sample
Frep Dil Factor:	1.00
Total Dil Factor:	1.00

Step	Tune Name
#1	h2.u
#2	he.u
#3	norm.u
#4	

T = 0.075

Read this Column
ug/L

QC Elements

Element			Conc.	Corr. Conc.	RSD(%)	High Limit	Flag
27	aluminium	# 3	-2.5090 ppb	-2.5090	14.05	1100	
121	antimony	# 3	-0.0673 ppb	-0.0673	7.22	110	
75	arsenic	# 2	0.0510 ppb	0.0510	60.08	110	
137	barium	# 3	346.3000 ppb	346.3000	5.59	1100	
9	beryllium	# 3	0.0253 ppb	0.0253	53.40	110	
11	boron	# 3	920.8000 ppb	920.8000	4.37	110	high
114	cadmium	# 3	0.0230 ppb	0.0230	28.26	110	
40	calcium	# 1	8665.0000 ppb	8665.0000	1.36	11000	
52	chromium	# 2	0.4828 ppb	0.4828	5.60	110	
59	cobalt	# 3	0.0170 ppb	0.0170	31.11	110	
63	copper	# 2	0.4289 ppb	0.4289	8.59	110	
56	iron	# 1	-0.3989 ppb	-0.3989	4.93	11000	
208	lead	# 3	0.0241 ppb	0.0241	5.14	110	
7	lithium	# 3	1.4370 ppb	1.4370	7.28	110	
24	magnesium	# 3	71.0800 ppb	71.0800	5.31	11000	
55	manganese	# 3	0.0328 ppb	0.0328	52.68	11000	
202	mercury	# 3	0.0390 ppb	0.0390	16.01	3	
201	mercury	# 2	0.0469 ppb	0.0469	11.20	3	
201	mercury	# 3	0.0495 ppb	0.0495	4.23	3	
95	molybdenum	# 3	0.0534 ppb	0.0534	42.50	110	
60	nickel	# 2	0.0279 ppb	0.0279	120.87	110	
39	potassium	# 3	1432.0000 ppb	1432.0000	5.37	11000	
78	selenium	# 1	-0.0266 ppb	-0.0266	213.82	110	
107	silver	# 3	0.1437 ppb	0.1437	11.55	110	
23	sodium	# 1	18990.0000 ppb	18990.0000	0.60	11000	high
88	strontium	# 3	11.9800 ppb	11.9800	4.36	1100	
159	terbium	# 3	-0.0031 ppb	-0.0031	51.80	1100	
159	terbium	# 1	-0.0119 ppb	-0.0119	2.10	1100	
159	terbium	# 2	-0.0049 ppb	-0.0049	36.75	1100	
205	thallium	# 3	0.0014 ppb	0.0014	96.24	110	
232	thorium	# 3	-0.1696 ppb	-0.1696	4.35	110	
118	tin	# 3	-0.2392 ppb	-0.2392	3.39	110	
47	titanium	# 3	0.1066 ppb	0.1066	23.24	110	
182	tungsten	# 3	0.0050 ppb	0.0050	155.87	11	
238	uranium	# 3	-0.0005 ppb	-0.0005	114.13	110	
51	vanadium	# 2	0.0212 ppb	0.0212	162.76	110	
66	zinc	# 3	22.1100 ppb	22.1100	4.35	1100	
66	zinc	# 2	22.1600 ppb	22.1600	0.41	1100	

ISTD Elements

Element			CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
209	bismuth	# 2	521901.50	0.36	593621.81	87.9	60 - 125	
209	bismuth	# 3	1523731.80	4.86	1712813.00	89.0	60 - 125	
72	germanium	# 3	457742.66	3.89	439661.75	104.1	60 - 125	
72	germanium	# 2	32137.96	0.37	31666.97	101.5	60 - 125	
72	germanium	# 1	350712.47	0.38	340631.78	103.0	60 - 125	
165	holmium	# 3	2250388.80	4.41	2420327.50	93.0	60 - 125	
165	holmium	# 1	1729476.30	0.40	1888396.90	91.6	60 - 125	
165	holmium	# 2	668976.44	0.53	726423.19	92.1	60 - 125	
115	indium	# 3	1474584.00	5.55	1464354.30	100.7	60 - 125	
6	lithium	# 3	656104.56	3.28	645804.63	101.6	60 - 125	
45	scandium	# 1	768445.63	0.69	722619.00	106.3	60 - 125	
45	scandium	# 2	20697.71	0.67	20182.60	102.6	60 - 125	
45	scandium	# 3	1042508.30	4.75	957419.69	108.9	60 - 125	

ISTD Ref File : C:\ICPCHEM\1\DATA\041214_A.B\010CALB.D\010CALB.D#

2 :Element Failures
0 :ISTD Failures

0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Data Results:

Analytes:	**Fail**
ISTD:	**Pass**

Sample QC Report

Data File:	C:\ICPCHEM\1\DATA\041414_A.B\203SMPL.D\203SMPL.D#
Date Acquired:	Apr 15 2014 05:27 am
Operator:	
Sample Name:	mb cam di w
Misc Info:	12hr cent. filter with 0.45uM
Current Method:	C:\ICPCHEM\1\METHODS\5point_Z.M
Calibration File:	C:\ICPCHEM\1\CALIB\5point_Z.C
Last Cal Update:	Apr 12 2014 10:36 pm
Vial Number:	3101
Sample Type:	Sample
Prep Dil Factor:	1.00
Total Dil Factor:	1.00

MB-12hr

1402489 = PILOT WATER

Vortex 30 minutes, Centrifuge 12hrs

Turbidity = 0.075NTU

Step	Tune Name
#1	h2.u
#2	he.u
#3	norm.u
#4	

Read this Column
ug/L

T= 0.075

QC Elements

Element			Conc.	Corr. Conc.	RSD(%)	High Limit	Flag
27	aluminium	# 3	-4.1890 ppb	-4.1890	9.71	1100	
121	antimony	# 3	-0.0741 ppb	-0.0741	3.49	110	
75	arsenic	# 2	0.0714 ppb	0.0714	122.93	110	
137	barium	# 3	400.0000 ppb	400.0000	7.37	1100	
9	beryllium	# 3	0.0277 ppb	0.0277	21.65	110	
11	boron	# 3	1027.0000 ppb	1027.0000	5.51	110	high
114	cadmium	# 3	0.0196 ppb	0.0196	76.05	110	
40	calcium	# 1	8619.0000 ppb	8619.0000	0.86	11000	
52	chromium	# 2	0.7682 ppb	0.7682	6.16	110	
59	cobalt	# 3	0.0267 ppb	0.0267	15.02	110	
63	copper	# 2	0.5410 ppb	0.5410	8.98	110	
56	iron	# 1	-0.6128 ppb	-0.6128	5.50	11000	
208	lead	# 3	0.0637 ppb	0.0637	10.61	110	
7	lithium	# 3	1.9230 ppb	1.9230	9.14	110	
24	magnesium	# 3	66.5400 ppb	66.5400	6.82	11000	
55	manganese	# 3	0.1142 ppb	0.1142	32.26	11000	
202	mercury	# 3	0.0398 ppb	0.0398	3.33	3	
201	mercury	# 2	0.0387 ppb	0.0387	8.48	3	
201	mercury	# 3	0.0468 ppb	0.0468	17.31	3	
95	molybdenum	# 3	0.0567 ppb	0.0567	41.23	110	
60	nickel	# 2	0.0819 ppb	0.0819	26.76	110	
39	potassium	# 3	1367.0000 ppb	1367.0000	7.34	11000	
78	selenium	# 1	0.0210 ppb	0.0210	53.90	110	
107	silver	# 3	-0.0005 ppb	-0.0005	396.97	110	
23	sodium	# 1	19090.0000 ppb	19090.0000	0.91	11000	high
88	strontium	# 3	12.2600 ppb	12.2600	5.55	1100	
159	terbium	# 3	0.0018 ppb	0.0018	75.48	1100	
159	terbium	# 1	-0.0099 ppb	-0.0099	17.93	1100	
159	terbium	# 2	-0.0028 ppb	-0.0028	64.71	1100	
205	thallium	# 3	0.0041 ppb	0.0041	42.32	110	
232	thorium	# 3	-0.1266 ppb	-0.1266	5.97	110	
118	tin	# 3	-0.2286 ppb	-0.2286	3.08	110	
47	titanium	# 3	0.1493 ppb	0.1493	3.04	110	
182	tungsten	# 3	0.0449 ppb	0.0449	13.84	11	
238	uranium	# 3	0.0020 ppb	0.0020	36.32	110	
51	vanadium	# 2	-0.0054 ppb	-0.0054	328.16	110	
66	zinc	# 3	19.5800 ppb	19.5800	6.26	1100	
66	zinc	# 2	20.4000 ppb	20.4000	6.17	1100	

ISTD Elements

Element			CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
209	bismuth	# 2	522421.97	0.62	593621.81	88.0	60 - 125	
209	bismuth	# 3	1592413.00	7.96	1712813.00	93.0	60 - 125	
72	germanium	# 3	473755.88	6.77	439661.75	107.8	60 - 125	
72	germanium	# 2	31934.78	1.08	31666.97	100.8	60 - 125	
72	germanium	# 1	351403.09	1.31	340631.78	103.2	60 - 125	
165	holmium	# 3	2351650.30	8.28	2420327.50	97.2	60 - 125	
165	holmium	# 1	1724841.00	0.24	1888396.90	91.3	60 - 125	
165	holmium	# 2	665500.69	0.68	726423.19	91.6	60 - 125	
115	indium	# 3	1533404.60	8.96	1464354.30	104.7	60 - 125	
6	lithium	# 3	679167.25	6.59	645804.63	105.2	60 - 125	
45	scandium	# 1	766938.13	1.12	722619.00	106.1	60 - 125	
45	scandium	# 2	20465.21	0.58	20182.60	101.4	60 - 125	
45	scandium	# 3	1085895.60	7.86	957419.69	113.4	60 - 125	

ISTD Ref File : C:\ICPCHEM\1\DATA\041214_A.B\010CALB.D\010CALB.D#

2 :Element Failures — 0 :Max. Number of Failures Allowed
0 :ISTD Failures — 0 :Max. Number of ISTD Failures Allowed

Data Results:

Analytes: Fail
ISTD: Pass

Sample QC Report

Data File:	C:\ICPCHEM\1\DATA\041414_A.B\205SMPL.D\205SMPL.D#
Date Acquired:	Apr 15 2014 05:40 am
Operator:	
Sample Name:	mb cam di w
Misc Info:	24hr test
Current Method:	C:\ICPCHEM\1\METHODS\5point_Z.M
Calibration File:	C:\ICPCHEM\1\CALIB\5point_Z.C
Last Cal Update:	Apr 12 2014 10:36 pm
Vial Number:	3108
Sample Type:	Sample
Prep Dil Factor:	1.00
Total Dil Factor:	1.00

MB - 24hr

1402489 = PILOT WATER

Vortex 30 minutes, Centrifuge 24hrs

Turbidity = 0.075NTU

Step	Tune Name
#1	h2.u
#2	he.u
#3	norm.u
#4	

Read this Column
ug/L

T=0.075

QC Elements

Element			Conc.	Corr. Conc.	RSD(%)	High Limit	Flag
27	aluminium	# 3	9.0400 ppb	9.0400	7.09	1100	
121	antimony	# 3	-0.0729 ppb	-0.0729	1.05	110	
75	arsenic	# 2	0.1108 ppb	0.1108	25.84	110	
137	barium	# 3	257.2000 ppb	257.2000	2.89	1100	
9	beryllium	# 3	0.0380 ppb	0.0380	28.71	110	
11	boron	# 3	1153.0000 ppb	1153.0000	1.85	110	high
114	cadmium	# 3	0.0224 ppb	0.0224	34.34	110	
40	calcium	# 1	9042.0000 ppb	9042.0000	2.39	11000	
52	chromium	# 2	0.7370 ppb	0.7370	6.00	110	
59	cobalt	# 3	0.0379 ppb	0.0379	10.44	110	
63	copper	# 2	0.3818 ppb	0.3818	9.21	110	
56	iron	# 1	-0.0621 ppb	-0.0621	94.90	11000	
208	lead	# 3	0.0354 ppb	0.0354	6.10	110	
7	lithium	# 3	2.3860 ppb	2.3860	7.82	110	
24	magnesium	# 3	169.7000 ppb	169.7000	3.50	11000	
55	manganese	# 3	0.1127 ppb	0.1127	13.51	11000	
202	mercury	# 3	0.0419 ppb	0.0419	6.14	3	
201	mercury	# 2	0.0356 ppb	0.0356	9.58	3	
201	mercury	# 3	0.0521 ppb	0.0521	6.34	3	
95	molybdenum	# 3	0.0441 ppb	0.0441	29.41	110	
60	nickel	# 2	0.1007 ppb	0.1007	44.48	110	
39	potassium	# 3	1442.0000 ppb	1442.0000	3.64	11000	
78	selenium	# 1	0.0671 ppb	0.0671	128.81	110	
107	silver	# 3	0.0006 ppb	0.0006	175.73	110	
23	sodium	# 1	20250.0000 ppb	20250.0000	2.50	11000	high
88	strontium	# 3	10.0600 ppb	10.0600	3.26	1100	
159	terbium	# 3	-0.0022 ppb	-0.0022	19.75	1100	
159	terbium	# 1	-0.0120 ppb	-0.0120	5.22	1100	
159	terbium	# 2	-0.0041 ppb	-0.0041	68.33	1100	
205	thallium	# 3	0.0013 ppb	0.0013	33.36	110	
232	thorium	# 3	-0.2048 ppb	-0.2048	2.86	110	
118	tin	# 3	-0.2355 ppb	-0.2355	0.56	110	
47	titanium	# 3	0.2199 ppb	0.2199	37.84	110	
182	tungsten	# 3	0.0577 ppb	0.0577	2.03	11	
238	uranium	# 3	-0.0002 ppb	-0.0002	520.96	110	
51	vanadium	# 2	-0.0038 ppb	-0.0038	583.58	110	
66	zinc	# 3	38.5300 ppb	38.5300	3.14	1100	
66	zinc	# 2	37.2300 ppb	37.2300	2.46	1100	

ISTD Elements

Element			CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
209	bismuth	# 2	525871.19	1.38	593621.81	88.6	60 - 125	
209	bismuth	# 3	1489429.50	1.86	1712813.00	87.0	60 - 125	
72	germanium	# 3	448126.97	2.58	439661.75	101.9	60 - 125	
72	germanium	# 2	32434.67	2.02	31666.97	102.4	60 - 125	
72	germanium	# 1	346432.88	1.13	340631.78	101.7	60 - 125	
165	holmium	# 3	2192794.30	3.55	2420327.50	90.6	60 - 125	
165	holmium	# 1	1687247.60	1.79	1888396.90	89.3	60 - 125	
165	holmium	# 2	672330.44	1.31	726423.19	92.6	60 - 125	
115	indium	# 3	1427759.80	2.63	1464354.30	97.5	60 - 125	
6	lithium	# 3	638746.94	3.18	645804.63	98.9	60 - 125	
45	scandium	# 1	753755.06	2.05	722619.00	104.3	60 - 125	
45	scandium	# 2	20864.05	2.77	20182.60	103.4	60 - 125	
45	scandium	# 3	1011701.90	3.41	957419.69	105.7	60 - 125	

ISTD Ref File : C:\ICPCHEM\1\DATA\041214_A.B\010CALB.D\010CALB.D#

2 :Element Failures — 0 :Max. Number of Failures Allowed
0 :ISTD Failures — 0 :Max. Number of ISTD Failures Allowed

Data Results:

Analytes: **Fail**
ISTD: **Pass**

Vortage for 30min + centrifuge 6hr, 12hr, 24hr,

C:\ICPCHEM\1\DATA\041414_A.B\206SMPL.D\206SMPL.D#

Sample QC Report

Data File:	C:\ICPCHEM\1\DATA\041414_A.B\206SMPL.D\206SMPL.D#
Date Acquired:	Apr 15 2014 05:46 am
Operator:	
Sample Name:	1312545-004acam di w
Misc Info:	6hr cent. filter with 0.45uM
Current Method:	C:\ICPCHEM\1\METHODS\5point_Z.M
Calibration File:	C:\ICPCHEM\1\CALIB\5point_Z.C
Last Cal Update:	Apr 12 2014 10:36 pm
Vial Number:	3106
Sample Type:	Sample
Prep Dil Factor:	10.00
Total Dil Factor:	10.00

Step	Tune Name
#1	h2.u
#2	he.u
#3	norm.u
#4	

6hr

1312545-004a = MW-1 129.5-142.0

Vortex 30 minutes, Centrifuge 6hrs

Turbidity = 141 / 12 NTU before/ after centrifuging

Read this Column
ug/L

Turbidity
~~before~~
141 / 12

QC Elements

Element			Conc.	Corr. Conc.	RSD(%)	High Limit	Flag
27	aluminium	# 3	322.5000 ppb	3225.0000	1.79	1100	
121	antimony	# 3	-0.0851 ppb	-0.8510	2.67	110	
75	arsenic	# 2	0.2369 ppb	2.3690	29.49	110	
137	barium	# 3	31.6300 ppb	316.3000	0.48	1100	
9	beryllium	# 3	0.0096 ppb	0.0957	54.52	110	
11	boron	# 3	114.5000 ppb	1145.0000	1.52	110	
114	cadmium	# 3	0.0126 ppb	0.1261	47.03	110	high
40	calcium	# 1	388.3000 ppb	3883.0000	0.52	11000	
52	chromium	# 2	0.3304 ppb	3.3040	12.33	110	
59	cobalt	# 3	0.0195 ppb	0.1947	29.40	110	
63	copper	# 2	0.0121 ppb	0.1209	54.11	110	
56	iron	# 1	104.0000 ppb	1040.0000	0.67	11000	
208	lead	# 3	0.0645 ppb	0.6449	7.38	110	
7	lithium	# 3	-0.0081 ppb	-0.0806	2641.10	110	
24	magnesium	# 3	192.3000 ppb	1923.0000	0.57	11000	
55	manganese	# 3	0.5398 ppb	5.3980	4.65	11000	
202	mercury	# 3	0.0009 ppb	0.0086	98.22	3	
201	mercury	# 2	0.0011 ppb	0.0111	177.01	3	
201	mercury	# 3	0.0030 ppb	0.0299	20.39	3	
95	molybdenum	# 3	-0.0160 ppb	-0.1603	26.30	110	
60	nickel	# 2	0.3154 ppb	3.1540	9.92	110	
39	potassium	# 3	174.1000 ppb	1741.0000	3.12	11000	
78	selenium	# 1	0.0142 ppb	0.1421	363.05	110	
107	silver	# 3	0.0003 ppb	0.0029	734.55	110	
23	sodium	# 1	2279.0000 ppb	22790.0000	1.31	11000	
88	strontium	# 3	5.2090 ppb	52.0900	1.55	1100	
159	terbium	# 3	-0.0039 ppb	-0.0385	25.46	1100	
159	terbium	# 1	-0.0104 ppb	-0.1037	11.23	1100	
159	terbium	# 2	-0.0026 ppb	-0.0260	41.28	1100	
205	thallium	# 3	-0.0009 ppb	-0.0085	243.69	110	
232	thorium	# 3	-0.1827 ppb	-1.8270	2.00	110	
118	tin	# 3	-0.2356 ppb	-2.3560	1.47	110	
47	titanium	# 3	7.5230 ppb	75.2300	0.86	110	
182	tungsten	# 3	-0.0019 ppb	-0.0186	98.55	11	
238	uranium	# 3	0.0082 ppb	0.0819	35.14	110	
51	vanadium	# 2	0.3481 ppb	3.4810	7.62	110	
66	zinc	# 3	2.2290 ppb	22.2900	2.69	1100	
66	zinc	# 2	2.2970 ppb	22.9700	9.48	1100	

ISTD Elements

Element			CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
209	bismuth	# 2	528080.00	1.52	593621.81	89.0	60 - 125	
209	bismuth	# 3	1542989.10	0.76	1712813.00	90.1	60 - 125	
72	germanium	# 3	438553.47	0.45	439661.75	99.7	60 - 125	
72	germanium	# 2	30541.96	2.21	31666.97	96.4	60 - 125	
72	germanium	# 1	343811.38	1.06	340631.78	100.9	60 - 125	
165	holmium	# 3	2240053.80	0.25	2420327.50	92.6	60 - 125	
165	holmium	# 1	1735038.40	2.26	1888396.90	91.9	60 - 125	
165	holmium	# 2	664363.75	2.21	726423.19	91.5	60 - 125	
115	indium	# 3	1436190.10	0.62	1464354.30	98.1	60 - 125	
6	lithium	# 3	597286.25	1.29	645804.63	92.5	60 - 125	
45	scandium	# 1	738539.19	0.87	722619.00	102.2	60 - 125	
45	scandium	# 2	19467.78	1.34	20182.60	96.5	60 - 125	
45	scandium	# 3	971384.44	1.01	957419.69	101.5	60 - 125	

ISTD Ref File : C:\ICPCHEM\1\DATA\041214_A.B\010CALB.D\010CALB.D#

1 :Element Failures
0 :ISTD Failures

0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Data Results:

Analytes:	**Fail**
ISTD:	**Pass**

Sample QC Report

Data File:	C:\ICPCHEM\1\DATA\041414_A.B\207SMPL.D\207SMPL.D#
Date Acquired:	Apr 15 2014 05:52 am
Operator:	
Sample Name:	1312545-004acam di w
Misc Info:	12hr cent. filter with 0.45uM
Current Method:	C:\ICPCHEM\1\METHODS\5point_Z.M
Calibration File:	C:\ICPCHEM\1\CALIB\5point_Z.C
Last Cal Update:	Apr 12 2014 10:36 pm
Vial Number:	3102
Sample Type:	Sample
Prep Dil Factor:	10.00
Total Dil Factor:	10.00

Step	Tune Name
#1	h2.u
#2	he.u
#3	norm.u
#4	

12hr

1312545-004a = MW-1 129.5-142.0

Vortex 30 minutes, Centrifuge 12hrs

Turbidity = 84 / 12 NTU before/ after centrifuging

84/12

Read this Column
ug/L

QC Elements

Element			Conc.	Corr. Conc.	RSD(%)	High Limit	Flag
27	aluminium	# 3	213.6000 ppb	2136.0000	7.57	1100	
121	antimony	# 3	-0.0855 ppb	-0.8545	4.09	110	
75	arsenic	# 2	0.0433 ppb	0.4332	114.10	110	
137	barium	# 3	10.7200 ppb	107.2000	0.90	1100	
9	beryllium	# 3	0.0197 ppb	0.1973	31.89	110	
11	boron	# 3	118.2000 ppb	1182.0000	1.15	110	high
114	cadmium	# 3	0.0177 ppb	0.1771	70.86	110	
40	calcium	# 1	375.9000 ppb	3759.0000	1.72	11000	
52	chromium	# 2	0.2505 ppb	2.5050	22.32	110	
59	cobalt	# 3	0.0137 ppb	0.1365	27.40	110	
63	copper	# 2	0.0036 ppb	0.0364	308.31	110	
56	iron	# 1	71.6600 ppb	716.6000	1.51	11000	
208	lead	# 3	0.0530 ppb	0.5296	3.73	110	
7	lithium	# 3	-0.0880 ppb	-0.8804	91.42	110	
24	magnesium	# 3	184.0000 ppb	1840.0000	0.81	11000	
55	manganese	# 3	0.3325 ppb	3.3250	5.06	11000	
202	mercury	# 3	0.0008 ppb	0.0079	236.33	3	
201	mercury	# 2	0.0014 ppb	0.0136	61.73	3	
201	mercury	# 3	-0.0005 ppb	-0.0051	416.62	3	
95	molybdenum	# 3	-0.0113 ppb	-0.1133	27.37	110	
60	nickel	# 2	0.2375 ppb	2.3750	17.42	110	
39	potassium	# 3	178.5000 ppb	1785.0000	2.27	11000	
78	selenium	# 1	0.0256 ppb	0.2562	148.71	110	
107	silver	# 3	0.0003 ppb	0.0028	768.06	110	
23	sodium	# 1	2240.0000 ppb	22400.0000	1.92	11000	
88	strontium	# 3	3.8880 ppb	38.8800	0.71	1100	
159	terbium	# 3	-0.0047 ppb	-0.0466	11.64	1100	
159	terbium	# 1	-0.0115 ppb	-0.1147	4.62	1100	
159	terbium	# 2	-0.0063 ppb	-0.0631	11.00	1100	
205	thallium	# 3	-0.0003 ppb	-0.0029	411.15	110	
232	thorium	# 3	-0.1915 ppb	-1.9150	1.70	110	
118	tin	# 3	-0.2333 ppb	-2.3330	3.42	110	
47	titanium	# 3	5.2460 ppb	52.4600	9.11	110	
182	tungsten	# 3	0.0029 ppb	0.0289	267.40	11	
238	uranium	# 3	0.0054 ppb	0.0541	13.99	110	
51	vanadium	# 2	0.3869 ppb	3.8690	12.55	110	
66	zinc	# 3	3.5530 ppb	35.5300	2.77	1100	
66	zinc	# 2	3.7560 ppb	37.5600	1.57	1100	

ISTD Elements

Element			CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)		Flag
209	bismuth	# 2	530104.75	1.15	593621.81	89.3	60 -	125	
209	bismuth	# 3	1535698.50	0.11	1712813.00	89.7	60 -	125	
72	germanium	# 3	436790.03	0.05	439661.75	99.3	60 -	125	
72	germanium	# 2	30835.28	1.62	31666.97	97.4	60 -	125	
72	germanium	# 1	342647.38	1.68	340631.78	100.6	60 -	125	
165	holmium	# 3	2206916.50	0.71	2420327.50	91.2	60 -	125	
165	holmium	# 1	1733472.80	0.81	1888396.90	91.8	60 -	125	
165	holmium	# 2	666324.75	1.95	726423.19	91.7	60 -	125	
115	indium	# 3	1443388.60	0.70	1464354.30	98.6	60 -	125	
6	lithium	# 3	589967.00	1.60	645804.63	91.4	60 -	125	
45	scandium	# 1	734049.00	1.24	722619.00	101.6	60 -	125	
45	scandium	# 2	19444.44	2.63	20182.60	96.3	60 -	125	
45	scandium	# 3	972688.31	0.72	957419.69	101.6	60 -	125	

ISTD Ref File : C:\ICPCHEM\1\DATA\041214_A.B\010CALB.D\010CALB.D#

1 :Element Failures
0 :ISTD Failures

0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Data Results:

Analytes: **Fail**
ISTD: **Pass**

ABERRANT TURBIDITY DATA - EXCLUDED

Sample QC Report

24hr

Data File:	C:\ICPCHEM\1\DATA\041414_A.B\208SMPL.D\208SMPL.D#
Date Acquired:	Apr 15 2014 05:59 am
Operator:	
Sample Name:	1312545-004acam di w
Misc Info:	24hr test
Current Method:	C:\ICPCHEM\1\METHODS\5point_Z.M
Calibration File:	C:\ICPCHEM\1\CALIB\5point_Z.C
Last Cal Update:	Apr 12 2014 10:36 pm
Vial Number:	3109
Sample Type:	Sample
Prep Dil Factor:	10.00
Total Dil Factor:	10.00

Step	Tune Name
#1	h2.u
#2	he.u
#3	norm.u
#4	

1312545-004a = MW-1 129.5-142.0

Vortex 30 minutes, Centrifuge 24hrs

Turbidity = 4.0 / 0.9 NTU before/ after centrifuging

Read this Column
ug/L

4.0 / 0.9

QC Elements

Element			Conc.	Corr. Conc.	RSD(%)	High Limit	Flag
27	aluminium	# 3	60.7800 ppb	607.8000	9.79	1100	
121	antimony	# 3	-0.0883 ppb	-0.8829	3.70	110	
75	arsenic	# 2	0.1387 ppb	1.3870	71.12	110	
137	barium	# 3	24.4100 ppb	244.1000	1.67	1100	
9	beryllium	# 3	0.0047 ppb	0.0469	47.00	110	
11	boron	# 3	129.0000 ppb	1290.0000	2.23	110	high
114	cadmium	# 3	0.0056 ppb	0.0557	222.98	110	
40	calcium	# 1	381.7000 ppb	3817.0000	1.29	11000	
52	chromium	# 2	0.0578 ppb	0.5781	44.09	110	
59	cobalt	# 3	0.0061 ppb	0.0614	52.32	110	
63	copper	# 2	-0.0093 ppb	-0.0935	99.85	110	
56	iron	# 1	16.1300 ppb	161.3000	1.97	11000	
208	lead	# 3	0.0062 ppb	0.0619	26.48	110	
7	lithium	# 3	-0.2992 ppb	-2.9920	64.17	110	
24	magnesium	# 3	195.0000 ppb	1950.0000	2.79	11000	
55	manganese	# 3	-0.0117 ppb	-0.1173	153.45	11000	
202	mercury	# 3	0.0008 ppb	0.0084	107.43	3	
201	mercury	# 2	0.0004 ppb	0.0035	0.31	3	
201	mercury	# 3	-0.0014 ppb	-0.0135	220.43	3	
95	molybdenum	# 3	-0.0100 ppb	-0.1004	46.32	110	
60	nickel	# 2	0.0713 ppb	0.7126	44.20	110	
39	potassium	# 3	159.1000 ppb	1591.0000	4.66	11000	
78	selenium	# 1	0.0255 ppb	0.2550	40.71	110	
107	silver	# 3	-0.0014 ppb	-0.0139	71.36	110	
23	sodium	# 1	2291.0000 ppb	22910.0000	0.70	11000	
88	strontium	# 3	3.7160 ppb	37.1600	1.48	1100	
159	terbium	# 3	-0.0056 ppb	-0.0560	4.86	1100	
159	terbium	# 1	-0.0126 ppb	-0.1264	3.62	1100	
159	terbium	# 2	-0.0068 ppb	-0.0676	15.70	1100	
205	thallium	# 3	-0.0020 ppb	-0.0202	24.68	110	
232	thorium	# 3	-0.2150 ppb	-2.1500	2.49	110	
118	tin	# 3	-0.2319 ppb	-2.3190	2.09	110	
47	titanium	# 3	1.0460 ppb	10.4600	8.17	110	
182	tungsten	# 3	0.0045 ppb	0.0450	99.40	11	
238	uranium	# 3	-0.0025 ppb	-0.0245	7.85	110	
51	vanadium	# 2	0.1900 ppb	1.9000	17.75	110	
66	zinc	# 3	11.9200 ppb	119.2000	2.07	1100	
66	zinc	# 2	11.5300 ppb	115.3000	3.43	1100	

ISTD Elements

Element			CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
209	bismuth	# 2	528246.13	0.03	593621.81	89.0	60 - 125	
209	bismuth	# 3	1533758.30	1.56	1712813.00	89.5	60 - 125	
72	germanium	# 3	433860.53	0.90	439661.75	98.7	60 - 125	
72	germanium	# 2	30918.82	0.94	31666.97	97.6	60 - 125	
72	germanium	# 1	343525.84	0.62	340631.78	100.8	60 - 125	
165	holmium	# 3	2201616.80	1.54	2420327.50	91.0	60 - 125	
165	holmium	# 1	1727097.80	2.20	1888396.90	91.5	60 - 125	
165	holmium	# 2	659796.06	0.36	726423.19	90.8	60 - 125	
115	indium	# 3	1421069.30	1.24	1464354.30	97.0	60 - 125	
6	lithium	# 3	589513.31	0.88	645804.63	91.3	60 - 125	
45	scandium	# 1	734362.63	1.12	722619.00	101.6	60 - 125	
45	scandium	# 2	19389.94	0.92	20182.60	96.1	60 - 125	
45	scandium	# 3	961411.56	2.82	957419.69	100.4	60 - 125	

ISTD Ref File : C:\ICPCHEM\1\DATA\041214_A.B\010CALB.D\010CALB.D#

1 :Element Failures — 0 :Max. Number of Failures Allowed
0 :ISTD Failures — 0 :Max. Number of ISTD Failures Allowed

Data Results:

Analytes: Fail
ISTD: Pass

Vortage For 30min + Centrifuge 6hr, 12hr, 24hr

C:\ICPCHEM\1\DATA\041414_A.B\214SMPL.D\214SMPL.D#

1312545-006a = MW-1 297-298.5

Vortex 30 minutes, Centrifuge 6hrs

Turbidity = 506 / 25 NTU before / after centrifuging

Sample QC Report

6hr

NTU Turbidity 506/25

Data File:	C:\ICPCHEM\1\DATA\041414_A.B\214SMPL.D\214SMPL.D#
Date Acquired:	Apr 15 2014 06:37 am
Operator:	
Sample Name:	1312545-006acam di w
Misc Info:	6hr cent. filter with 0.45uM
Current Method:	C:\ICPCHEM\1\METHODS\5point_Z.M
Calibration File:	C:\ICPCHEM\1\CALIB\5point_Z.C
Last Cal Update:	Apr 12 2014 10:36 pm
Vial Number:	3107
Sample Type:	Sample
Prep Dil Factor:	10.00
Total Dil Factor:	10.00

Step	Tune Name
#1	h2.u
#2	he.u
#3	norm.u
#4	

Read this Column
ug/L

QC Elements

Element			Conc.	Corr. Conc.	RSD(%)	High Limit	Flag
27	aluminium	# 3	84.1600 ppb	841.6000	15.68	1100	
121	antimony	# 3	-0.0147 ppb	-0.1468	63.58	110	
75	arsenic	# 2	0.1840 ppb	1.8400	35.25	110	
137	barium	# 3	38.3200 ppb	383.2000	7.73	1100	
9	beryllium	# 3	0.0321 ppb	0.3208	23.08	110	
11	boron	# 3	162.6000 ppb	1626.0000	8.11	110	high
114	cadmium	# 3	0.1504 ppb	1.5040	4.53	110	
40	calcium	# 1	2275.0000 ppb	22750.0000	1.11	11000	
52	chromium	# 2	0.6373 ppb	6.3730	9.83	110	
59	cobalt	# 3	0.0566 ppb	0.5662	20.22	110	
63	copper	# 2	0.8948 ppb	8.9480	3.36	110	
56	iron	# 1	156.2000 ppb	1562.0000	0.66	11000	
208	lead	# 3	0.2840 ppb	2.8400	5.06	110	
7	lithium	# 3	-0.0752 ppb	-0.7516	357.77	110	
24	magnesium	# 3	386.6000 ppb	3866.0000	8.34	11000	
55	manganese	# 3	5.8640 ppb	58.6400	8.79	11000	
202	mercury	# 3	0.0018 ppb	0.0181	69.66	3	
201	mercury	# 2	0.0030 ppb	0.0301	65.50	3	
201	mercury	# 3	0.0019 ppb	0.0188	174.92	3	
95	molybdenum	# 3	0.0812 ppb	0.8120	24.95	110	
60	nickel	# 2	0.6340 ppb	6.3400	12.83	110	
39	potassium	# 3	155.7000 ppb	1557.0000	15.44	11000	
78	selenium	# 1	0.1546 ppb	1.5460	28.43	110	
107	silver	# 3	0.0040 ppb	0.0400	66.38	110	
23	sodium	# 1	3861.0000 ppb	38610.0000	1.88	11000	
88	strontium	# 3	19.5400 ppb	195.4000	5.49	1100	
159	terbium	# 3	0.0333 ppb	0.3328	15.90	1100	
159	terbium	# 1	0.0083 ppb	0.0826	70.17	1100	
159	terbium	# 2	0.0236 ppb	0.2355	23.71	1100	
205	thallium	# 3	0.0035 ppb	0.0354	53.08	110	
232	thorium	# 3	0.1637 ppb	1.6370	12.40	110	
118	tin	# 3	~~-0.2243 ppb~~	-2.2430	4.39	110	
47	titanium	# 3	8.4120 ppb	84.1200	18.82	110	
182	tungsten	# 3	0.0143 ppb	0.1425	21.05	11	
238	uranium	# 3	0.0837 ppb	0.8370	2.63	110	
51	vanadium	# 2	1.3290 ppb	13.2900	4.21	110	
66	zinc	# 3	14.2100 ppb	142.1000	7.12	1100	
66	zinc	# 2	14.1900 ppb	141.9000	0.96	1100	

ISTD Elements

Element			CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
209	bismuth	# 2	522160.34	0.36	593621.81	88.0	60 - 125	
209	bismuth	# 3	1593035.10	6.94	1712813.00	93.0	60 - 125	
72	germanium	# 3	449003.84	5.07	439661.75	102.1	60 - 125	
72	germanium	# 2	30354.95	0.31	31666.97	95.9	60 - 125	
72	germanium	# 1	339768.78	0.27	340631.78	99.7	60 - 125	
165	holmium	# 3	2298783.50	7.60	2420327.50	95.0	60 - 125	
165	holmium	# 1	1721097.50	0.70	1888396.90	91.1	60 - 125	
165	holmium	# 2	654627.75	0.40	726423.19	90.1	60 - 125	
115	indium	# 3	1496594.90	8.33	1464354.30	102.2	60 - 125	
6	lithium	# 3	603119.50	8.07	645804.63	93.4	60 - 125	
45	scandium	# 1	730031.44	0.94	722619.00	101.0	60 - 125	
45	scandium	# 2	19131.28	1.91	20182.60	94.8	60 - 125	
45	scandium	# 3	1000997.90	7.31	957419.69	104.6	60 - 125	

ISTD Ref File : C:\ICPCHEM\1\DATA\041214_A.B\010CALB.D\010CALB.D#

1 :Element Failures
0 :ISTD Failures

0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Data Results:

Analytes:	Fail
ISTD:	Pass

C:\ICPCHEM\1\RPTTMP\sample_A.qct

4/15/2014 6:42 AM

Sample QC Report

12hr

Data File:	C:\ICPCHEM\1\DATA\041414_A.B\210SMPL.D\210SMPL.D#
Date Acquired:	Apr 15 2014 06:11 am
Operator:	
Sample Name:	1312545-006acam di w
Misc Info:	12hr cent. filter with 0.45uM
Current Method:	C:\ICPCHEM\1\METHODS\5point_Z.M
Calibration File:	C:\ICPCHEM\1\CALIB\5point_Z.C
Last Cal Update:	Apr 12 2014 10:36 pm
Vial Number:	3103
Sample Type:	Sample
Prep Dil Factor:	10.00
Total Dil Factor:	10.00

1312545-006a = MW-1 297-298.5

Vortex 30 minutes, Centrifuge 12hrs

Turbidity = 685 / 31 NTU before / after centrifuging

685 / 31

Step	Tune Name
#1	h2.u
#2	he.u
#3	norm.u
#4	

Read this Column
ug/L

QC Elements

Element			Conc.	Corr. Conc.	RSD(%)	High Limit	Flag
27	aluminium	# 3	93.6800 ppb	936.8000	16.68	1100	
121	antimony	# 3	-0.0706 ppb	-0.7055	7.26	110	
75	arsenic	# 2	0.2164 ppb	2.1640	44.35	110	
137	barium	# 3	29.2200 ppb	292.2000	9.48	1100	
9	beryllium	# 3	0.0340 ppb	0.3397	42.83	110	
11	boron	# 3	210.4000 ppb	2104.0000	9.27	110	high
114	cadmium	# 3	0.1726 ppb	1.7260	6.73	110	
40	calcium	# 1	2896.0000 ppb	28960.0000	0.77	11000	
52	chromium	# 2	0.7049 ppb	7.0490	4.35	110	
59	cobalt	# 3	0.0830 ppb	0.8297	9.88	110	
63	copper	# 2	1.0930 ppb	10.9300	3.23	110	
56	iron	# 1	170.4000 ppb	1704.0000	0.90	11000	
208	lead	# 3	0.3753 ppb	3.7530	9.32	110	
7	lithium	# 3	-0.0623 ppb	-0.6232	483.63	110	
24	magnesium	# 3	447.4000 ppb	4474.0000	10.12	11000	
55	manganese	# 3	8.5510 ppb	85.5100	9.46	11000	
202	mercury	# 3	0.0006 ppb	0.0064	59.21	3	
201	mercury	# 2	0.0049 ppb	0.0488	24.24	3	
201	mercury	# 3	0.0021 ppb	0.0208	145.67	3	
95	molybdenum	# 3	0.1013 ppb	1.0130	30.25	110	
60	nickel	# 2	0.9035 ppb	9.0350	8.56	110	
39	potassium	# 3	158.3000 ppb	1583.0000	18.11	11000	
78	selenium	# 1	0.2540 ppb	2.5400	27.32	110	
107	silver	# 3	0.0017 ppb	0.0173	50.48	110	
23	sodium	# 1	4406.0000 ppb	44060.0000	1.06	11000	
88	strontium	# 3	24.0900 ppb	240.9000	7.95	1100	
159	terbium	# 3	0.0113 ppb	0.1125	7.76	1100	
159	terbium	# 1	0.0089 ppb	0.0894	16.08	1100	
159	terbium	# 2	0.0109 ppb	0.1089	21.47	1100	
205	thallium	# 3	-0.0017 ppb	-0.0172	64.22	110	
232	thorium	# 3	-0.0723 ppb	-0.7230	37.84	110	
118	tin	# 3	-0.2346 ppb	-2.3460	0.55	110	
47	titanium	# 3	9.0080 ppb	90.0800	10.56	110	
182	tungsten	# 3	0.0299 ppb	0.2993	13.85	11	
238	uranium	# 3	0.0995 ppb	0.9950	8.29	110	
51	vanadium	# 2	1.5920 ppb	15.9200	0.94	110	
66	zinc	# 3	20.6000 ppb	206.0000	8.42	1100	
66	zinc	# 2	21.1600 ppb	211.6000	4.39	1100	

ISTD Elements

Element			CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)	Flag
209	bismuth	# 2	519398.75	0.34	593621.81	87.5	60 - 125	
209	bismuth	# 3	1608782.40	8.51	1712813.00	93.9	60 - 125	
72	germanium	# 3	452379.00	8.15	439661.75	102.9	60 - 125	
72	germanium	# 2	30316.52	0.62	31666.97	95.7	60 - 125	
72	germanium	# 1	339923.59	1.01	340631.78	99.8	60 - 125	
165	holmium	# 3	2331412.30	9.90	2420327.50	96.3	60 - 125	
165	holmium	# 1	1728052.00	1.04	1888396.90	91.5	60 - 125	
165	holmium	# 2	653371.94	0.73	726423.19	89.9	60 - 125	
115	indium	# 3	1502704.90	8.76	1464354.30	102.6	60 - 125	
6	lithium	# 3	614633.63	9.65	645804.63	95.2	60 - 125	
45	scandium	# 1	727554.75	1.25	722619.00	100.7	60 - 125	
45	scandium	# 2	18877.63	1.22	20182.60	93.5	60 - 125	
45	scandium	# 3	1014771.10	9.19	957419.69	106.0	60 - 125	

ISTD Ref File : C:\ICPCHEM\1\DATA\041214_A.B\010CALB.D\010CALB.D#

1 :Element Failures
0 :ISTD Failures

0 :Max. Number of Failures Allowed
0 :Max. Number of ISTD Failures Allowed

Data Results:

Analytes:	**Fail**
ISTD:	**Pass**

Sample QC Report

1312545-006a = MW-1 297-298.5

Vortex 30 minutes, Centrifuge 24hrs

Turbidity = 153 / 95 NTU before / after centrifuging

24 hr

153 / 95

Data File:	C:\ICPCHEM\1\DATA\041414_A.B\215SMPL.D\215SMPL.D#
Date Acquired:	Apr 15 2014 06:43 am
Operator:	
Sample Name:	1312545-006acam di w
Misc Info:	24hr test
Current Method:	C:\ICPCHEM\1\METHODS\5point_Z.M
Calibration File:	C:\ICPCHEM\1\CALIB\5point_Z.C
Last Cal Update:	Apr 12 2014 10:36 pm
Vial Number:	3110
Sample Type:	Sample
Prep Dil Factor:	10.00
Total Dil Factor:	10.00

Step	Tune Name
#1	h2.u
#2	he.u
#3	norm.u
#4	

Read this Column
ug/L

QC Elements

Element			Conc.	Corr. Conc.	RSD(%)	High Limit	Flag
27	aluminium	# 3	695.1000 ppb	6951.0000	30.26	1100	
121	antimony	# 3	-0.0366 ppb	-0.3655	37.84	110	
75	arsenic	# 2	0.4226 ppb	4.2260	15.31	110	
137	barium	# 3	95.6500 ppb	956.5000	1.87	1100	
9	beryllium	# 3	0.0776 ppb	0.7755	9.44	110	
11	boron	# 3	137.4000 ppb	1374.0000	2.13	110	high
114	cadmium	# 3	0.6497 ppb	6.4970	4.84	110	
40	calcium	# 1	7662.0000 ppb	76620.0000	1.33	11000	
52	chromium	# 2	3.1120 ppb	31.1200	2.46	110	
59	cobalt	# 3	0.4508 ppb	4.5080	4.50	110	
63	copper	# 2	3.6530 ppb	36.5300	3.57	110	
56	iron	# 1	1230.0000 ppb	12300.0000	1.19	11000	
208	lead	# 3	1.3480 ppb	13.4800	1.03	110	
7	lithium	# 3	0.3152 ppb	3.1520	63.86	110	
24	magnesium	# 3	1981.0000 ppb	19810.0000	0.49	11000	
55	manganese	# 3	43.3800 ppb	433.8000	2.16	11000	
202	mercury	# 3	0.0104 ppb	0.1038	14.55	3	
201	mercury	# 2	0.0132 ppb	0.1324	11.74	3	
201	mercury	# 3	0.0128 ppb	0.1283	29.78	3	
95	molybdenum	# 3	0.1332 ppb	1.3320	11.70	110	
60	nickel	# 2	3.3380 ppb	33.3800	7.40	110	
39	potassium	# 3	224.5000 ppb	2245.0000	9.34	11000	
78	selenium	# 1	0.2911 ppb	2.9110	11.69	110	
107	silver	# 3	0.0110 ppb	0.1099	18.12	110	
23	sodium	# 1	3008.0000 ppb	30080.0000	1.58	11000	
88	strontium	# 3	73.6700 ppb	736.7000	1.10	1100	
159	terbium	# 3	0.0613 ppb	0.6129	6.44	1100	
159	terbium	# 1	0.0542 ppb	0.5420	4.82	1100	
159	terbium	# 2	0.0524 ppb	0.5236	1.82	1100	
205	thallium	# 3	0.0017 ppb	0.0166	92.47	110	
232	thorium	# 3	0.4839 ppb	4.8390	31.60	110	
118	tin	# 3	-0.2045 ppb	-2.0450	2.39	110	
47	titanium	# 3	40.9400 ppb	409.4000	20.95	110	
182	tungsten	# 3	0.0183 ppb	0.1829	16.24	11	
238	uranium	# 3	0.3535 ppb	3.5350	1.43	110	
51	vanadium	# 2	3.4340 ppb	34.3400	1.43	110	
66	zinc	# 3	53.8200 ppb	538.2000	1.57	1100	
66	zinc	# 2	53.1300 ppb	531.3000	2.03	1100	

ISTD Elements

Element			CPS Mean	RSD(%)	Ref Value	Rec(%)	QC Range(%)		Flag
209	bismuth	# 2	520115.31	0.57	593621.81	87.6	60 -	125	
209	bismuth	# 3	1541473.00	1.40	1712813.00	90.0	60 -	125	
72	germanium	# 3	435441.06	1.36	439661.75	99.0	60 -	125	
72	germanium	# 2	30258.02	1.39	31666.97	95.6	60 -	125	
72	germanium	# 1	340762.94	0.23	340631.78	100.0	60 -	125	
165	holmium	# 3	2239460.00	2.14	2420327.50	92.5	60 -	125	
165	holmium	# 1	1731375.10	1.10	1888396.90	91.7	60 -	125	
165	holmium	# 2	655230.94	1.12	726423.19	90.2	60 -	125	
115	indium	# 3	1433841.90	1.76	1464354.30	97.9	60 -	125	
6	lithium	# 3	586536.13	4.24	645804.63	90.8	60 -	125	
45	scandium	# 1	736068.81	0.67	722619.00	101.9	60 -	125	
45	scandium	# 2	18969.43	0.83	20182.60	94.0	60 -	125	
45	scandium	# 3	974842.56	2.55	957419.69	101.8	60 -	125	

ISTD Ref File : C:\ICPCHEM\1\DATA\041214_A.B\010CALB.D\010CALB.D#

1 :Element Failures — 0 :Max. Number of Failures Allowed

0 :ISTD Failures — 0 :Max. Number of ISTD Failures Allowed

Data Results:

Analytes: Fail

ISTD: Pass

Case Narrative for WOs 1312545 Solids and 1312650 Solids

Issues with *Major Elements as Oxides* Analysis

In order for the oxide concentrations of a sample to be correctly obtained, the sample needs to be fully digested such that all metals are brought into solution. Many oxides are difficult or impossible to dissolve with an atmospheric pressure, high temperature acid digest, so a lithium borate fusion extraction was used as this should in theory make it possible to bring the entire sample into solution. The procedure used is described in USGS Methods for Geochemical Analysis, USGS Bulletin 1770, pB4-B6. After the extraction and analysis, it was apparent that the sample wasn't adequately digested by the fusion method or the post-fusion acid digestion as there were still solid particles at the base of the digest tube, and the sum of the oxides fell short of the expected 100%.

Silicon dioxide is likely one the oxides that wasn't fully represented by the analysis as it is a difficult mineral to digest without the aid of pressurized microwave digestion. Because sand (quartz) is the principal constituent of most of the samples, the percent concentration for silicon dioxide should be significantly higher (75-99%) than the ~1% that was obtained for a majority of the samples tested. The solids left on the bottom of the digestion tube appeared to be sand which is comprised mainly of silicon dioxide. There is also the potential that other difficult to digest oxides may have been under-represented, but which ones were affected and by how much is unknown.

Delano Boese, Metals Supervisor & Edward Hamilton, Lab Director

DRAFT - COMMUNICATION

MRWPCA – Groundwater Replenishment (GWR) Project

Date: **February 10, 2014**

To: **Todd Engineers**

From: **Trussell Technologies, Inc.**
Gordon J. Williams, Ph.D., P.E.
Sarah Triolo
John Kenny

Subject: **Post-treatment stabilization bench-top protocol**

This communication provides an explanation of the bench-top post-treatment stabilization protocol that will be used as part of the Monterey Groundwater Replenishment (GWR) pilot testing. Reverse osmosis (RO) permeate from the GWR pilot plant will be collected and stabilized using a bench-scale setup to produce the water for Todd Engineers for leaching tests. There are several strategies available for full-scale RO permeate stabilization (*e.g.*, approaches that use calcite contactors, lime saturators, caustic, carbon dioxide addition), but the most straightforward approach for bench testing is to use a combination of calcium chloride, caustic, and carbon dioxide (CO_2) addition. Although this approach may differ from the full-scale stabilization process, it is expected to achieve a similar water quality to what can be expected for the full-scale GWR process. As the final product water quality goals for the GWR project have yet to be determined, the approach taken for this protocol is to mimic the goals established for the Orange County Water District (OCWD) Groundwater Replenishment System (GWRS).

OCWD has invested considerable effort developing GWRS water quality goals (Table 1). OCWD has balanced factors related the corrosion of pipelines and the groundwater water quality in developing their goals. Calcium will be added in the form of calcium chloride ($CaCl_2$), along with sodium hydroxide (NaOH) to increase the alkalinity, and finally bubbling in CO_2 gas to bring the pH down to the target goal. As a result of this approach the final chloride concentration of the lab-treated water will be higher (from approximately 3 mg/L at full-scale to approximately 30 mg/L on the bench), but it is not anticipated that this will impact the leaching experiments.

Table 1: GWR Bench-Scale Post-treatment Stabilization Goals

Parameter	Unit	Target Value
LSI[a]	**--**	**-0.1**
Calcium	**mg/L as $CaCO_3$**	**32**
Alkalinity	**mg/L as $CaCO_3$**	**40**
pH	**--**	**8.5**

[a]Langelier Saturation Index

The stabilization experiment will be conducted in two batches due to volumetric constraints. Each batch will produce 16 liters (L) of stabilized water, for a total of 32 L of product water for Todd Engineers. The 16 L of RO permeate will be collected in a five-gallon glass carboy. While the RO permeate is being sampled for the stabilization experiment, grab samples will also be collected for the monthly pilot water quality sampling campaign, which includes a significant amount of water quality data.

The following analysis will be performed at the bench top, prior to stabilization:

- Turbidity
- Alkalinity
- Temperature
- pH, and
- Calcium.

The following water quality values will be assumed from previous RO permeate samples:

- TDS
- Chloride, and
- Sulfate

The stabilization experiment will be carried out as follows:

1. Add calcium in the form of calcium chloride dihydrate ($CaCl_2 \bullet 2H_2O$) to a produce a calcium concentration of 32 mg/L as $CaCO_3$ (approximately 34 mg/L as $CaCO_3$)
2. Increase the alkalinity through the addition of sodium hydroxide (NaOH) until a target alkalinity of 40 mg/L as $CaCO_3$ is reached
3. Bubble carbon dioxide through the solution to lower the pH just below $CaCO_3$ saturation with a glass diffuser and plastic tubing until the solution reaches a target pH of approximately 8.5
4. Store in eight 4 L amber glass bottles with no headspace at room temperature. Samples will be transported at ambient temperatures

Todd Engineers will pick up the samples from Trussell Technologies at 1904 Franklin Street, Suite 800, Oakland, on the morning of Wednesday February 12, 2014.

CHAIN OF CUSTODY

Client: MRWPCA/Todd Engineers

Project: Todd Engineers Leaching Experiment

Sampled by: G. Williams, S. Triolo, J. Kenny

Sample Location: RO permeate with bench-scale stabilization

Sample date and time: 2/11/14 Composite (9:30 AM and 8:00 PM)

Sample water quality at time of sampling:

Temperature: 21.7 C
pH: 8.5
Alkalinity: ~40 mg/L as CaCO3
Calcium: ~26 mg/L as CaCO3

Requested analyses: Todd Engineers Soil Leaching Study

NOTES

- 8 x 4-L bottles – glass amber (no head space); 32L total
- RO permeate samples stabilized with Calcium chloride and caustic soda
- Samples were initially stripped of CO_2 to raise pH, Ca and NaOH added to reach target pH, alk, and LSI
- Bench scale stabilization conducted in two batches; both batches were evenly distributed between both bottles

Relinquished by (name/sign)	Company	Date/Time	Received by (name/sign)	Company
Gordon Williams	TT	2/12/14 940	William E. [illegible]	Todd Groundwater

1904 Franklin Street Suite 800, Oakland, CA 94612
Tel (858) 458-1030 Fax (626) 486-0571

Trussell TECHNOLOGIES INC

APPENDIX F

Alpha Analytical Laboratory Reports and Chain-of-Custody Form

(Groundwater Quality)

APPENDIX F

Alpha Analytical Laboratory Reports and Chain-of-Custody Form

(Groundwater Quality)

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

ELAP Certificate Numbers 1551 and 2728

18 February 2014

Todd Groundwater
Attn: Dr. Bill Motzer
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
RE: Groundwater Reuse Project
Work Order: 14A1643

Enclosed are the results of analyses for samples received by the laboratory on 01/29/14 21:15. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeanette Poplin

Jeanette L. Poplin For David S. Pingatore
Project Manager

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 11:04

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MRWPCA MW-1	14A1643-01	Water	01/29/14 14:15	01/29/14 21:15
Trip Blank	14A1643-02	Water	01/29/14 14:15	01/29/14 21:15

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Metals (Drinking Water) by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Mercury	ND	0.060	1.0	ug/l	1	AA43136	02/05/14 09:00	02/05/14 13:37	EPA 245.1	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Metals by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Calcium	**17**	0.010	1.0	mg/l	1	AA43133	01/31/14 14:45	02/05/14 12:48	EPA 200.7	
Magnesium	**6.5**	0.0080	1.0	"	"	"	"	"	"	
Potassium	**3.4**	0.0080	1.0	"	"	"	"	"	"	
Sodium	**50**	0.020	1.0	"	"	"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Metals by EPA Method 200.8 ICP/MS
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Aluminum	**2700**	20	500	ug/l	10	AB40328	02/03/14 09:47	02/11/14 16:46	EPA 200.8	
Antimony	**0.51**	0.020	6.0	"	1	"	"	02/05/14 14:35	"	J
Arsenic	**2.8**	0.070	2.0	"	"	"	"	"	"	
Barium	**40**	0.030	100	"	"	"	"	"	"	J
Beryllium	**0.044**	0.020	1.0	"	"	"	"	"	"	J
Boron	**36**	6.0	50	"	"	"	"	"	"	J
Cadmium	**0.15**	0.020	1.0	"	"	"	"	"	"	J
Chromium	**13**	0.080	10	"	"	"	"	"	"	
Copper	**3.7**	0.040	0.50	"	"	"	"	"	"	
Iron	**4000**	18	500	"	10	"	"	02/11/14 16:46	"	
Lead	**1.3**	0.020	5.0	"	1	"	"	02/05/14 14:35	"	J
Manganese	**150**	0.030	5.0	"	"	"	"	"	"	
Nickel	**8.1**	0.060	10	"	"	"	"	"	"	J
Selenium	**1.5**	0.070	5.0	"	"	"	"	"	"	J
Silver	**0.028**	0.020	0.10	"	"	"	"	"	"	J
Thallium	**0.027**	0.020	1.0	"	"	"	"	"	"	J
Uranium	**0.33**	0.020	1.0	pCi/l	"	"	"	"	"	J
Vanadium	**9.5**	0.30	1.0	ug/l	"	"	"	"	"	
Zinc	**69**	0.50	5.0	"	"	"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Conventional Chemistry Parameters by APHA/EPA Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Bicarbonate	**70**	0.060	5.0	mg/l	1	AA43121	02/11/14 10:19	02/11/14 17:00	SM2320B	
Color	**28**	6.0	10	Color Units	2	AA42421	01/31/14 07:40	01/31/14 07:40	SM2120B	
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l	1	AA43107	01/31/14 07:27	02/04/14 16:00	SM5540C	U
Odor	**1.4**		1.0	T.O.N.	"	AA42421	01/30/14 13:32	01/30/14 13:32	EPA 140.1	OD-1
Perchlorate	ND	0.90	4.0	ug/l	"	AB41141	02/11/14 09:49	02/11/14 12:26	EPA 314.0	U
Specific Conductance (EC)	**270**	1.0	20	umhos/cm	"	AA43044	01/30/14 13:00	01/30/14 17:00	SM2510B	
Total Dissolved Solids	**220**	5.0	10	mg/l	"	AB40322	02/03/14 09:00	02/05/14 08:30	SM2540C	
Turbidity	**71**	0.040	0.10	NTU	"	AA43044	01/30/14 13:00	01/30/14 17:00	SM2130B	
Nitrate + Nitrite as N	**0.61**	0.0086	0.40	mg/l	"	AB41339	02/13/14 10:39	02/13/14 11:18	EPA 300.0	
Total Organic Carbon	**0.898**	0.100	0.300	"	"	AA43131	01/31/14 13:10	01/31/14 20:10	SM5310C	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Miscellaneous Physical/Conventional Chemistry Parameters
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Cyanide (total)	ND	0.0020	0.10	mg/l	1	AB40428	02/04/14 09:46	02/05/14 15:18	10-204-00-1X	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Anions by EPA Method 300.0
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Nitrate as NO3	**2.7**	0.20	2.0	mg/l	1	AA43037	01/30/14 11:23	01/30/14 21:42	EPA 300.0	
Chloride	**79**	0.15	2.5	"	5	"	"	01/30/14 21:27	"	
Fluoride	ND	0.070	0.10	"	1	"	"	01/30/14 21:42	"	U
Nitrite as N	ND	0.020	0.40	"	"	"	"	"	"	U
Sulfate as SO4	**9.9**	0.090	0.50	"	"	"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Acetone	ND	0.80	5.0	ug/l	1	AB40523	02/03/14 09:12	02/04/14 16:54	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
1,3-Dichloropropane	ND	0.20	0.50	ug/l	1	AB40523	02/03/14 09:12	02/04/14 16:54	EPA 524.2	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	**0.18**	0.10	0.50	"	"	"	"	"	"	J
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	**2.0**	0.10	0.50	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
o-Xylene	ND	0.10	0.50	ug/l	1	AB40523	02/03/14 09:12	02/04/14 16:54	EPA 524.2	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*98.8 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*95.2 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*99.8 %*	*70-130*			"	"	"	"	
Trip Blank (14A1643-02) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Acetone	ND	0.80	5.0	ug/l	1	AB40523	02/03/14 09:12	02/04/14 17:28	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14A1643-02) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
1,2-Dichlorobenzene	ND	0.20	0.50	ug/l	1	AB40523	02/03/14 09:12	02/04/14 17:28	EPA 524.2	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14A1643-02) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
1,2,4-Trichlorobenzene	ND	0.20	0.50	ug/l	1	AB40523	02/03/14 09:12	02/04/14 17:28	EPA 524.2	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U
o-Xylene	ND	0.10	0.50	"	"	"	"	"	"	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*99.2 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*96.3 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*98.9 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Aldrin	ND	0.010	0.050	ug/l	1	AA43038	01/30/14 11:31	02/01/14 03:03	EPA 508	U
Chloroneb	ND	0.20	0.50	"	"	"	"	"	"	U
Chlorobenzilate	ND	2.0	5.0	"	"	"	"	"	"	U
Chlorothalonil	ND	0.030	0.10	"	"	"	"	"	"	U
DCPA	ND	0.020	0.040	"	"	"	"	"	"	U
4,4´-DDD	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDE	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDT	ND	0.020	0.020	"	"	"	"	"	"	U
Dieldrin	ND	0.010	0.010	"	"	"	"	"	"	U
Endosulfan I	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan II	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan sulfate	ND	0.020	0.020	"	"	"	"	"	"	U
Endrin	ND	0.030	0.10	"	"	"	"	"	"	U
Endrin aldehyde	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-alpha	ND	0.010	0.050	"	"	"	"	"	"	U
HCH-beta	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-delta	ND	0.030	0.050	"	"	"	"	"	"	U
HCH-gamma (Lindane)	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor epoxide	ND	0.010	0.010	"	"	"	"	"	"	U
Hexachlorobenzene	ND	0.010	0.040	"	"	"	"	"	"	U
Hexachlorocyclopentadiene	ND	0.040	0.40	"	"	"	"	"	"	U
Methoxychlor	ND	0.020	0.020	"	"	"	"	"	"	U
cis-Permethrin	ND	0.070	0.20	"	"	"	"	"	"	U
trans-Permethrin	ND	0.090	0.20	"	"	"	"	"	"	U
Propachlor	ND	0.070	0.20	"	"	"	"	"	"	U
Trifluralin	ND	0.020	0.040	"	"	"	"	"	"	U
PCB-1016	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1221	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1232	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1242	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1248	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1254	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1260	ND	0.030	0.50	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Total PCBs	ND	0.30	0.50	ug/l	1	AA43038	01/30/14 11:31	02/01/14 03:03	EPA 508	U
Toxaphene	ND	0.40	0.50	"	"	"	"	"	"	U
Chlordane (tech)	ND	0.030	0.050	"	"	"	"	"	"	U
Surrogate: Dibutylchlorendate		*86.8 %*	*70-130*			"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Nitrogen- and Phosphorus- Pesticides by EPA Method 507
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Alachlor	ND	0.50	0.50	ug/l	1	AB40730	02/08/14 15:03	02/11/14 07:22	EPA 507	U
Atrazine	ND	0.30	0.50	"	"	"	"	"	"	U
Bromacil	ND	0.50	5.0	"	"	"	"	"	"	U
Butachlor	ND	0.40	0.50	"	"	"	"	"	"	U
Dimethoate	ND	0.20	1.0	"	"	"	"	"	"	U
Metolachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Metribuzin	ND	0.40	0.50	"	"	"	"	"	"	U
Molinate	ND	0.20	0.50	"	"	"	"	"	"	U
Prometryn	ND	0.50	0.50	"	"	"	"	"	"	U
Propachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Simazine	ND	0.30	0.50	"	"	"	"	"	"	U
Thiobencarb	ND	0.20	1.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*88.6 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Organic Analytes by EPA Method 504.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40359	02/04/14 10:00	02/05/14 02:21	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U
Trip Blank (14A1643-02) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40359	02/04/14 10:00	02/05/14 02:56	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Chlorinated Acids by EPA Method 515.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Acifluorfen	ND	0.50	1.0	ug/l	1	AB40536	02/06/14 14:29	02/08/14 04:19	EPA 515.1	U
Bentazon	ND	0.40	0.40	"	"	"	"	"	"	U
2,4-D	ND	0.80	1.0	"	"	"	"	"	"	U
Dalapon	ND	6.0	6.0	"	"	"	"	"	"	U
2,4-DB	ND	4.0	5.0	"	"	"	"	"	"	U
Dicamba	ND	0.40	0.40	"	"	"	"	"	"	U
Dichlorprop	ND	1.0	1.0	"	"	"	"	"	"	U
Dinoseb	ND	0.80	1.0	"	"	"	"	"	"	U
4-Nitrophenol	ND	0.70	1.0	"	"	"	"	"	"	U
Pentachlorophenol	ND	0.20	0.20	"	"	"	"	"	"	U
Picloram	ND	0.50	1.0	"	"	"	"	"	"	U
2,4,5-T	ND	0.40	0.50	"	"	"	"	"	"	U
2,4,5-TP (Silvex)	ND	0.50	0.50	"	"	"	"	"	"	U
Surrogate: DCAA		*90.2 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Carbamates by EPA Method 531.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Aldicarb	ND	0.70	3.0	ug/l	1	AA42932	01/30/14 09:25	01/31/14 02:53	EPA 531.1	U
Aldicarb sulfone	ND	0.70	4.0	"	"	"	"	"	"	U
Aldicarb sulfoxide	ND	0.80	3.0	"	"	"	"	"	"	U
Carbaryl	ND	0.70	5.0	"	"	"	"	"	"	U
Carbofuran	ND	2.0	5.0	"	"	"	"	"	"	U
3-Hydroxycarbofuran	ND	0.90	3.0	"	"	"	"	"	"	U
Methiocarb	ND	2.0	5.0	"	"	"	"	"	"	U
Methomyl	ND	2.0	2.0	"	"	"	"	"	"	U
Oxamyl	ND	0.80	20	"	"	"	"	"	"	U
Propoxur	ND	2.0	5.0	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Endothall by EPA Method 548.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Endothall	ND	2.0	45	ug/l	1	AB40357	02/04/14 14:37	02/06/14 15:13	EPA 548.1	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Glyphosate by EPA Method 547
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Glyphosate	ND	3.0	10	ug/l	1	AB40427	02/04/14 09:22	02/04/14 23:29	EPA 547	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Diquat by EPA Method 549.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Diquat	ND	2.0	2.0	ug/l	1	AA43118	02/03/14 09:48	02/10/14 21:03	EPA 549.2	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Haloacetic Acids by EPA Method 552.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water Sampled: 01/29/14 14:15 Received: 01/29/14 21:15										
Monobromoacetic Acid	ND	0.8	1.0	ug/l	1	AB40444	02/05/14 13:05	02/07/14 20:08	EPA 552.2	U
Monochloroacetic Acid	ND	1.1	2.0	"	"	"	"	"	"	U
Dibromoacetic Acid	ND	0.8	1.0	"	"	"	"	"	"	U
Dichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Trichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"	"	"	"	"	"	U
Surrogate: 2,3-Dibromopropionic Acid		*108 %*	*70-130*			"	"	"	"	
Surrogate: 2-Bromopropionic Acid		*97.2 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Semivolatile Organic Compounds by EPA Method 525.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MRWPCA MW-1 (14A1643-01) Water	**Sampled: 01/29/14 14:15**		**Received: 01/29/14 21:15**							**A-02**
Benzo (a) pyrene	ND	0.11	0.13	ug/l	1.32	AB40727	02/08/14 13:35	02/13/14 17:59	EPA 525.2	U
Di(2-ethylhexyl)adipate	ND	0.53	6.6	"	"	"	"	"	"	U
Di(2-ethylhexyl)phthalate	**0.29**	0.26	4.0	"	"	"	"	"	"	J
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*50.2 %*	*70-130*			"	"	"	"	
Surrogate: Perylene-d12		*19.0 %*	*70-130*			"	"	"	"	
Surrogate: Triphenyl phosphate		*55.2 %*	*70-130*			"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Metals (Drinking Water) by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43136 - EPA 245.1 Hg Water											
Blank (AA43136-BLK1)					Prepared & Analyzed: 02/05/14						
Mercury	ND	0.060	1.0	ug/l							U
LCS (AA43136-BS1)					Prepared & Analyzed: 02/05/14						
Mercury	2.30	0.060	1.0	ug/l	2.50		92.0	80-120			
Duplicate (AA43136-DUP1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	ND	0.060	1.0	ug/l		ND				20	U
Matrix Spike (AA43136-MS1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	2.26	0.060	1.0	ug/l	2.50	ND	90.4	60-140			
Matrix Spike (AA43136-MS2)		**Source: 14B0218-01**			Prepared & Analyzed: 02/05/14						
Mercury	2.32	0.060	1.0	ug/l	2.50	0.0600	90.4	60-140			
Matrix Spike Dup (AA43136-MSD1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	2.29	0.060	1.0	ug/l	2.50	ND	91.6	60-140	1.32	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43133 - Metals Digest											
Blank (AA43133-BLK1)					Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	ND	0.010	1.0	mg/l							U
Magnesium	ND	0.0080	1.0	"							U
Potassium	ND	0.0080	1.0	"							U
Sodium	ND	0.020	1.0	"							U
LCS (AA43133-BS1)					Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	5.36	0.010	1.0	mg/l	5.88		91.2	85-115			
Magnesium	7.09	0.0080	1.0	"	8.00		88.6	85-115			
Potassium	7.97	0.0080	1.0	"	8.00		99.6	85-115			
Sodium	7.75	0.020	1.0	"	8.00		96.8	85-115			
Duplicate (AA43133-DUP1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/12/14						
Calcium	18.2	0.010	1.0	mg/l		16.5			9.76	20	
Magnesium	6.86	0.0080	1.0	"		6.53			4.91	20	
Potassium	3.66	0.0080	1.0	"		3.35			8.82	20	
Sodium	52.8	0.020	1.0	"		50.2			5.03	20	
Matrix Spike (AA43133-MS1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	22.4	0.010	1.0	mg/l	5.88	16.5	100	70-130			
Magnesium	13.0	0.0080	1.0	"	8.00	6.53	81.3	70-130			
Potassium	10.8	0.0080	1.0	"	8.00	3.35	92.8	70-130			
Sodium	58.8	0.020	1.0	"	8.00	50.2	107	70-130			
Matrix Spike (AA43133-MS2)		**Source: 14A1713-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	35.4	0.010	1.0	mg/l	5.88	28.8	112	70-130			
Magnesium	11.0	0.0080	1.0	"	8.00	3.85	89.5	70-130			
Potassium	11.1	0.0080	1.0	"	8.00	3.56	94.7	70-130			
Sodium	47.2	0.020	1.0	"	8.00	38.1	114	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43133 - Metals Digest											
Matrix Spike Dup (AA43133-MSD1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	23.2	0.010	1.0	mg/l	5.88	16.5	113	70-130	3.39	20	
Magnesium	14.3	0.0080	1.0	"	8.00	6.53	97.1	70-130	9.24	20	
Potassium	11.0	0.0080	1.0	"	8.00	3.35	95.8	70-130	2.21	20	
Sodium	60.3	0.020	1.0	"	8.00	50.2	126	70-130	2.49	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Blank (AB40328-BLK1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	ND	2.0	50	ug/l							U
Antimony	ND	0.020	6.0	"							U
Arsenic	ND	0.070	2.0	"							U
Barium	ND	0.030	100	"							U
Beryllium	ND	0.020	1.0	"							U
Boron	17.8	6.0	50	"							J
Cadmium	ND	0.020	1.0	"							U
Chromium	ND	0.080	10	"							U
Copper	ND	0.040	0.50	"							U
Iron	ND	1.8	50	"							U
Lead	ND	0.020	5.0	"							U
Manganese	ND	0.030	5.0	"							U
Nickel	ND	0.060	10	"							U
Selenium	0.0754	0.070	5.0	"							J
Silver	ND	0.020	0.10	"							U
Thallium	ND	0.020	1.0	"							U
Uranium	ND	0.020	1.0	pCi/l							U
Vanadium	ND	0.30	1.0	ug/l							U
Zinc	1.13	0.50	5.0	"							J
LCS (AB40328-BS1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	483	2.0	50	ug/l	520		92.8	85-115			
Antimony	20.1	0.020	6.0	"	20.0		100	85-115			
Arsenic	19.7	0.070	2.0	"	20.0		98.7	85-115			
Barium	19.1	0.030	100	"	20.0		95.4	85-115			J
Beryllium	18.8	0.020	1.0	"	20.0		94.1	85-115			
Boron	110	6.0	50	"	100		110	85-115			
Cadmium	18.8	0.020	1.0	"	20.0		94.0	85-115			
Chromium	19.3	0.080	10	"	20.0		96.6	85-115			
Copper	19.0	0.040	0.50	"	20.0		95.1	85-115			
Iron	502	1.8	50	"	520		96.6	85-115			
Lead	17.5	0.020	5.0	"	20.0		87.5	85-115			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
LCS (AB40328-BS1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Manganese	18.8	0.030	5.0	ug/l	20.0		94.2	85-115			
Nickel	19.3	0.060	10	"	20.0		96.6	85-115			
Selenium	20.1	0.070	5.0	"	20.0		100	85-115			
Silver	18.1	0.020	0.10	"	20.0		90.4	85-115			
Thallium	17.1	0.020	1.0	"	20.0		85.6	85-115			
Uranium	11.5	0.020	1.0	pCi/l	13.4		85.5	85-115			
Vanadium	19.8	0.30	1.0	ug/l	20.0		99.0	85-115			
Zinc	98.6	0.50	5.0	"	100		98.6	85-115			
Duplicate (AB40328-DUP1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1120	2.0	50	ug/l		1150			1.98	20	
Antimony	0.0754	0.020	6.0	"		0.0744			1.34	20	J
Arsenic	1.08	0.070	2.0	"		1.15			6.89	20	J
Barium	70.3	0.030	100	"		68.3			2.85	20	J
Beryllium	0.0788	0.020	1.0	"		0.0838			6.24	20	J
Boron	37.9	6.0	50	"		36.2			4.75	20	J
Cadmium	0.0848	0.020	1.0	"		0.0857			1.11	20	J
Chromium	0.470	0.080	10	"		0.382			20.5	20	J
Copper	12.8	0.040	0.50	"		12.3			3.69	20	
Iron	412	1.8	50	"		408			0.910	20	
Lead	1.06	0.020	5.0	"		1.12			4.92	20	J
Manganese	6.46	0.030	5.0	"		7.23			11.3	20	
Nickel	1.21	0.060	10	"		1.20			1.54	20	J
Selenium	0.159	0.070	5.0	"		0.171			7.50	20	J
Silver	0.0362	0.020	0.10	"		0.0220			48.8	20	J
Thallium	0.105	0.020	1.0	"		0.0948			9.86	20	J
Uranium	0.249	0.020	1.0	pCi/l		0.265			6.25	20	J
Vanadium	1.52	0.30	1.0	ug/l		1.64			7.56	20	
Zinc	6.79	0.50	5.0	"		6.73			0.780	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Matrix Spike (AB40328-MS1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1570	2.0	50	ug/l	520	1150	81.5	70-130			
Antimony	18.9	0.020	6.0	"	20.0	0.0744	94.1	70-130			
Arsenic	19.9	0.070	2.0	"	20.0	1.15	93.5	70-130			
Barium	85.5	0.030	100	"	20.0	68.3	85.8	70-130			J
Beryllium	17.8	0.020	1.0	"	20.0	0.0838	88.5	70-130			
Boron	114	6.0	50	"	100	36.2	78.1	70-130			
Cadmium	18.7	0.020	1.0	"	20.0	0.0857	93.0	70-130			
Chromium	17.4	0.080	10	"	20.0	0.382	85.1	70-130			
Copper	29.6	0.040	0.50	"	20.0	12.3	86.4	70-130			
Iron	858	1.8	50	"	520	408	86.4	70-130			
Lead	19.8	0.020	5.0	"	20.0	1.12	93.4	70-130			
Manganese	23.4	0.030	5.0	"	20.0	7.23	80.7	70-130			
Nickel	18.2	0.060	10	"	20.0	1.20	85.0	70-130			
Selenium	18.7	0.070	5.0	"	20.0	0.171	92.7	70-130			
Silver	17.9	0.020	0.10	"	20.0	0.0220	89.3	70-130			
Thallium	18.5	0.020	1.0	"	20.0	0.0948	92.1	70-130			
Uranium	13.5	0.020	1.0	pCi/l	13.4	0.265	98.5	70-130			
Vanadium	19.1	0.30	1.0	ug/l	20.0	1.64	87.4	70-130			
Zinc	98.9	0.50	5.0	"	100	6.73	92.1	70-130			
Matrix Spike (AB40328-MS2)		**Source: 14B0124-02**			Prepared: 02/05/14 Analyzed: 02/06/14						
Aluminum	529	2.0	50	ug/l	520	70.3	88.1	70-130			
Antimony	20.4	0.020	6.0	"	20.0	0.0711	102	70-130			
Arsenic	21.4	0.070	2.0	"	20.0	2.13	96.2	70-130			
Barium	35.8	0.030	100	"	20.0	16.9	94.7	70-130			J
Beryllium	19.3	0.020	1.0	"	20.0	ND	96.4	70-130			
Boron	150	6.0	50	"	100	63.0	87.0	70-130			
Cadmium	19.4	0.020	1.0	"	20.0	ND	97.0	70-130			
Chromium	20.0	0.080	10	"	20.0	0.590	97.0	70-130			
Copper	19.6	0.040	0.50	"	20.0	1.39	90.9	70-130			
Iron	602	1.8	50	"	520	91.5	98.1	70-130			
Lead	20.2	0.020	5.0	"	20.0	0.0825	101	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Matrix Spike (AB40328-MS2)		**Source: 14B0124-02**			Prepared: 02/05/14 Analyzed: 02/06/14						
Manganese	26.7	0.030	5.0	ug/l	20.0	7.07	98.0	70-130			
Nickel	19.5	0.060	10	"	20.0	0.983	92.8	70-130			
Selenium	19.2	0.070	5.0	"	20.0	0.207	95.2	70-130			
Silver	19.4	0.020	0.10	"	20.0	ND	97.2	70-130			
Thallium	19.8	0.020	1.0	"	20.0	ND	99.0	70-130			
Uranium	14.2	0.020	1.0	pCi/l	13.4	0.107	105	70-130			
Vanadium	24.6	0.30	1.0	ug/l	20.0	5.40	95.9	70-130			
Zinc	99.9	0.50	5.0	"	100	3.69	96.2	70-130			
Matrix Spike Dup (AB40328-MSD1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1580	2.0	50	ug/l	520	1150	83.4	70-130	0.635	20	
Antimony	19.7	0.020	6.0	"	20.0	0.0744	98.1	70-130	4.13	20	
Arsenic	20.5	0.070	2.0	"	20.0	1.15	96.6	70-130	3.05	20	
Barium	88.4	0.030	100	"	20.0	68.3	100	70-130	3.29	20	J
Beryllium	19.1	0.020	1.0	"	20.0	0.0838	95.3	70-130	7.32	20	
Boron	125	6.0	50	"	100	36.2	88.8	70-130	8.99	20	
Cadmium	19.7	0.020	1.0	"	20.0	0.0857	98.0	70-130	5.25	20	
Chromium	18.0	0.080	10	"	20.0	0.382	88.1	70-130	3.40	20	
Copper	30.7	0.040	0.50	"	20.0	12.3	91.9	70-130	3.64	20	
Iron	860	1.8	50	"	520	408	86.8	70-130	0.291	20	
Lead	21.5	0.020	5.0	"	20.0	1.12	102	70-130	8.35	20	
Manganese	23.8	0.030	5.0	"	20.0	7.23	83.1	70-130	2.03	20	
Nickel	18.6	0.060	10	"	20.0	1.20	87.2	70-130	2.36	20	
Selenium	19.1	0.070	5.0	"	20.0	0.171	94.8	70-130	2.29	20	
Silver	19.1	0.020	0.10	"	20.0	0.0220	95.5	70-130	6.75	20	
Thallium	20.0	0.020	1.0	"	20.0	0.0948	99.5	70-130	7.72	20	
Uranium	14.5	0.020	1.0	pCi/l	13.4	0.265	107	70-130	7.74	20	
Vanadium	19.8	0.30	1.0	ug/l	20.0	1.64	91.0	70-130	3.68	20	
Zinc	105	0.50	5.0	"	100	6.73	97.9	70-130	5.71	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43044 - General Preparation											
Duplicate (AA43044-DUP1)		**Source: 14A1628-02**			Prepared & Analyzed: 01/30/14						
Specific Conductance (EC)	360	1.0	20	umhos/cm		384			6.45	10	
Batch AA43107 - General Preparation											
Blank (AA43107-BLK1)					Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l							U
LCS (AA43107-BS1)					Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.205	0.030	0.050	mg/l	0.200		103	80-120			
Duplicate (AA43107-DUP1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l		ND				20	U
Matrix Spike (AA43107-MS1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.208	0.030	0.050	mg/l	0.200	ND	104	80-120			
Matrix Spike Dup (AA43107-MSD1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.210	0.030	0.050	mg/l	0.200	ND	105	80-120	0.826	20	
Batch AA43121 - General Preparation											
Duplicate (AA43121-DUP1)		**Source: 14B0229-03**			Prepared: 02/01/14 Analyzed: 02/11/14						
Bicarbonate	42.7	0.060	5.0	mg/l		42.7			0.00	20	
Batch AA43131 - General Prep											
Blank (AA43131-BLK1)					Prepared & Analyzed: 01/31/14						
Total Organic Carbon	0.142	0.100	0.300	mg/l							J

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43131 - General Prep											
LCS (AA43131-BS1)					Prepared & Analyzed: 01/31/14						
Total Organic Carbon	10.9	0.100	0.300	mg/l	10.0		109	85-115			
LCS Dup (AA43131-BSD1)					Prepared & Analyzed: 01/31/14						
Total Organic Carbon	10.4	0.100	0.300	mg/l	10.0		104	85-115	4.47	20	
Duplicate (AA43131-DUP1)		**Source: 14A1101-01**			Prepared & Analyzed: 01/31/14						
Total Organic Carbon	0.853	0.100	0.300	mg/l		0.895			4.80	20	
Matrix Spike (AA43131-MS1)		**Source: 14A1101-02**			Prepared & Analyzed: 01/31/14						
Total Organic Carbon	21.5	0.200	0.600	mg/l	20.0	0.789	103	70-130			
Matrix Spike Dup (AA43131-MSD1)		**Source: 14A1101-02**			Prepared & Analyzed: 01/31/14						
Total Organic Carbon	21.8	0.200	0.600	mg/l	20.0	0.789	105	70-130	1.81	20	
Batch AB40322 - General Preparation											
Blank (AB40322-BLK1)					Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	ND	5.0	10	mg/l							U
Duplicate (AB40322-DUP1)		**Source: 14A1635-01**			Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	361	5.0	10	mg/l		352			2.52	30	
Duplicate (AB40322-DUP2)		**Source: 14A1730-01**			Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	1010	5.0	10	mg/l		964			4.46	30	
Batch AB41141 - General Preparation											
Blank (AB41141-BLK1)					Prepared & Analyzed: 02/11/14						
Perchlorate	0.967	0.90	4.0	ug/l							J

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41141 - General Preparation											
LCS (AB41141-BS1)					Prepared & Analyzed: 02/11/14						
Perchlorate	23.9	0.90	4.0	ug/l	25.0		95.5	85-115			
Duplicate (AB41141-DUP1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	ND	0.90	4.0	ug/l		ND				15	U
Matrix Spike (AB41141-MS1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130			
Matrix Spike Dup (AB41141-MSD1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130	0.00386	15	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Miscellaneous Physical/Conventional Chemistry Parameters - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40428 - General Preparation											
Blank (AB40428-BLK1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l							U
LCS (AB40428-BS1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.202	0.0020	0.10	mg/l	0.200		101	85-115			
Duplicate (AB40428-DUP1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l		ND				25	U
Matrix Spike (AB40428-MS1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.188	0.0020	0.10	mg/l	0.200	ND	93.9	85-115			
Matrix Spike (AB40428-MS2)		**Source: 14A1635-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.220	0.0020	0.10	mg/l	0.200	ND	110	85-115			
Matrix Spike Dup (AB40428-MSD1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.186	0.0020	0.10	mg/l	0.200	ND	92.8	85-115	1.23	25	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43037 - General Preparation											
Blank (AA43037-BLK1)					Prepared & Analyzed: 01/30/14						
Nitrate as NO3	ND	0.20	2.0	mg/l							U
Sulfate as SO4	ND	0.090	0.50	"							U
Nitrite as N	ND	0.020	0.40	"							U
Chloride	ND	0.030	0.50	"							U
Fluoride	ND	0.070	0.10	"							U
LCS (AA43037-BS1)					Prepared & Analyzed: 01/30/14						
Nitrate as NO3	22	0.20	2.0	mg/l	22.2		100	90-110			
Nitrite as N	5.18	0.020	0.40	"	5.00		104	90-110			
Sulfate as SO4	20.0	0.090	0.50	"	20.0		99.8	90-110			
Chloride	10.1	0.030	0.50	"	10.0		101	90-110			
Fluoride	5.17	0.070	0.10	"	5.00		103	90-110			
Duplicate (AA43037-DUP1)		**Source: 14A1612-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Nitrate as NO3	76	1.0	10	mg/l		76			0.434	20	
Chloride	49.3	0.15	2.5	"		48.5			1.72	20	
Fluoride	ND	0.070	0.10	"		ND				20	U
Sulfate as SO4	13.1	0.090	0.50	"		13.2			0.396	20	
Nitrite as N	ND	0.020	0.40	"		ND				20	U
Matrix Spike (AA43037-MS1)		**Source: 14A1612-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Nitrate as NO3	100	1.0	10	mg/l	24.7	76	98.0	80-120			
Sulfate as SO4	33.9	0.45	2.5	"	22.2	13.2	93.5	80-120			
Fluoride	4.96	0.35	0.50	"	5.56	ND	89.3	80-120			
Nitrite as N	5.37	0.10	2.0	"	5.56	ND	96.6	80-120			
Chloride	59.9	0.15	2.5	"	11.1	48.5	103	80-120			
Matrix Spike (AA43037-MS2)		**Source: 14A1643-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Nitrate as NO3	27	1.0	10	mg/l	24.7	2.7	97.4	80-120			
Chloride	90.7	0.15	2.5	"	11.1	78.6	108	80-120			
Fluoride	5.13	0.35	0.50	"	5.56	ND	92.4	80-120			
Sulfate as SO4	31.5	0.45	2.5	"	22.2	9.88	97.4	80-120			
Nitrite as N	5.55	0.10	2.0	"	5.56	ND	99.9	80-120			

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2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43037 - General Preparation											
Matrix Spike Dup (AA43037-MSD1)		**Source: 14A1612-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Nitrate as NO3	100	1.0	10	mg/l	24.7	76	98.4	80-120	0.116	20	
Sulfate as SO4	34.1	0.45	2.5	"	22.2	13.2	94.2	80-120	0.425	20	
Nitrite as N	5.39	0.10	2.0	"	5.56	ND	97.1	80-120	0.516	20	
Chloride	60.0	0.15	2.5	"	11.1	48.5	103	80-120	0.102	20	
Fluoride	5.01	0.35	0.50	"	5.56	ND	90.2	80-120	1.00	20	

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2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Blank (AB40523-BLK1)					Prepared & Analyzed: 02/03/14						
Acetone	ND	0.80	5.0	ug/l							U
Acrylonitrile	ND	0.20	5.0	"							U
Benzene	ND	0.20	0.30	"							U
Bromobenzene	ND	0.10	0.50	"							U
Bromochloromethane	ND	0.20	0.50	"							U
Bromodichloromethane	ND	0.50	0.50	"							U
Bromoform	ND	0.50	0.50	"							U
Bromomethane	ND	0.20	0.50	"							U
n-Butylbenzene	ND	0.10	0.50	"							U
sec-Butylbenzene	ND	0.10	0.50	"							U
tert-Butylbenzene	ND	0.10	0.50	"							U
Carbon disulfide	ND	0.20	0.50	"							U
Carbon tetrachloride	ND	0.30	0.50	"							U
Chlorobenzene	ND	0.20	0.50	"							U
Chloroethane	ND	0.10	0.50	"							U
Chloroform	ND	0.50	0.50	"							U
Chloromethane	ND	0.20	0.50	"							U
2-Chlorotoluene	ND	0.20	0.50	"							U
4-Chlorotoluene	ND	0.10	0.50	"							U
Dibromochloromethane	ND	0.50	0.50	"							U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"							U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"							U
Dibromomethane	ND	0.20	0.50	"							U
1,2-Dichlorobenzene	ND	0.20	0.50	"							U
1,3-Dichlorobenzene	ND	0.20	0.50	"							U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"							U
1,4-Dichlorobenzene	ND	0.10	0.50	"							U
Dichlorodifluoromethane	ND	0.20	0.50	"							U
1,1-Dichloroethane	ND	0.10	0.50	"							U
1,2-Dichloroethane	ND	0.20	0.50	"							U
1,1-Dichloroethene	ND	0.10	0.30	"							U
cis-1,2-Dichloroethene	ND	0.20	0.50	"							U

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Blank (AB40523-BLK1)					Prepared & Analyzed: 02/03/14						
trans-1,2-Dichloroethene	ND	0.20	0.50	ug/l							U
1,2-Dichloropropane	ND	0.20	0.50	"							U
1,3-Dichloropropane	ND	0.20	0.50	"							U
2,2-Dichloropropane	ND	0.10	0.50	"							U
1,1-Dichloropropene	ND	0.10	0.50	"							U
cis-1,3-Dichloropropene	ND	0.20	0.50	"							U
trans-1,3-Dichloropropene	ND	0.20	0.50	"							U
Ethylbenzene	ND	0.10	0.50	"							U
1,3-Dichloropropene (total)	ND	0.20	0.50	"							U
2-Hexanone	ND	0.097	5.0	"							U
Hexachlorobutadiene	ND	0.30	0.50	"							U
Isopropylbenzene	ND	0.20	0.50	"							U
p-Isopropyltoluene	ND	0.10	0.50	"							U
Methyl ethyl ketone	ND	0.40	1.0	"							U
Methyl iodide	ND	0.12	2.0	"							U
Methyl isobutyl ketone	ND	0.30	1.0	"							U
Methylene chloride	ND	0.40	0.50	"							U
Naphthalene	ND	0.20	0.50	"							U
n-Propylbenzene	ND	0.20	0.50	"							U
Styrene	ND	0.10	0.50	"							U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"							U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"							U
Tetrachloroethene	ND	0.20	0.50	"							U
Toluene	ND	0.10	0.50	"							U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"							U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"							U
1,1,1-Trichloroethane	ND	0.20	0.50	"							U
1,1,2-Trichloroethane	ND	0.20	0.50	"							U
Trichloroethene	ND	0.20	0.50	"							U
Trichlorofluoromethane	ND	0.20	0.50	"							U
Trichlorotrifluoroethane	ND	0.20	0.50	"							U
1,2,3-Trichloropropane	ND	0.13	0.50	"							U

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2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Blank (AB40523-BLK1)					Prepared & Analyzed: 02/03/14						
1,2,4-Trimethylbenzene	ND	0.10	0.50	ug/l							U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"							U
Vinyl chloride	ND	0.10	0.50	"							U
m,p-Xylene	ND	0.20	0.50	"							U
o-Xylene	ND	0.10	0.50	"							U
Xylenes (total)	ND	0.20	0.50	"							U
Trihalomethanes (total)	ND	0.50	0.50	"							U
Methyl tert-butyl ether	ND	0.50	0.50	"							U
Ethyl tert-butyl ether	ND	0.20	0.50	"							U
Tert-amyl methyl ether	ND	0.20	0.50	"							U
Surrogate: Bromofluorobenzene	*24.6*			*"*	*25.0*		*98.3*	*70-130*			
Surrogate: Dibromofluoromethane	*23.4*			*"*	*25.0*		*93.4*	*70-130*			
Surrogate: Toluene-d8	*24.8*			*"*	*25.0*		*99.3*	*70-130*			
LCS (AB40523-BS1)					Prepared & Analyzed: 02/03/14						
Acetone	21.8	0.80	5.0	ug/l	20.0		109	70-130			
Acrylonitrile	5.49	0.20	5.0	"	5.00		110	70-130			
Benzene	4.86	0.20	0.30	"	5.00		97.2	70-130			
Bromobenzene	4.87	0.10	0.50	"	5.00		97.4	70-130			
Bromochloromethane	4.99	0.20	0.50	"	5.00		99.8	70-130			
Bromodichloromethane	4.76	0.50	0.50	"	5.00		95.2	70-130			
Bromoform	4.54	0.50	0.50	"	5.00		90.8	70-130			
Bromomethane	5.21	0.20	0.50	"	5.00		104	70-130			
n-Butylbenzene	4.94	0.10	0.50	"	5.00		98.8	70-130			
sec-Butylbenzene	4.94	0.10	0.50	"	5.00		98.8	70-130			
tert-Butylbenzene	5.07	0.10	0.50	"	5.00		101	70-130			
Carbon disulfide	4.99	0.20	0.50	"	5.00		99.8	70-130			
Carbon tetrachloride	4.48	0.30	0.50	"	5.00		89.6	70-130			
Chlorobenzene	4.94	0.20	0.50	"	5.00		98.8	70-130			
Chloroethane	5.47	0.10	0.50	"	5.00		109	70-130			
Chloroform	5.06	0.50	0.50	"	5.00		101	70-130			
Chloromethane	5.63	0.20	0.50	"	5.00		113	70-130			

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Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS (AB40523-BS1)					Prepared & Analyzed: 02/03/14						
2-Chlorotoluene	4.97	0.20	0.50	ug/l	5.00		99.4	70-130			
4-Chlorotoluene	5.04	0.10	0.50	"	5.00		101	70-130			
Dibromochloromethane	4.79	0.50	0.50	"	5.00		95.8	70-130			
1,2-Dibromo-3-chloropropane	5.46	0.36	0.50	"	5.00		109	70-130			
1,2-Dibromoethane (EDB)	4.99	0.14	0.50	"	5.00		99.8	70-130			
Dibromomethane	4.96	0.20	0.50	"	5.00		99.2	70-130			
1,2-Dichlorobenzene	4.92	0.20	0.50	"	5.00		98.4	70-130			
1,3-Dichlorobenzene	4.84	0.20	0.50	"	5.00		96.8	70-130			
1,4-Dichlorobenzene	4.86	0.10	0.50	"	5.00		97.2	70-130			
trans-1,4-Dichloro-2-butene	4.54	0.095	5.0	"	5.00		90.8	70-130			J
Dichlorodifluoromethane	5.94	0.20	0.50	"	5.00		119	70-130			
1,1-Dichloroethane	5.26	0.10	0.50	"	5.00		105	70-130			
1,2-Dichloroethane	5.05	0.20	0.50	"	5.00		101	70-130			
1,1-Dichloroethene	4.85	0.10	0.30	"	5.00		97.0	70-130			
cis-1,2-Dichloroethene	5.17	0.20	0.50	"	5.00		103	70-130			
trans-1,2-Dichloroethene	4.90	0.20	0.50	"	5.00		98.0	70-130			
1,2-Dichloropropane	5.01	0.20	0.50	"	5.00		100	70-130			
1,3-Dichloropropane	5.18	0.20	0.50	"	5.00		104	70-130			
2,2-Dichloropropane	4.34	0.10	0.50	"	5.00		86.8	70-130			
1,1-Dichloropropene	4.74	0.10	0.50	"	5.00		94.8	70-130			
cis-1,3-Dichloropropene	5.42	0.20	0.50	"	5.00		108	70-130			
trans-1,3-Dichloropropene	4.43	0.20	0.50	"	5.00		88.6	70-130			
2-Hexanone	5.00	0.097	5.0	"	5.00		100	70-130			
Ethylbenzene	4.99	0.10	0.50	"	5.00		99.8	70-130			
Hexachlorobutadiene	4.57	0.30	0.50	"	5.00		91.4	70-130			
Isopropylbenzene	5.14	0.20	0.50	"	5.00		103	70-130			
p-Isopropyltoluene	4.96	0.10	0.50	"	5.00		99.2	70-130			
Methyl ethyl ketone	10.9	0.40	1.0	"	10.0		109	70-130			
Methyl iodide	5.04	0.12	2.0	"	5.00		101	70-130			
Methyl isobutyl ketone	10.2	0.30	1.0	"	10.0		102	70-130			
Methylene chloride	4.68	0.40	0.50	"	5.00		93.6	70-130			
Naphthalene	5.61	0.20	0.50	"	5.00		112	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS (AB40523-BS1)					Prepared & Analyzed: 02/03/14						
n-Propylbenzene	5.19	0.20	0.50	ug/l	5.00		104	70-130			
Styrene	5.23	0.10	0.50	"	5.00		105	70-130			
1,1,1,2-Tetrachloroethane	4.54	0.20	0.50	"	5.00		90.8	70-130			
1,1,2,2-Tetrachloroethane	5.08	0.20	0.50	"	5.00		102	70-130			
Tetrachloroethene	4.76	0.20	0.50	"	5.00		95.2	70-130			
Toluene	4.96	0.10	0.50	"	5.00		99.2	70-130			
1,2,3-Trichlorobenzene	5.54	0.10	0.50	"	5.00		111	70-130			
1,2,4-Trichlorobenzene	5.06	0.20	0.50	"	5.00		101	70-130			
1,1,1-Trichloroethane	4.85	0.20	0.50	"	5.00		97.0	70-130			
1,1,2-Trichloroethane	5.08	0.20	0.50	"	5.00		102	70-130			
Trichloroethene	4.77	0.20	0.50	"	5.00		95.4	70-130			
Trichlorofluoromethane	5.34	0.20	0.50	"	5.00		107	70-130			
Trichlorotrifluoroethane	5.42	0.20	0.50	"	5.00		108	70-130			
1,2,3-Trichloropropane	5.07	0.13	0.50	"	5.00		101	70-130			
1,2,4-Trimethylbenzene	5.17	0.10	0.50	"	5.00		103	70-130			
1,3,5-Trimethylbenzene	5.00	0.10	0.50	"	5.00		100	70-130			
Vinyl chloride	5.10	0.10	0.50	"	5.00		102	70-130			
m,p-Xylene	9.81	0.20	0.50	"	10.0		98.1	70-130			
o-Xylene	5.07	0.10	0.50	"	5.00		101	70-130			
Xylenes (total)	14.9	0.20	0.50	"	15.0		99.2	70-130			
Methyl tert-butyl ether	5.00	0.50	0.50	"	5.00		100	70-130			
Ethyl tert-butyl ether	5.28	0.20	0.50	"	5.00		106	70-130			
Tert-amyl methyl ether	5.25	0.20	0.50	"	5.00		105	70-130			
Surrogate: Bromofluorobenzene	*24.8*			*"*	*25.0*		*99.4*	*70-130*			
Surrogate: Dibromofluoromethane	*23.9*			*"*	*25.0*		*95.4*	*70-130*			
Surrogate: Toluene-d8	*25.1*			*"*	*25.0*		*101*	*70-130*			
LCS Dup (AB40523-BSD1)					Prepared & Analyzed: 02/03/14						
Acetone	21.6	0.80	5.0	ug/l	20.0		108	70-130	1.06	30	
Acrylonitrile	5.42	0.20	5.0	"	5.00		108	70-130	1.28	30	
Benzene	4.79	0.20	0.30	"	5.00		95.8	70-130	1.45	30	
Bromobenzene	4.90	0.10	0.50	"	5.00		98.0	70-130	0.614	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS Dup (AB40523-BSD1)					Prepared & Analyzed: 02/03/14						
Bromochloromethane	4.89	0.20	0.50	ug/l	5.00		97.8	70-130	2.02	30	
Bromodichloromethane	4.86	0.50	0.50	"	5.00		97.2	70-130	2.08	30	
Bromoform	4.50	0.50	0.50	"	5.00		90.0	70-130	0.885	30	
Bromomethane	5.26	0.20	0.50	"	5.00		105	70-130	0.955	30	
n-Butylbenzene	4.86	0.10	0.50	"	5.00		97.2	70-130	1.63	30	
sec-Butylbenzene	4.84	0.10	0.50	"	5.00		96.8	70-130	2.04	30	
tert-Butylbenzene	4.96	0.10	0.50	"	5.00		99.2	70-130	2.19	30	
Carbon disulfide	4.96	0.20	0.50	"	5.00		99.2	70-130	0.603	30	
Carbon tetrachloride	4.42	0.30	0.50	"	5.00		88.4	70-130	1.35	30	
Chlorobenzene	4.78	0.20	0.50	"	5.00		95.6	70-130	3.29	30	
Chloroethane	5.51	0.10	0.50	"	5.00		110	70-130	0.729	30	
Chloroform	4.98	0.50	0.50	"	5.00		99.6	70-130	1.59	30	
Chloromethane	5.75	0.20	0.50	"	5.00		115	70-130	2.11	30	
2-Chlorotoluene	4.88	0.20	0.50	"	5.00		97.6	70-130	1.83	30	
4-Chlorotoluene	4.90	0.10	0.50	"	5.00		98.0	70-130	2.82	30	
Dibromochloromethane	4.77	0.50	0.50	"	5.00		95.4	70-130	0.418	30	
1,2-Dibromo-3-chloropropane	5.48	0.36	0.50	"	5.00		110	70-130	0.366	25	
1,2-Dibromoethane (EDB)	4.91	0.14	0.50	"	5.00		98.2	70-130	1.62	25	
Dibromomethane	4.90	0.20	0.50	"	5.00		98.0	70-130	1.22	30	
1,2-Dichlorobenzene	4.81	0.20	0.50	"	5.00		96.2	70-130	2.26	30	
1,3-Dichlorobenzene	4.78	0.20	0.50	"	5.00		95.6	70-130	1.25	30	
1,4-Dichlorobenzene	4.72	0.10	0.50	"	5.00		94.4	70-130	2.92	30	
trans-1,4-Dichloro-2-butene	4.70	0.095	5.0	"	5.00		94.0	70-130	3.46	25	J
Dichlorodifluoromethane	5.79	0.20	0.50	"	5.00		116	70-130	2.56	30	
1,1-Dichloroethane	5.24	0.10	0.50	"	5.00		105	70-130	0.381	30	
1,2-Dichloroethane	4.96	0.20	0.50	"	5.00		99.2	70-130	1.80	30	
1,1-Dichloroethene	4.89	0.10	0.30	"	5.00		97.8	70-130	0.821	30	
cis-1,2-Dichloroethene	5.01	0.20	0.50	"	5.00		100	70-130	3.14	30	
trans-1,2-Dichloroethene	4.82	0.20	0.50	"	5.00		96.4	70-130	1.65	30	
1,2-Dichloropropane	4.92	0.20	0.50	"	5.00		98.4	70-130	1.81	30	
1,3-Dichloropropane	4.98	0.20	0.50	"	5.00		99.6	70-130	3.94	30	
2,2-Dichloropropane	4.24	0.10	0.50	"	5.00		84.8	70-130	2.33	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS Dup (AB40523-BSD1)					Prepared & Analyzed: 02/03/14						
1,1-Dichloropropene	4.64	0.10	0.50	ug/l	5.00		92.8	70-130	2.13	30	
cis-1,3-Dichloropropene	5.41	0.20	0.50	"	5.00		108	70-130	0.185	30	
trans-1,3-Dichloropropene	4.43	0.20	0.50	"	5.00		88.6	70-130	0.00	30	
Ethylbenzene	4.92	0.10	0.50	"	5.00		98.4	70-130	1.41	30	
2-Hexanone	4.97	0.097	5.0	"	5.00		99.4	70-130	0.602	25	J
Hexachlorobutadiene	4.70	0.30	0.50	"	5.00		94.0	70-130	2.80	30	
Isopropylbenzene	5.06	0.20	0.50	"	5.00		101	70-130	1.57	30	
p-Isopropyltoluene	4.91	0.10	0.50	"	5.00		98.2	70-130	1.01	30	
Methyl ethyl ketone	10.5	0.40	1.0	"	10.0		105	70-130	3.73	30	
Methyl iodide	4.98	0.12	2.0	"	5.00		99.6	70-130	1.20	25	
Methyl isobutyl ketone	9.94	0.30	1.0	"	10.0		99.4	70-130	3.07	30	
Methylene chloride	4.78	0.40	0.50	"	5.00		95.6	70-130	2.11	30	
Naphthalene	5.65	0.20	0.50	"	5.00		113	70-130	0.710	30	
n-Propylbenzene	5.14	0.20	0.50	"	5.00		103	70-130	0.968	30	
Styrene	5.18	0.10	0.50	"	5.00		104	70-130	0.961	30	
1,1,1,2-Tetrachloroethane	4.49	0.20	0.50	"	5.00		89.8	70-130	1.11	30	
1,1,2,2-Tetrachloroethane	4.96	0.20	0.50	"	5.00		99.2	70-130	2.39	30	
Tetrachloroethene	4.50	0.20	0.50	"	5.00		90.0	70-130	5.62	30	
Toluene	4.83	0.10	0.50	"	5.00		96.6	70-130	2.66	30	
1,2,3-Trichlorobenzene	5.52	0.10	0.50	"	5.00		110	70-130	0.362	30	
1,2,4-Trichlorobenzene	5.08	0.20	0.50	"	5.00		102	70-130	0.394	30	
1,1,1-Trichloroethane	4.87	0.20	0.50	"	5.00		97.4	70-130	0.412	30	
1,1,2-Trichloroethane	4.99	0.20	0.50	"	5.00		99.8	70-130	1.79	30	
Trichloroethene	4.78	0.20	0.50	"	5.00		95.6	70-130	0.209	30	
Trichlorofluoromethane	5.36	0.20	0.50	"	5.00		107	70-130	0.374	30	
Trichlorotrifluoroethane	5.24	0.20	0.50	"	5.00		105	70-130	3.38	30	
1,2,3-Trichloropropane	4.89	0.13	0.50	"	5.00		97.8	70-130	3.61	25	
1,2,4-Trimethylbenzene	5.11	0.10	0.50	"	5.00		102	70-130	1.17	30	
1,3,5-Trimethylbenzene	4.90	0.10	0.50	"	5.00		98.0	70-130	2.02	30	
Vinyl chloride	5.01	0.10	0.50	"	5.00		100	70-130	1.78	30	
m,p-Xylene	9.61	0.20	0.50	"	10.0		96.1	70-130	2.06	30	
o-Xylene	4.88	0.10	0.50	"	5.00		97.6	70-130	3.82	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS Dup (AB40523-BSD1)					Prepared & Analyzed: 02/03/14						
Xylenes (total)	14.5	0.20	0.50	ug/l	15.0		96.6	70-130	2.66	30	
Methyl tert-butyl ether	4.92	0.50	0.50	"	5.00		98.4	70-130	1.61	30	
Ethyl tert-butyl ether	5.35	0.20	0.50	"	5.00		107	70-130	1.32	30	
Tert-amyl methyl ether	5.20	0.20	0.50	"	5.00		104	70-130	0.957	30	
Surrogate: Bromofluorobenzene	*25.0*			*"*	*25.0*		*99.9*	*70-130*			
Surrogate: Dibromofluoromethane	*23.9*			*"*	*25.0*		*95.6*	*70-130*			
Surrogate: Toluene-d8	*25.0*			*"*	*25.0*		*99.9*	*70-130*			
Matrix Spike (AB40523-MS1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Acetone	21.5	0.80	5.0	ug/l	20.0	ND	108	70-130			
Acrylonitrile	5.26	0.20	5.0	"	5.00	ND	105	70-130			
Benzene	4.79	0.20	0.30	"	5.00	ND	95.8	70-130			
Bromobenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130			
Bromochloromethane	5.11	0.20	0.50	"	5.00	ND	102	70-130			
Bromodichloromethane	4.76	0.50	0.50	"	5.00	ND	95.2	70-130			
Bromoform	4.59	0.50	0.50	"	5.00	ND	91.8	70-130			
Bromomethane	5.15	0.20	0.50	"	5.00	ND	103	70-130			
n-Butylbenzene	4.59	0.10	0.50	"	5.00	ND	91.8	70-130			
sec-Butylbenzene	4.98	0.10	0.50	"	5.00	ND	99.6	70-130			
tert-Butylbenzene	5.24	0.10	0.50	"	5.00	ND	105	70-130			
Carbon disulfide	4.96	0.20	0.50	"	5.00	ND	99.2	70-130			
Carbon tetrachloride	4.66	0.30	0.50	"	5.00	ND	93.2	70-130			
Chlorobenzene	4.99	0.20	0.50	"	5.00	ND	99.8	70-130			
Chloroethane	5.32	0.10	0.50	"	5.00	ND	106	70-130			
Chloroform	5.17	0.50	0.50	"	5.00	ND	103	70-130			
Chloromethane	5.63	0.20	0.50	"	5.00	ND	113	70-130			
2-Chlorotoluene	5.16	0.20	0.50	"	5.00	ND	103	70-130			
4-Chlorotoluene	4.98	0.10	0.50	"	5.00	ND	99.6	70-130			
Dibromochloromethane	4.86	0.50	0.50	"	5.00	ND	97.2	70-130			
1,2-Dibromo-3-chloropropane	5.18	0.36	0.50	"	5.00	ND	104	70-130			
1,2-Dibromoethane (EDB)	4.84	0.14	0.50	"	5.00	ND	96.8	70-130			
Dibromomethane	5.02	0.20	0.50	"	5.00	ND	100	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike (AB40523-MS1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
1,2-Dichlorobenzene	4.78	0.20	0.50	ug/l	5.00	ND	95.6	70-130			
1,3-Dichlorobenzene	4.99	0.20	0.50	"	5.00	ND	99.8	70-130			
1,4-Dichlorobenzene	4.65	0.10	0.50	"	5.00	ND	93.0	70-130			
trans-1,4-Dichloro-2-butene	3.95	0.095	5.0	"	5.00	ND	79.0	70-130			J
Dichlorodifluoromethane	5.90	0.20	0.50	"	5.00	ND	118	70-130			
1,1-Dichloroethane	5.27	0.10	0.50	"	5.00	ND	105	70-130			
1,2-Dichloroethane	5.05	0.20	0.50	"	5.00	ND	101	70-130			
1,1-Dichloroethene	5.18	0.10	0.30	"	5.00	ND	104	70-130			
cis-1,2-Dichloroethene	5.19	0.20	0.50	"	5.00	ND	104	70-130			
trans-1,2-Dichloroethene	5.01	0.20	0.50	"	5.00	ND	100	70-130			
1,2-Dichloropropane	4.78	0.20	0.50	"	5.00	ND	95.6	70-130			
1,3-Dichloropropane	4.94	0.20	0.50	"	5.00	ND	98.8	70-130			
2,2-Dichloropropane	4.69	0.10	0.50	"	5.00	ND	93.8	70-130			
1,1-Dichloropropene	4.67	0.10	0.50	"	5.00	ND	93.4	70-130			
cis-1,3-Dichloropropene	5.25	0.20	0.50	"	5.00	ND	105	70-130			
trans-1,3-Dichloropropene	4.29	0.20	0.50	"	5.00	ND	85.8	70-130			
2-Hexanone	4.68	0.097	5.0	"	5.00	ND	93.6	70-130			J
Ethylbenzene	5.04	0.10	0.50	"	5.00	ND	101	70-130			
Hexachlorobutadiene	4.29	0.30	0.50	"	5.00	ND	85.8	70-130			
Isopropylbenzene	5.29	0.20	0.50	"	5.00	ND	106	70-130			
p-Isopropyltoluene	5.08	0.10	0.50	"	5.00	ND	102	70-130			
Methyl ethyl ketone	10.3	0.40	1.0	"	10.0	ND	103	70-130			
Methyl iodide	5.38	0.12	2.0	"	5.00	ND	108	70-130			
Methyl isobutyl ketone	9.45	0.30	1.0	"	10.0	ND	94.5	70-130			
Methylene chloride	4.31	0.40	0.50	"	5.00	ND	86.2	70-130			
Naphthalene	5.17	0.20	0.50	"	5.00	ND	103	70-130			
n-Propylbenzene	5.36	0.20	0.50	"	5.00	ND	107	70-130			
Styrene	5.27	0.10	0.50	"	5.00	ND	105	70-130			
1,1,1,2-Tetrachloroethane	4.70	0.20	0.50	"	5.00	ND	94.0	70-130			
1,1,2,2-Tetrachloroethane	4.89	0.20	0.50	"	5.00	ND	97.8	70-130			
Tetrachloroethene	4.92	0.20	0.50	"	5.00	ND	98.4	70-130			
Toluene	5.00	0.10	0.50	"	5.00	ND	100	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike (AB40523-MS1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
1,2,3-Trichlorobenzene	5.13	0.10	0.50	ug/l	5.00	ND	103	70-130			
1,2,4-Trichlorobenzene	4.71	0.20	0.50	"	5.00	ND	94.2	70-130			
1,1,1-Trichloroethane	5.10	0.20	0.50	"	5.00	ND	102	70-130			
1,1,2-Trichloroethane	5.02	0.20	0.50	"	5.00	ND	100	70-130			
Trichloroethene	4.98	0.20	0.50	"	5.00	ND	99.6	70-130			
Trichlorofluoromethane	5.44	0.20	0.50	"	5.00	ND	109	70-130			
Trichlorotrifluoroethane	5.40	0.20	0.50	"	5.00	ND	108	70-130			
1,2,3-Trichloropropane	5.05	0.13	0.50	"	5.00	ND	101	70-130			
1,2,4-Trimethylbenzene	5.29	0.10	0.50	"	5.00	ND	106	70-130			
1,3,5-Trimethylbenzene	5.08	0.10	0.50	"	5.00	ND	102	70-130			
Vinyl chloride	5.05	0.10	0.50	"	5.00	ND	101	70-130			
m,p-Xylene	9.97	0.20	0.50	"	10.0	ND	99.7	70-130			
o-Xylene	5.12	0.10	0.50	"	5.00	ND	102	70-130			
Xylenes (total)	15.1	0.20	0.50	"	15.0	ND	101	70-130			
Methyl tert-butyl ether	4.49	0.50	0.50	"	5.00	ND	89.8	70-130			
Ethyl tert-butyl ether	4.96	0.20	0.50	"	5.00	ND	99.2	70-130			
Tert-amyl methyl ether	4.80	0.20	0.50	"	5.00	ND	96.0	70-130			
Surrogate: Bromofluorobenzene	*24.6*			*"*	*25.0*		*98.3*	*70-130*			
Surrogate: Dibromofluoromethane	*23.8*			*"*	*25.0*		*95.4*	*70-130*			
Surrogate: Toluene-d8	*24.6*			*"*	*25.0*		*98.5*	*70-130*			
Matrix Spike Dup (AB40523-MSD1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Acetone	21.7	0.80	5.0	ug/l	20.0	ND	109	70-130	0.971	30	
Acrylonitrile	5.22	0.20	5.0	"	5.00	ND	104	70-130	0.763	30	
Benzene	4.68	0.20	0.30	"	5.00	ND	93.6	70-130	2.32	30	
Bromobenzene	4.78	0.10	0.50	"	5.00	ND	95.6	70-130	6.67	30	
Bromochloromethane	5.02	0.20	0.50	"	5.00	ND	100	70-130	1.78	30	
Bromodichloromethane	4.78	0.50	0.50	"	5.00	ND	95.6	70-130	0.419	30	
Bromoform	4.59	0.50	0.50	"	5.00	ND	91.8	70-130	0.00	30	
Bromomethane	5.01	0.20	0.50	"	5.00	ND	100	70-130	2.76	30	
n-Butylbenzene	4.08	0.10	0.50	"	5.00	ND	81.6	70-130	11.8	30	
sec-Butylbenzene	4.45	0.10	0.50	"	5.00	ND	89.0	70-130	11.2	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike Dup (AB40523-MSD1)		**Source: 14A1588-01**		Prepared: 02/03/14 Analyzed: 02/04/14							
tert-Butylbenzene	4.78	0.10	0.50	ug/l	5.00	ND	95.6	70-130	9.18	30	
Carbon disulfide	4.67	0.20	0.50	"	5.00	ND	93.4	70-130	6.02	30	
Carbon tetrachloride	4.57	0.30	0.50	"	5.00	ND	91.4	70-130	1.95	30	
Chlorobenzene	4.71	0.20	0.50	"	5.00	ND	94.2	70-130	5.77	30	
Chloroethane	5.25	0.10	0.50	"	5.00	ND	105	70-130	1.32	30	
Chloroform	5.07	0.50	0.50	"	5.00	ND	101	70-130	1.95	30	
Chloromethane	5.41	0.20	0.50	"	5.00	ND	108	70-130	3.99	30	
2-Chlorotoluene	4.63	0.20	0.50	"	5.00	ND	92.6	70-130	10.8	30	
4-Chlorotoluene	4.54	0.10	0.50	"	5.00	ND	90.8	70-130	9.24	30	
Dibromochloromethane	4.71	0.50	0.50	"	5.00	ND	94.2	70-130	3.13	30	
1,2-Dibromo-3-chloropropane	5.18	0.36	0.50	"	5.00	ND	104	70-130	0.00	25	
1,2-Dibromoethane (EDB)	4.80	0.14	0.50	"	5.00	ND	96.0	70-130	0.830	25	
Dibromomethane	4.88	0.20	0.50	"	5.00	ND	97.6	70-130	2.83	30	
1,2-Dichlorobenzene	4.52	0.20	0.50	"	5.00	ND	90.4	70-130	5.59	30	
1,3-Dichlorobenzene	4.52	0.20	0.50	"	5.00	ND	90.4	70-130	9.88	30	
trans-1,4-Dichloro-2-butene	3.99	0.095	5.0	"	5.00	ND	79.8	70-130	1.01	25	J
1,4-Dichlorobenzene	4.33	0.10	0.50	"	5.00	ND	86.6	70-130	7.13	30	
Dichlorodifluoromethane	5.39	0.20	0.50	"	5.00	ND	108	70-130	9.03	30	
1,1-Dichloroethane	5.24	0.10	0.50	"	5.00	ND	105	70-130	0.571	30	
1,2-Dichloroethane	4.94	0.20	0.50	"	5.00	ND	98.8	70-130	2.20	30	
1,1-Dichloroethene	4.91	0.10	0.30	"	5.00	ND	98.2	70-130	5.35	30	
cis-1,2-Dichloroethene	5.13	0.20	0.50	"	5.00	ND	103	70-130	1.16	30	
trans-1,2-Dichloroethene	4.73	0.20	0.50	"	5.00	ND	94.6	70-130	5.75	30	
1,2-Dichloropropane	4.78	0.20	0.50	"	5.00	ND	95.6	70-130	0.00	30	
1,3-Dichloropropane	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	1.63	30	
2,2-Dichloropropane	4.67	0.10	0.50	"	5.00	ND	93.4	70-130	0.427	30	
1,1-Dichloropropene	4.38	0.10	0.50	"	5.00	ND	87.6	70-130	6.41	30	
cis-1,3-Dichloropropene	5.17	0.20	0.50	"	5.00	ND	103	70-130	1.54	30	
trans-1,3-Dichloropropene	4.23	0.20	0.50	"	5.00	ND	84.6	70-130	1.41	30	
Ethylbenzene	4.69	0.10	0.50	"	5.00	ND	93.8	70-130	7.19	30	
2-Hexanone	4.63	0.097	5.0	"	5.00	ND	92.6	70-130	1.07	25	J
Hexachlorobutadiene	4.09	0.30	0.50	"	5.00	ND	81.8	70-130	4.77	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike Dup (AB40523-MSD1)		**Source: 14A1588-01**		Prepared: 02/03/14 Analyzed: 02/04/14							
Isopropylbenzene	4.79	0.20	0.50	ug/l	5.00	ND	95.8	70-130	9.92	30	
p-Isopropyltoluene	4.42	0.10	0.50	"	5.00	ND	88.4	70-130	13.9	30	
Methyl ethyl ketone	10.2	0.40	1.0	"	10.0	ND	102	70-130	1.56	30	
Methyl iodide	5.32	0.12	2.0	"	5.00	ND	106	70-130	1.12	25	
Methyl isobutyl ketone	9.31	0.30	1.0	"	10.0	ND	93.1	70-130	1.49	30	
Methylene chloride	4.17	0.40	0.50	"	5.00	ND	83.4	70-130	3.30	30	
Naphthalene	5.24	0.20	0.50	"	5.00	ND	105	70-130	1.34	30	
n-Propylbenzene	4.69	0.20	0.50	"	5.00	ND	93.8	70-130	13.3	30	
Styrene	4.91	0.10	0.50	"	5.00	ND	98.2	70-130	7.07	30	
1,1,1,2-Tetrachloroethane	4.58	0.20	0.50	"	5.00	ND	91.6	70-130	2.59	30	
1,1,2,2-Tetrachloroethane	4.78	0.20	0.50	"	5.00	ND	95.6	70-130	2.28	30	
Tetrachloroethene	4.32	0.20	0.50	"	5.00	ND	86.4	70-130	13.0	30	
Toluene	4.75	0.10	0.50	"	5.00	ND	95.0	70-130	5.13	30	
1,2,3-Trichlorobenzene	5.01	0.10	0.50	"	5.00	ND	100	70-130	2.37	30	
1,2,4-Trichlorobenzene	4.41	0.20	0.50	"	5.00	ND	88.2	70-130	6.58	30	
1,1,1-Trichloroethane	5.04	0.20	0.50	"	5.00	ND	101	70-130	1.18	30	
1,1,2-Trichloroethane	4.88	0.20	0.50	"	5.00	ND	97.6	70-130	2.83	30	
Trichloroethene	4.70	0.20	0.50	"	5.00	ND	94.0	70-130	5.79	30	
Trichlorofluoromethane	5.05	0.20	0.50	"	5.00	ND	101	70-130	7.44	30	
Trichlorotrifluoroethane	4.83	0.20	0.50	"	5.00	ND	96.6	70-130	11.1	30	
1,2,3-Trichloropropane	4.84	0.13	0.50	"	5.00	ND	96.8	70-130	4.25	25	
1,2,4-Trimethylbenzene	4.73	0.10	0.50	"	5.00	ND	94.6	70-130	11.2	30	
1,3,5-Trimethylbenzene	4.58	0.10	0.50	"	5.00	ND	91.6	70-130	10.4	30	
Vinyl chloride	4.75	0.10	0.50	"	5.00	ND	95.0	70-130	6.12	30	
m,p-Xylene	9.08	0.20	0.50	"	10.0	ND	90.8	70-130	9.34	30	
o-Xylene	4.80	0.10	0.50	"	5.00	ND	96.0	70-130	6.45	30	
Xylenes (total)	13.9	0.20	0.50	"	15.0	ND	92.5	70-130	8.35	30	
Methyl tert-butyl ether	4.48	0.50	0.50	"	5.00	ND	89.6	70-130	0.223	30	
Ethyl tert-butyl ether	4.97	0.20	0.50	"	5.00	ND	99.4	70-130	0.201	30	
Tert-amyl methyl ether	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	1.24	30	
Surrogate: Bromofluorobenzene	*24.6*			*"*	*25.0*		*98.6*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*96.0*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike Dup (AB40523-MSD1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Surrogate: Toluene-d8	*24.4*			*ug/l*	*25.0*		*97.4*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
Blank (AA43038-BLK1)					Prepared: 01/30/14 Analyzed: 01/31/14						
Aldrin	ND	0.010	0.050	ug/l							U
Chloroneb	ND	0.20	0.50	"							U
Chlorobenzilate	ND	2.0	5.0	"							U
Chlorothalonil	ND	0.030	0.10	"							U
DCPA	ND	0.020	0.040	"							U
4,4´-DDD	ND	0.020	0.050	"							U
4,4´-DDE	ND	0.020	0.050	"							U
4,4´-DDT	ND	0.020	0.020	"							U
Dieldrin	ND	0.010	0.010	"							U
Endosulfan I	ND	0.020	0.050	"							U
Endosulfan II	ND	0.020	0.050	"							U
Endosulfan sulfate	ND	0.020	0.020	"							U
Endrin	ND	0.030	0.10	"							U
Endrin aldehyde	ND	0.020	0.050	"							U
HCH-alpha	ND	0.010	0.050	"							U
HCH-beta	ND	0.020	0.050	"							U
HCH-delta	ND	0.030	0.050	"							U
HCH-gamma (Lindane)	ND	0.010	0.010	"							U
Heptachlor	ND	0.010	0.010	"							U
Heptachlor epoxide	ND	0.010	0.010	"							U
Hexachlorocyclopentadiene	ND	0.040	0.40	"							U
Hexachlorobenzene	ND	0.010	0.040	"							U
Methoxychlor	ND	0.020	0.020	"							U
cis-Permethrin	ND	0.070	0.20	"							U
trans-Permethrin	ND	0.090	0.20	"							U
Propachlor	ND	0.070	0.20	"							U
Trifluralin	ND	0.020	0.040	"							U
PCB-1016	ND	0.030	0.50	"							U
PCB-1221	ND	0.030	0.50	"							U
PCB-1232	ND	0.030	0.50	"							U
PCB-1242	ND	0.030	0.50	"							U
PCB-1248	ND	0.030	0.50	"							U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
Blank (AA43038-BLK1)					Prepared: 01/30/14 Analyzed: 01/31/14						
PCB-1254	ND	0.030	0.50	ug/l							U
PCB-1260	ND	0.030	0.50	"							U
Total PCBs	ND	0.30	0.50	"							U
Toxaphene	ND	0.40	0.50	"							U
Chlordane (tech)	ND	0.030	0.050	"							U
Surrogate: Dibutylchlorendate	*0.959*			*"*	*0.952*		*101*	*70-130*			
LCS (AA43038-BS1)					Prepared: 01/30/14 Analyzed: 02/01/14						
Aldrin	0.258	0.010	0.050	ug/l	0.280		92.3	70-130			
Chloroneb	2.60	0.20	0.50	"	2.80		92.8	70-130			
Chlorobenzilate	3.09	2.0	5.0	"	2.80		110	70-130			J
Chlorothalonil	0.299	0.030	0.10	"	0.280		107	70-130			
DCPA	0.284	0.020	0.040	"	0.280		101	70-130			
4,4´-DDD	0.202	0.020	0.050	"	0.280		72.2	70-130			
4,4´-DDE	0.274	0.020	0.050	"	0.280		98.0	70-130			
4,4´-DDT	0.275	0.020	0.020	"	0.280		98.1	70-130			
Dieldrin	0.278	0.010	0.010	"	0.280		99.4	70-130			
Endosulfan I	0.280	0.020	0.050	"	0.280		99.9	70-130			
Endosulfan II	0.273	0.020	0.050	"	0.280		97.6	70-130			
Endosulfan sulfate	0.287	0.020	0.020	"	0.280		102	70-130			
Endrin	0.303	0.030	0.10	"	0.280		108	70-130			
Endrin aldehyde	0.284	0.020	0.050	"	0.280		101	70-130			
HCH-alpha	0.259	0.010	0.050	"	0.280		92.6	70-130			
HCH-beta	0.272	0.020	0.050	"	0.280		97.0	70-130			
HCH-delta	0.276	0.030	0.050	"	0.280		98.7	70-130			
HCH-gamma (Lindane)	0.267	0.010	0.010	"	0.280		95.3	70-130			
Heptachlor	0.264	0.010	0.010	"	0.280		94.3	70-130			
Heptachlor epoxide	0.269	0.010	0.010	"	0.280		96.1	70-130			
Hexachlorobenzene	0.227	0.010	0.040	"	0.280		81.0	70-130			
Hexachlorocyclopentadiene	0.325	0.040	0.40	"	0.560		58.0	15-90			J
Methoxychlor	0.283	0.020	0.020	"	0.280		101	70-130			
cis-Permethrin	1.50	0.070	0.20	"	1.40		107	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
LCS (AA43038-BS1)					Prepared: 01/30/14 Analyzed: 02/01/14						
trans-Permethrin	1.53	0.090	0.20	ug/l	1.40		109	70-130			
Propachlor	0.290	0.070	0.20	"	0.280		104	70-130			
Trifluralin	0.411	0.020	0.040	"	0.420		97.8	70-130			
Surrogate: Dibutylchlorendate	*0.912*			*"*	*0.952*		*95.8*	*70-130*			
LCS Dup (AA43038-BSD1)					Prepared: 01/30/14 Analyzed: 02/01/14						
Aldrin	0.268	0.010	0.050	ug/l	0.280		95.7	70-130	3.62	25	
Chloroneb	2.71	0.20	0.50	"	2.80		96.7	70-130	4.09	25	
Chlorobenzilate	3.24	2.0	5.0	"	2.80		116	70-130	4.70	25	J
Chlorothalonil	0.311	0.030	0.10	"	0.280		111	70-130	4.00	25	
DCPA	0.294	0.020	0.040	"	0.280		105	70-130	3.49	25	
4,4´-DDD	0.210	0.020	0.050	"	0.280		75.2	70-130	3.96	25	
4,4´-DDE	0.286	0.020	0.050	"	0.280		102	70-130	4.27	25	
4,4´-DDT	0.288	0.020	0.020	"	0.280		103	70-130	4.76	25	
Dieldrin	0.290	0.010	0.010	"	0.280		104	70-130	4.19	25	
Endosulfan I	0.291	0.020	0.050	"	0.280		104	70-130	4.03	25	
Endosulfan II	0.283	0.020	0.050	"	0.280		101	70-130	3.55	25	
Endosulfan sulfate	0.301	0.020	0.020	"	0.280		107	70-130	4.76	25	
Endrin	0.316	0.030	0.10	"	0.280		113	70-130	4.19	25	
Endrin aldehyde	0.296	0.020	0.050	"	0.280		106	70-130	4.05	25	
HCH-alpha	0.272	0.010	0.050	"	0.280		97.3	70-130	4.91	25	
HCH-beta	0.282	0.020	0.050	"	0.280		101	70-130	3.61	25	
HCH-delta	0.288	0.030	0.050	"	0.280		103	70-130	4.18	25	
HCH-gamma (Lindane)	0.279	0.010	0.010	"	0.280		99.7	70-130	4.50	25	
Heptachlor	0.273	0.010	0.010	"	0.280		97.7	70-130	3.56	25	
Heptachlor epoxide	0.281	0.010	0.010	"	0.280		100	70-130	4.42	25	
Hexachlorocyclopentadiene	0.345	0.040	0.40	"	0.560		61.7	15-90	6.10	50	J
Hexachlorobenzene	0.240	0.010	0.040	"	0.280		85.6	70-130	5.53	25	
Methoxychlor	0.298	0.020	0.020	"	0.280		106	70-130	5.01	25	
cis-Permethrin	1.58	0.070	0.20	"	1.40		113	70-130	5.41	25	
trans-Permethrin	1.62	0.090	0.20	"	1.40		116	70-130	5.91	25	
Propachlor	0.301	0.070	0.20	"	0.280		108	70-130	3.83	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
LCS Dup (AA43038-BSD1)					Prepared: 01/30/14 Analyzed: 02/01/14						
Trifluralin	0.427	0.020	0.040	ug/l	0.420		102	70-130	3.96	25	
Surrogate: Dibutylchlorendate	*0.941*			*"*	*0.952*		*98.8*	*70-130*			
Matrix Spike (AA43038-MS1)		**Source: 14A1635-01**			Prepared: 01/30/14 Analyzed: 02/01/14						
Aldrin	0.255	0.010	0.050	ug/l	0.280	ND	91.2	70-130			
Chloroneb	2.50	0.20	0.50	"	2.80	ND	89.2	70-130			
Chlorobenzilate	3.12	2.0	5.0	"	2.80	ND	111	70-130			J
Chlorothalonil	0.299	0.030	0.10	"	0.280	ND	107	70-130			
DCPA	0.285	0.020	0.040	"	0.280	ND	102	70-130			
4,4´-DDD	0.222	0.020	0.050	"	0.280	ND	79.3	70-130			
4,4´-DDE	0.280	0.020	0.050	"	0.280	ND	100	70-130			
4,4´-DDT	0.281	0.020	0.020	"	0.280	ND	100	70-130			
Dieldrin	0.284	0.010	0.010	"	0.280	ND	102	70-130			
Endosulfan I	0.280	0.020	0.050	"	0.280	ND	100	70-130			
Endosulfan II	0.283	0.020	0.050	"	0.280	ND	101	70-130			
Endosulfan sulfate	0.292	0.020	0.020	"	0.280	ND	104	70-130			
Endrin	0.306	0.030	0.10	"	0.280	ND	109	70-130			
Endrin aldehyde	0.284	0.020	0.050	"	0.280	ND	102	70-130			
HCH-alpha	0.257	0.010	0.050	"	0.280	ND	91.9	70-130			
HCH-beta	0.273	0.020	0.050	"	0.280	ND	97.5	70-130			
HCH-delta	0.279	0.030	0.050	"	0.280	ND	99.8	70-130			
HCH-gamma (Lindane)	0.267	0.010	0.010	"	0.280	ND	95.3	70-130			
Heptachlor	0.261	0.010	0.010	"	0.280	ND	93.2	70-130			
Heptachlor epoxide	0.277	0.010	0.010	"	0.280	ND	98.8	70-130			
Hexachlorocyclopentadiene	0.358	0.040	0.40	"	0.560	ND	63.9	15-90			J
Hexachlorobenzene	0.225	0.010	0.040	"	0.280	ND	80.4	70-130			
Methoxychlor	0.297	0.020	0.020	"	0.280	ND	106	70-130			
cis-Permethrin	1.40	0.070	0.20	"	1.40	ND	100	70-130			
trans-Permethrin	1.44	0.090	0.20	"	1.40	ND	103	70-130			
Propachlor	0.285	0.070	0.20	"	0.280	ND	102	70-130			
Trifluralin	0.414	0.020	0.040	"	0.420	ND	98.6	70-130			
Surrogate: Dibutylchlorendate	*0.934*			*"*	*0.952*		*98.1*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
Matrix Spike Dup (AA43038-MSD1)		**Source: 14A1635-01**		Prepared: 01/30/14 Analyzed: 02/01/14							
Aldrin	0.255	0.010	0.050	ug/l	0.280	ND	91.1	70-130	0.148	25	
Chloroneb	2.55	0.20	0.50	"	2.80	ND	91.2	70-130	2.25	25	
Chlorobenzilate	3.18	2.0	5.0	"	2.80	ND	114	70-130	2.03	25	J
Chlorothalonil	0.302	0.030	0.10	"	0.280	ND	108	70-130	0.907	25	
DCPA	0.288	0.020	0.040	"	0.280	ND	103	70-130	1.15	25	
4,4´-DDD	0.223	0.020	0.050	"	0.280	ND	79.8	70-130	0.557	25	
4,4´-DDE	0.280	0.020	0.050	"	0.280	ND	100	70-130	0.148	25	
4,4´-DDT	0.284	0.020	0.020	"	0.280	ND	102	70-130	1.18	25	
Dieldrin	0.286	0.010	0.010	"	0.280	ND	102	70-130	0.667	25	
Endosulfan I	0.285	0.020	0.050	"	0.280	ND	102	70-130	1.64	25	
Endosulfan II	0.283	0.020	0.050	"	0.280	ND	101	70-130	0.0502	25	
Endosulfan sulfate	0.296	0.020	0.020	"	0.280	ND	106	70-130	1.20	25	
Endrin	0.310	0.030	0.10	"	0.280	ND	111	70-130	1.51	25	
Endrin aldehyde	0.290	0.020	0.050	"	0.280	ND	103	70-130	1.83	25	
HCH-alpha	0.261	0.010	0.050	"	0.280	ND	93.3	70-130	1.48	25	
HCH-beta	0.276	0.020	0.050	"	0.280	ND	98.7	70-130	1.17	25	
HCH-delta	0.283	0.030	0.050	"	0.280	ND	101	70-130	1.39	25	
HCH-gamma (Lindane)	0.270	0.010	0.010	"	0.280	ND	96.4	70-130	1.15	25	
Heptachlor	0.263	0.010	0.010	"	0.280	ND	94.0	70-130	0.878	25	
Heptachlor epoxide	0.277	0.010	0.010	"	0.280	ND	98.8	70-130	0.00397	25	
Hexachlorocyclopentadiene	0.366	0.040	0.40	"	0.560	ND	65.4	15-90	2.41	50	J
Hexachlorobenzene	0.229	0.010	0.040	"	0.280	ND	81.8	70-130	1.71	25	
Methoxychlor	0.299	0.020	0.020	"	0.280	ND	107	70-130	0.522	25	
cis-Permethrin	1.37	0.070	0.20	"	1.40	ND	97.6	70-130	2.67	25	
trans-Permethrin	1.41	0.090	0.20	"	1.40	ND	101	70-130	1.64	25	
Propachlor	0.297	0.070	0.20	"	0.280	ND	106	70-130	4.07	25	
Trifluralin	0.416	0.020	0.040	"	0.420	ND	99.0	70-130	0.441	25	
Surrogate: Dibutylchlorendate	*0.955*			*"*	*0.952*		*100*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Blank (AB40730-BLK1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	ND	0.50	0.50	ug/l							U
Atrazine	ND	0.30	0.50	"							U
Bromacil	ND	0.50	5.0	"							U
Butachlor	ND	0.40	0.50	"							U
Dimethoate	ND	0.20	1.0	"							U
Metolachlor	ND	0.30	0.50	"							U
Metribuzin	ND	0.40	0.50	"							U
Molinate	ND	0.20	0.50	"							U
Prometryn	ND	0.50	0.50	"							U
Propachlor	ND	0.30	0.50	"							U
Simazine	ND	0.30	0.50	"							U
Thiobencarb	ND	0.20	1.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.69*			*"*	*2.00*		*84.3*	*70-130*			
LCS (AB40730-BS1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.88	0.50	0.50	ug/l	2.00		94.2	62-128			
Atrazine	1.92	0.30	0.50	"	2.00		96.1	62-122			
Bromacil	1.94	0.50	5.0	"	2.00		96.9	61-121			J
Butachlor	1.99	0.40	0.50	"	2.00		99.3	66-126			
Dimethoate	1.97	0.20	1.0	"	2.00		98.3	67-127			
Metolachlor	1.93	0.30	0.50	"	2.00		96.6	63-123			
Metribuzin	1.91	0.40	0.50	"	2.00		95.4	71-131			
Molinate	1.95	0.20	0.50	"	2.00		97.4	44-137			
Prometryn	1.95	0.50	0.50	"	2.00		97.6	63-123			
Propachlor	1.95	0.30	0.50	"	2.00		97.3	66-126			
Simazine	1.94	0.30	0.50	"	2.00		96.9	70-130			
Thiobencarb	2.01	0.20	1.0	"	2.00		100	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.80*			*"*	*2.00*		*89.8*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
LCS Dup (AB40730-BSD1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	2.02	0.50	0.50	ug/l	2.00		101	62-128	6.95	30	
Atrazine	2.01	0.30	0.50	"	2.00		100	62-122	4.47	30	
Bromacil	2.14	0.50	5.0	"	2.00		107	61-121	10.0	30	J
Butachlor	2.09	0.40	0.50	"	2.00		105	66-126	5.23	30	
Dimethoate	2.17	0.20	1.0	"	2.00		108	67-127	9.82	30	
Metolachlor	2.02	0.30	0.50	"	2.00		101	63-123	4.37	30	
Metribuzin	2.04	0.40	0.50	"	2.00		102	71-131	6.92	30	
Molinate	1.94	0.20	0.50	"	2.00		96.8	44-137	0.569	30	
Prometryn	2.07	0.50	0.50	"	2.00		103	63-123	5.75	30	
Propachlor	2.00	0.30	0.50	"	2.00		100	66-126	2.80	30	
Simazine	2.09	0.30	0.50	"	2.00		105	70-130	7.61	30	
Thiobencarb	2.19	0.20	1.0	"	2.00		109	69-129	8.57	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.85*			*"*	*2.00*		*92.6*	*70-130*			
Matrix Spike (AB40730-MS1)		**Source: 14A1588-01**			Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.81	0.50	0.50	ug/l	2.00	ND	90.7	62-128			
Atrazine	1.79	0.30	0.50	"	2.00	ND	89.7	62-122			
Bromacil	1.75	0.50	5.0	"	2.00	ND	87.5	61-121			J
Butachlor	1.85	0.40	0.50	"	2.00	ND	92.6	66-126			
Dimethoate	1.70	0.20	1.0	"	2.00	ND	84.9	67-127			
Metolachlor	1.82	0.30	0.50	"	2.00	ND	91.2	63-123			
Metribuzin	1.78	0.40	0.50	"	2.00	ND	89.2	71-131			
Molinate	1.87	0.20	0.50	"	2.00	ND	93.4	44-137			
Prometryn	1.68	0.50	0.50	"	2.00	ND	83.9	63-123			
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.6	66-126			
Simazine	1.85	0.30	0.50	"	2.00	ND	92.5	70-130			
Thiobencarb	1.90	0.20	1.0	"	2.00	ND	95.2	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.51*			*"*	*2.00*		*75.3*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Matrix Spike Dup (AB40730-MSD1)		**Source: 14A1588-01**		Prepared: 02/08/14 Analyzed: 02/11/14							
Alachlor	1.91	0.50	0.50	ug/l	2.00	ND	95.3	62-128	4.97	30	
Atrazine	1.96	0.30	0.50	"	2.00	ND	98.2	62-122	9.04	30	
Bromacil	2.13	0.50	5.0	"	2.00	ND	107	61-121	19.7	30	J
Butachlor	2.02	0.40	0.50	"	2.00	ND	101	66-126	8.67	30	
Dimethoate	2.14	0.20	1.0	"	2.00	ND	107	67-127	23.0	30	
Metolachlor	1.96	0.30	0.50	"	2.00	ND	97.9	63-123	7.12	30	
Metribuzin	2.02	0.40	0.50	"	2.00	ND	101	71-131	12.3	30	
Molinate	1.79	0.20	0.50	"	2.00	ND	89.6	44-137	4.16	30	
Prometryn	2.02	0.50	0.50	"	2.00	ND	101	63-123	18.4	30	
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.4	66-126	0.171	30	
Simazine	2.07	0.30	0.50	"	2.00	ND	104	70-130	11.3	30	
Thiobencarb	1.96	0.20	1.0	"	2.00	ND	97.8	69-129	2.64	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.60*			*"*	*2.00*		*79.9*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Organic Analytes by EPA Method 504.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40359 - EPA 504.1											
Blank (AB40359-BLK1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l							U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"							U
LCS (AB40359-BS1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.262	0.0040	0.010	ug/l	0.250		105	70-130			
1,2-Dibromoethane (EDB)	0.255	0.0050	0.020	"	0.250		102	70-130			
LCS Dup (AB40359-BSD1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.273	0.0040	0.010	ug/l	0.250		109	70-130	4.17	25	
1,2-Dibromoethane (EDB)	0.270	0.0050	0.020	"	0.250		108	70-130	5.47	25	
Matrix Spike (AB40359-MS1)		**Source: 14A1588-01**			Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.212	0.0040	0.010	ug/l	0.250	ND	84.8	70-130			
1,2-Dibromoethane (EDB)	0.214	0.0050	0.020	"	0.250	ND	85.5	70-130			
Matrix Spike Dup (AB40359-MSD1)		**Source: 14A1588-01**			Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.211	0.0040	0.010	ug/l	0.250	ND	84.2	70-130	0.698	25	
1,2-Dibromoethane (EDB)	0.212	0.0050	0.020	"	0.250	ND	84.8	70-130	0.771	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
Blank (AB40536-BLK1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	ND	0.50	1.0	ug/l							U
Bentazon	ND	0.40	0.40	"							U
2,4-D	ND	0.80	1.0	"							U
Dalapon	ND	6.0	6.0	"							U
2,4-DB	ND	4.0	5.0	"							U
Dicamba	ND	0.40	0.40	"							U
Dichlorprop	ND	1.0	1.0	"							U
Dinoseb	ND	0.80	1.0	"							U
4-Nitrophenol	ND	0.70	1.0	"							U
Pentachlorophenol	ND	0.20	0.20	"							U
Picloram	ND	0.50	1.0	"							U
2,4,5-T	ND	0.40	0.50	"							U
2,4,5-TP (Silvex)	ND	0.50	0.50	"							U
Surrogate: DCAA	*13.2*			*"*	*14.2*		*93.2*	*70-130*			
LCS (AB40536-BS1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	1.04	0.50	1.0	ug/l	0.960		109	70-130			
Bentazon	1.48	0.40	0.40	"	1.92		76.9	70-130			
2,4-D	1.68	0.80	1.0	"	1.92		87.8	48-124			
Dalapon	11.3	6.0	6.0	"	12.5		90.3	40-112			
2,4-DB	7.11	4.0	5.0	"	7.68		92.6	54-123			
Dicamba	0.876	0.40	0.40	"	0.960		91.3	70-130			
Dichlorprop	2.70	1.0	1.0	"	2.88		93.7	54-106			
Dinoseb	5.59	0.80	1.0	"	6.42		87.1	20-105			
4-Nitrophenol	1.13	0.70	1.0	"	0.960		117	60-202			
Pentachlorophenol	0.840	0.20	0.20	"	0.960		87.5	70-130			
Picloram	1.07	0.50	1.0	"	0.960		111	70-130			
2,4,5-T	0.892	0.40	0.50	"	0.960		93.0	68-166			
2,4,5-TP (Silvex)	0.900	0.50	0.50	"	0.960		93.7	70-130			
Surrogate: DCAA	*14.5*			*"*	*14.2*		*102*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
LCS Dup (AB40536-BSD1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	1.03	0.50	1.0	ug/l	0.960		108	70-130	0.944	50	
Bentazon	1.63	0.40	0.40	"	1.92		84.8	70-130	9.86	50	
2,4-D	1.69	0.80	1.0	"	1.92		88.0	48-124	0.327	50	
Dalapon	11.4	6.0	6.0	"	12.5		91.2	40-112	0.968	50	
2,4-DB	7.24	4.0	5.0	"	7.68		94.3	54-123	1.84	50	
Dicamba	0.877	0.40	0.40	"	0.960		91.4	70-130	0.0891	50	
Dichlorprop	2.69	1.0	1.0	"	2.88		93.5	54-106	0.220	50	
Dinoseb	5.77	0.80	1.0	"	6.42		89.9	20-105	3.18	50	
4-Nitrophenol	0.901	0.70	1.0	"	0.960		93.8	60-202	22.3	50	J
Pentachlorophenol	0.841	0.20	0.20	"	0.960		87.6	70-130	0.0986	50	
Picloram	0.964	0.50	1.0	"	0.960		100	70-130	10.5	50	J
2,4,5-T	0.931	0.40	0.50	"	0.960		96.9	68-166	4.18	50	
2,4,5-TP (Silvex)	0.964	0.50	0.50	"	0.960		100	70-130	6.85	50	
Surrogate: DCAA	*14.2*			*"*	*14.2*		*99.8*	*70-130*			
Matrix Spike (AB40536-MS1)		**Source: 14A1588-01**			Prepared: 02/06/14 Analyzed: 02/08/14						
Acifluorfen	0.696	0.50	1.0	ug/l	0.960	ND	72.5	70-130			J
Bentazon	1.79	0.40	0.40	"	1.92	ND	93.0	70-130			
2,4-D	1.50	0.80	1.0	"	1.92	ND	78.3	48-124			
Dalapon	11.1	6.0	6.0	"	12.5	ND	88.8	40-112			
2,4-DB	7.08	4.0	5.0	"	7.68	ND	92.2	54-123			
Dicamba	0.867	0.40	0.40	"	0.960	ND	90.3	70-130			
Dichlorprop	2.75	1.0	1.0	"	2.88	ND	95.6	54-106			
Dinoseb	5.23	0.80	1.0	"	6.42	ND	81.4	20-105			
4-Nitrophenol	0.969	0.70	1.0	"	0.960	ND	101	60-202			J
Pentachlorophenol	0.642	0.20	0.20	"	0.960	ND	66.9	70-130			QM-07
Picloram	0.973	0.50	1.0	"	0.960	ND	101	70-130			J
2,4,5-T	0.862	0.40	0.50	"	0.960	ND	89.8	68-166			
2,4,5-TP (Silvex)	0.911	0.50	0.50	"	0.960	ND	94.9	70-130			
Surrogate: DCAA	*13.8*			*"*	*14.2*		*97.5*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
Matrix Spike Dup (AB40536-MSD1)		**Source: 14A1588-01**		Prepared: 02/06/14 Analyzed: 02/08/14							
Acifluorfen	0.926	0.50	1.0	ug/l	0.960	ND	96.5	70-130	28.3	50	J
Bentazon	1.79	0.40	0.40	"	1.92	ND	93.5	70-130	0.474	50	
2,4-D	1.64	0.80	1.0	"	1.92	ND	85.2	48-124	8.45	50	
Dalapon	11.5	6.0	6.0	"	12.5	ND	92.3	40-112	3.86	50	
2,4-DB	7.32	4.0	5.0	"	7.68	ND	95.4	54-123	3.40	50	
Dicamba	0.910	0.40	0.40	"	0.960	ND	94.8	70-130	4.86	50	
Dichlorprop	2.90	1.0	1.0	"	2.88	ND	101	54-106	5.12	50	
Dinoseb	5.49	0.80	1.0	"	6.42	ND	85.5	20-105	4.84	50	
4-Nitrophenol	1.04	0.70	1.0	"	0.960	ND	108	60-202	6.64	50	
Pentachlorophenol	0.721	0.20	0.20	"	0.960	ND	75.1	70-130	11.5	50	
Picloram	1.16	0.50	1.0	"	0.960	ND	121	70-130	17.4	50	
2,4,5-T	0.945	0.40	0.50	"	0.960	ND	98.4	68-166	9.12	50	
2,4,5-TP (Silvex)	0.967	0.50	0.50	"	0.960	ND	101	70-130	5.94	50	
Surrogate: DCAA	*14.5*			*"*	*14.2*		*102*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA42932 - HPLC											
Blank (AA42932-BLK1)					Prepared & Analyzed: 01/30/14						
Aldicarb	ND	0.70	3.0	ug/l							U
Aldicarb sulfone	ND	0.70	4.0	"							U
Aldicarb sulfoxide	ND	0.80	3.0	"							U
Carbaryl	ND	0.70	5.0	"							U
Carbofuran	ND	2.0	5.0	"							U
3-Hydroxycarbofuran	ND	0.90	3.0	"							U
Methiocarb	ND	2.0	5.0	"							U
Methomyl	ND	2.0	2.0	"							U
Oxamyl	ND	0.80	20	"							U
Propoxur	ND	2.0	5.0	"							U
LCS (AA42932-BS1)					Prepared & Analyzed: 01/30/14						
Aldicarb	20.2	0.70	3.0	ug/l	20.0		101	80-120			
Aldicarb sulfone	19.4	0.70	4.0	"	19.0		102	80-120			
Aldicarb sulfoxide	19.6	0.80	3.0	"	19.8		98.9	80-120			
Carbaryl	19.3	0.70	5.0	"	20.0		96.4	80-120			
Carbofuran	20.4	2.0	5.0	"	20.0		102	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0		104	80-120			
Methiocarb	20.4	2.0	5.0	"	20.0		102	80-120			
Methomyl	20.5	2.0	2.0	"	20.0		102	80-120			
Oxamyl	19.3	0.80	20	"	20.0		96.5	80-120			J
Propoxur	20.5	2.0	5.0	"	20.0		103	80-120			
LCS Dup (AA42932-BSD1)					Prepared & Analyzed: 01/30/14						
Aldicarb	19.9	0.70	3.0	ug/l	20.0		99.3	80-120	1.91	20	
Aldicarb sulfone	20.1	0.70	4.0	"	19.0		106	80-120	3.52	20	
Aldicarb sulfoxide	19.8	0.80	3.0	"	19.8		99.8	80-120	0.858	20	
Carbaryl	20.7	0.70	5.0	"	20.0		104	80-120	7.36	20	
Carbofuran	21.9	2.0	5.0	"	20.0		109	80-120	6.80	20	
3-Hydroxycarbofuran	20.3	0.90	3.0	"	20.0		102	80-120	1.87	20	
Methiocarb	19.1	2.0	5.0	"	20.0		95.3	80-120	6.64	20	
Methomyl	20.4	2.0	2.0	"	20.0		102	80-120	0.165	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA42932 - HPLC											
LCS Dup (AA42932-BSD1)					Prepared & Analyzed: 01/30/14						
Oxamyl	19.5	0.80	20	ug/l	20.0		97.5	80-120	1.06	20	J
Propoxur	21.3	2.0	5.0	"	20.0		106	80-120	3.46	20	
Matrix Spike (AA42932-MS1)		**Source: 14A1643-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Aldicarb	19.4	0.70	3.0	ug/l	20.0	ND	97.2	80-120			
Aldicarb sulfone	19.6	0.70	4.0	"	19.0	ND	103	80-120			
Aldicarb sulfoxide	19.5	0.80	3.0	"	19.8	ND	98.6	80-120			
Carbaryl	20.0	0.70	5.0	"	20.0	ND	99.9	80-120			
Carbofuran	19.7	2.0	5.0	"	20.0	ND	98.4	80-120			
3-Hydroxycarbofuran	19.8	0.90	3.0	"	20.0	ND	98.9	80-120			
Methiocarb	19.1	2.0	5.0	"	20.0	ND	95.3	80-120			
Methomyl	20.3	2.0	2.0	"	20.0	ND	101	80-120			
Oxamyl	19.9	0.80	20	"	20.0	ND	99.7	80-120			J
Propoxur	19.8	2.0	5.0	"	20.0	ND	99.0	80-120			
Matrix Spike Dup (AA42932-MSD1)		**Source: 14A1643-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Aldicarb	18.6	0.70	3.0	ug/l	20.0	ND	92.9	80-120	4.53	20	
Aldicarb sulfone	19.0	0.70	4.0	"	19.0	ND	100	80-120	3.38	20	
Aldicarb sulfoxide	19.0	0.80	3.0	"	19.8	ND	96.1	80-120	2.58	20	
Carbaryl	19.3	0.70	5.0	"	20.0	ND	96.7	80-120	3.24	20	
Carbofuran	18.8	2.0	5.0	"	20.0	ND	94.1	80-120	4.43	20	
3-Hydroxycarbofuran	20.9	0.90	3.0	"	20.0	ND	104	80-120	5.39	20	
Methiocarb	18.4	2.0	5.0	"	20.0	ND	92.1	80-120	3.43	20	
Methomyl	19.6	2.0	2.0	"	20.0	ND	97.8	80-120	3.62	20	
Oxamyl	18.7	0.80	20	"	20.0	ND	93.3	80-120	6.68	20	J
Propoxur	19.5	2.0	5.0	"	20.0	ND	97.6	80-120	1.47	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Endothall by EPA Method 548.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40357 - EPA 548.1											
Blank (AB40357-BLK1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	ND	2.0	45	ug/l							U
LCS (AB40357-BS1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	209	2.0	45	ug/l	200		104	80-120			
LCS Dup (AB40357-BSD1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	217	2.0	45	ug/l	200		108	80-120	3.75	30	
Matrix Spike (AB40357-MS1)		**Source: 14A1588-01**			Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	187	2.0	45	ug/l	200	ND	93.7	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Glyphosate by EPA Method 547 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40427 - HPLC											
Blank (AB40427-BLK1)					Prepared & Analyzed: 02/04/14						
Glyphosate	ND	3.0	10	ug/l							U
LCS (AB40427-BS1)					Prepared & Analyzed: 02/04/14						
Glyphosate	111	3.0	10	ug/l	120		92.7	66-126			
LCS Dup (AB40427-BSD1)					Prepared & Analyzed: 02/04/14						
Glyphosate	112	3.0	10	ug/l	120		93.7	66-126	1.08	30	
Matrix Spike (AB40427-MS1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	111	3.0	10	ug/l	120	ND	92.7	66-126			
Matrix Spike Dup (AB40427-MSD1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	110	3.0	10	ug/l	120	ND	92.0	66-126	0.801	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Diquat by EPA Method 549.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43118 - HPLC											
Blank (AA43118-BLK1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	ND	2.0	2.0	ug/l							U
LCS (AA43118-BS1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	16.5	2.0	2.0	ug/l	19.8		83.3	70-130			
LCS Dup (AA43118-BSD1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	16.2	2.0	2.0	ug/l	19.8		81.6	70-130	2.03	25	
Matrix Spike (AA43118-MS1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	8.63	2.0	2.0	ug/l	19.8	ND	43.5	70-130			QM-05

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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408		Reported: 02/18/14 11:04

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40444 - EPA 552.2											
Blank (AB40444-BLK1)					Prepared: 02/05/14 Analyzed: 02/07/14						
Monobromoacetic Acid	ND	0.8	1.0	ug/l							U
Monochloroacetic Acid	ND	1.1	2.0	"							U
Dibromoacetic Acid	ND	0.8	1.0	"							U
Dichloroacetic Acid	ND	1.0	1.0	"							U
Trichloroacetic Acid	ND	1.0	1.0	"							U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"							U
Surrogate: 2,3-Dibromopropionic Acid	*8.41*			*"*	*10.0*		*83.8*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*10.5*			*"*	*10.0*		*105*	*70-130*			
LCS (AB40444-BS1)					Prepared: 02/05/14 Analyzed: 02/07/14						
Monobromoacetic Acid	22.8	0.8	1.0	ug/l	25.0		91.1	70-130			
Monochloroacetic Acid	25.3	1.1	2.0	"	25.0		101	70-130			
Dibromoacetic Acid	22.8	0.8	1.0	"	25.0		91.0	70-130			
Dichloroacetic Acid	23.2	1.0	1.0	"	25.0		93.0	70-130			
Trichloroacetic Acid	21.8	1.0	1.0	"	25.0		87.2	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*8.18*			*"*	*10.0*		*81.6*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*8.36*			*"*	*10.0*		*83.6*	*70-130*			
Matrix Spike (AB40444-MS1)		**Source: 14A1572-01**			Prepared: 02/05/14 Analyzed: 02/08/14						
Monobromoacetic Acid	26.0	0.8	1.0	ug/l	25.0	ND	104	70-130			
Monochloroacetic Acid	26.4	1.1	2.0	"	25.0	ND	106	70-130			
Dibromoacetic Acid	33.8	0.8	1.0	"	25.0	1.60	129	70-130			
Dichloroacetic Acid	25.3	1.0	1.0	"	25.0	ND	101	70-130			
Trichloroacetic Acid	25.6	1.0	1.0	"	25.0	1.23	97.4	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*12.4*			*"*	*10.0*		*124*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*11.4*			*"*	*10.0*		*114*	*70-130*			
Matrix Spike (AB40444-MS2)		**Source: 14A1702-01**			Prepared: 02/05/14 Analyzed: 02/08/14						
Monobromoacetic Acid	23.4	0.8	1.0	ug/l	25.0	ND	93.6	70-130			
Monochloroacetic Acid	25.5	1.1	2.0	"	25.0	ND	102	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:04

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40444 - EPA 552.2											
Matrix Spike (AB40444-MS2)		**Source: 14A1702-01**			Prepared: 02/05/14 Analyzed: 02/08/14						
Dibromoacetic Acid	31.1	0.8	1.0	ug/l	25.0	ND	124	70-130			
Dichloroacetic Acid	36.3	1.0	1.0	"	25.0	12.8	94.3	70-130			
Trichloroacetic Acid	34.6	1.0	1.0	"	25.0	12.2	89.6	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*12.7*			*"*	*10.0*		*127*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.49*			*"*	*10.0*		*94.9*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Blank (AB40727-BLK1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	ND	0.080	0.10	ug/l							U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"							U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.23*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*3.73*			*"*	*5.00*		*74.6*	*70-130*			
Surrogate: Triphenyl phosphate	*4.72*			*"*	*5.00*		*94.4*	*70-130*			
LCS (AB40727-BS1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.13	0.080	0.10	ug/l	3.00		71.0	70-130			
Di(2-ethylhexyl)adipate	2.49	0.40	5.0	"	3.00		83.0	70-130			J
Di(2-ethylhexyl)phthalate	2.40	0.20	3.0	"	3.00		80.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.36*			*"*	*5.00*		*107*	*70-130*			
Surrogate: Perylene-d12	*4.65*			*"*	*5.00*		*93.0*	*70-130*			
Surrogate: Triphenyl phosphate	*5.36*			*"*	*5.00*		*107*	*70-130*			
LCS Dup (AB40727-BSD1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.40	0.080	0.10	ug/l	3.00		80.0	70-130	11.9	20	
Di(2-ethylhexyl)adipate	2.70	0.40	5.0	"	3.00		90.0	70-130	8.09	20	J
Di(2-ethylhexyl)phthalate	2.57	0.20	3.0	"	3.00		85.7	70-130	6.84	20	J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.39*			*"*	*5.00*		*108*	*70-130*			
Surrogate: Perylene-d12	*4.84*			*"*	*5.00*		*96.8*	*70-130*			
Surrogate: Triphenyl phosphate	*5.47*			*"*	*5.00*		*109*	*70-130*			
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.79	0.080	0.10	ug/l	3.00	ND	93.0	70-130			
Di(2-ethylhexyl)adipate	3.11	0.40	5.0	"	3.00	ND	104	70-130			J
Di(2-ethylhexyl)phthalate	2.79	0.20	3.0	"	3.00	ND	93.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.27*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*5.52*			*"*	*5.00*		*110*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:04

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Surrogate: Triphenyl phosphate	*5.65*			*ug/l*	*5.00*		*113*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 11:04

Notes and Definitions

A-02	Dilution required due to high suspended solids. Data should be considered informational only.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ).
OD-1	Odor described as "WAX"
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
U	Analyte included in analysis, but not detected at or above MDL.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 1401906

Report Created for: Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Project Contact: David S. Pingatore
Project P.O.:
Project Name: #14A1643

Project Received: 01/31/2014

Analytical Report reviewed & approved for release on 02/06/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.

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http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: Alpha Analytical Laboratories
Project: #14A1643
WorkOrder: 1401906

Glossary Abbreviation	Description
95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

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Analytical Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1401906
Project:	#14A1643	**Extraction Method**	E218.6
Date Received:	1/31/14 12:19	**Analytical Method:**	E218.6
Date Prepared:	1/31/14	**Unit:**	µg/L

Hexachrome by IC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
MRWPCA MW-1	**1401906-001A**	**Water**	**01/29/2014 14:15**	**IC2**	**86616**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	**1.1**	0.050	1	01/31/2014 18:29

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Quality Control Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1401906
Date Prepared:	1/31/14	**BatchID:**	86616
Date Analyzed:	1/31/14	**Extraction Method**	E218.6
Instrument:	IC2	**Analytical Method:**	E218.6
Matrix:	Water	**Unit:**	µg/L
Project:	#14A1643	**Sample ID:**	MB/LCS-86616 1401905-001AMS/MSD

QC Summary Report for E218.6

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	ND	25.38	0.050	25	-	102	90-110

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	24.94	25.03	25	1.560	93.5	93.9	90-110	0.360	10

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1401906 **ClientCode: ALPU**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
David S. Pingatore
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482
(707) 468-0401 FAX: (707) 468-5267

Email: sspeaks@alpha-labs.com;david@alpha-lab
cc:
PO:
ProjectNo: #14A1643

Bill to:
Accounts Payable
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Requested TAT: 5 days

Date Received: 01/31/2014
Date Printed: 01/31/2014

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1401906-001	MRWPCA MW-1	Water	1/29/2014 14:15	☐	A											

Test Legend:

1	218_6_DW	2		3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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WORK ORDER SUMMARY

Client Name: ALPHA ANALYTICAL LABORATORIES
QC Level: LEVEL 2
Work Order: 1401906
Project: #14A1643
Client Contact: David S. Pingatore
Date Received: 1/31/2014
Comments:
Contact's Email: sspeaks@alpha-labs.com;david@alpha-labs.com

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Number of Containers	Bottle & Preservative	De-chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1401906-001A	MRWPCA MW-1	Water	E218.6 (Hexachrome)	1	250mL HDPE w/ (NH4)2SO4	☐	1/29/2014 14:15	5 days	Present	☐	

*** NOTE: STLC and TCLP extractions require 48 hrs to complete; therefore, all TATs begin after the extraction is completed (i.e., 24hr TAT yields results in 72 hrs from sample submission).**

Bottle Legend:

250mL HDPE w/ (NH4)2SO4 = 250mL HDPE Bottle w/ Ammonium Sulfate

1401906

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1643

SENDING LABORATORY:	**RECEIVING LABORATORY:**
Alpha Analytical Laboratories, Inc.	McCampbell Analytical
208 Mason St.	1534 Willowpass Rd.
Ukiah, CA 95482	Pittsburg, CA 94565
Phone: (707)468-0401	Phone :(925) 252-9262
Fax: (707)468-5267	Fax: (925) 252-9269
Project Manager: David S. Pingatore	**Terms: Net 30**

Analysis	Due	Expires	Comments
14A1643-01 MRWPCA MW-1 [Water] Sampled 01/29/14 14:15 Pacific			
Cr6 218.6 DW	02/13/14 12:00	02/03/14 14:15	
Containers Supplied:			
250ml Poly - (NH4)2SO4 (A			

☐ *Report to State*

System Name: NO **Employed by:**

User ID: **Sampler:**

System Number:

3.2

CONDITION APPROPRIATE
HEAD SPACE ABSENT CONTAINERS
DECHLORINATED IN LAB PRESERVED IN LAB

PRESERVATION	VOAS	O&G	METALS	OTHER

Released By	Date	Received By	Date
[signature]	01/31/14	[signature]	1/31/14
[signature]	1/31/14	[signature]	1/31/14 1158

Page 1 of 1

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http://www.mccampbell.com / E-mail: main@mccampbell.com

Sample Receipt Checklist

Client Name:	**Alpha Analytical Laboratories**	Date and Time Received:	**1/31/2014 12:19:55 PM**
Project Name:	**#14A1643**	LogIn Reviewed by:	Maria Venegas
WorkOrder N°:	**1401906** Matrix: Water	Carrier:	Client Drop-In

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☐	No ☑

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp: 3.2°C		NA ☐
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	NA ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑
Samples Received on Ice?	Yes ☑	No ☐	

(Ice Type: BLUE ICE)

** NOTE: If the "No" box is checked, see comments below.*

Comments:

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

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Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14A1643

Report to:	Invoice to (if different):	Project Info for Report:
Company: Todd Engineers	Company:	Project ID: Groundwater Reuse Project
Attn: Dr. Bill Motzer	Attn:	
Address: 2490 Mariner Square Loop, Suite 215 Alameda, CA 94501	Address:	Project No: Project # 60408
Phone/Fax: 510.747.6920 / 510.747.6921	Phone/Fax:	PO/Reference :
Email Address: bmotzer@toddengineers.com	Email Address:	

Samplers Signature:

Print:

Signature below authorizes work under terms stated on reverse side.

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only): Temperature: DU 4.8 / <12 deg. C; Shipment Method:; Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	Container: 40ml VOA	Poly	Amber glass	Soil jar		Preservative: NaOH	HNO3	H2SO4	Other	None	Matrix: Water	Soil		Total Number of Containers	Analyses Requested: Inorganics Scan, DU-General Physical Scan	200.7 - Ca, K, Mg, Na	200.8 - Ag, B, Cu, Fe, Mn, U, V, Zn	Bicarbonate, Chloride, Conductivity	MBAS, Perchlorate, TDS, Sulfate	HAA5, TOC	507, 508, 515, 525 DHS, 531, 547, 548, 549	504.1, 524.2 Sample Traps scan	Asbestos DW (sub TEM Lab)	Cr6 218.6 DW (sub MAI)	Dioxin 2,3,7,8 TCDD DW (sub UL)	Sample Notes or CDPH Source Numbers:
MRWPCA MW-1	1-29-14	1415		x	x			x	x			x	x			4	x	x	x	x	x							
			x		x						x		x			3						x						
				x	x						x	x	x			10							x					(507/508/515.1 = one 1L BRA ea)
			x								x		x			7								x				
					x							x	x			2									x			
				x							x		x			1										x		
					x							x	x			2											x	
Trip blank ($0.00 analysis)	1-29-14	1415	x								x	x	x			2								x				

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	1-29-14	1525
[signature]	Rodney Santillan	1/29/14	17:45
Rodney Santillan	[signature]	1-29-14	1850
[signature]	[signature]	1-29-14	2115

CDPH Write On EDT Transmission? ○ Yes ○ No

State System Number:

If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No

Global ID: Sampling Company Log Code:

EDF to (Email Address):

Travel and Site Time: Mileage: Misc. Supplies:

ASBESTOS TEM LABORATORIES, INC.

EPA 600/4-83 Drinking Water
Transmission Electron Microscopy
Analytical Report

Laboratory Job # 1288-00570

630 Bancroft Way
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

Certified by
CA DPH ELAP
Lab No. 1866

Feb/12/2014

David S. Pingatore
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482

RE: LABORATORY JOB # 1288-00570
Transmission electron microscopy analytical results for 1 water sample(s).
Job Site:
Job No.: 14A1643

Enclosed please find results for the TEM analysis of one or more water samples. The analytical procedures were performed according to EPA Method 100.2 for the analysis of asbestos in drinking water.

Prior to analysis, samples are checked for damage, disruption of any chain-of-custody seals, and completeness of accompanying paperwork. If no problems are found, samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

Preparation of water samples is performed within a HEPA filtered, Class 100 air, laminar flow clean bench environment. Prior to filtration, water sample containers are ultrasonicated, and the exterior surfaces cleaned. An aliquot of water is drawn from the sample container and drawn through a special filtration apparatus and collected onto a mixed cellulose ester (MCE) or polycarbonate (PC) filter. The filters are removed from the apparatus and dried. A portion of each sample filter is sectioned, placed onto a glass microscope slide, and carbon coated. The filters are further sectioned and placed carbon side up onto 200-mesh copper TEM sample grids in a solvent bath until all filter material is dissolved. The TEM grids are removed and placed into labeled grid storage boxes.

TEM analysis is performed on a Philips EM-300 or CM-12 transmission electron microscope operating at 80 or 100 kV. Initially, the grid is scanned at low and medium magnification to insure proper sample loading, and coherence of the carbon support film. Then TEM grid openings are analyzed at a magnification of 10,000X. All fibers >10 um in length and exhibiting an aspect ratio >3:1 are analyzed. Scanning continues until either 100 asbestiform fibers >10um in length are counted, or an analytical sensitivity of 0.2 million fibers per liter (MFL) is achieved. Analyzed fibers are subjected to detailed morphological and selected area diffraction (SAED) analysis. Fibers indicated as asbestos, or potentially asbestos, are further analyzed by energy dispersive X-ray (EDX) analysis as needed. The number of asbestos fibers detected, and other analytical parameters, are then used to calculate the concentration of asbestos in MFL. The results are entered into a standard report format and reviewed by the analyst and the laboratory manager before release to the client.

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

630 Bancroft Way • BERKELEY, CA 94710 • (510) 704-8930 • FAX (510) 704-8429
www.asbestostemlabs.com *With Offices in Reno, NV (775) 359-3377*

TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL REPORT

Contact:	David S. Pingatore		
Address:	Alpha Analytical Laboratories, Inc. 208 Mason Street Ukiah, CA 95482	Report No.:	323872
		Date:	Feb-12-14
Job Site / No.	14A1643	Total Samples Analyzed:	1
		Sample Collector:	

CLIENT SAMPLE #	**14A1643-01**	**SAMPLE LOCATION/DESCRIPTION**	MW-1
Laboratory Sample #	1288-00570-001		

WATER SAMPLE DATA

Date/Time Collected	Jan-29-14 / 2:15 pm	Volume Submitted (ml)	1000
Date/Time Lab Received	Jan-30-14 / 4:40 pm	Volume Filtered (ml)	1
Date/Time Filtered	Jan-30-14 / 7:20 pm	Filter & Pore Size	MCE 0.22
Date/Time Analyzed	Feb-12-14 / 9:50 am	UV/Ozone Treated:	NO

IDENTIFIED STRUCTURES (>10um)			
ASBESTOS		OTHER	
CHRYS	AMPH	AMBIG	NON-ASB
NSD	NSD	NSD	NSD

CALCULATED ASBESTOS STRUCTURE CONCENTRATION (>10um)		
CHRYS	AMPH	TOTAL
< 0.3 MFL	< 0.3 MFL	< 0.3 MFL

COMMENTS

No asbestos detected. Very heavy particle loading.

Filter Loading: HEAVY

SAED Photo ID Nos.

TEM / ANALYTICAL PARAMETERS

Grid Openings Scanned at 10,000X	40	Analytical Sensitivity	0.3 MFL
Grid Opening Area (mm2)	0.0094	95% UCL	1.00 MFL
Scan Area (mm2)	0.3760	95% LCL	0 MFL

WATER SAMPLE LAB BLANK RESULTS

Lab ID#	Blank 9485	Analytical Sensitivity	0.01 MFL
Grid Openings Scanned at 10,000X	8	Asbestos Structure Concentration	<0.01 MFL
Volume Filtered (ml)	300		

NOTATION KEY

Chrys. - Chrysotile Asbestos
Amph. - Amphibole Asbestos
NSD - No Structures Detected
1 mm = 1 millimeter

1 um = 1 micron = 0.001 mm
MFL = Millions of Fibers per Liter
UCL = Upper Confidence Level
LCL = Lower Confidence Level

ANALYST SIGNATURE

Stephanie Dunn
LAB QC REVIEWER SIGNATURE

ASBESTOS TEM LABORATORIES, INC.
www.asbestostemlabs.com
630 BANCROFT WAY, BERKELEY, CA 94710 (510) 704-8930
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ALS Environmental
ALS Group USA, Corp.
1317 South 13th Avenue
Kelso, WA 98626
T: +1 360 577 7222
F: +1 360 636 1068
www.alsglobal.com

February 20, 2014 Analytical Report for Service Request No: K1400990

David Pingatore
Alpha Analytical Laboratories, Inc.
6398 Dougherty Road, Suite 35
Dublin, CA 94568

RE: 14A1643

Dear David:

Enclosed are the results of the sample submitted to our laboratory on January 31, 2014. For your reference, these analyses have been assigned our service request number K1400990.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3293. You may also contact me via Email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Shar Samy, Ph.D.
Project Manager

SS/mj

RIGHT SOLUTIONS | RIGHT PARTNER

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2286
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L12-28
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Georgia DNR	http://www.gaepd.org/Documents/techguide_pcb.html#cel	881
Hawaii DOH	Not available	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
Indiana DOH	http://www.in.gov/isdh/24859.htm	C-WA-01
ISO 17025	http://www.pjlabs.com/	L12-27
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	3016
Maine DHS	Not available	WA0035
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-368
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA35
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA200001
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	4704427-08-TX
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C1203
Wisconsin DNR	http://dnr.wi.gov/	998386840
Wyoming (EPA Region 8)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.caslab.com or at the accreditation bodies web site

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

ALS ENVIRONMENTAL

Client:	Alpha Analytical Laboratories, Inc.	**Service Request No.:**	K1400990
Project:	14A1634	**Date Received:**	01/31/14
Sample Matrix:	Water		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS), and Laboratory Control Sample (LCS).

Sample Receipt

One water sample was received for analysis at ALS Environmental on 01/31/14. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4ºC upon receipt at the laboratory.

Explosives by EPA Method 8330

Elevated Detection Limits:
The detection limit was elevated for 3,5-Dinitroaniline in sample 14A1643-01. The chromatogram indicated the presence of non-target background components. The matrix interference prevented adequate resolution of the target compound at the normal limit. No further corrective action was appropriate.

Sample Notes and Discussion:
Insufficient sample volume was received to perform a Matrix Spike/Matrix Spike Duplicate (MS/MSD). A Laboratory Control Sample/Duplicate Laboratory Control Sample (LCS/DLCS) was analyzed and reported in lieu of the MS/MSD.

No other anomalies associated with the analysis of this sample were observed.

Approved by_____

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1635

K1400991

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

ALS Environmental - Kelso
1317 S. 13th Ave
Kelso, WA 98626
Phone :(360) 577-7222
Fax: -
Terms: Net 30

Analysis	Due	Expires	Comments
14A1635-01 PRTIW (At Mission Memorial) [Water] Sampled 01/29/14 14:57 Pacific			
8330B Explosives Water	02/13/14 12:00	02/05/14 14:57	
Containers Supplied:			
1L Amber- Unpres. (AD) 1L Amber- Unpres. (AE)			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
	1-30-14	ALS	1/31/14 1020

(ALS)

PC SHAK

Cooler Receipt and Preservation Form

Client / Project: Alpha Analytical Service Request K14 00991

Received: 1/31/14 Opened: 1/31/14 By: UL Unloaded: 1/31/14 By: UL

. Samples were received via? *Mail* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*

. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*

. Were custody seals on coolers? NA Y N If yes, how many and where? _____

If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected. Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
-0.1	-0.3	—	—	-0.2	337	14A1643/14A1635	1289425001489639 52	

. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____

. Were custody papers properly filled out (ink, signed, etc.)? NA Y N

. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA Y N

. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N

. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N

. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N

10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N

11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N

12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

Page ____ *of* ____

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1400990
Project:	14A1643	**Date Collected:**	01/29/2014
Sample Matrix:	Water	**Date Received:**	01/31/2014

Nitroaromatics and Nitramines (Explosives)

Sample Name:	14A1643-01	**Units:**	ug/L
Lab Code:	K1400990-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.11	0.011	1	02/04/14	02/08/14	KWG1400907	
RDX	ND	U	0.11	0.019	1	02/04/14	02/08/14	KWG1400907	
1,3,5-Trinitrobenzene	ND	U	0.22	0.054	1	02/04/14	02/08/14	KWG1400907	
1,3-Dinitrobenzene	ND	U	0.11	0.0091	1	02/04/14	02/08/14	KWG1400907	
3,5-Dinitroaniline	ND	Ui	0.30	0.30	1	02/04/14	02/08/14	KWG1400907	
TETRYL	ND	U	0.11	0.045	1	02/04/14	02/08/14	KWG1400907	
Nitrobenzene	ND	U	0.11	0.014	1	02/04/14	02/08/14	KWG1400907	
4-Amino-2,6-dinitrotoluene	ND	U	0.11	0.018	1	02/04/14	02/08/14	KWG1400907	
2-Amino-4,6-dinitrotoluene	ND	U	0.11	0.0095	1	02/04/14	02/08/14	KWG1400907	
2,4,6-Trinitrotoluene	ND	U	0.11	0.028	1	02/04/14	02/08/14	KWG1400907	
2,6-Dinitrotoluene	ND	U	0.22	0.058	1	02/04/14	02/08/14	KWG1400907	
2,4-Dinitrotoluene	ND	U	0.11	0.0097	1	02/04/14	02/08/14	KWG1400907	
2-Nitrotoluene	ND	U	0.11	0.035	1	02/04/14	02/08/14	KWG1400907	
4-Nitrotoluene	ND	U	0.11	0.021	1	02/04/14	02/08/14	KWG1400907	
3-Nitrotoluene	ND	U	0.11	0.0069	1	02/04/14	02/08/14	KWG1400907	
Nitroglycerin	ND	U	1.1	0.42	1	02/04/14	02/08/14	KWG1400907	
Pentaerythritol Tetranitrate	ND	U	0.54	0.20	1	02/04/14	02/08/14	KWG1400907	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	81	23-98	02/08/14	Acceptable

Comments:

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1400990
Project:	14A1643	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Nitroaromatics and Nitramines (Explosives)

Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1400907-3	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.099	0.010	1	02/04/14	02/08/14	KWG1400907	
RDX	ND	U	0.099	0.017	1	02/04/14	02/08/14	KWG1400907	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/04/14	02/08/14	KWG1400907	
1,3-Dinitrobenzene	ND	U	0.099	0.0085	1	02/04/14	02/08/14	KWG1400907	
3,5-Dinitroaniline	ND	U	0.099	0.013	1	02/04/14	02/08/14	KWG1400907	
TETRYL	ND	U	0.10	0.042	1	02/04/14	02/08/14	KWG1400907	
Nitrobenzene	ND	U	0.099	0.013	1	02/04/14	02/08/14	KWG1400907	
4-Amino-2,6-dinitrotoluene	ND	U	0.099	0.016	1	02/04/14	02/08/14	KWG1400907	
2-Amino-4,6-dinitrotoluene	ND	U	0.099	0.0089	1	02/04/14	02/08/14	KWG1400907	
2,4,6-Trinitrotoluene	ND	U	0.099	0.026	1	02/04/14	02/08/14	KWG1400907	
2,6-Dinitrotoluene	ND	U	0.20	0.054	1	02/04/14	02/08/14	KWG1400907	
2,4-Dinitrotoluene	ND	U	0.099	0.0091	1	02/04/14	02/08/14	KWG1400907	
2-Nitrotoluene	ND	U	0.10	0.032	1	02/04/14	02/08/14	KWG1400907	
4-Nitrotoluene	ND	U	0.099	0.019	1	02/04/14	02/08/14	KWG1400907	
3-Nitrotoluene	ND	U	0.099	0.0064	1	02/04/14	02/08/14	KWG1400907	
Nitroglycerin	ND	U	0.99	0.39	1	02/04/14	02/08/14	KWG1400907	
Pentaerythritol Tetranitrate	ND	U	0.50	0.18	1	02/04/14	02/08/14	KWG1400907	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	68	23-98	02/08/14	Acceptable

Comments:

Client: Alpha Analytical Laboratories, Inc. (Uki
Service Request: K1400990
Project: 14A1643
Sample Matrix: Water

Surrogate Recovery Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method: METHOD
Units: Percent
Analysis Method: 8330B
Level: Low

Sample Name	Lab Code	Sur1
14A1643-01	K1400990-001	81
Method Blank	KWG1400907-3	68
Lab Control Sample	KWG1400907-1	70
Duplicate Lab Control Sample	KWG1400907-2	69

Surrogate Recovery Control Limits (%)

Sur1 = 1-Chloro-3-nitrobenzene 23-98

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1400990
Project:	14A1643	**Date Extracted:**	02/04/2014
Sample Matrix:	Water	**Date Analyzed:**	02/08/2014

Lab Control Spike/Duplicate Lab Control Spike Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method:	METHOD	**Units:**	ug/L
Analysis Method:	8330B	**Basis:**	NA
		Level:	Low
		Extraction Lot:	KWG1400907

	Lab Control Sample KWG1400907-1 Lab Control Spike			Duplicate Lab Control Sample KWG1400907-2 Duplicate Lab Control Spike					
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**	**RPD**	**RPD Limit**
HMX	6.40	8.00	80	6.33	8.00	79	11-147	1	30
RDX	6.20	8.00	77	6.17	8.00	77	10-142	0	30
1,3,5-Trinitrobenzene	5.95	8.00	74	5.93	8.00	74	16-137	0	30
1,3-Dinitrobenzene	6.03	8.00	75	6.01	8.00	75	26-125	0	30
3,5-Dinitroaniline	5.95	8.00	74	5.91	8.00	74	30-133	1	30
TETRYL	6.12	8.00	77	6.00	8.00	75	29-123	2	30
Nitrobenzene	5.92	8.00	74	5.88	8.00	74	10-116	1	30
4-Amino-2,6-dinitrotoluene	6.09	8.00	76	6.08	8.00	76	55-117	0	30
2-Amino-4,6-dinitrotoluene	5.98	8.00	75	5.95	8.00	74	54-116	0	30
2,4,6-Trinitrotoluene	5.93	8.00	74	5.90	8.00	74	47-118	1	30
2,6-Dinitrotoluene	5.98	8.00	75	5.95	8.00	74	40-108	1	30
2,4-Dinitrotoluene	5.89	8.00	74	5.85	8.00	73	50-111	1	30
2-Nitrotoluene	5.64	8.00	70	5.58	8.00	70	12-110	1	30
4-Nitrotoluene	5.64	8.00	71	5.57	8.00	70	16-113	1	30
3-Nitrotoluene	5.92	8.00	74	5.84	8.00	73	13-109	1	30
Nitroglycerin	6.30	8.00	79	6.13	8.00	77	15-136	3	30
Pentaerythritol Tetranitrate	6.19	8.00	77	6.18	8.00	77	66-103	0	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Report Date: 02/24/14 10:54
Received Date: 01/31/14 10:20
Turnaround Time: Normal

Project: 14A1643

Phones: (925) 872-9637
Fax: (707) 468-5267

P.O. #:

Attn: David S. Pingatore

Client: Alpha Analytical Laboratories - Ukiah
208 Mason St
Ukiah, CA 95482

Dear David S. Pingatore :

Enclosed are the results of analyses for samples received 1/31/2014 with the Chain of Custody document. The samples were received in good condition, at 2.4 °C and on ice. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Lab Sample ID: 4A31032-01 **Sample ID: 14A1643-01** **Matrix:** Water
Sampled by: Client **Sampled: 01/29/14 14:15** **Sample Note: MRWPCA MW-1**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
N-Nitrosodiethylamine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 14:19	W4B0023	
N-Nitrosodimethylamine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 14:19	W4B0023	
N-Nitrosodi-n-butylamine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 14:19	W4B0023	
N-Nitrosodi-n-propylamine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 14:19	W4B0023	
N-Nitrosomethylethylamine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 14:19	W4B0023	
N-Nitrosomorpholine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 14:19	W4B0023	
N-Nitrosopiperidine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 14:19	W4B0023	
N-Nitrosopyrrolidine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 14:19	W4B0023	
17-a-Ethynylestradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 17:48	W4B0281	
17-b-Estradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 17:48	W4B0281	
Estrone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 17:48	W4B0281	
Progesterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 17:48	W4B0281	
Testosterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 17:48	W4B0281	
Bisphenol A	**390**		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 22:51	W4B0283	
Gemfibrozil	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 22:51	W4B0283	
Ibuprofen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 22:51	W4B0283	
Iopromide	ND		5.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 22:51	W4B0283	
Naproxen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 22:51	W4B0283	
Salicylic Acid	ND		50	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 22:51	W4B0283	
Triclosan	ND		2.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 22:51	W4B0283	

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Lab Sample ID: 4A31032-01 **Sample ID:** 14A1643-01 **Matrix:** Water
Sampled by: Client **Sampled:** 01/29/14 14:15 **Sample Note:** MRWPCA MW-1

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
Acetaminophen	ND		20	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Amoxicillin	**14**		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Atenolol	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Atorvastatin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Azithromycin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Caffeine	**6.8**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Carbamazepine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Ciprofloxacin	**5.9**		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Cotinine	ND		2.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
DEET	**6.0**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Diazepam	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Fluoxetine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Meprobamate	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Methadone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Oxybenzone	**87**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Phenytoin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Primidone	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	R-01
Sucralose	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Sulfamethoxazole	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
TCEP	**6.4**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
TCPP	**11**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	B
TDCPP	**3.8**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	
Trimethoprim	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:21	W4B0282	

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Quality Control Section

Nitrosamines by isotopic dilution GC/MS CI Mode - Quality Control

Batch W4B0023 - EPA 1625M

Blank (W4B0023-BLK1) — **Prepared: 02/03/14 Analyzed: 02/04/14 21:48**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		ND		ng/l					
N-Nitrosomethylethylamine		ND		ng/l					
N-Nitrosodiethylamine		ND		ng/l					
N-Nitrosodi-n-propylamine		ND		ng/l					
N-Nitrosomorpholine		ND		ng/l					
N-Nitrosopyrrolidine		ND		ng/l					
N-Nitrosopiperidine		ND		ng/l					
N-Nitrosodi-n-butylamine		ND		ng/l					

Blank (W4B0023-BLK2) — **Prepared: 02/03/14 Analyzed: 02/05/14 14:48**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		ND	QC-2	ng/l					
N-Nitrosomethylethylamine		ND	QC-2	ng/l					
N-Nitrosodiethylamine		ND	QC-2	ng/l					
N-Nitrosodi-n-propylamine		ND	QC-2	ng/l					
N-Nitrosomorpholine		ND	QC-2	ng/l					
N-Nitrosopyrrolidine		ND	QC-2	ng/l					
N-Nitrosopiperidine		ND	QC-2	ng/l					
N-Nitrosodi-n-butylamine		ND	QC-2	ng/l					

LCS (W4B0023-BS1) — **Prepared: 02/03/14 Analyzed: 02/04/14 22:17**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		3.47		ng/l	3.00	116	50-150		
N-Nitrosomethylethylamine		2.67		ng/l	3.00	89	50-150		
N-Nitrosodiethylamine		2.79		ng/l	3.00	93	50-150		
N-Nitrosodi-n-propylamine		1.94		ng/l	3.00	65	50-150		
N-Nitrosomorpholine		2.50		ng/l	3.00	83	50-150		
N-Nitrosopyrrolidine		2.91		ng/l	3.00	97	50-150		
N-Nitrosopiperidine		2.83		ng/l	3.00	94	50-150		
N-Nitrosodi-n-butylamine		3.49		ng/l	3.00	116	50-150		

LCS (W4B0023-BS2) — **Prepared: 02/03/14 Analyzed: 02/05/14 13:23**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		3.61	QC-2	ng/l	3.00	120	50-150		
N-Nitrosomethylethylamine		2.65	QC-2	ng/l	3.00	88	50-150		
N-Nitrosodiethylamine		2.20	QC-2	ng/l	3.00	73	50-150		
N-Nitrosodi-n-propylamine		1.95	QC-2	ng/l	3.00	65	50-150		
N-Nitrosomorpholine		3.06	QC-2	ng/l	3.00	102	50-150		
N-Nitrosopyrrolidine		2.94	QC-2	ng/l	3.00	98	50-150		
N-Nitrosopiperidine		3.14	QC-2	ng/l	3.00	105	50-150		
N-Nitrosodi-n-butylamine		4.29	QC-2	ng/l	3.00	143	50-150		

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Nitrosamines by isotopic dilution GC/MS CI Mode - Quality Control

Batch W4B0023 - EPA 1625M

Matrix Spike (W4B0023-MS1) **Source: 4A31028-01** **Prepared: 02/03/14** **Analyzed: 02/04/14 23:15**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine	ND	2.69		ng/l	3.00	90	50-150		
N-Nitrosomethylethylamine	ND	2.88		ng/l	3.00	96	50-150		
N-Nitrosodiethylamine	ND	3.34		ng/l	3.00	111	50-150		
N-Nitrosodi-n-propylamine	ND	2.40		ng/l	3.00	80	50-150		
N-Nitrosomorpholine	ND	2.95		ng/l	3.00	98	50-150		
N-Nitrosopyrrolidine	ND	3.14		ng/l	3.00	105	50-150		
N-Nitrosopiperidine	ND	2.87		ng/l	3.00	96	50-150		
N-Nitrosodi-n-butylamine	ND	3.46		ng/l	3.00	115	50-150		

Matrix Spike Dup (W4B0023-MSD1) **Source: 4A31028-01** **Prepared: 02/03/14** **Analyzed: 02/04/14 22:46**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine	ND	2.76		ng/l	3.00	92	50-150	3	30
N-Nitrosomethylethylamine	ND	2.78		ng/l	3.00	93	50-150	4	30
N-Nitrosodiethylamine	ND	4.40		ng/l	3.00	147	50-150	27	30
N-Nitrosodi-n-propylamine	ND	3.11		ng/l	3.00	104	50-150	26	30
N-Nitrosomorpholine	ND	2.92		ng/l	3.00	97	50-150	1	30
N-Nitrosopyrrolidine	ND	3.14		ng/l	3.00	105	50-150	0.3	30
N-Nitrosopiperidine	ND	3.28		ng/l	3.00	109	50-150	14	30
N-Nitrosodi-n-butylamine	ND	4.74	MS-05	ng/l	3.00	158	50-150	31	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) **Prepared: 02/07/14** **Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		ND		ng/l					
Caffeine		ND		ng/l					
Sulfamethoxazole		ND		ng/l					
Trimethoprim		ND		ng/l					
Azithromycin		ND		ng/l					
Cotinine		ND		ng/l					
Atenolol		ND		ng/l					
Ciprofloxacin		ND		ng/l					
Carbamazepine		ND		ng/l					
DEET		ND		ng/l					
Fluoxetine		ND		ng/l					
Atorvastatin		ND		ng/l					
Methadone		ND		ng/l					
Primidone		ND		ng/l					
Diazepam		ND		ng/l					
TCPP		2.23	B	ng/l					
TCEP		ND		ng/l					
TDCPP		ND		ng/l					
Phenytoin		ND		ng/l					

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Amoxicillin		ND		ng/l					
Meprobamate		ND		ng/l					
Sucralose		ND		ng/l					
Oxybenzone		ND		ng/l					

LCS (W4B0282-BS1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:53**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		435		ng/l	400	109	66-156		
Caffeine		17.4		ng/l	20.0	87	55-152		
Sulfamethoxazole		17.6		ng/l	20.0	88	60-133		
Trimethoprim		18.6		ng/l	20.0	93	67-139		
Azithromycin		199		ng/l	200	100	52-166		
Cotinine		22.6		ng/l	20.0	113	68-155		
Atenolol		21.0		ng/l	20.0	105	56-164		
Ciprofloxacin		83.8		ng/l	100	84	51-168		
Carbamazepine		19.3		ng/l	20.0	96	60-135		
DEET		15.5		ng/l	20.0	78	45-135		
Fluoxetine		23.8		ng/l	20.0	119	55-150		
Atorvastatin		16.3		ng/l	20.0	82	0.1-173		
Methadone		19.0		ng/l	20.0	95	62-137		
Primidone		17.1		ng/l	20.0	86	54-147		
Diazepam		18.3		ng/l	20.0	92	58-127		
TCPP		18.1		ng/l	20.0	90	24-149		
TCEP		17.5		ng/l	20.0	88	25-149		
TDCPP		17.7		ng/l	20.0	88	20-158		
Phenytoin		18.2		ng/l	20.0	91	69-138		
Amoxicillin		164		ng/l	200	82	14-167		
Meprobamate		20.5		ng/l	20.0	102	11-166		
Sucralose		95.7		ng/l	100	96	50-150		
Oxybenzone		15.4		ng/l	20.0	77	50-150		

LCS Dup (W4B0282-BSD1) — **Prepared: 02/07/14 Analyzed: 02/18/14 23:07**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		499		ng/l	400	125	66-156	14	30
Caffeine		18.2		ng/l	20.0	91	55-152	4	30
Sulfamethoxazole		19.4		ng/l	20.0	97	60-133	10	30
Trimethoprim		18.4		ng/l	20.0	92	67-139	1	30
Azithromycin		206		ng/l	200	103	52-166	3	30
Cotinine		26.7		ng/l	20.0	134	68-155	17	30
Atenolol		23.0		ng/l	20.0	115	56-164	9	30
Ciprofloxacin		83.4		ng/l	100	83	51-168	0.5	30
Carbamazepine		19.7		ng/l	20.0	98	60-135	2	30
DEET		16.4		ng/l	20.0	82	45-135	6	30
Fluoxetine		22.8		ng/l	20.0	114	55-150	4	30

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

LCS Dup (W4B0282-BSD1) — **Prepared: 02/07/14 Analyzed: 02/18/14 23:07**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Atorvastatin		15.1		ng/l	20.0	76	0.1-173	8	30
Methadone		19.1		ng/l	20.0	96	62-137	0.5	30
Primidone		16.2		ng/l	20.0	81	54-147	5	30
Diazepam		18.9		ng/l	20.0	94	58-127	3	30
TCPP		21.0		ng/l	20.0	105	24-149	15	30
TCEP		20.6		ng/l	20.0	103	25-149	16	30
TDCPP		18.9		ng/l	20.0	94	20-158	7	30
Phenytoin		18.4		ng/l	20.0	92	69-138	1	30
Amoxicillin		164		ng/l	200	82	14-167	0	30
Meprobamate		20.6		ng/l	20.0	103	11-166	0.5	30
Sucralose		93.0		ng/l	100	93	50-150	3	30
Oxybenzone		18.3		ng/l	20.0	92	50-150	17	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

Blank (W4B0283-BLK1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:08**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		1.99	B	ng/l					
Gemfibrozil		ND		ng/l					
Ibuprofen		ND		ng/l					
Naproxen		ND		ng/l					
Salicylic Acid		ND		ng/l					
Triclosan		ND		ng/l					
Iopromide		ND		ng/l					

LCS (W4B0283-BS1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:22**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		19.5		ng/l	20.0	98	53-168		
Gemfibrozil		18.0		ng/l	20.0	90	76-122		
Ibuprofen		17.7		ng/l	20.0	88	67-139		
Naproxen		17.3		ng/l	20.0	86	64-138		
Salicylic Acid		171		ng/l	200	86	56-229		
Triclosan		38.9		ng/l	40.0	97	76-139		
Iopromide		114		ng/l	100	114	0.1-163		

LCS Dup (W4B0283-BSD1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		18.4		ng/l	20.0	92	53-168	6	30
Gemfibrozil		18.3		ng/l	20.0	92	76-122	2	30
Ibuprofen		19.8		ng/l	20.0	99	67-139	11	30
Naproxen		19.1		ng/l	20.0	96	64-138	10	30
Salicylic Acid		183		ng/l	200	92	56-229	7	30
Triclosan		40.5		ng/l	40.0	101	76-139	4	30

Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634
www.wecklabs.com

Certificate of Analysis

PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

LCS Dup (W4B0283-BSD1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Iopromide		104		ng/l	100	104	0.1-163	9	30

PPCPs - Hormones by LC/MSMS-APCI - Quality Control

Batch W4B0281 - EPA 1694M-APCI

Blank (W4B0281-BLK1) — **Prepared: 02/07/14 Analyzed: 02/19/14 16:58**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		ND		ng/l					
17-b-Estradiol		ND		ng/l					
Estrone		ND		ng/l					
Progesterone		ND		ng/l					
Testosterone		ND		ng/l					

LCS (W4B0281-BS1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:15**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		19.1		ng/l	20.0	96	68-159		
17-b-Estradiol		18.0		ng/l	20.0	90	65-146		
Estrone		17.6		ng/l	20.0	88	59-141		
Progesterone		17.8		ng/l	20.0	89	58-154		
Testosterone		24.8		ng/l	20.0	124	60-172		

LCS Dup (W4B0281-BSD1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:31**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		18.9		ng/l	20.0	94	68-159	1	30
17-b-Estradiol		18.4		ng/l	20.0	92	65-146	2	30
Estrone		18.3		ng/l	20.0	92	59-141	4	30
Progesterone		18.1		ng/l	20.0	90	58-154	2	30
Testosterone		26.0		ng/l	20.0	130	60-172	5	30

Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634
www.wecklabs.com

Certificate of Analysis

Notes:
The Chain of Custody document is part of the analytical report.
Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
All results are expressed on wet weight basis unless otherwise specified.

An Absence of Total Coliform meets the drinking water standards as established by the State of California Department of Health Services.
The Reporting Limit (RL) is referenced as laboratory's Practical Quantitation Limit (PQL).
For Potable water analysis, the Reporting Limit (RL) is referenced as Detection Limit for reporting purposes (DLRs) defined by EPA.

If sample collected by Weck Laboratories, sampled in accordance to lab SOP MIS002

Authorized Signature
Contact: Kim G Tu
(Project Manager)

ELAP # 1132
LACSD # 10143
NELAC # 04229CA

The results in this report apply to the samples analyzed in accordance with the chain of custody document. Weck Laboratories certifies that the test results meet all requirements of NELAC unless noted in the Case Narrative. This analytical report must be reproduced in its entirety.

Flags for Data Qualifiers:

B	Blank contamination. The analyte was found in the associated blank as well as in the sample.
MS-05	The spike recovery and/or RPD were outside acceptance limits for the MS and/or MSD due to possible matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QC-2	This QC sample was reanalyzed to complement samples that require re-analysis on different date. See analysis date.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
ND	NOT DETECTED at or above the Reporting Limit. If J-value reported, then NOT DETECTED at or above the Method Detection Limit (MDL).
Sub	Subcontracted analysis, original report enclosed.
DL	Method Detection Limit
RL	Method Reporting Limit
MDA	Minimum Detectable Activity
NR	Not Reportable

Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634
www.wecklabs.com

NELAC NARRATIVE PAGE

Client: Alpha Analytical Report #: 310987NP

Underwriters Laboratories is a NELAP accredited laboratory. All reported results meet the requirements of the NELAC standards, unless otherwise noted.

UL contact person: James Van Fleit

NELAP requires complete reporting of deviations from method requirements, regardless of the suspected impact on the data. Quality control failures not reported within the report summary are noted here.

There were no quality control failures.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature Title Date

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Laboratory Report

Client:	Alpha Analytical	Report:	310987
Attn:	David Pingatore 6398 Dougherty Road, Suite 35 Dublin, CA 94568	Priority:	Standard Written
		Status:	Final
		PWS ID:	Not Supplied
Copies to:	None		

Sample Information

UL ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
2967032	14A1643-01	905.0	01/29/14 14:15	Client	02/04/14 11:45
2967033	14A1643-01	1613	01/29/14 14:15	Client	02/04/14 11:45
2967034	14A1643-01	7110 B	01/29/14 14:15	Client	02/04/14 11:45
2967035	14A1643-01	7500-Ra B	01/29/14 14:15	Client	02/04/14 11:45
2967035	14A1643-01	7500-Ra D	01/29/14 14:15	Client	02/04/14 11:45
2967036	14A1643-01	300.0	01/29/14 14:15	Client	02/04/14 11:45
2967037	14A1643-01	300.1	01/29/14 14:15	Client	02/04/14 11:45

Report Summary

Note: See attached page for additional comments.

Note: Sample containers were provided by the client except for Methods 300.0 and 300.1.

Note: Strontium-90 analysis was performed by General Engineering Laboratories, Charleston, SC.

Note: Dioxin analysis was performed by Pace Analytical, Minneapolis, MN.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call James Van Fleit at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature | Title | Date

Client Name: Alpha Analytical
Report #: 310987

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Client Name: Alpha Analytical

Report #: 310987

Sampling Point: 14A1643-01

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
14998-27-7	Chlorite	300.0	1000 *	20	< 20	ug/L	---	02/06/14 23:35	2967036
15541-45-4	Bromate	300.1	10 *	5.0	< 5.0	ug/L	---	02/05/14 03:19	2967037

Radionuclides

Analyte ID #	Analyte	Method	Reg Limit	DL**	Result	Units	Preparation Date	Analyzed	UL ID #
---	Gross Alpha	7110 B	15 *	3.0	**6.3 ± 1.2**	pCi/L	02/21/14 07:49	02/27/14 10:40	2967034
---	Gross Beta	7110 B	50 *	4.0	**7.5 ± 1.1**	pCi/L	02/21/14 07:49	02/27/14 10:40	2967034
13982-63-3	Radium-226	7500-Ra B	3 *	1.00	0.62 ± 0.31	pCi/L	02/18/14 09:45	02/24/14 10:13	2967035
15262-20-1	Radium-228	7500-Ra D	2 *	1.0	-0.08 ± 0.51	pCi/L	02/18/14 09:45	02/26/14 16:02	2967035
---	Combined Radium	calc.	5 *	1.0	0.54 ± 0.60	pCi/L	02/18/14 09:45	02/26/14 16:02	2967035

** Detection Limit (DL) shall be that concentration which can be counted with a precision of plus or minus 100% at the 95 % confidence level.

Reference Lab Tests

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	UL ID #
1746-01-6	Dioxin	1613	30 *	5	< 5	pg/L	03/03/14 00:00	03/04/14 14:10	2967033
---	Strontium-90	905.0	8 *	2.00	**0.090 ± 1.070**	pCi/L	---	02/20/14 11:39	2967032

† UL has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

ISOTECH

ISOTECH LABORATORIES INC

ANALYSIS REPORT

Water Analysis

Lab Number: 410664 Job Number: 24232 IS-69368

Sample Name: MRWPCA MW-1

Company Lab #:

Company Job #:

Company: Alpha Analytical, Inc.

API/Well:

Field or Site: WO 14A1643

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Date Sampled: 1/29/2014 Date Received 2/05/2014 Date Reported: 2/26/2014

δD of water	----------	na
$\delta^{18}O$ of water	----------	na
Tritium content of water	----------	< 1.00 TU
$\delta^{13}C$ of DIC	----------	na
^{14}C content of DIC	----------	na
$\delta^{15}N$ of nitrate	----------	na
$\delta^{18}O$ of nitrate	----------	na
$\delta^{34}S$ of sulfate	----------	na
$\delta^{18}O$ of sulfate	----------	na

Remarks:

David S. Pingatore
Project Manager
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482
Tel: 707.468.0401
Fax: 707.468.5267
Project: 14A1643
Email: david @ alpha.com

Dr. Yi Wang
Director of ZymaX Forensics Isotope
Senior Environmental Geochemist, PACE
600 S. Andreasen Dr., Suite B
Escondido, CA 92029
Tel: 760.781.3338 ext 202
Fax: 760.781.3339
Cell: 609.721.2843
Email: yi.wang@zymaxusa.com

REPORT OF ENVIRONMENTAL FORENSICS ISOTOPE ANALYSES

Date Received: February 5th, 2014
Date Reported: March 20th, 2014

Sample from Alpha Analytical Labs for $\delta^{15}N$ (‰ Air), $\delta^{18}O$ and δD (‰ VSMOW) stable isotope analysis

ZymaX ID	Client ID/Sample Description	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
43449-1	14A1643-01 MRWPCA MW-1	-6.56	-43.87	8.9	4.4
	Analytical precision (1σ)	0.06	0.32	0.2	0.4

ZymaX ID	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
QC-01	-5.89	-41.12	4.5	25.3
QC-02	-5.98	-41.57	4.8	25.9
Mean	-5.94	-41.35	4.7	25.6
Analytical Precision (1σ)	0.06	0.32	0.2	0.4

ZymaX Forensics Isotope Services

Product or Dissolved Organics: Chlorinated Solvents, Oil, Extract, Fraction and Kerogen
3D-CSIA of ^{13}C, ^{37}Cl, and ^{2}H for PCE, TCE, DCE, MTBE, BTEX, PAHs, Pesticides, Alkanes, Gasoline and Oil; Bulk ^{13}C, ^{2}H, ^{18}O, ^{34}S, and ^{15}N
Gas Sample
Gas Composition and 2D-CSIA of ^{13}C and ^{2}H of C1 to C5; ^{13}C of CO_2; ^{14}C of C1 and CO_2; ^{34}S of H_2S; ^{15}N and ^{18}O of N_2O gas
Water and Dissolved Inorganics
^{2}H, ^{3}H and ^{18}O; ^{34}S and ^{18}O of dissolved sulfate; ^{34}S of dissolved H_2S
^{15}N and ^{18}O of dissolved Nitrate; ^{15}N of Ammonia; ^{13}C of dissolved CO_2 and Carbonate/Bicarbonate
Soil and Minerals
^{13}C, ^{18}O, ^{15}N, ^{34}S, D/H; ^{14}C of carbonate or organics
Post-Analysis Forensic Isotope Data Interpretation

NEW CLIENT

Laboratory Order - Summary

analytical chemistry for a better environment

Report To:	David S. Pingatore Alpha Analytical Laboratories, Inc. 208 Mason St. Ukiah, CA. 95482	Date Received: Date Due: Project:	02/05/2014 9:05AM 04/30/2014 9:05AM 14A1643
Phone: Fax:	(707) 468-0401 (707) 468-5267	Project Number:	

Lab Number	Description	Analysis	Dept
43449-1	14A1643-01 MRWPCA MW-1	d15N and d18O of NO3	M6
		d18O+dD of H2O	M6

Notes/Special Instructions	SC Login/Computer Login CY/CY	DPRA PM: YW

ZymaX FORENSICS

Condition Upon Reciept

Lab Number: 43449 Client: AAL

Sample Temprature (should be 2-6 degrees C): 1.9°C

Do the sample descriptions on the containers match the discriptions on the COC? ☒ Yes ☐ No

Do the sample dates on the containers match the sample dates on the COC? ☒ Yes ☐ No

Are the samples within holding time for each analysis at time of reciapt? ☒ Yes ☐ No ☐ N/A

Do the number of containers received match the number listed on the COC, and are all of the necessary containers for the required analysis available? ☒ Yes ☐ No ☐ N/A

Does the preservation of the samples match the notation on the COC, and is the preservation correct for requested analysis? ☐ Yes ☐ No ☐ N/A ☒ Zymax

Are all of the samples intact with no headspace, if required for analysis? ☒ Yes ☐ No

Did samples arrive with custody seal intact? ☒ Yes ☐ No ☐ N/A

Sample Control Signature: [signature] Date: 2/5/14 Time: 9:05

Client Discrepancies

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14A1643

Report to:
Company: Todd Engineers
Attn: Dr. Bill Motzer
Address: 2490 Mariner Square Loop, Suite 215, Alameda, CA 94501
Phone/Fax: 510.747.6920 / 510.747.6921
Email Address: bmotzer@toddengineers.com

Invoice to (if different):
Company:
Attn:
Address:
Phone/Fax:
Email Address:

Project Info for Report:
Project ID: Groundwater Reuse Project
Project No: Project # 60408
PO/Reference :

Signature below authorizes work under terms stated on reverse side.

TAT: 10 days ● / RUSH: 5 days ○ / 48 hours ○ / Other: ___ days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only): Temperature: 4 deg. C; Shipment Method:; Custody Seals: Y / N

Samplers Signature:
Print:

Sample Identification	Sampled: Date	Sampled: Time	Container: 40ml VOA	Poly	Amber glass	Soil jar		Preservative: HCL	HNO3	H2SO4	Other	None	Matrix: Water	Soil		Total Number of Containers	8330B Explosives (sub ALS)	PPCP Hormones 1694M (sub Weck)	PPCP Negative Pharmas 1694M (sub Weck)	PPCP Positive Pharmas 1694M (sub Weck)	Nitrosamines LL 1625M (sub Weck)	Gross A & B, R226 &R228, Sr 90 (sub UL)	Bromate 300.1, Chlorite 300.0 (sub UL)	Tritium, Enriched (sub Isotech)	Oxygen 18 Isotope (sub Zymax)	N and O Isotopes of NO3 (sub Zymax)	j-flag MDL reporting + Standard excel EDD	Sample Notes or CDPH Source Numbers:
MRWPCA MW-1	1-29-14	1415			x							x	x			2	x										x	
					x						x		x			2		x	x	x								
					x							x	x			2					x							
				x					x				x			4						x						
				x							x		x			2							x					
				x								x	x			1								x				
				x								x	x			1									x			
				x								x	x			1										x		

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	1-29-14	1525
[signature] Witzi	[signature] Witzi	1-29-14	1650
Witzi	LAB [signature]	1-29-14	1115

CDPH Write On EDT Transmission? ○ Yes ○ No

State System Number:

If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No

Global ID: Sampling Company Log Code:

EDF to (Email Address):

Travel and Site Time: Mileage: Misc. Supplies:

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

ELAP Certificate Numbers 1551 and 2728

18 February 2014

Todd Groundwater
Attn: Dr. Bill Motzer
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
RE: Groundwater Reuse Project
Work Order: 14A1635

Enclosed are the results of analyses for samples received by the laboratory on 01/29/14 21:15. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeanette Poplin

Jeanette L. Poplin For David S. Pingatore
Project Manager

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 10:55

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
PRTIW (At Mission Memorial)	14A1635-01	Water	01/29/14 14:57	01/29/14 21:15
Trip Blank	14A1635-02	Water	01/29/14 00:00	01/29/14 21:15

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Metals (Drinking Water) by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Mercury	ND	0.060	1.0	ug/l	1	AA43136	02/05/14 09:00	02/05/14 13:35	EPA 245.1	U

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Metals by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Calcium	**37**	0.010	1.0	mg/l	1	AA43133	01/31/14 14:45	02/05/14 13:43	EPA 200.7	
Magnesium	**10**	0.0080	1.0	"	"	"	"	"	"	
Potassium	**3.1**	0.0080	1.0	"	"	"	"	"	"	
Sodium	**64**	0.020	1.0	"	"	"	"	"	"	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Metals by EPA Method 200.8 ICP/MS
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Aluminum	**4.3**	2.0	50	ug/l	1	AA43114	01/31/14 09:29	02/06/14 17:06	EPA 200.8	J
Antimony	**0.033**	0.020	6.0	"	"	"	"	"	"	J
Arsenic	**1.6**	0.070	2.0	"	"	"	"	"	"	J
Barium	**59**	0.030	100	"	"	"	"	"	"	J
Beryllium	ND	0.020	1.0	"	"	"	"	"	"	U
Boron	**32**	6.0	50	"	"	"	"	"	"	J
Cadmium	**0.10**	0.020	1.0	"	"	"	"	"	"	J
Chromium	**3.4**	0.080	10	"	"	"	"	"	"	J
Copper	**1.9**	0.040	0.50	"	"	"	"	"	"	
Iron	**67**	1.8	50	"	"	"	"	"	"	
Lead	**0.061**	0.020	5.0	"	"	"	"	"	"	J
Manganese	**1.1**	0.030	5.0	"	"	"	"	"	"	J
Nickel	**1.3**	0.060	10	"	"	"	"	"	"	J
Selenium	**2.2**	0.070	5.0	"	"	"	"	"	"	J
Silver	ND	0.020	0.10	"	"	"	"	"	"	U
Thallium	**0.045**	0.020	1.0	"	"	"	"	"	"	J
Uranium	**0.20**	0.020	1.0	pCi/l	"	"	"	"	"	J
Vanadium	**1.6**	0.30	1.0	ug/l	"	"	"	"	"	
Zinc	**75**	0.50	5.0	"	"	"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 10:55

Conventional Chemistry Parameters by APHA/EPA Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Bicarbonate	**130**	0.060	5.0	mg/l	1	AA43121	02/11/14 10:19	02/11/14 17:00	SM2320B	
Color	**6.0**	3.0	5.0	Color Units	"	AA42421	01/31/14 07:40	01/31/14 07:40	SM2120B	
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l	"	AA43107	01/31/14 07:27	02/04/14 16:00	SM5540C	U
Odor	ND		1.0	T.O.N.	"	AA42421	01/30/14 13:32	01/30/14 13:32	EPA 140.1	U
Perchlorate	**1.1**	0.90	4.0	ug/l	"	AB41141	02/11/14 09:49	02/11/14 12:09	EPA 314.0	J
Specific Conductance (EC)	**440**	1.0	20	umhos/cm	"	AA43044	01/30/14 13:00	01/30/14 17:00	SM2510B	
Total Dissolved Solids	**350**	5.0	10	mg/l	"	AB40322	02/03/14 09:00	02/05/14 08:30	SM2540C	
Turbidity	**0.98**	0.040	0.10	NTU	"	AA43044	01/30/14 13:00	01/30/14 17:00	SM2130B	
Nitrate + Nitrite as N	**2.4**	0.0086	0.40	mg/l	"	AB41339	02/13/14 10:39	02/13/14 11:18	EPA 300.0	
Total Organic Carbon	**0.519**	0.100	0.300	"	"	AA43131	01/31/14 13:10	01/31/14 19:57	SM5310C	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Miscellaneous Physical/Conventional Chemistry Parameters
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Cyanide (total)	ND	0.0020	0.10	mg/l	1	AB40428	02/04/14 09:46	02/05/14 15:17	10-204-00-1X	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Anions by EPA Method 300.0
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Nitrate as NO3	**11**	0.20	2.0	mg/l	1	AA43037	01/30/14 11:23	01/30/14 21:12	EPA 300.0	
Chloride	**86**	0.30	5.0	"	10	"	"	01/30/14 20:56	"	
Fluoride	ND	0.070	0.10	"	1	"	"	01/30/14 21:12	"	U
Nitrite as N	ND	0.020	0.40	"	"	"	"	"	"	U
Sulfate as SO4	**39**	0.90	5.0	"	10	"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Acetone	ND	0.80	5.0	ug/l	1	AB40523	02/03/14 09:12	02/04/14 15:45	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	**1.2**	0.50	0.50	"	"	"	"	"	"	
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
1,3-Dichloropropane	ND	0.20	0.50	ug/l	1	AB40523	02/03/14 09:12	02/04/14 15:45	EPA 524.2	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	**0.20**	0.20	0.50	"	"	"	"	"	"	J
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
o-Xylene	ND	0.10	0.50	ug/l	1	AB40523	02/03/14 09:12	02/04/14 15:45	EPA 524.2	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	**1.2**	0.50	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*98.8 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*94.8 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*101 %*	*70-130*			"	"	"	"	
Trip Blank (14A1635-02) Water Sampled: 01/29/14 00:00 Received: 01/29/14 21:15										
Acetone	ND	0.80	5.0	ug/l	1	AB40523	02/03/14 09:12	02/04/14 16:20	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14A1635-02) Water Sampled: 01/29/14 00:00 Received: 01/29/14 21:15										
1,2-Dichlorobenzene	ND	0.20	0.50	ug/l	1	AB40523	02/03/14 09:12	02/04/14 16:20	EPA 524.2	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14A1635-02) Water Sampled: 01/29/14 00:00 Received: 01/29/14 21:15										
1,2,4-Trichlorobenzene	ND	0.20	0.50	ug/l	1	AB40523	02/03/14 09:12	02/04/14 16:20	EPA 524.2	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U
o-Xylene	ND	0.10	0.50	"	"	"	"	"	"	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*97.9 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*94.6 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*99.7 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Aldrin	ND	0.010	0.050	ug/l	1	AA43038	01/30/14 11:31	02/01/14 02:08	EPA 508	U
Chloroneb	ND	0.20	0.50	"	"	"	"	"	"	U
Chlorobenzilate	ND	2.0	5.0	"	"	"	"	"	"	U
Chlorothalonil	ND	0.030	0.10	"	"	"	"	"	"	U
DCPA	ND	0.020	0.040	"	"	"	"	"	"	U
4,4´-DDD	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDE	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDT	ND	0.020	0.020	"	"	"	"	"	"	U
Dieldrin	ND	0.010	0.010	"	"	"	"	"	"	U
Endosulfan I	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan II	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan sulfate	ND	0.020	0.020	"	"	"	"	"	"	U
Endrin	ND	0.030	0.10	"	"	"	"	"	"	U
Endrin aldehyde	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-alpha	ND	0.010	0.050	"	"	"	"	"	"	U
HCH-beta	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-delta	ND	0.030	0.050	"	"	"	"	"	"	U
HCH-gamma (Lindane)	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor epoxide	ND	0.010	0.010	"	"	"	"	"	"	U
Hexachlorobenzene	ND	0.010	0.040	"	"	"	"	"	"	U
Hexachlorocyclopentadiene	ND	0.040	0.40	"	"	"	"	"	"	U
Methoxychlor	ND	0.020	0.020	"	"	"	"	"	"	U
cis-Permethrin	ND	0.070	0.20	"	"	"	"	"	"	U
trans-Permethrin	ND	0.090	0.20	"	"	"	"	"	"	U
Propachlor	ND	0.070	0.20	"	"	"	"	"	"	U
Trifluralin	ND	0.020	0.040	"	"	"	"	"	"	U
PCB-1016	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1221	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1232	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1242	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1248	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1254	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1260	ND	0.030	0.50	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Total PCBs	ND	0.30	0.50	ug/l	1	AA43038	01/30/14 11:31	02/01/14 02:08	EPA 508	U
Toxaphene	ND	0.40	0.50	"	"	"	"	"	"	U
Chlordane (tech)	ND	0.030	0.050	"	"	"	"	"	"	U
Surrogate: Dibutylchlorendate		*93.6 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Nitrogen- and Phosphorus- Pesticides by EPA Method 507
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Alachlor	ND	0.50	0.50	ug/l	1	AB40730	02/08/14 15:03	02/11/14 06:25	EPA 507	U
Atrazine	ND	0.30	0.50	"	"	"	"	"	"	U
Bromacil	ND	0.50	5.0	"	"	"	"	"	"	U
Butachlor	ND	0.40	0.50	"	"	"	"	"	"	U
Dimethoate	ND	0.20	1.0	"	"	"	"	"	"	U
Metolachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Metribuzin	ND	0.40	0.50	"	"	"	"	"	"	U
Molinate	ND	0.20	0.50	"	"	"	"	"	"	U
Prometryn	ND	0.50	0.50	"	"	"	"	"	"	U
Propachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Simazine	ND	0.30	0.50	"	"	"	"	"	"	U
Thiobencarb	ND	0.20	1.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*119 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Organic Analytes by EPA Method 504.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40359	02/04/14 10:00	02/05/14 01:10	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U
Trip Blank (14A1635-02) Water Sampled: 01/29/14 00:00 Received: 01/29/14 21:15										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40359	02/04/14 10:00	02/05/14 01:45	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Chlorinated Acids by EPA Method 515.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Acifluorfen	ND	0.50	1.0	ug/l	1	AB40536	02/06/14 14:29	02/08/14 02:51	EPA 515.1	U
Bentazon	ND	0.40	0.40	"	"	"	"	"	"	U
2,4-D	ND	0.80	1.0	"	"	"	"	"	"	U
Dalapon	ND	6.0	6.0	"	"	"	"	"	"	U
2,4-DB	ND	4.0	5.0	"	"	"	"	"	"	U
Dicamba	ND	0.40	0.40	"	"	"	"	"	"	U
Dichlorprop	ND	1.0	1.0	"	"	"	"	"	"	U
Dinoseb	ND	0.80	1.0	"	"	"	"	"	"	U
4-Nitrophenol	ND	0.70	1.0	"	"	"	"	"	"	U
Pentachlorophenol	ND	0.20	0.20	"	"	"	"	"	"	U
Picloram	ND	0.50	1.0	"	"	"	"	"	"	U
2,4,5-T	ND	0.40	0.50	"	"	"	"	"	"	U
2,4,5-TP (Silvex)	ND	0.50	0.50	"	"	"	"	"	"	U
Surrogate: DCAA		*92.8 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Carbamates by EPA Method 531.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Aldicarb	ND	0.70	3.0	ug/l	1	AA42932	01/30/14 09:25	01/31/14 01:00	EPA 531.1	U
Aldicarb sulfone	ND	0.70	4.0	"	"	"	"	"	"	U
Aldicarb sulfoxide	ND	0.80	3.0	"	"	"	"	"	"	U
Carbaryl	ND	0.70	5.0	"	"	"	"	"	"	U
Carbofuran	ND	2.0	5.0	"	"	"	"	"	"	U
3-Hydroxycarbofuran	ND	0.90	3.0	"	"	"	"	"	"	U
Methiocarb	ND	2.0	5.0	"	"	"	"	"	"	U
Methomyl	ND	2.0	2.0	"	"	"	"	"	"	U
Oxamyl	ND	0.80	20	"	"	"	"	"	"	U
Propoxur	ND	2.0	5.0	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Endothall by EPA Method 548.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Endothall	ND	2.0	45	ug/l	1	AB40357	02/04/14 14:37	02/06/14 14:44	EPA 548.1	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Glyphosate by EPA Method 547
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Glyphosate	ND	3.0	10	ug/l	1	AB40427	02/04/14 09:22	02/04/14 22:56	EPA 547	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Diquat by EPA Method 549.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Diquat	ND	2.0	2.0	ug/l	1	AA43118	02/03/14 09:48	02/10/14 20:37	EPA 549.2	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Haloacetic Acids by EPA Method 552.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Monobromoacetic Acid	ND	0.8	1.0	ug/l	1	AB40444	02/05/14 13:05	02/07/14 18:14	EPA 552.2	U
Monochloroacetic Acid	ND	1.1	2.0	"	"	"	"	"	"	U
Dibromoacetic Acid	ND	0.8	1.0	"	"	"	"	"	"	U
Dichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Trichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"	"	"	"	"	"	U
Surrogate: 2,3-Dibromopropionic Acid		*122 %*	*70-130*			*"*	*"*	*"*	*"*	
Surrogate: 2-Bromopropionic Acid		*95.5 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Semivolatile Organic Compounds by EPA Method 525.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
PRTIW (At Mission Memorial) (14A1635-01) Water Sampled: 01/29/14 14:57 Received: 01/29/14 21:15										
Benzo (a) pyrene	ND	0.080	0.10	ug/l	1	AB40727	02/08/14 13:35	02/13/14 17:28	EPA 525.2	U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"	"	"	"	"	"	U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*104 %*	*70-130*			"	"	"	"	
Surrogate: Perylene-d12		*79.0 %*	*70-130*			"	"	"	"	
Surrogate: Triphenyl phosphate		*105 %*	*70-130*			"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Metals (Drinking Water) by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43136 - EPA 245.1 Hg Water											
Blank (AA43136-BLK1)					Prepared & Analyzed: 02/05/14						
Mercury	ND	0.060	1.0	ug/l							U
LCS (AA43136-BS1)					Prepared & Analyzed: 02/05/14						
Mercury	2.30	0.060	1.0	ug/l	2.50		92.0	80-120			
Duplicate (AA43136-DUP1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	ND	0.060	1.0	ug/l		ND				20	U
Matrix Spike (AA43136-MS1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	2.26	0.060	1.0	ug/l	2.50	ND	90.4	60-140			
Matrix Spike (AA43136-MS2)		**Source: 14B0218-01**			Prepared & Analyzed: 02/05/14						
Mercury	2.32	0.060	1.0	ug/l	2.50	0.0600	90.4	60-140			
Matrix Spike Dup (AA43136-MSD1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	2.29	0.060	1.0	ug/l	2.50	ND	91.6	60-140	1.32	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43133 - Metals Digest											
Blank (AA43133-BLK1)					Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	ND	0.010	1.0	mg/l							U
Magnesium	ND	0.0080	1.0	"							U
Potassium	ND	0.0080	1.0	"							U
Sodium	ND	0.020	1.0	"							U
LCS (AA43133-BS1)					Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	5.36	0.010	1.0	mg/l	5.88		91.2	85-115			
Magnesium	7.09	0.0080	1.0	"	8.00		88.6	85-115			
Potassium	7.97	0.0080	1.0	"	8.00		99.6	85-115			
Sodium	7.75	0.020	1.0	"	8.00		96.8	85-115			
Duplicate (AA43133-DUP1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/12/14						
Calcium	18.2	0.010	1.0	mg/l		16.5			9.76	20	
Magnesium	6.86	0.0080	1.0	"		6.53			4.91	20	
Potassium	3.66	0.0080	1.0	"		3.35			8.82	20	
Sodium	52.8	0.020	1.0	"		50.2			5.03	20	
Matrix Spike (AA43133-MS1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	22.4	0.010	1.0	mg/l	5.88	16.5	100	70-130			
Magnesium	13.0	0.0080	1.0	"	8.00	6.53	81.3	70-130			
Potassium	10.8	0.0080	1.0	"	8.00	3.35	92.8	70-130			
Sodium	58.8	0.020	1.0	"	8.00	50.2	107	70-130			
Matrix Spike (AA43133-MS2)		**Source: 14A1713-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	35.4	0.010	1.0	mg/l	5.88	28.8	112	70-130			
Magnesium	11.0	0.0080	1.0	"	8.00	3.85	89.5	70-130			
Potassium	11.1	0.0080	1.0	"	8.00	3.56	94.7	70-130			
Sodium	47.2	0.020	1.0	"	8.00	38.1	114	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43133 - Metals Digest											
Matrix Spike Dup (AA43133-MSD1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	23.2	0.010	1.0	mg/l	5.88	16.5	113	70-130	3.39	20	
Magnesium	14.3	0.0080	1.0	"	8.00	6.53	97.1	70-130	9.24	20	
Potassium	11.0	0.0080	1.0	"	8.00	3.35	95.8	70-130	2.21	20	
Sodium	60.3	0.020	1.0	"	8.00	50.2	126	70-130	2.49	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43114 - EPA 200.8											
Blank (AA43114-BLK1)					Prepared: 01/31/14 Analyzed: 02/06/14						
Aluminum	ND	2.0	50	ug/l							U
Antimony	ND	0.020	6.0	"							U
Arsenic	ND	0.070	2.0	"							U
Barium	ND	0.030	100	"							U
Beryllium	ND	0.020	1.0	"							U
Boron	15.2	6.0	50	"							J
Cadmium	ND	0.020	1.0	"							U
Chromium	ND	0.080	10	"							U
Copper	ND	0.040	0.50	"							U
Iron	ND	1.8	50	"							U
Lead	ND	0.020	5.0	"							U
Manganese	ND	0.030	5.0	"							U
Nickel	ND	0.060	10	"							U
Selenium	ND	0.070	5.0	"							U
Silver	ND	0.020	0.10	"							U
Thallium	ND	0.020	1.0	"							U
Uranium	ND	0.020	1.0	pCi/l							U
Vanadium	ND	0.30	1.0	ug/l							U
Zinc	1.06	0.50	5.0	"							J
LCS (AA43114-BS1)					Prepared: 01/31/14 Analyzed: 02/06/14						
Aluminum	499	2.0	50	ug/l	520		96.0	85-115			
Antimony	20.0	0.020	6.0	"	20.0		99.9	85-115			
Arsenic	19.9	0.070	2.0	"	20.0		99.5	85-115			
Barium	18.6	0.030	100	"	20.0		92.8	85-115			J
Beryllium	20.0	0.020	1.0	"	20.0		99.8	85-115			
Boron	112	6.0	50	"	100		112	85-115			
Cadmium	19.8	0.020	1.0	"	20.0		98.8	85-115			
Chromium	19.5	0.080	10	"	20.0		97.6	85-115			
Copper	19.4	0.040	0.50	"	20.0		97.2	85-115			
Iron	506	1.8	50	"	520		97.4	85-115			
Lead	19.2	0.020	5.0	"	20.0		95.8	85-115			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43114 - EPA 200.8											
LCS (AA43114-BS1)					Prepared: 01/31/14 Analyzed: 02/06/14						
Manganese	19.8	0.030	5.0	ug/l	20.0		99.1	85-115			
Nickel	19.7	0.060	10	"	20.0		98.6	85-115			
Selenium	20.1	0.070	5.0	"	20.0		100	85-115			
Silver	19.0	0.020	0.10	"	20.0		94.9	85-115			
Thallium	18.8	0.020	1.0	"	20.0		94.1	85-115			
Uranium	12.8	0.020	1.0	pCi/l	13.4		95.4	85-115			
Vanadium	19.8	0.30	1.0	ug/l	20.0		99.1	85-115			
Zinc	104	0.50	5.0	"	100		104	85-115			
Duplicate (AA43114-DUP1)		**Source: 14A1635-01**			Prepared: 01/31/14 Analyzed: 02/06/14						
Aluminum	4.47	2.0	50	ug/l		4.30			3.91	20	J
Antimony	0.0425	0.020	6.0	"		0.0326			26.3	20	J
Arsenic	1.36	0.070	2.0	"		1.56			13.8	20	J
Barium	58.6	0.030	100	"		59.4			1.25	20	J
Beryllium	ND	0.020	1.0	"		ND				20	U
Boron	20.9	6.0	50	"		32.3			42.7	20	J
Cadmium	0.0918	0.020	1.0	"		0.104			12.4	20	J
Chromium	3.32	0.080	10	"		3.42			2.88	20	J
Copper	1.89	0.040	0.50	"		1.86			1.52	20	
Iron	65.6	1.8	50	"		67.0			2.11	20	
Lead	0.0883	0.020	5.0	"		0.0610			36.6	20	J
Manganese	1.21	0.030	5.0	"		1.14			5.66	20	J
Nickel	1.39	0.060	10	"		1.32			4.69	20	J
Selenium	2.08	0.070	5.0	"		2.20			5.62	20	J
Silver	ND	0.020	0.10	"		ND				20	U
Thallium	0.123	0.020	1.0	"		0.0449			93.1	20	J
Uranium	0.196	0.020	1.0	pCi/l		0.199			1.36	20	J
Vanadium	1.62	0.30	1.0	ug/l		1.61			0.912	20	
Zinc	72.5	0.50	5.0	"		75.4			3.81	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43114 - EPA 200.8											
Matrix Spike (AA43114-MS1)		**Source: 14A1635-01**			Prepared: 01/31/14 Analyzed: 02/06/14						
Aluminum	436	2.0	50	ug/l	520	4.30	83.0	70-130			
Antimony	19.7	0.020	6.0	"	20.0	0.0326	98.5	70-130			
Arsenic	21.0	0.070	2.0	"	20.0	1.56	97.3	70-130			
Barium	76.2	0.030	100	"	20.0	59.4	84.0	70-130			J
Beryllium	19.8	0.020	1.0	"	20.0	ND	99.1	70-130			
Boron	124	6.0	50	"	100	32.3	92.2	70-130			
Cadmium	19.1	0.020	1.0	"	20.0	0.104	94.9	70-130			
Chromium	20.8	0.080	10	"	20.0	3.42	86.8	70-130			
Copper	19.6	0.040	0.50	"	20.0	1.86	88.6	70-130			
Iron	504	1.8	50	"	520	67.0	84.1	70-130			
Lead	17.9	0.020	5.0	"	20.0	0.0610	89.4	70-130			
Manganese	18.5	0.030	5.0	"	20.0	1.14	87.0	70-130			
Nickel	18.5	0.060	10	"	20.0	1.32	85.7	70-130			
Selenium	20.8	0.070	5.0	"	20.0	2.20	93.2	70-130			
Silver	17.8	0.020	0.10	"	20.0	ND	89.1	70-130			
Thallium	17.0	0.020	1.0	"	20.0	0.0449	85.0	70-130			
Uranium	12.7	0.020	1.0	pCi/l	13.4	0.199	93.3	70-130			
Vanadium	19.9	0.30	1.0	ug/l	20.0	1.61	91.4	70-130			
Zinc	181	0.50	5.0	"	100	75.4	106	70-130			
Matrix Spike (AA43114-MS2)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/06/14						
Aluminum	469	2.0	50	ug/l	520	6.54	89.0	70-130			
Antimony	20.1	0.020	6.0	"	20.0	0.126	99.6	70-130			
Arsenic	20.4	0.070	2.0	"	20.0	0.632	98.8	70-130			
Barium	81.8	0.030	100	"	20.0	64.1	88.8	70-130			J
Beryllium	19.4	0.020	1.0	"	20.0	ND	97.1	70-130			
Cadmium	19.0	0.020	1.0	"	20.0	ND	95.2	70-130			
Chromium	18.8	0.080	10	"	20.0	ND	94.1	70-130			
Copper	19.0	0.040	0.50	"	20.0	0.653	91.7	70-130			
Iron	467	1.8	50	"	520	ND	89.7	70-130			
Lead	18.1	0.020	5.0	"	20.0	0.0253	90.6	70-130			
Manganese	18.9	0.030	5.0	"	20.0	0.390	92.3	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43114 - EPA 200.8											
Matrix Spike (AA43114-MS2)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/06/14						
Nickel	19.4	0.060	10	ug/l	20.0	1.19	91.2	70-130			
Selenium	19.5	0.070	5.0	"	20.0	ND	97.6	70-130			
Silver	18.3	0.020	0.10	"	20.0	ND	91.4	70-130			
Thallium	18.1	0.020	1.0	"	20.0	0.0225	90.2	70-130			
Uranium	12.5	0.020	1.0	pCi/l	13.4	ND	93.0	70-130			
Vanadium	19.5	0.30	1.0	ug/l	20.0	ND	97.6	70-130			
Zinc	115	0.50	5.0	"	100	3.79	111	70-130			
Matrix Spike Dup (AA43114-MSD1)		**Source: 14A1635-01**			Prepared: 01/31/14 Analyzed: 02/06/14						
Aluminum	446	2.0	50	ug/l	520	4.30	84.9	70-130	2.18	20	
Antimony	20.5	0.020	6.0	"	20.0	0.0326	102	70-130	3.70	20	
Arsenic	21.4	0.070	2.0	"	20.0	1.56	99.3	70-130	1.81	20	
Barium	77.2	0.030	100	"	20.0	59.4	89.5	70-130	1.42	20	J
Beryllium	19.7	0.020	1.0	"	20.0	ND	98.7	70-130	0.391	20	
Boron	122	6.0	50	"	100	32.3	90.2	70-130	1.62	20	
Cadmium	19.5	0.020	1.0	"	20.0	0.104	96.9	70-130	2.06	20	
Chromium	21.5	0.080	10	"	20.0	3.42	90.4	70-130	3.40	20	
Copper	20.3	0.040	0.50	"	20.0	1.86	92.3	70-130	3.66	20	
Iron	531	1.8	50	"	520	67.0	89.3	70-130	5.25	20	
Lead	18.9	0.020	5.0	"	20.0	0.0610	94.0	70-130	5.02	20	
Manganese	19.4	0.030	5.0	"	20.0	1.14	91.4	70-130	4.65	20	
Nickel	18.8	0.060	10	"	20.0	1.32	87.3	70-130	1.73	20	
Selenium	20.8	0.070	5.0	"	20.0	2.20	92.9	70-130	0.349	20	
Silver	18.4	0.020	0.10	"	20.0	ND	91.8	70-130	3.06	20	
Thallium	18.4	0.020	1.0	"	20.0	0.0449	91.9	70-130	7.76	20	
Uranium	13.2	0.020	1.0	pCi/l	13.4	0.199	97.0	70-130	3.79	20	
Vanadium	20.4	0.30	1.0	ug/l	20.0	1.61	94.0	70-130	2.55	20	
Zinc	167	0.50	5.0	"	100	75.4	91.5	70-130	8.30	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43044 - General Preparation											
Duplicate (AA43044-DUP1)		**Source: 14A1628-02**			Prepared & Analyzed: 01/30/14						
Specific Conductance (EC)	360	1.0	20	umhos/cm		384			6.45	10	
Batch AA43107 - General Preparation											
Blank (AA43107-BLK1)					Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l							U
LCS (AA43107-BS1)					Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.205	0.030	0.050	mg/l	0.200		103	80-120			
Duplicate (AA43107-DUP1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l		ND				20	U
Matrix Spike (AA43107-MS1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.208	0.030	0.050	mg/l	0.200	ND	104	80-120			
Matrix Spike Dup (AA43107-MSD1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.210	0.030	0.050	mg/l	0.200	ND	105	80-120	0.826	20	
Batch AA43121 - General Preparation											
Duplicate (AA43121-DUP1)		**Source: 14B0229-03**			Prepared: 02/01/14 Analyzed: 02/11/14						
Bicarbonate	42.7	0.060	5.0	mg/l		42.7			0.00	20	
Batch AA43131 - General Prep											
Blank (AA43131-BLK1)					Prepared & Analyzed: 01/31/14						
Total Organic Carbon	0.142	0.100	0.300	mg/l							J

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43131 - General Prep											
LCS (AA43131-BS1)					Prepared & Analyzed: 01/31/14						
Total Organic Carbon	10.9	0.100	0.300	mg/l	10.0		109	85-115			
LCS Dup (AA43131-BSD1)					Prepared & Analyzed: 01/31/14						
Total Organic Carbon	10.4	0.100	0.300	mg/l	10.0		104	85-115	4.47	20	
Duplicate (AA43131-DUP1)		**Source: 14A1101-01**			Prepared & Analyzed: 01/31/14						
Total Organic Carbon	0.853	0.100	0.300	mg/l		0.895			4.80	20	
Matrix Spike (AA43131-MS1)		**Source: 14A1101-02**			Prepared & Analyzed: 01/31/14						
Total Organic Carbon	21.5	0.200	0.600	mg/l	20.0	0.789	103	70-130			
Matrix Spike Dup (AA43131-MSD1)		**Source: 14A1101-02**			Prepared & Analyzed: 01/31/14						
Total Organic Carbon	21.8	0.200	0.600	mg/l	20.0	0.789	105	70-130	1.81	20	
Batch AB40322 - General Preparation											
Blank (AB40322-BLK1)					Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	ND	5.0	10	mg/l							U
Duplicate (AB40322-DUP1)		**Source: 14A1635-01**			Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	361	5.0	10	mg/l		352			2.52	30	
Duplicate (AB40322-DUP2)		**Source: 14A1730-01**			Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	1010	5.0	10	mg/l		964			4.46	30	
Batch AB41141 - General Preparation											
Blank (AB41141-BLK1)					Prepared & Analyzed: 02/11/14						
Perchlorate	0.967	0.90	4.0	ug/l							J

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41141 - General Preparation											
LCS (AB41141-BS1)					Prepared & Analyzed: 02/11/14						
Perchlorate	23.9	0.90	4.0	ug/l	25.0		95.5	85-115			
Duplicate (AB41141-DUP1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	ND	0.90	4.0	ug/l		ND				15	U
Matrix Spike (AB41141-MS1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130			
Matrix Spike Dup (AB41141-MSD1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130	0.00386	15	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Miscellaneous Physical/Conventional Chemistry Parameters - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40428 - General Preparation											
Blank (AB40428-BLK1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l							U
LCS (AB40428-BS1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.202	0.0020	0.10	mg/l	0.200		101	85-115			
Duplicate (AB40428-DUP1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l		ND				25	U
Matrix Spike (AB40428-MS1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.188	0.0020	0.10	mg/l	0.200	ND	93.9	85-115			
Matrix Spike (AB40428-MS2)		**Source: 14A1635-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.220	0.0020	0.10	mg/l	0.200	ND	110	85-115			
Matrix Spike Dup (AB40428-MSD1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.186	0.0020	0.10	mg/l	0.200	ND	92.8	85-115	1.23	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43037 - General Preparation											
Blank (AA43037-BLK1)					Prepared & Analyzed: 01/30/14						
Nitrate as NO3	ND	0.20	2.0	mg/l							U
Fluoride	ND	0.070	0.10	"							U
Chloride	ND	0.030	0.50	"							U
Nitrite as N	ND	0.020	0.40	"							U
Sulfate as SO4	ND	0.090	0.50	"							U
LCS (AA43037-BS1)					Prepared & Analyzed: 01/30/14						
Nitrate as NO3	22	0.20	2.0	mg/l	22.2		100	90-110			
Sulfate as SO4	20.0	0.090	0.50	"	20.0		99.8	90-110			
Fluoride	5.17	0.070	0.10	"	5.00		103	90-110			
Nitrite as N	5.18	0.020	0.40	"	5.00		104	90-110			
Chloride	10.1	0.030	0.50	"	10.0		101	90-110			
Duplicate (AA43037-DUP1)		**Source: 14A1612-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Nitrate as NO3	76	1.0	10	mg/l		76			0.434	20	
Chloride	49.3	0.15	2.5	"		48.5			1.72	20	
Sulfate as SO4	13.1	0.090	0.50	"		13.2			0.396	20	
Fluoride	ND	0.070	0.10	"		ND				20	U
Nitrite as N	ND	0.020	0.40	"		ND				20	U
Matrix Spike (AA43037-MS1)		**Source: 14A1612-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Nitrate as NO3	100	1.0	10	mg/l	24.7	76	98.0	80-120			
Fluoride	4.96	0.35	0.50	"	5.56	ND	89.3	80-120			
Chloride	59.9	0.15	2.5	"	11.1	48.5	103	80-120			
Nitrite as N	5.37	0.10	2.0	"	5.56	ND	96.6	80-120			
Sulfate as SO4	33.9	0.45	2.5	"	22.2	13.2	93.5	80-120			
Matrix Spike (AA43037-MS2)		**Source: 14A1643-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Nitrate as NO3	27	1.0	10	mg/l	24.7	2.7	97.4	80-120			
Sulfate as SO4	31.5	0.45	2.5	"	22.2	9.88	97.4	80-120			
Fluoride	5.13	0.35	0.50	"	5.56	ND	92.4	80-120			
Nitrite as N	5.55	0.10	2.0	"	5.56	ND	99.9	80-120			
Chloride	90.7	0.15	2.5	"	11.1	78.6	108	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43037 - General Preparation											
Matrix Spike Dup (AA43037-MSD1)		**Source: 14A1612-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Nitrate as NO3	100	1.0	10	mg/l	24.7	76	98.4	80-120	0.116	20	
Sulfate as SO4	34.1	0.45	2.5	"	22.2	13.2	94.2	80-120	0.425	20	
Fluoride	5.01	0.35	0.50	"	5.56	ND	90.2	80-120	1.00	20	
Chloride	60.0	0.15	2.5	"	11.1	48.5	103	80-120	0.102	20	
Nitrite as N	5.39	0.10	2.0	"	5.56	ND	97.1	80-120	0.516	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Blank (AB40523-BLK1)					Prepared & Analyzed: 02/03/14						
Acetone	ND	0.80	5.0	ug/l							U
Acrylonitrile	ND	0.20	5.0	"							U
Benzene	ND	0.20	0.30	"							U
Bromobenzene	ND	0.10	0.50	"							U
Bromochloromethane	ND	0.20	0.50	"							U
Bromodichloromethane	ND	0.50	0.50	"							U
Bromoform	ND	0.50	0.50	"							U
Bromomethane	ND	0.20	0.50	"							U
n-Butylbenzene	ND	0.10	0.50	"							U
sec-Butylbenzene	ND	0.10	0.50	"							U
tert-Butylbenzene	ND	0.10	0.50	"							U
Carbon disulfide	ND	0.20	0.50	"							U
Carbon tetrachloride	ND	0.30	0.50	"							U
Chlorobenzene	ND	0.20	0.50	"							U
Chloroethane	ND	0.10	0.50	"							U
Chloroform	ND	0.50	0.50	"							U
Chloromethane	ND	0.20	0.50	"							U
2-Chlorotoluene	ND	0.20	0.50	"							U
4-Chlorotoluene	ND	0.10	0.50	"							U
Dibromochloromethane	ND	0.50	0.50	"							U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"							U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"							U
Dibromomethane	ND	0.20	0.50	"							U
1,2-Dichlorobenzene	ND	0.20	0.50	"							U
1,3-Dichlorobenzene	ND	0.20	0.50	"							U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"							U
1,4-Dichlorobenzene	ND	0.10	0.50	"							U
Dichlorodifluoromethane	ND	0.20	0.50	"							U
1,1-Dichloroethane	ND	0.10	0.50	"							U
1,2-Dichloroethane	ND	0.20	0.50	"							U
1,1-Dichloroethene	ND	0.10	0.30	"							U
cis-1,2-Dichloroethene	ND	0.20	0.50	"							U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Blank (AB40523-BLK1)					Prepared & Analyzed: 02/03/14						
trans-1,2-Dichloroethene	ND	0.20	0.50	ug/l							U
1,2-Dichloropropane	ND	0.20	0.50	"							U
1,3-Dichloropropane	ND	0.20	0.50	"							U
2,2-Dichloropropane	ND	0.10	0.50	"							U
1,1-Dichloropropene	ND	0.10	0.50	"							U
cis-1,3-Dichloropropene	ND	0.20	0.50	"							U
trans-1,3-Dichloropropene	ND	0.20	0.50	"							U
1,3-Dichloropropene (total)	ND	0.20	0.50	"							U
2-Hexanone	ND	0.097	5.0	"							U
Ethylbenzene	ND	0.10	0.50	"							U
Hexachlorobutadiene	ND	0.30	0.50	"							U
Isopropylbenzene	ND	0.20	0.50	"							U
p-Isopropyltoluene	ND	0.10	0.50	"							U
Methyl ethyl ketone	ND	0.40	1.0	"							U
Methyl iodide	ND	0.12	2.0	"							U
Methyl isobutyl ketone	ND	0.30	1.0	"							U
Methylene chloride	ND	0.40	0.50	"							U
Naphthalene	ND	0.20	0.50	"							U
n-Propylbenzene	ND	0.20	0.50	"							U
Styrene	ND	0.10	0.50	"							U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"							U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"							U
Tetrachloroethene	ND	0.20	0.50	"							U
Toluene	ND	0.10	0.50	"							U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"							U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"							U
1,1,1-Trichloroethane	ND	0.20	0.50	"							U
1,1,2-Trichloroethane	ND	0.20	0.50	"							U
Trichloroethene	ND	0.20	0.50	"							U
Trichlorofluoromethane	ND	0.20	0.50	"							U
Trichlorotrifluoroethane	ND	0.20	0.50	"							U
1,2,3-Trichloropropane	ND	0.13	0.50	"							U

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Blank (AB40523-BLK1)					Prepared & Analyzed: 02/03/14						
1,2,4-Trimethylbenzene	ND	0.10	0.50	ug/l							U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"							U
Vinyl chloride	ND	0.10	0.50	"							U
m,p-Xylene	ND	0.20	0.50	"							U
o-Xylene	ND	0.10	0.50	"							U
Xylenes (total)	ND	0.20	0.50	"							U
Trihalomethanes (total)	ND	0.50	0.50	"							U
Methyl tert-butyl ether	ND	0.50	0.50	"							U
Ethyl tert-butyl ether	ND	0.20	0.50	"							U
Tert-amyl methyl ether	ND	0.20	0.50	"							U
Surrogate: Bromofluorobenzene	*24.6*			*"*	*25.0*		*98.3*	*70-130*			
Surrogate: Dibromofluoromethane	*23.4*			*"*	*25.0*		*93.4*	*70-130*			
Surrogate: Toluene-d8	*24.8*			*"*	*25.0*		*99.3*	*70-130*			
LCS (AB40523-BS1)					Prepared & Analyzed: 02/03/14						
Acetone	21.8	0.80	5.0	ug/l	20.0		109	70-130			
Acrylonitrile	5.49	0.20	5.0	"	5.00		110	70-130			
Benzene	4.86	0.20	0.30	"	5.00		97.2	70-130			
Bromobenzene	4.87	0.10	0.50	"	5.00		97.4	70-130			
Bromochloromethane	4.99	0.20	0.50	"	5.00		99.8	70-130			
Bromodichloromethane	4.76	0.50	0.50	"	5.00		95.2	70-130			
Bromoform	4.54	0.50	0.50	"	5.00		90.8	70-130			
Bromomethane	5.21	0.20	0.50	"	5.00		104	70-130			
n-Butylbenzene	4.94	0.10	0.50	"	5.00		98.8	70-130			
sec-Butylbenzene	4.94	0.10	0.50	"	5.00		98.8	70-130			
tert-Butylbenzene	5.07	0.10	0.50	"	5.00		101	70-130			
Carbon disulfide	4.99	0.20	0.50	"	5.00		99.8	70-130			
Carbon tetrachloride	4.48	0.30	0.50	"	5.00		89.6	70-130			
Chlorobenzene	4.94	0.20	0.50	"	5.00		98.8	70-130			
Chloroethane	5.47	0.10	0.50	"	5.00		109	70-130			
Chloroform	5.06	0.50	0.50	"	5.00		101	70-130			
Chloromethane	5.63	0.20	0.50	"	5.00		113	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS (AB40523-BS1)					Prepared & Analyzed: 02/03/14						
2-Chlorotoluene	4.97	0.20	0.50	ug/l	5.00		99.4	70-130			
4-Chlorotoluene	5.04	0.10	0.50	"	5.00		101	70-130			
Dibromochloromethane	4.79	0.50	0.50	"	5.00		95.8	70-130			
1,2-Dibromo-3-chloropropane	5.46	0.36	0.50	"	5.00		109	70-130			
1,2-Dibromoethane (EDB)	4.99	0.14	0.50	"	5.00		99.8	70-130			
Dibromomethane	4.96	0.20	0.50	"	5.00		99.2	70-130			
1,2-Dichlorobenzene	4.92	0.20	0.50	"	5.00		98.4	70-130			
1,3-Dichlorobenzene	4.84	0.20	0.50	"	5.00		96.8	70-130			
1,4-Dichlorobenzene	4.86	0.10	0.50	"	5.00		97.2	70-130			
trans-1,4-Dichloro-2-butene	4.54	0.095	5.0	"	5.00		90.8	70-130			J
Dichlorodifluoromethane	5.94	0.20	0.50	"	5.00		119	70-130			
1,1-Dichloroethane	5.26	0.10	0.50	"	5.00		105	70-130			
1,2-Dichloroethane	5.05	0.20	0.50	"	5.00		101	70-130			
1,1-Dichloroethene	4.85	0.10	0.30	"	5.00		97.0	70-130			
cis-1,2-Dichloroethene	5.17	0.20	0.50	"	5.00		103	70-130			
trans-1,2-Dichloroethene	4.90	0.20	0.50	"	5.00		98.0	70-130			
1,2-Dichloropropane	5.01	0.20	0.50	"	5.00		100	70-130			
1,3-Dichloropropane	5.18	0.20	0.50	"	5.00		104	70-130			
2,2-Dichloropropane	4.34	0.10	0.50	"	5.00		86.8	70-130			
1,1-Dichloropropene	4.74	0.10	0.50	"	5.00		94.8	70-130			
cis-1,3-Dichloropropene	5.42	0.20	0.50	"	5.00		108	70-130			
trans-1,3-Dichloropropene	4.43	0.20	0.50	"	5.00		88.6	70-130			
Ethylbenzene	4.99	0.10	0.50	"	5.00		99.8	70-130			
2-Hexanone	5.00	0.097	5.0	"	5.00		100	70-130			
Hexachlorobutadiene	4.57	0.30	0.50	"	5.00		91.4	70-130			
Isopropylbenzene	5.14	0.20	0.50	"	5.00		103	70-130			
p-Isopropyltoluene	4.96	0.10	0.50	"	5.00		99.2	70-130			
Methyl ethyl ketone	10.9	0.40	1.0	"	10.0		109	70-130			
Methyl iodide	5.04	0.12	2.0	"	5.00		101	70-130			
Methyl isobutyl ketone	10.2	0.30	1.0	"	10.0		102	70-130			
Methylene chloride	4.68	0.40	0.50	"	5.00		93.6	70-130			
Naphthalene	5.61	0.20	0.50	"	5.00		112	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS (AB40523-BS1)					Prepared & Analyzed: 02/03/14						
n-Propylbenzene	5.19	0.20	0.50	ug/l	5.00		104	70-130			
Styrene	5.23	0.10	0.50	"	5.00		105	70-130			
1,1,1,2-Tetrachloroethane	4.54	0.20	0.50	"	5.00		90.8	70-130			
1,1,2,2-Tetrachloroethane	5.08	0.20	0.50	"	5.00		102	70-130			
Tetrachloroethene	4.76	0.20	0.50	"	5.00		95.2	70-130			
Toluene	4.96	0.10	0.50	"	5.00		99.2	70-130			
1,2,3-Trichlorobenzene	5.54	0.10	0.50	"	5.00		111	70-130			
1,2,4-Trichlorobenzene	5.06	0.20	0.50	"	5.00		101	70-130			
1,1,1-Trichloroethane	4.85	0.20	0.50	"	5.00		97.0	70-130			
1,1,2-Trichloroethane	5.08	0.20	0.50	"	5.00		102	70-130			
Trichloroethene	4.77	0.20	0.50	"	5.00		95.4	70-130			
Trichlorofluoromethane	5.34	0.20	0.50	"	5.00		107	70-130			
Trichlorotrifluoroethane	5.42	0.20	0.50	"	5.00		108	70-130			
1,2,3-Trichloropropane	5.07	0.13	0.50	"	5.00		101	70-130			
1,2,4-Trimethylbenzene	5.17	0.10	0.50	"	5.00		103	70-130			
1,3,5-Trimethylbenzene	5.00	0.10	0.50	"	5.00		100	70-130			
Vinyl chloride	5.10	0.10	0.50	"	5.00		102	70-130			
m,p-Xylene	9.81	0.20	0.50	"	10.0		98.1	70-130			
o-Xylene	5.07	0.10	0.50	"	5.00		101	70-130			
Xylenes (total)	14.9	0.20	0.50	"	15.0		99.2	70-130			
Methyl tert-butyl ether	5.00	0.50	0.50	"	5.00		100	70-130			
Ethyl tert-butyl ether	5.28	0.20	0.50	"	5.00		106	70-130			
Tert-amyl methyl ether	5.25	0.20	0.50	"	5.00		105	70-130			
Surrogate: Bromofluorobenzene	*24.8*			*"*	*25.0*		*99.4*	*70-130*			
Surrogate: Dibromofluoromethane	*23.9*			*"*	*25.0*		*95.4*	*70-130*			
Surrogate: Toluene-d8	*25.1*			*"*	*25.0*		*101*	*70-130*			
LCS Dup (AB40523-BSD1)					Prepared & Analyzed: 02/03/14						
Acetone	21.6	0.80	5.0	ug/l	20.0		108	70-130	1.06	30	
Acrylonitrile	5.42	0.20	5.0	"	5.00		108	70-130	1.28	30	
Benzene	4.79	0.20	0.30	"	5.00		95.8	70-130	1.45	30	
Bromobenzene	4.90	0.10	0.50	"	5.00		98.0	70-130	0.614	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS Dup (AB40523-BSD1)					Prepared & Analyzed: 02/03/14						
Bromochloromethane	4.89	0.20	0.50	ug/l	5.00		97.8	70-130	2.02	30	
Bromodichloromethane	4.86	0.50	0.50	"	5.00		97.2	70-130	2.08	30	
Bromoform	4.50	0.50	0.50	"	5.00		90.0	70-130	0.885	30	
Bromomethane	5.26	0.20	0.50	"	5.00		105	70-130	0.955	30	
n-Butylbenzene	4.86	0.10	0.50	"	5.00		97.2	70-130	1.63	30	
sec-Butylbenzene	4.84	0.10	0.50	"	5.00		96.8	70-130	2.04	30	
tert-Butylbenzene	4.96	0.10	0.50	"	5.00		99.2	70-130	2.19	30	
Carbon disulfide	4.96	0.20	0.50	"	5.00		99.2	70-130	0.603	30	
Carbon tetrachloride	4.42	0.30	0.50	"	5.00		88.4	70-130	1.35	30	
Chlorobenzene	4.78	0.20	0.50	"	5.00		95.6	70-130	3.29	30	
Chloroethane	5.51	0.10	0.50	"	5.00		110	70-130	0.729	30	
Chloroform	4.98	0.50	0.50	"	5.00		99.6	70-130	1.59	30	
Chloromethane	5.75	0.20	0.50	"	5.00		115	70-130	2.11	30	
2-Chlorotoluene	4.88	0.20	0.50	"	5.00		97.6	70-130	1.83	30	
4-Chlorotoluene	4.90	0.10	0.50	"	5.00		98.0	70-130	2.82	30	
Dibromochloromethane	4.77	0.50	0.50	"	5.00		95.4	70-130	0.418	30	
1,2-Dibromo-3-chloropropane	5.48	0.36	0.50	"	5.00		110	70-130	0.366	25	
1,2-Dibromoethane (EDB)	4.91	0.14	0.50	"	5.00		98.2	70-130	1.62	25	
Dibromomethane	4.90	0.20	0.50	"	5.00		98.0	70-130	1.22	30	
1,2-Dichlorobenzene	4.81	0.20	0.50	"	5.00		96.2	70-130	2.26	30	
1,3-Dichlorobenzene	4.78	0.20	0.50	"	5.00		95.6	70-130	1.25	30	
trans-1,4-Dichloro-2-butene	4.70	0.095	5.0	"	5.00		94.0	70-130	3.46	25	J
1,4-Dichlorobenzene	4.72	0.10	0.50	"	5.00		94.4	70-130	2.92	30	
Dichlorodifluoromethane	5.79	0.20	0.50	"	5.00		116	70-130	2.56	30	
1,1-Dichloroethane	5.24	0.10	0.50	"	5.00		105	70-130	0.381	30	
1,2-Dichloroethane	4.96	0.20	0.50	"	5.00		99.2	70-130	1.80	30	
1,1-Dichloroethene	4.89	0.10	0.30	"	5.00		97.8	70-130	0.821	30	
cis-1,2-Dichloroethene	5.01	0.20	0.50	"	5.00		100	70-130	3.14	30	
trans-1,2-Dichloroethene	4.82	0.20	0.50	"	5.00		96.4	70-130	1.65	30	
1,2-Dichloropropane	4.92	0.20	0.50	"	5.00		98.4	70-130	1.81	30	
1,3-Dichloropropane	4.98	0.20	0.50	"	5.00		99.6	70-130	3.94	30	
2,2-Dichloropropane	4.24	0.10	0.50	"	5.00		84.8	70-130	2.33	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS Dup (AB40523-BSD1)					Prepared & Analyzed: 02/03/14						
1,1-Dichloropropene	4.64	0.10	0.50	ug/l	5.00		92.8	70-130	2.13	30	
cis-1,3-Dichloropropene	5.41	0.20	0.50	"	5.00		108	70-130	0.185	30	
trans-1,3-Dichloropropene	4.43	0.20	0.50	"	5.00		88.6	70-130	0.00	30	
2-Hexanone	4.97	0.097	5.0	"	5.00		99.4	70-130	0.602	25	J
Ethylbenzene	4.92	0.10	0.50	"	5.00		98.4	70-130	1.41	30	
Hexachlorobutadiene	4.70	0.30	0.50	"	5.00		94.0	70-130	2.80	30	
Isopropylbenzene	5.06	0.20	0.50	"	5.00		101	70-130	1.57	30	
p-Isopropyltoluene	4.91	0.10	0.50	"	5.00		98.2	70-130	1.01	30	
Methyl ethyl ketone	10.5	0.40	1.0	"	10.0		105	70-130	3.73	30	
Methyl iodide	4.98	0.12	2.0	"	5.00		99.6	70-130	1.20	25	
Methyl isobutyl ketone	9.94	0.30	1.0	"	10.0		99.4	70-130	3.07	30	
Methylene chloride	4.78	0.40	0.50	"	5.00		95.6	70-130	2.11	30	
Naphthalene	5.65	0.20	0.50	"	5.00		113	70-130	0.710	30	
n-Propylbenzene	5.14	0.20	0.50	"	5.00		103	70-130	0.968	30	
Styrene	5.18	0.10	0.50	"	5.00		104	70-130	0.961	30	
1,1,1,2-Tetrachloroethane	4.49	0.20	0.50	"	5.00		89.8	70-130	1.11	30	
1,1,2,2-Tetrachloroethane	4.96	0.20	0.50	"	5.00		99.2	70-130	2.39	30	
Tetrachloroethene	4.50	0.20	0.50	"	5.00		90.0	70-130	5.62	30	
Toluene	4.83	0.10	0.50	"	5.00		96.6	70-130	2.66	30	
1,2,3-Trichlorobenzene	5.52	0.10	0.50	"	5.00		110	70-130	0.362	30	
1,2,4-Trichlorobenzene	5.08	0.20	0.50	"	5.00		102	70-130	0.394	30	
1,1,1-Trichloroethane	4.87	0.20	0.50	"	5.00		97.4	70-130	0.412	30	
1,1,2-Trichloroethane	4.99	0.20	0.50	"	5.00		99.8	70-130	1.79	30	
Trichloroethene	4.78	0.20	0.50	"	5.00		95.6	70-130	0.209	30	
Trichlorofluoromethane	5.36	0.20	0.50	"	5.00		107	70-130	0.374	30	
Trichlorotrifluoroethane	5.24	0.20	0.50	"	5.00		105	70-130	3.38	30	
1,2,3-Trichloropropane	4.89	0.13	0.50	"	5.00		97.8	70-130	3.61	25	
1,2,4-Trimethylbenzene	5.11	0.10	0.50	"	5.00		102	70-130	1.17	30	
1,3,5-Trimethylbenzene	4.90	0.10	0.50	"	5.00		98.0	70-130	2.02	30	
Vinyl chloride	5.01	0.10	0.50	"	5.00		100	70-130	1.78	30	
m,p-Xylene	9.61	0.20	0.50	"	10.0		96.1	70-130	2.06	30	
o-Xylene	4.88	0.10	0.50	"	5.00		97.6	70-130	3.82	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
LCS Dup (AB40523-BSD1)					Prepared & Analyzed: 02/03/14						
Xylenes (total)	14.5	0.20	0.50	ug/l	15.0		96.6	70-130	2.66	30	
Methyl tert-butyl ether	4.92	0.50	0.50	"	5.00		98.4	70-130	1.61	30	
Ethyl tert-butyl ether	5.35	0.20	0.50	"	5.00		107	70-130	1.32	30	
Tert-amyl methyl ether	5.20	0.20	0.50	"	5.00		104	70-130	0.957	30	
Surrogate: Bromofluorobenzene	*25.0*			*"*	*25.0*		*99.9*	*70-130*			
Surrogate: Dibromofluoromethane	*23.9*			*"*	*25.0*		*95.6*	*70-130*			
Surrogate: Toluene-d8	*25.0*			*"*	*25.0*		*99.9*	*70-130*			
Matrix Spike (AB40523-MS1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Acetone	21.5	0.80	5.0	ug/l	20.0	ND	108	70-130			
Acrylonitrile	5.26	0.20	5.0	"	5.00	ND	105	70-130			
Benzene	4.79	0.20	0.30	"	5.00	ND	95.8	70-130			
Bromobenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130			
Bromochloromethane	5.11	0.20	0.50	"	5.00	ND	102	70-130			
Bromodichloromethane	4.76	0.50	0.50	"	5.00	ND	95.2	70-130			
Bromoform	4.59	0.50	0.50	"	5.00	ND	91.8	70-130			
Bromomethane	5.15	0.20	0.50	"	5.00	ND	103	70-130			
n-Butylbenzene	4.59	0.10	0.50	"	5.00	ND	91.8	70-130			
sec-Butylbenzene	4.98	0.10	0.50	"	5.00	ND	99.6	70-130			
tert-Butylbenzene	5.24	0.10	0.50	"	5.00	ND	105	70-130			
Carbon disulfide	4.96	0.20	0.50	"	5.00	ND	99.2	70-130			
Carbon tetrachloride	4.66	0.30	0.50	"	5.00	ND	93.2	70-130			
Chlorobenzene	4.99	0.20	0.50	"	5.00	ND	99.8	70-130			
Chloroethane	5.32	0.10	0.50	"	5.00	ND	106	70-130			
Chloroform	5.17	0.50	0.50	"	5.00	ND	103	70-130			
Chloromethane	5.63	0.20	0.50	"	5.00	ND	113	70-130			
2-Chlorotoluene	5.16	0.20	0.50	"	5.00	ND	103	70-130			
4-Chlorotoluene	4.98	0.10	0.50	"	5.00	ND	99.6	70-130			
Dibromochloromethane	4.86	0.50	0.50	"	5.00	ND	97.2	70-130			
1,2-Dibromo-3-chloropropane	5.18	0.36	0.50	"	5.00	ND	104	70-130			
1,2-Dibromoethane (EDB)	4.84	0.14	0.50	"	5.00	ND	96.8	70-130			
Dibromomethane	5.02	0.20	0.50	"	5.00	ND	100	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike (AB40523-MS1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
1,2-Dichlorobenzene	4.78	0.20	0.50	ug/l	5.00	ND	95.6	70-130			
1,3-Dichlorobenzene	4.99	0.20	0.50	"	5.00	ND	99.8	70-130			
trans-1,4-Dichloro-2-butene	3.95	0.095	5.0	"	5.00	ND	79.0	70-130			J
1,4-Dichlorobenzene	4.65	0.10	0.50	"	5.00	ND	93.0	70-130			
Dichlorodifluoromethane	5.90	0.20	0.50	"	5.00	ND	118	70-130			
1,1-Dichloroethane	5.27	0.10	0.50	"	5.00	ND	105	70-130			
1,2-Dichloroethane	5.05	0.20	0.50	"	5.00	ND	101	70-130			
1,1-Dichloroethene	5.18	0.10	0.30	"	5.00	ND	104	70-130			
cis-1,2-Dichloroethene	5.19	0.20	0.50	"	5.00	ND	104	70-130			
trans-1,2-Dichloroethene	5.01	0.20	0.50	"	5.00	ND	100	70-130			
1,2-Dichloropropane	4.78	0.20	0.50	"	5.00	ND	95.6	70-130			
1,3-Dichloropropane	4.94	0.20	0.50	"	5.00	ND	98.8	70-130			
2,2-Dichloropropane	4.69	0.10	0.50	"	5.00	ND	93.8	70-130			
1,1-Dichloropropene	4.67	0.10	0.50	"	5.00	ND	93.4	70-130			
cis-1,3-Dichloropropene	5.25	0.20	0.50	"	5.00	ND	105	70-130			
trans-1,3-Dichloropropene	4.29	0.20	0.50	"	5.00	ND	85.8	70-130			
Ethylbenzene	5.04	0.10	0.50	"	5.00	ND	101	70-130			
2-Hexanone	4.68	0.097	5.0	"	5.00	ND	93.6	70-130			J
Hexachlorobutadiene	4.29	0.30	0.50	"	5.00	ND	85.8	70-130			
Isopropylbenzene	5.29	0.20	0.50	"	5.00	ND	106	70-130			
p-Isopropyltoluene	5.08	0.10	0.50	"	5.00	ND	102	70-130			
Methyl ethyl ketone	10.3	0.40	1.0	"	10.0	ND	103	70-130			
Methyl iodide	5.38	0.12	2.0	"	5.00	ND	108	70-130			
Methyl isobutyl ketone	9.45	0.30	1.0	"	10.0	ND	94.5	70-130			
Methylene chloride	4.31	0.40	0.50	"	5.00	ND	86.2	70-130			
Naphthalene	5.17	0.20	0.50	"	5.00	ND	103	70-130			
n-Propylbenzene	5.36	0.20	0.50	"	5.00	ND	107	70-130			
Styrene	5.27	0.10	0.50	"	5.00	ND	105	70-130			
1,1,1,2-Tetrachloroethane	4.70	0.20	0.50	"	5.00	ND	94.0	70-130			
1,1,2,2-Tetrachloroethane	4.89	0.20	0.50	"	5.00	ND	97.8	70-130			
Tetrachloroethene	4.92	0.20	0.50	"	5.00	ND	98.4	70-130			
Toluene	5.00	0.10	0.50	"	5.00	ND	100	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike (AB40523-MS1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
1,2,3-Trichlorobenzene	5.13	0.10	0.50	ug/l	5.00	ND	103	70-130			
1,2,4-Trichlorobenzene	4.71	0.20	0.50	"	5.00	ND	94.2	70-130			
1,1,1-Trichloroethane	5.10	0.20	0.50	"	5.00	ND	102	70-130			
1,1,2-Trichloroethane	5.02	0.20	0.50	"	5.00	ND	100	70-130			
Trichloroethene	4.98	0.20	0.50	"	5.00	ND	99.6	70-130			
Trichlorofluoromethane	5.44	0.20	0.50	"	5.00	ND	109	70-130			
Trichlorotrifluoroethane	5.40	0.20	0.50	"	5.00	ND	108	70-130			
1,2,3-Trichloropropane	5.05	0.13	0.50	"	5.00	ND	101	70-130			
1,2,4-Trimethylbenzene	5.29	0.10	0.50	"	5.00	ND	106	70-130			
1,3,5-Trimethylbenzene	5.08	0.10	0.50	"	5.00	ND	102	70-130			
Vinyl chloride	5.05	0.10	0.50	"	5.00	ND	101	70-130			
m,p-Xylene	9.97	0.20	0.50	"	10.0	ND	99.7	70-130			
o-Xylene	5.12	0.10	0.50	"	5.00	ND	102	70-130			
Xylenes (total)	15.1	0.20	0.50	"	15.0	ND	101	70-130			
Methyl tert-butyl ether	4.49	0.50	0.50	"	5.00	ND	89.8	70-130			
Ethyl tert-butyl ether	4.96	0.20	0.50	"	5.00	ND	99.2	70-130			
Tert-amyl methyl ether	4.80	0.20	0.50	"	5.00	ND	96.0	70-130			
Surrogate: Bromofluorobenzene	*24.6*			*"*	*25.0*		*98.3*	*70-130*			
Surrogate: Dibromofluoromethane	*23.8*			*"*	*25.0*		*95.4*	*70-130*			
Surrogate: Toluene-d8	*24.6*			*"*	*25.0*		*98.5*	*70-130*			
Matrix Spike Dup (AB40523-MSD1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Acetone	21.7	0.80	5.0	ug/l	20.0	ND	109	70-130	0.971	30	
Acrylonitrile	5.22	0.20	5.0	"	5.00	ND	104	70-130	0.763	30	
Benzene	4.68	0.20	0.30	"	5.00	ND	93.6	70-130	2.32	30	
Bromobenzene	4.78	0.10	0.50	"	5.00	ND	95.6	70-130	6.67	30	
Bromochloromethane	5.02	0.20	0.50	"	5.00	ND	100	70-130	1.78	30	
Bromodichloromethane	4.78	0.50	0.50	"	5.00	ND	95.6	70-130	0.419	30	
Bromoform	4.59	0.50	0.50	"	5.00	ND	91.8	70-130	0.00	30	
Bromomethane	5.01	0.20	0.50	"	5.00	ND	100	70-130	2.76	30	
n-Butylbenzene	4.08	0.10	0.50	"	5.00	ND	81.6	70-130	11.8	30	
sec-Butylbenzene	4.45	0.10	0.50	"	5.00	ND	89.0	70-130	11.2	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike Dup (AB40523-MSD1)		**Source: 14A1588-01**		Prepared: 02/03/14 Analyzed: 02/04/14							
tert-Butylbenzene	4.78	0.10	0.50	ug/l	5.00	ND	95.6	70-130	9.18	30	
Carbon disulfide	4.67	0.20	0.50	"	5.00	ND	93.4	70-130	6.02	30	
Carbon tetrachloride	4.57	0.30	0.50	"	5.00	ND	91.4	70-130	1.95	30	
Chlorobenzene	4.71	0.20	0.50	"	5.00	ND	94.2	70-130	5.77	30	
Chloroethane	5.25	0.10	0.50	"	5.00	ND	105	70-130	1.32	30	
Chloroform	5.07	0.50	0.50	"	5.00	ND	101	70-130	1.95	30	
Chloromethane	5.41	0.20	0.50	"	5.00	ND	108	70-130	3.99	30	
2-Chlorotoluene	4.63	0.20	0.50	"	5.00	ND	92.6	70-130	10.8	30	
4-Chlorotoluene	4.54	0.10	0.50	"	5.00	ND	90.8	70-130	9.24	30	
Dibromochloromethane	4.71	0.50	0.50	"	5.00	ND	94.2	70-130	3.13	30	
1,2-Dibromo-3-chloropropane	5.18	0.36	0.50	"	5.00	ND	104	70-130	0.00	25	
1,2-Dibromoethane (EDB)	4.80	0.14	0.50	"	5.00	ND	96.0	70-130	0.830	25	
Dibromomethane	4.88	0.20	0.50	"	5.00	ND	97.6	70-130	2.83	30	
1,2-Dichlorobenzene	4.52	0.20	0.50	"	5.00	ND	90.4	70-130	5.59	30	
1,3-Dichlorobenzene	4.52	0.20	0.50	"	5.00	ND	90.4	70-130	9.88	30	
1,4-Dichlorobenzene	4.33	0.10	0.50	"	5.00	ND	86.6	70-130	7.13	30	
trans-1,4-Dichloro-2-butene	3.99	0.095	5.0	"	5.00	ND	79.8	70-130	1.01	25	J
Dichlorodifluoromethane	5.39	0.20	0.50	"	5.00	ND	108	70-130	9.03	30	
1,1-Dichloroethane	5.24	0.10	0.50	"	5.00	ND	105	70-130	0.571	30	
1,2-Dichloroethane	4.94	0.20	0.50	"	5.00	ND	98.8	70-130	2.20	30	
1,1-Dichloroethene	4.91	0.10	0.30	"	5.00	ND	98.2	70-130	5.35	30	
cis-1,2-Dichloroethene	5.13	0.20	0.50	"	5.00	ND	103	70-130	1.16	30	
trans-1,2-Dichloroethene	4.73	0.20	0.50	"	5.00	ND	94.6	70-130	5.75	30	
1,2-Dichloropropane	4.78	0.20	0.50	"	5.00	ND	95.6	70-130	0.00	30	
1,3-Dichloropropane	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	1.63	30	
2,2-Dichloropropane	4.67	0.10	0.50	"	5.00	ND	93.4	70-130	0.427	30	
1,1-Dichloropropene	4.38	0.10	0.50	"	5.00	ND	87.6	70-130	6.41	30	
cis-1,3-Dichloropropene	5.17	0.20	0.50	"	5.00	ND	103	70-130	1.54	30	
trans-1,3-Dichloropropene	4.23	0.20	0.50	"	5.00	ND	84.6	70-130	1.41	30	
Ethylbenzene	4.69	0.10	0.50	"	5.00	ND	93.8	70-130	7.19	30	
2-Hexanone	4.63	0.097	5.0	"	5.00	ND	92.6	70-130	1.07	25	J
Hexachlorobutadiene	4.09	0.30	0.50	"	5.00	ND	81.8	70-130	4.77	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike Dup (AB40523-MSD1)		**Source: 14A1588-01**		Prepared: 02/03/14 Analyzed: 02/04/14							
Isopropylbenzene	4.79	0.20	0.50	ug/l	5.00	ND	95.8	70-130	9.92	30	
p-Isopropyltoluene	4.42	0.10	0.50	"	5.00	ND	88.4	70-130	13.9	30	
Methyl ethyl ketone	10.2	0.40	1.0	"	10.0	ND	102	70-130	1.56	30	
Methyl iodide	5.32	0.12	2.0	"	5.00	ND	106	70-130	1.12	25	
Methyl isobutyl ketone	9.31	0.30	1.0	"	10.0	ND	93.1	70-130	1.49	30	
Methylene chloride	4.17	0.40	0.50	"	5.00	ND	83.4	70-130	3.30	30	
Naphthalene	5.24	0.20	0.50	"	5.00	ND	105	70-130	1.34	30	
n-Propylbenzene	4.69	0.20	0.50	"	5.00	ND	93.8	70-130	13.3	30	
Styrene	4.91	0.10	0.50	"	5.00	ND	98.2	70-130	7.07	30	
1,1,1,2-Tetrachloroethane	4.58	0.20	0.50	"	5.00	ND	91.6	70-130	2.59	30	
1,1,2,2-Tetrachloroethane	4.78	0.20	0.50	"	5.00	ND	95.6	70-130	2.28	30	
Tetrachloroethene	4.32	0.20	0.50	"	5.00	ND	86.4	70-130	13.0	30	
Toluene	4.75	0.10	0.50	"	5.00	ND	95.0	70-130	5.13	30	
1,2,3-Trichlorobenzene	5.01	0.10	0.50	"	5.00	ND	100	70-130	2.37	30	
1,2,4-Trichlorobenzene	4.41	0.20	0.50	"	5.00	ND	88.2	70-130	6.58	30	
1,1,1-Trichloroethane	5.04	0.20	0.50	"	5.00	ND	101	70-130	1.18	30	
1,1,2-Trichloroethane	4.88	0.20	0.50	"	5.00	ND	97.6	70-130	2.83	30	
Trichloroethene	4.70	0.20	0.50	"	5.00	ND	94.0	70-130	5.79	30	
Trichlorofluoromethane	5.05	0.20	0.50	"	5.00	ND	101	70-130	7.44	30	
Trichlorotrifluoroethane	4.83	0.20	0.50	"	5.00	ND	96.6	70-130	11.1	30	
1,2,3-Trichloropropane	4.84	0.13	0.50	"	5.00	ND	96.8	70-130	4.25	25	
1,2,4-Trimethylbenzene	4.73	0.10	0.50	"	5.00	ND	94.6	70-130	11.2	30	
1,3,5-Trimethylbenzene	4.58	0.10	0.50	"	5.00	ND	91.6	70-130	10.4	30	
Vinyl chloride	4.75	0.10	0.50	"	5.00	ND	95.0	70-130	6.12	30	
m,p-Xylene	9.08	0.20	0.50	"	10.0	ND	90.8	70-130	9.34	30	
o-Xylene	4.80	0.10	0.50	"	5.00	ND	96.0	70-130	6.45	30	
Xylenes (total)	13.9	0.20	0.50	"	15.0	ND	92.5	70-130	8.35	30	
Methyl tert-butyl ether	4.48	0.50	0.50	"	5.00	ND	89.6	70-130	0.223	30	
Ethyl tert-butyl ether	4.97	0.20	0.50	"	5.00	ND	99.4	70-130	0.201	30	
Tert-amyl methyl ether	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	1.24	30	
Surrogate: Bromofluorobenzene	*24.6*			*"*	*25.0*		*98.6*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*96.0*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40523 - VOAs in Water GCMS											
Matrix Spike Dup (AB40523-MSD1)		**Source: 14A1588-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Surrogate: Toluene-d8	*24.4*			*ug/l*	*25.0*		*97.4*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
Blank (AA43038-BLK1)					Prepared: 01/30/14 Analyzed: 01/31/14						
Aldrin	ND	0.010	0.050	ug/l							U
Chloroneb	ND	0.20	0.50	"							U
Chlorobenzilate	ND	2.0	5.0	"							U
Chlorothalonil	ND	0.030	0.10	"							U
DCPA	ND	0.020	0.040	"							U
4,4´-DDD	ND	0.020	0.050	"							U
4,4´-DDE	ND	0.020	0.050	"							U
4,4´-DDT	ND	0.020	0.020	"							U
Dieldrin	ND	0.010	0.010	"							U
Endosulfan I	ND	0.020	0.050	"							U
Endosulfan II	ND	0.020	0.050	"							U
Endosulfan sulfate	ND	0.020	0.020	"							U
Endrin	ND	0.030	0.10	"							U
Endrin aldehyde	ND	0.020	0.050	"							U
HCH-alpha	ND	0.010	0.050	"							U
HCH-beta	ND	0.020	0.050	"							U
HCH-delta	ND	0.030	0.050	"							U
HCH-gamma (Lindane)	ND	0.010	0.010	"							U
Heptachlor	ND	0.010	0.010	"							U
Heptachlor epoxide	ND	0.010	0.010	"							U
Hexachlorobenzene	ND	0.010	0.040	"							U
Hexachlorocyclopentadiene	ND	0.040	0.40	"							U
Methoxychlor	ND	0.020	0.020	"							U
cis-Permethrin	ND	0.070	0.20	"							U
trans-Permethrin	ND	0.090	0.20	"							U
Propachlor	ND	0.070	0.20	"							U
Trifluralin	ND	0.020	0.040	"							U
PCB-1016	ND	0.030	0.50	"							U
PCB-1221	ND	0.030	0.50	"							U
PCB-1232	ND	0.030	0.50	"							U
PCB-1242	ND	0.030	0.50	"							U
PCB-1248	ND	0.030	0.50	"							U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
Blank (AA43038-BLK1)					Prepared: 01/30/14 Analyzed: 01/31/14						
PCB-1254	ND	0.030	0.50	ug/l							U
PCB-1260	ND	0.030	0.50	"							U
Total PCBs	ND	0.30	0.50	"							U
Toxaphene	ND	0.40	0.50	"							U
Chlordane (tech)	ND	0.030	0.050	"							U
Surrogate: Dibutylchlorendate	*0.959*			*"*	*0.952*		*101*	*70-130*			
LCS (AA43038-BS1)					Prepared: 01/30/14 Analyzed: 02/01/14						
Aldrin	0.258	0.010	0.050	ug/l	0.280		92.3	70-130			
Chloroneb	2.60	0.20	0.50	"	2.80		92.8	70-130			
Chlorobenzilate	3.09	2.0	5.0	"	2.80		110	70-130			J
Chlorothalonil	0.299	0.030	0.10	"	0.280		107	70-130			
DCPA	0.284	0.020	0.040	"	0.280		101	70-130			
4,4´-DDD	0.202	0.020	0.050	"	0.280		72.2	70-130			
4,4´-DDE	0.274	0.020	0.050	"	0.280		98.0	70-130			
4,4´-DDT	0.275	0.020	0.020	"	0.280		98.1	70-130			
Dieldrin	0.278	0.010	0.010	"	0.280		99.4	70-130			
Endosulfan I	0.280	0.020	0.050	"	0.280		99.9	70-130			
Endosulfan II	0.273	0.020	0.050	"	0.280		97.6	70-130			
Endosulfan sulfate	0.287	0.020	0.020	"	0.280		102	70-130			
Endrin	0.303	0.030	0.10	"	0.280		108	70-130			
Endrin aldehyde	0.284	0.020	0.050	"	0.280		101	70-130			
HCH-alpha	0.259	0.010	0.050	"	0.280		92.6	70-130			
HCH-beta	0.272	0.020	0.050	"	0.280		97.0	70-130			
HCH-delta	0.276	0.030	0.050	"	0.280		98.7	70-130			
HCH-gamma (Lindane)	0.267	0.010	0.010	"	0.280		95.3	70-130			
Heptachlor	0.264	0.010	0.010	"	0.280		94.3	70-130			
Heptachlor epoxide	0.269	0.010	0.010	"	0.280		96.1	70-130			
Hexachlorocyclopentadiene	0.325	0.040	0.40	"	0.560		58.0	15-90			J
Hexachlorobenzene	0.227	0.010	0.040	"	0.280		81.0	70-130			
Methoxychlor	0.283	0.020	0.020	"	0.280		101	70-130			
cis-Permethrin	1.50	0.070	0.20	"	1.40		107	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
LCS (AA43038-BS1)					Prepared: 01/30/14 Analyzed: 02/01/14						
trans-Permethrin	1.53	0.090	0.20	ug/l	1.40		109	70-130			
Propachlor	0.290	0.070	0.20	"	0.280		104	70-130			
Trifluralin	0.411	0.020	0.040	"	0.420		97.8	70-130			
Surrogate: Dibutylchlorendate	*0.912*			*"*	*0.952*		*95.8*	*70-130*			
LCS Dup (AA43038-BSD1)					Prepared: 01/30/14 Analyzed: 02/01/14						
Aldrin	0.268	0.010	0.050	ug/l	0.280		95.7	70-130	3.62	25	
Chloroneb	2.71	0.20	0.50	"	2.80		96.7	70-130	4.09	25	
Chlorobenzilate	3.24	2.0	5.0	"	2.80		116	70-130	4.70	25	J
Chlorothalonil	0.311	0.030	0.10	"	0.280		111	70-130	4.00	25	
DCPA	0.294	0.020	0.040	"	0.280		105	70-130	3.49	25	
4,4´-DDD	0.210	0.020	0.050	"	0.280		75.2	70-130	3.96	25	
4,4´-DDE	0.286	0.020	0.050	"	0.280		102	70-130	4.27	25	
4,4´-DDT	0.288	0.020	0.020	"	0.280		103	70-130	4.76	25	
Dieldrin	0.290	0.010	0.010	"	0.280		104	70-130	4.19	25	
Endosulfan I	0.291	0.020	0.050	"	0.280		104	70-130	4.03	25	
Endosulfan II	0.283	0.020	0.050	"	0.280		101	70-130	3.55	25	
Endosulfan sulfate	0.301	0.020	0.020	"	0.280		107	70-130	4.76	25	
Endrin	0.316	0.030	0.10	"	0.280		113	70-130	4.19	25	
Endrin aldehyde	0.296	0.020	0.050	"	0.280		106	70-130	4.05	25	
HCH-alpha	0.272	0.010	0.050	"	0.280		97.3	70-130	4.91	25	
HCH-beta	0.282	0.020	0.050	"	0.280		101	70-130	3.61	25	
HCH-delta	0.288	0.030	0.050	"	0.280		103	70-130	4.18	25	
HCH-gamma (Lindane)	0.279	0.010	0.010	"	0.280		99.7	70-130	4.50	25	
Heptachlor	0.273	0.010	0.010	"	0.280		97.7	70-130	3.56	25	
Heptachlor epoxide	0.281	0.010	0.010	"	0.280		100	70-130	4.42	25	
Hexachlorocyclopentadiene	0.345	0.040	0.40	"	0.560		61.7	15-90	6.10	50	J
Hexachlorobenzene	0.240	0.010	0.040	"	0.280		85.6	70-130	5.53	25	
Methoxychlor	0.298	0.020	0.020	"	0.280		106	70-130	5.01	25	
cis-Permethrin	1.58	0.070	0.20	"	1.40		113	70-130	5.41	25	
trans-Permethrin	1.62	0.090	0.20	"	1.40		116	70-130	5.91	25	
Propachlor	0.301	0.070	0.20	"	0.280		108	70-130	3.83	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
LCS Dup (AA43038-BSD1)					Prepared: 01/30/14 Analyzed: 02/01/14						
Trifluralin	0.427	0.020	0.040	ug/l	0.420		102	70-130	3.96	25	
Surrogate: Dibutylchlorendate	*0.941*			*"*	*0.952*		*98.8*	*70-130*			
Matrix Spike (AA43038-MS1)		**Source: 14A1635-01**			Prepared: 01/30/14 Analyzed: 02/01/14						
Aldrin	0.255	0.010	0.050	ug/l	0.280	ND	91.2	70-130			
Chloroneb	2.50	0.20	0.50	"	2.80	ND	89.2	70-130			
Chlorobenzilate	3.12	2.0	5.0	"	2.80	ND	111	70-130			J
Chlorothalonil	0.299	0.030	0.10	"	0.280	ND	107	70-130			
DCPA	0.285	0.020	0.040	"	0.280	ND	102	70-130			
4,4´-DDD	0.222	0.020	0.050	"	0.280	ND	79.3	70-130			
4,4´-DDE	0.280	0.020	0.050	"	0.280	ND	100	70-130			
4,4´-DDT	0.281	0.020	0.020	"	0.280	ND	100	70-130			
Dieldrin	0.284	0.010	0.010	"	0.280	ND	102	70-130			
Endosulfan I	0.280	0.020	0.050	"	0.280	ND	100	70-130			
Endosulfan II	0.283	0.020	0.050	"	0.280	ND	101	70-130			
Endosulfan sulfate	0.292	0.020	0.020	"	0.280	ND	104	70-130			
Endrin	0.306	0.030	0.10	"	0.280	ND	109	70-130			
Endrin aldehyde	0.284	0.020	0.050	"	0.280	ND	102	70-130			
HCH-alpha	0.257	0.010	0.050	"	0.280	ND	91.9	70-130			
HCH-beta	0.273	0.020	0.050	"	0.280	ND	97.5	70-130			
HCH-delta	0.279	0.030	0.050	"	0.280	ND	99.8	70-130			
HCH-gamma (Lindane)	0.267	0.010	0.010	"	0.280	ND	95.3	70-130			
Heptachlor	0.261	0.010	0.010	"	0.280	ND	93.2	70-130			
Heptachlor epoxide	0.277	0.010	0.010	"	0.280	ND	98.8	70-130			
Hexachlorocyclopentadiene	0.358	0.040	0.40	"	0.560	ND	63.9	15-90			J
Hexachlorobenzene	0.225	0.010	0.040	"	0.280	ND	80.4	70-130			
Methoxychlor	0.297	0.020	0.020	"	0.280	ND	106	70-130			
cis-Permethrin	1.40	0.070	0.20	"	1.40	ND	100	70-130			
trans-Permethrin	1.44	0.090	0.20	"	1.40	ND	103	70-130			
Propachlor	0.285	0.070	0.20	"	0.280	ND	102	70-130			
Trifluralin	0.414	0.020	0.040	"	0.420	ND	98.6	70-130			
Surrogate: Dibutylchlorendate	*0.934*			*"*	*0.952*		*98.1*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43038 - SVOAs in Water GC											
Matrix Spike Dup (AA43038-MSD1)		**Source: 14A1635-01**		Prepared: 01/30/14 Analyzed: 02/01/14							
Aldrin	0.255	0.010	0.050	ug/l	0.280	ND	91.1	70-130	0.148	25	
Chloroneb	2.55	0.20	0.50	"	2.80	ND	91.2	70-130	2.25	25	
Chlorobenzilate	3.18	2.0	5.0	"	2.80	ND	114	70-130	2.03	25	J
Chlorothalonil	0.302	0.030	0.10	"	0.280	ND	108	70-130	0.907	25	
DCPA	0.288	0.020	0.040	"	0.280	ND	103	70-130	1.15	25	
4,4´-DDD	0.223	0.020	0.050	"	0.280	ND	79.8	70-130	0.557	25	
4,4´-DDE	0.280	0.020	0.050	"	0.280	ND	100	70-130	0.148	25	
4,4´-DDT	0.284	0.020	0.020	"	0.280	ND	102	70-130	1.18	25	
Dieldrin	0.286	0.010	0.010	"	0.280	ND	102	70-130	0.667	25	
Endosulfan I	0.285	0.020	0.050	"	0.280	ND	102	70-130	1.64	25	
Endosulfan II	0.283	0.020	0.050	"	0.280	ND	101	70-130	0.0502	25	
Endosulfan sulfate	0.296	0.020	0.020	"	0.280	ND	106	70-130	1.20	25	
Endrin	0.310	0.030	0.10	"	0.280	ND	111	70-130	1.51	25	
Endrin aldehyde	0.290	0.020	0.050	"	0.280	ND	103	70-130	1.83	25	
HCH-alpha	0.261	0.010	0.050	"	0.280	ND	93.3	70-130	1.48	25	
HCH-beta	0.276	0.020	0.050	"	0.280	ND	98.7	70-130	1.17	25	
HCH-delta	0.283	0.030	0.050	"	0.280	ND	101	70-130	1.39	25	
HCH-gamma (Lindane)	0.270	0.010	0.010	"	0.280	ND	96.4	70-130	1.15	25	
Heptachlor	0.263	0.010	0.010	"	0.280	ND	94.0	70-130	0.878	25	
Heptachlor epoxide	0.277	0.010	0.010	"	0.280	ND	98.8	70-130	0.00397	25	
Hexachlorocyclopentadiene	0.366	0.040	0.40	"	0.560	ND	65.4	15-90	2.41	50	J
Hexachlorobenzene	0.229	0.010	0.040	"	0.280	ND	81.8	70-130	1.71	25	
Methoxychlor	0.299	0.020	0.020	"	0.280	ND	107	70-130	0.522	25	
cis-Permethrin	1.37	0.070	0.20	"	1.40	ND	97.6	70-130	2.67	25	
trans-Permethrin	1.41	0.090	0.20	"	1.40	ND	101	70-130	1.64	25	
Propachlor	0.297	0.070	0.20	"	0.280	ND	106	70-130	4.07	25	
Trifluralin	0.416	0.020	0.040	"	0.420	ND	99.0	70-130	0.441	25	
Surrogate: Dibutylchlorendate	*0.955*			*"*	*0.952*		*100*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Blank (AB40730-BLK1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	ND	0.50	0.50	ug/l							U
Atrazine	ND	0.30	0.50	"							U
Bromacil	ND	0.50	5.0	"							U
Butachlor	ND	0.40	0.50	"							U
Dimethoate	ND	0.20	1.0	"							U
Metolachlor	ND	0.30	0.50	"							U
Metribuzin	ND	0.40	0.50	"							U
Molinate	ND	0.20	0.50	"							U
Prometryn	ND	0.50	0.50	"							U
Propachlor	ND	0.30	0.50	"							U
Simazine	ND	0.30	0.50	"							U
Thiobencarb	ND	0.20	1.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.69*			*"*	*2.00*		*84.3*	*70-130*			
LCS (AB40730-BS1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.88	0.50	0.50	ug/l	2.00		94.2	62-128			
Atrazine	1.92	0.30	0.50	"	2.00		96.1	62-122			
Bromacil	1.94	0.50	5.0	"	2.00		96.9	61-121			J
Butachlor	1.99	0.40	0.50	"	2.00		99.3	66-126			
Dimethoate	1.97	0.20	1.0	"	2.00		98.3	67-127			
Metolachlor	1.93	0.30	0.50	"	2.00		96.6	63-123			
Metribuzin	1.91	0.40	0.50	"	2.00		95.4	71-131			
Molinate	1.95	0.20	0.50	"	2.00		97.4	44-137			
Prometryn	1.95	0.50	0.50	"	2.00		97.6	63-123			
Propachlor	1.95	0.30	0.50	"	2.00		97.3	66-126			
Simazine	1.94	0.30	0.50	"	2.00		96.9	70-130			
Thiobencarb	2.01	0.20	1.0	"	2.00		100	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.80*			*"*	*2.00*		*89.8*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
LCS Dup (AB40730-BSD1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	2.02	0.50	0.50	ug/l	2.00		101	62-128	6.95	30	
Atrazine	2.01	0.30	0.50	"	2.00		100	62-122	4.47	30	
Bromacil	2.14	0.50	5.0	"	2.00		107	61-121	10.0	30	J
Butachlor	2.09	0.40	0.50	"	2.00		105	66-126	5.23	30	
Dimethoate	2.17	0.20	1.0	"	2.00		108	67-127	9.82	30	
Metolachlor	2.02	0.30	0.50	"	2.00		101	63-123	4.37	30	
Metribuzin	2.04	0.40	0.50	"	2.00		102	71-131	6.92	30	
Molinate	1.94	0.20	0.50	"	2.00		96.8	44-137	0.569	30	
Prometryn	2.07	0.50	0.50	"	2.00		103	63-123	5.75	30	
Propachlor	2.00	0.30	0.50	"	2.00		100	66-126	2.80	30	
Simazine	2.09	0.30	0.50	"	2.00		105	70-130	7.61	30	
Thiobencarb	2.19	0.20	1.0	"	2.00		109	69-129	8.57	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.85*			*"*	*2.00*		*92.6*	*70-130*			
Matrix Spike (AB40730-MS1)		**Source: 14A1588-01**			Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.81	0.50	0.50	ug/l	2.00	ND	90.7	62-128			
Atrazine	1.79	0.30	0.50	"	2.00	ND	89.7	62-122			
Bromacil	1.75	0.50	5.0	"	2.00	ND	87.5	61-121			J
Butachlor	1.85	0.40	0.50	"	2.00	ND	92.6	66-126			
Dimethoate	1.70	0.20	1.0	"	2.00	ND	84.9	67-127			
Metolachlor	1.82	0.30	0.50	"	2.00	ND	91.2	63-123			
Metribuzin	1.78	0.40	0.50	"	2.00	ND	89.2	71-131			
Molinate	1.87	0.20	0.50	"	2.00	ND	93.4	44-137			
Prometryn	1.68	0.50	0.50	"	2.00	ND	83.9	63-123			
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.6	66-126			
Simazine	1.85	0.30	0.50	"	2.00	ND	92.5	70-130			
Thiobencarb	1.90	0.20	1.0	"	2.00	ND	95.2	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.51*			*"*	*2.00*		*75.3*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Matrix Spike Dup (AB40730-MSD1)		**Source: 14A1588-01**		Prepared: 02/08/14 Analyzed: 02/11/14							
Alachlor	1.91	0.50	0.50	ug/l	2.00	ND	95.3	62-128	4.97	30	
Atrazine	1.96	0.30	0.50	"	2.00	ND	98.2	62-122	9.04	30	
Bromacil	2.13	0.50	5.0	"	2.00	ND	107	61-121	19.7	30	J
Butachlor	2.02	0.40	0.50	"	2.00	ND	101	66-126	8.67	30	
Dimethoate	2.14	0.20	1.0	"	2.00	ND	107	67-127	23.0	30	
Metolachlor	1.96	0.30	0.50	"	2.00	ND	97.9	63-123	7.12	30	
Metribuzin	2.02	0.40	0.50	"	2.00	ND	101	71-131	12.3	30	
Molinate	1.79	0.20	0.50	"	2.00	ND	89.6	44-137	4.16	30	
Prometryn	2.02	0.50	0.50	"	2.00	ND	101	63-123	18.4	30	
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.4	66-126	0.171	30	
Simazine	2.07	0.30	0.50	"	2.00	ND	104	70-130	11.3	30	
Thiobencarb	1.96	0.20	1.0	"	2.00	ND	97.8	69-129	2.64	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.60*			*"*	*2.00*		*79.9*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Organic Analytes by EPA Method 504.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40359 - EPA 504.1											
Blank (AB40359-BLK1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l							U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"							U
LCS (AB40359-BS1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.262	0.0040	0.010	ug/l	0.250		105	70-130			
1,2-Dibromoethane (EDB)	0.255	0.0050	0.020	"	0.250		102	70-130			
LCS Dup (AB40359-BSD1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.273	0.0040	0.010	ug/l	0.250		109	70-130	4.17	25	
1,2-Dibromoethane (EDB)	0.270	0.0050	0.020	"	0.250		108	70-130	5.47	25	
Matrix Spike (AB40359-MS1)		**Source: 14A1588-01**			Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.212	0.0040	0.010	ug/l	0.250	ND	84.8	70-130			
1,2-Dibromoethane (EDB)	0.214	0.0050	0.020	"	0.250	ND	85.5	70-130			
Matrix Spike Dup (AB40359-MSD1)		**Source: 14A1588-01**			Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.211	0.0040	0.010	ug/l	0.250	ND	84.2	70-130	0.698	25	
1,2-Dibromoethane (EDB)	0.212	0.0050	0.020	"	0.250	ND	84.8	70-130	0.771	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
Blank (AB40536-BLK1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	ND	0.50	1.0	ug/l							U
Bentazon	ND	0.40	0.40	"							U
2,4-D	ND	0.80	1.0	"							U
Dalapon	ND	6.0	6.0	"							U
2,4-DB	ND	4.0	5.0	"							U
Dicamba	ND	0.40	0.40	"							U
Dichlorprop	ND	1.0	1.0	"							U
Dinoseb	ND	0.80	1.0	"							U
4-Nitrophenol	ND	0.70	1.0	"							U
Pentachlorophenol	ND	0.20	0.20	"							U
Picloram	ND	0.50	1.0	"							U
2,4,5-T	ND	0.40	0.50	"							U
2,4,5-TP (Silvex)	ND	0.50	0.50	"							U
Surrogate: DCAA	*13.2*			*"*	*14.2*		*93.2*	*70-130*			
LCS (AB40536-BS1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	1.04	0.50	1.0	ug/l	0.960		109	70-130			
Bentazon	1.48	0.40	0.40	"	1.92		76.9	70-130			
2,4-D	1.68	0.80	1.0	"	1.92		87.8	48-124			
Dalapon	11.3	6.0	6.0	"	12.5		90.3	40-112			
2,4-DB	7.11	4.0	5.0	"	7.68		92.6	54-123			
Dicamba	0.876	0.40	0.40	"	0.960		91.3	70-130			
Dichlorprop	2.70	1.0	1.0	"	2.88		93.7	54-106			
Dinoseb	5.59	0.80	1.0	"	6.42		87.1	20-105			
4-Nitrophenol	1.13	0.70	1.0	"	0.960		117	60-202			
Pentachlorophenol	0.840	0.20	0.20	"	0.960		87.5	70-130			
Picloram	1.07	0.50	1.0	"	0.960		111	70-130			
2,4,5-T	0.892	0.40	0.50	"	0.960		93.0	68-166			
2,4,5-TP (Silvex)	0.900	0.50	0.50	"	0.960		93.7	70-130			
Surrogate: DCAA	*14.5*			*"*	*14.2*		*102*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
LCS Dup (AB40536-BSD1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	1.03	0.50	1.0	ug/l	0.960		108	70-130	0.944	50	
Bentazon	1.63	0.40	0.40	"	1.92		84.8	70-130	9.86	50	
2,4-D	1.69	0.80	1.0	"	1.92		88.0	48-124	0.327	50	
Dalapon	11.4	6.0	6.0	"	12.5		91.2	40-112	0.968	50	
2,4-DB	7.24	4.0	5.0	"	7.68		94.3	54-123	1.84	50	
Dicamba	0.877	0.40	0.40	"	0.960		91.4	70-130	0.0891	50	
Dichlorprop	2.69	1.0	1.0	"	2.88		93.5	54-106	0.220	50	
Dinoseb	5.77	0.80	1.0	"	6.42		89.9	20-105	3.18	50	
4-Nitrophenol	0.901	0.70	1.0	"	0.960		93.8	60-202	22.3	50	J
Pentachlorophenol	0.841	0.20	0.20	"	0.960		87.6	70-130	0.0986	50	
Picloram	0.964	0.50	1.0	"	0.960		100	70-130	10.5	50	J
2,4,5-T	0.931	0.40	0.50	"	0.960		96.9	68-166	4.18	50	
2,4,5-TP (Silvex)	0.964	0.50	0.50	"	0.960		100	70-130	6.85	50	
Surrogate: DCAA	*14.2*			*"*	*14.2*		*99.8*	*70-130*			
Matrix Spike (AB40536-MS1)		**Source: 14A1588-01**			Prepared: 02/06/14 Analyzed: 02/08/14						
Acifluorfen	0.696	0.50	1.0	ug/l	0.960	ND	72.5	70-130			J
Bentazon	1.79	0.40	0.40	"	1.92	ND	93.0	70-130			
2,4-D	1.50	0.80	1.0	"	1.92	ND	78.3	48-124			
Dalapon	11.1	6.0	6.0	"	12.5	ND	88.8	40-112			
2,4-DB	7.08	4.0	5.0	"	7.68	ND	92.2	54-123			
Dicamba	0.867	0.40	0.40	"	0.960	ND	90.3	70-130			
Dichlorprop	2.75	1.0	1.0	"	2.88	ND	95.6	54-106			
Dinoseb	5.23	0.80	1.0	"	6.42	ND	81.4	20-105			
4-Nitrophenol	0.969	0.70	1.0	"	0.960	ND	101	60-202			J
Pentachlorophenol	0.642	0.20	0.20	"	0.960	ND	66.9	70-130			QM-07
Picloram	0.973	0.50	1.0	"	0.960	ND	101	70-130			J
2,4,5-T	0.862	0.40	0.50	"	0.960	ND	89.8	68-166			
2,4,5-TP (Silvex)	0.911	0.50	0.50	"	0.960	ND	94.9	70-130			
Surrogate: DCAA	*13.8*			*"*	*14.2*		*97.5*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
Matrix Spike Dup (AB40536-MSD1)		**Source: 14A1588-01**		Prepared: 02/06/14 Analyzed: 02/08/14							
Acifluorfen	0.926	0.50	1.0	ug/l	0.960	ND	96.5	70-130	28.3	50	J
Bentazon	1.79	0.40	0.40	"	1.92	ND	93.5	70-130	0.474	50	
2,4-D	1.64	0.80	1.0	"	1.92	ND	85.2	48-124	8.45	50	
Dalapon	11.5	6.0	6.0	"	12.5	ND	92.3	40-112	3.86	50	
2,4-DB	7.32	4.0	5.0	"	7.68	ND	95.4	54-123	3.40	50	
Dicamba	0.910	0.40	0.40	"	0.960	ND	94.8	70-130	4.86	50	
Dichlorprop	2.90	1.0	1.0	"	2.88	ND	101	54-106	5.12	50	
Dinoseb	5.49	0.80	1.0	"	6.42	ND	85.5	20-105	4.84	50	
4-Nitrophenol	1.04	0.70	1.0	"	0.960	ND	108	60-202	6.64	50	
Pentachlorophenol	0.721	0.20	0.20	"	0.960	ND	75.1	70-130	11.5	50	
Picloram	1.16	0.50	1.0	"	0.960	ND	121	70-130	17.4	50	
2,4,5-T	0.945	0.40	0.50	"	0.960	ND	98.4	68-166	9.12	50	
2,4,5-TP (Silvex)	0.967	0.50	0.50	"	0.960	ND	101	70-130	5.94	50	
Surrogate: DCAA	*14.5*			*"*	*14.2*		*102*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA42932 - HPLC											
Blank (AA42932-BLK1)					Prepared & Analyzed: 01/30/14						
Aldicarb	ND	0.70	3.0	ug/l							U
Aldicarb sulfone	ND	0.70	4.0	"							U
Aldicarb sulfoxide	ND	0.80	3.0	"							U
Carbaryl	ND	0.70	5.0	"							U
Carbofuran	ND	2.0	5.0	"							U
3-Hydroxycarbofuran	ND	0.90	3.0	"							U
Methiocarb	ND	2.0	5.0	"							U
Methomyl	ND	2.0	2.0	"							U
Oxamyl	ND	0.80	20	"							U
Propoxur	ND	2.0	5.0	"							U
LCS (AA42932-BS1)					Prepared & Analyzed: 01/30/14						
Aldicarb	20.2	0.70	3.0	ug/l	20.0		101	80-120			
Aldicarb sulfone	19.4	0.70	4.0	"	19.0		102	80-120			
Aldicarb sulfoxide	19.6	0.80	3.0	"	19.8		98.9	80-120			
Carbaryl	19.3	0.70	5.0	"	20.0		96.4	80-120			
Carbofuran	20.4	2.0	5.0	"	20.0		102	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0		104	80-120			
Methiocarb	20.4	2.0	5.0	"	20.0		102	80-120			
Methomyl	20.5	2.0	2.0	"	20.0		102	80-120			
Oxamyl	19.3	0.80	20	"	20.0		96.5	80-120			J
Propoxur	20.5	2.0	5.0	"	20.0		103	80-120			
LCS Dup (AA42932-BSD1)					Prepared & Analyzed: 01/30/14						
Aldicarb	19.9	0.70	3.0	ug/l	20.0		99.3	80-120	1.91	20	
Aldicarb sulfone	20.1	0.70	4.0	"	19.0		106	80-120	3.52	20	
Aldicarb sulfoxide	19.8	0.80	3.0	"	19.8		99.8	80-120	0.858	20	
Carbaryl	20.7	0.70	5.0	"	20.0		104	80-120	7.36	20	
Carbofuran	21.9	2.0	5.0	"	20.0		109	80-120	6.80	20	
3-Hydroxycarbofuran	20.3	0.90	3.0	"	20.0		102	80-120	1.87	20	
Methiocarb	19.1	2.0	5.0	"	20.0		95.3	80-120	6.64	20	
Methomyl	20.4	2.0	2.0	"	20.0		102	80-120	0.165	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA42932 - HPLC											
LCS Dup (AA42932-BSD1)					Prepared & Analyzed: 01/30/14						
Oxamyl	19.5	0.80	20	ug/l	20.0		97.5	80-120	1.06	20	J
Propoxur	21.3	2.0	5.0	"	20.0		106	80-120	3.46	20	
Matrix Spike (AA42932-MS1)		**Source: 14A1643-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Aldicarb	19.4	0.70	3.0	ug/l	20.0	ND	97.2	80-120			
Aldicarb sulfone	19.6	0.70	4.0	"	19.0	ND	103	80-120			
Aldicarb sulfoxide	19.5	0.80	3.0	"	19.8	ND	98.6	80-120			
Carbaryl	20.0	0.70	5.0	"	20.0	ND	99.9	80-120			
Carbofuran	19.7	2.0	5.0	"	20.0	ND	98.4	80-120			
3-Hydroxycarbofuran	19.8	0.90	3.0	"	20.0	ND	98.9	80-120			
Methiocarb	19.1	2.0	5.0	"	20.0	ND	95.3	80-120			
Methomyl	20.3	2.0	2.0	"	20.0	ND	101	80-120			
Oxamyl	19.9	0.80	20	"	20.0	ND	99.7	80-120			J
Propoxur	19.8	2.0	5.0	"	20.0	ND	99.0	80-120			
Matrix Spike Dup (AA42932-MSD1)		**Source: 14A1643-01**			Prepared: 01/30/14 Analyzed: 01/31/14						
Aldicarb	18.6	0.70	3.0	ug/l	20.0	ND	92.9	80-120	4.53	20	
Aldicarb sulfone	19.0	0.70	4.0	"	19.0	ND	100	80-120	3.38	20	
Aldicarb sulfoxide	19.0	0.80	3.0	"	19.8	ND	96.1	80-120	2.58	20	
Carbaryl	19.3	0.70	5.0	"	20.0	ND	96.7	80-120	3.24	20	
Carbofuran	18.8	2.0	5.0	"	20.0	ND	94.1	80-120	4.43	20	
3-Hydroxycarbofuran	20.9	0.90	3.0	"	20.0	ND	104	80-120	5.39	20	
Methiocarb	18.4	2.0	5.0	"	20.0	ND	92.1	80-120	3.43	20	
Methomyl	19.6	2.0	2.0	"	20.0	ND	97.8	80-120	3.62	20	
Oxamyl	18.7	0.80	20	"	20.0	ND	93.3	80-120	6.68	20	J
Propoxur	19.5	2.0	5.0	"	20.0	ND	97.6	80-120	1.47	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Endothall by EPA Method 548.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40357 - EPA 548.1											
Blank (AB40357-BLK1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	ND	2.0	45	ug/l							U
LCS (AB40357-BS1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	209	2.0	45	ug/l	200		104	80-120			
LCS Dup (AB40357-BSD1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	217	2.0	45	ug/l	200		108	80-120	3.75	30	
Matrix Spike (AB40357-MS1)		**Source: 14A1588-01**			Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	187	2.0	45	ug/l	200	ND	93.7	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Glyphosate by EPA Method 547 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40427 - HPLC											
Blank (AB40427-BLK1)					Prepared & Analyzed: 02/04/14						
Glyphosate	ND	3.0	10	ug/l							U
LCS (AB40427-BS1)					Prepared & Analyzed: 02/04/14						
Glyphosate	111	3.0	10	ug/l	120		92.7	66-126			
LCS Dup (AB40427-BSD1)					Prepared & Analyzed: 02/04/14						
Glyphosate	112	3.0	10	ug/l	120		93.7	66-126	1.08	30	
Matrix Spike (AB40427-MS1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	111	3.0	10	ug/l	120	ND	92.7	66-126			
Matrix Spike Dup (AB40427-MSD1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	110	3.0	10	ug/l	120	ND	92.0	66-126	0.801	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Diquat by EPA Method 549.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43118 - HPLC											
Blank (AA43118-BLK1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	ND	2.0	2.0	ug/l							U
LCS (AA43118-BS1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	16.5	2.0	2.0	ug/l	19.8		83.3	70-130			
LCS Dup (AA43118-BSD1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	16.2	2.0	2.0	ug/l	19.8		81.6	70-130	2.03	25	
Matrix Spike (AA43118-MS1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	8.63	2.0	2.0	ug/l	19.8	ND	43.5	70-130			QM-05

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408		Reported: 02/18/14 10:55

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40444 - EPA 552.2											
Blank (AB40444-BLK1)					Prepared: 02/05/14 Analyzed: 02/07/14						
Monobromoacetic Acid	ND	0.8	1.0	ug/l							U
Monochloroacetic Acid	ND	1.1	2.0	"							U
Dibromoacetic Acid	ND	0.8	1.0	"							U
Dichloroacetic Acid	ND	1.0	1.0	"							U
Trichloroacetic Acid	ND	1.0	1.0	"							U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"							U
Surrogate: 2,3-Dibromopropionic Acid	*8.41*			*"*	*10.0*		*83.8*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*10.5*			*"*	*10.0*		*105*	*70-130*			
LCS (AB40444-BS1)					Prepared: 02/05/14 Analyzed: 02/07/14						
Monobromoacetic Acid	22.8	0.8	1.0	ug/l	25.0		91.1	70-130			
Monochloroacetic Acid	25.3	1.1	2.0	"	25.0		101	70-130			
Dibromoacetic Acid	22.8	0.8	1.0	"	25.0		91.0	70-130			
Dichloroacetic Acid	23.2	1.0	1.0	"	25.0		93.0	70-130			
Trichloroacetic Acid	21.8	1.0	1.0	"	25.0		87.2	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*8.18*			*"*	*10.0*		*81.6*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*8.36*			*"*	*10.0*		*83.6*	*70-130*			
Matrix Spike (AB40444-MS1)		**Source: 14A1572-01**			Prepared: 02/05/14 Analyzed: 02/08/14						
Monobromoacetic Acid	26.0	0.8	1.0	ug/l	25.0	ND	104	70-130			
Monochloroacetic Acid	26.4	1.1	2.0	"	25.0	ND	106	70-130			
Dibromoacetic Acid	33.8	0.8	1.0	"	25.0	1.60	129	70-130			
Dichloroacetic Acid	25.3	1.0	1.0	"	25.0	ND	101	70-130			
Trichloroacetic Acid	25.6	1.0	1.0	"	25.0	1.23	97.4	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*12.4*			*"*	*10.0*		*124*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*11.4*			*"*	*10.0*		*114*	*70-130*			
Matrix Spike (AB40444-MS2)		**Source: 14A1702-01**			Prepared: 02/05/14 Analyzed: 02/08/14						
Monobromoacetic Acid	23.4	0.8	1.0	ug/l	25.0	ND	93.6	70-130			
Monochloroacetic Acid	25.5	1.1	2.0	"	25.0	ND	102	70-130			

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40444 - EPA 552.2											
Matrix Spike (AB40444-MS2)		**Source: 14A1702-01**			Prepared: 02/05/14 Analyzed: 02/08/14						
Dibromoacetic Acid	31.1	0.8	1.0	ug/l	25.0	ND	124	70-130			
Dichloroacetic Acid	36.3	1.0	1.0	"	25.0	12.8	94.3	70-130			
Trichloroacetic Acid	34.6	1.0	1.0	"	25.0	12.2	89.6	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*12.7*			*"*	*10.0*		*127*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.49*			*"*	*10.0*		*94.9*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 10:55

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Blank (AB40727-BLK1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	ND	0.080	0.10	ug/l							U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"							U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.23*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*3.73*			*"*	*5.00*		*74.6*	*70-130*			
Surrogate: Triphenyl phosphate	*4.72*			*"*	*5.00*		*94.4*	*70-130*			
LCS (AB40727-BS1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.13	0.080	0.10	ug/l	3.00		71.0	70-130			
Di(2-ethylhexyl)adipate	2.49	0.40	5.0	"	3.00		83.0	70-130			J
Di(2-ethylhexyl)phthalate	2.40	0.20	3.0	"	3.00		80.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.36*			*"*	*5.00*		*107*	*70-130*			
Surrogate: Perylene-d12	*4.65*			*"*	*5.00*		*93.0*	*70-130*			
Surrogate: Triphenyl phosphate	*5.36*			*"*	*5.00*		*107*	*70-130*			
LCS Dup (AB40727-BSD1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.40	0.080	0.10	ug/l	3.00		80.0	70-130	11.9	20	
Di(2-ethylhexyl)adipate	2.70	0.40	5.0	"	3.00		90.0	70-130	8.09	20	J
Di(2-ethylhexyl)phthalate	2.57	0.20	3.0	"	3.00		85.7	70-130	6.84	20	J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.39*			*"*	*5.00*		*108*	*70-130*			
Surrogate: Perylene-d12	*4.84*			*"*	*5.00*		*96.8*	*70-130*			
Surrogate: Triphenyl phosphate	*5.47*			*"*	*5.00*		*109*	*70-130*			
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.79	0.080	0.10	ug/l	3.00	ND	93.0	70-130			
Di(2-ethylhexyl)adipate	3.11	0.40	5.0	"	3.00	ND	104	70-130			J
Di(2-ethylhexyl)phthalate	2.79	0.20	3.0	"	3.00	ND	93.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.27*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*5.52*			*"*	*5.00*		*110*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 10:55

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Surrogate: Triphenyl phosphate	*5.65*			*ug/l*	*5.00*		*113*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 10:55

Notes and Definitions

J	Detected but below the Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ).
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
U	Analyte included in analysis, but not detected at or above MDL.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

ASBESTOS TEM LABORATORIES, INC.

EPA 600/4-83 Drinking Water
Transmission Electron Microscopy
Analytical Report

Laboratory Job # 1288-00569

630 Bancroft Way
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

Certified by
CA DPH ELAP
Lab No. 1866

Feb/07/2014

David Pingatore
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482

RE: LABORATORY JOB # 1288-00569
Transmission electron microscopy analytical results for 1 water sample(s).
Job Site: PRTIW (at Mission Memorial)
Job No.: 14A1635

Enclosed please find results for the TEM analysis of one or more water samples. The analytical procedures were performed according to EPA Method 100.2 for the analysis of asbestos in drinking water.

Prior to analysis, samples are checked for damage, disruption of any chain-of-custody seals, and completeness of accompanying paperwork. If no problems are found, samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

Preparation of water samples is performed within a HEPA filtered, Class 100 air, laminar flow clean bench environment. Prior to filtration, water sample containers are ultrasonicated, and the exterior surfaces cleaned. An aliquot of water is drawn from the sample container and drawn through a special filtration apparatus and collected onto a mixed cellulose ester (MCE) or polycarbonate (PC) filter. The filters are removed from the apparatus and dried. A portion of each sample filter is sectioned, placed onto a glass microscope slide, and carbon coated. The filters are further sectioned and placed carbon side up onto 200-mesh copper TEM sample grids in a solvent bath until all filter material is dissolved. The TEM grids are removed and placed into labeled grid storage boxes.

TEM analysis is performed on a Philips EM-300 or CM-12 transmission electron microscope operating at 80 or 100 kV. Initially, the grid is scanned at low and medium magnification to insure proper sample loading, and coherence of the carbon support film. Then TEM grid openings are analyzed at a magnification of 10,000X. All fibers >10 um in length and exhibiting an aspect ratio >3:1 are analyzed. Scanning continues until either 100 asbestiform fibers >10um in length are counted, or an analytical sensitivity of 0.2 million fibers per liter (MFL) is achieved. Analyzed fibers are subjected to detailed morphological and selected area diffraction (SAED) analysis. Fibers indicated as asbestos, or potentially asbestos, are further analyzed by energy dispersive X-ray (EDX) analysis as needed. The number of asbestos fibers detected, and other analytical parameters, are then used to calculate the concentration of asbestos in MFL. The results are entered into a standard report format and reviewed by the analyst and the laboratory manager before release to the client.

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

630 Bancroft Way ▪ BERKELEY, CA 94710 ▪ (510) 704-8930 ▪ FAX (510) 704-8429
www.asbestostemlabs.com *With Offices in Reno, NV (775) 359-3377*

TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL REPORT

Contact:	David Pingatore		
Address:	Alpha Analytical Laboratories, Inc. 208 Mason Street Ukiah, CA 95482	Report No.:	**323834**
		Date:	Feb-07-14
		Total Samples Analyzed:	1
Job Site / No.	PRTIW (at Mission Memorial) 14A1635	Sample Collector:	

CLIENT SAMPLE # **14A1635-01**

Laboratory Sample # 1288-00569-001

SAMPLE LOCATION/DESCRIPTION

WATER SAMPLE DATA

Date/Time Collected	Jan-29-14 / 2:57 pm	Volume Submitted (ml)	1000
Date/Time Lab Received	Jan-30-14 / 4:40 pm	Volume Filtered (ml)	15
Date/Time Filtered	Jan-30-14 / 7:40 pm	Filter & Pore Size	MCE 0.22
Date/Time Analyzed	Feb-07-14 / 9:00 am	UV/Ozone Treated:	NO

IDENTIFIED STRUCTURES (>10um)			
ASBESTOS		OTHER	
CHRYS	AMPH	AMBIG	NON-ASB
NSD	NSD	NSD	NSD

CALCULATED ASBESTOS STRUCTURE CONCENTRATION (>10um)		
CHRYS	AMPH	TOTAL
< 0.1 MFL	< 0.1 MFL	< 0.1 MFL

COMMENTS

No asbestos detected

Filter Loading: MODERATE

SAED Photo ID Nos.

TEM / ANALYTICAL PARAMETERS

Grid Openings Scanned at 10,000X	8	Analytical Sensitivity	0.1 MFL
Grid Opening Area (mm2)	0.0094	95% UCL	0.33 MFL
Scan Area (mm2)	0.0752	95% LCL	0 MFL

WATER SAMPLE LAB BLANK RESULTS

Lab ID#	Blank 9459	Analytical Sensitivity	0.01 MFL
Grid Openings Scanned at 10,000X	8	Asbestos Structure Concentration	<0.01 MFL
Volume Filtered (ml)	300		

NOTATION KEY

Chrys. - Chrysotile Asbestos
Amph. - Amphibole Asbestos
NSD - No Structures Detected
1 mm = 1 millimeter

1 um = 1 micron = 0.001 mm
MFL = Millions of Fibers per Liter
UCL = Upper Confidence Level
LCL = Lower Confidence Level

ANALYST SIGNATURE

Stephanie Dunn

LAB QC REVIEWER SIGNATURE

McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 1401905

Report Created for: Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Project Contact: David S. Pingatore
Project P.O.:
Project Name: #14A1635

Project Received: 01/31/2014

Analytical Report reviewed & approved for release on 02/06/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.

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Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: Alpha Analytical Laboratories
Project: #14A1635
WorkOrder: 1401905

Glossary Abbreviation	Description
95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

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Analytical Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1401905
Project:	#14A1635	**Extraction Method**	E218.6
Date Received:	1/31/14 12:18	**Analytical Method:**	E218.6
Date Prepared:	1/31/14	**Unit:**	µg/L

Hexachrome by IC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
PRTIW (at Mission Merorial)	**1401905-001A**	**Water**	**01/29/2014 14:57**	**IC2**	**86616**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	**1.6**	0.050	1	01/31/2014 16:52

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Quality Control Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1401905
Date Prepared:	1/31/14	**BatchID:**	86616
Date Analyzed:	1/31/14	**Extraction Method**	E218.6
Instrument:	IC2	**Analytical Method:**	E218.6
Matrix:	Water	**Unit:**	µg/L
Project:	#14A1635	**Sample ID:**	MB/LCS-86616 1401905-001AMS/MSD

QC Summary Report for E218.6

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	ND	25.38	0.050	25	-	102	90-110

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	24.94	25.03	25	1.560	93.5	93.9	90-110	0.360	10

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1401905 **ClientCode: ALPU**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
David S. Pingatore
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482
(707) 468-0401 FAX: (707) 468-5267

Email: sspeaks@alpha-labs.com;david@alpha-lab
cc:
PO:
ProjectNo: #14A1635

Bill to:
Accounts Payable
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Requested TAT: 5 days

Date Received: 01/31/2014
Date Printed: 01/31/2014

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1401905-001	PRTIW (at Mission Merorial)	Water	1/29/2014 14:57	☐	A											

Test Legend:

1	218_6_DW	2		3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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WORK ORDER SUMMARY

Client Name: ALPHA ANALYTICAL LABORATORIES
QC Level: LEVEL 2
Work Order: 1401905
Project: #14A1635
Client Contact: David S. Pingatore
Date Received: 1/31/2014
Comments:
Contact's Email: sspeaks@alpha-labs.com;david@alpha-labs.com

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Number of Containers	Bottle & Preservative	De-chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1401905-001A	PRTIW (at Mission Merorial)	Water	E218.6 (Hexachrome)	1	250mL HDPE w/ (NH4)2SO4	☐	1/29/2014 14:57	5 days	Trace	☐	

*** NOTE: STLC and TCLP extractions require 48 hrs to complete; therefore, all TATs begin after the extraction is completed (i.e., 24hr TAT yields results in 72 hrs from sample submission).**

Bottle Legend:

250mL HDPE w/ (NH4)2SO4 = 250mL HDPE Bottle w/ Ammonium Sulfate

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

1401905

14A1635

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

McCampbell Analytical
1534 Willowpass Rd.
Pittsburg, CA 94565
Phone :(925) 252-9262
Fax: (925) 252-9269
Terms: Net 30

Analysis	Due	Expires	Comments
14A1635-01 PRTIW (At Mission Memorial) [Water] Sampled 01/29/14 14:57			
Pacific			
Cr6 218.6 DW	02/13/14 12:00	02/03/14 14:57	
Containers Supplied:			
250ml Poly - (NH4)2SO4 (A			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

NO

ICE/t° 3.2
GOOD CONDITION_____ APPROPRIATE CONTAINERS_____
HEAD SPACE ABSENT_____
DECHLORINATED IN LAB_____ PRESERVED IN LAB_____

PRESERVATION	VOAS	O&G	METALS	OTHER

Released By	Date	Received By	Date
	01/31/14		1/31/14
	1/31/14		1/31/14 1150

Page 1 of 1

McCampbell Analytical, Inc.
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http://www.mccampbell.com / E-mail: main@mccampbell.com

Sample Receipt Checklist

Client Name:	**Alpha Analytical Laboratories**	Date and Time Received:	**1/31/2014 12:18:34 PM**
Project Name:	**#14A1635**	LogIn Reviewed by:	Maria Venegas
WorkOrder N°:	**1401905** Matrix: Water	Carrier:	Client Drop-In

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☐	No ☑

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp: 3.2°C		NA ☐
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	NA ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑
Samples Received on Ice?	Yes ☑	No ☐	

(Ice Type: BLUE ICE)

** NOTE: If the "No" box is checked, see comments below.*

Comments:

ALS Environmental
ALS Group USA, Corp.
1317 South 13th Avenue
Kelso, WA 98626
T: +1 360 577 7222
F: +1 360 636 1068
www.alsglobal.com

February 21, 2014 Analytical Report for Service Request No: K1400991

David Pingatore
Alpha Analytical Laboratories, Inc.
6398 Dougherty Road, Suite 35
Dublin, CA 94568

RE: 14A1635

Dear David:

Enclosed are the results of the sample submitted to our laboratory on January 31, 2014. For your reference, these analyses have been assigned our service request number K1400991.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3293. You may also contact me via Email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Shar Samy, Ph.D.
Project Manager

SS/mj

RIGHT SOLUTIONS | RIGHT PARTNER

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2286
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L12-28
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Georgia DNR	http://www.gaepd.org/Documents/techguide_pcb.html#cel	881
Hawaii DOH	Not available	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
Indiana DOH	http://www.in.gov/isdh/24859.htm	C-WA-01
ISO 17025	http://www.pjlabs.com/	L12-27
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	3016
Maine DHS	Not available	WA0035
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-368
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA35
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA200001
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	4704427-08-TX
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C1203
Wisconsin DNR	http://dnr.wi.gov/	998386840
Wyoming (EPA Region 8)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.caslab.com or at the accreditation bodies web site

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

ALS ENVIRONMENTAL

Client:	Alpha Analytical Laboratories, Inc.	**Service Request No.:**	K1400991
Project:	14A1635	**Date Received:**	01/31/14
Sample Matrix:	Water		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS), and Laboratory Control Sample (LCS).

Sample Receipt

One water sample was received for analysis at ALS Environmental on 01/31/14. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4ºC upon receipt at the laboratory.

Explosives by EPA Method 8330

Elevated Detection Limits:
The detection limit was elevated for 3,5-Dinitroaniline in sample 14A1635-01. The chromatogram indicated the presence of non-target background components. The matrix interference prevented adequate resolution of the target compound at the normal limit. No further corrective action was appropriate.

Sample Notes and Discussion:
Insufficient sample volume was received to perform a Matrix Spike/Matrix Spike Duplicate (MS/MSD). A Laboratory Control Sample/Duplicate Laboratory Control Sample (LCS/DLCS) was analyzed and reported in lieu of the MS/MSD.

No other anomalies associated with the analysis of this sample were observed.

Approved by_____

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1643 K1400990

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

ALS Environmental - Kelso
1317 S. 13th Ave
Kelso, WA 98626
Phone :(360) 577-7222
Fax: -
Terms: Net 30

Analysis	Due	Expires	Comments
14A1643-01 MRWPCA MW-1 [Water] Sampled 01/29/14 14:15 Pacific			
8330B Explosives Water	02/13/14 12:00	02/05/14 14:15	
Containers Supplied:			
1L Amber- Unpres. (AD) 1L Amber- Unpres. (AE)			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
	1-30-14	ALS	1/31/14 1020

ALS

PC SHAK

Cooler Receipt and Preservation Form

Client / Project: Alpha Analytical Service Request K14 00991

Received: 1/31/14 Opened: 1/31/14 By: UL Unloaded: 1/31/14 By: UL

1. Samples were received via? *Mail* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? _____

   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
-0.1	-0.3	—	—	-0.2	337	14A1643/14A1635	1289425001489639 52	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA Y N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

Page ____ *of* ____

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1400991
Project:	14A1635	**Date Collected:**	01/29/2014
Sample Matrix:	Water	**Date Received:**	01/31/2014

Nitroaromatics and Nitramines (Explosives)

Sample Name:	14A1635-01	**Units:**	ug/L
Lab Code:	K1400991-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.099	0.010	1	02/04/14	02/08/14	KWG1400907	
RDX	ND	U	0.099	0.017	1	02/04/14	02/08/14	KWG1400907	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/04/14	02/08/14	KWG1400907	
1,3-Dinitrobenzene	ND	U	0.099	0.0085	1	02/04/14	02/08/14	KWG1400907	
3,5-Dinitroaniline	ND	Ui	0.099	0.053	1	02/04/14	02/08/14	KWG1400907	
TETRYL	ND	U	0.10	0.042	1	02/04/14	02/08/14	KWG1400907	
Nitrobenzene	ND	U	0.099	0.013	1	02/04/14	02/08/14	KWG1400907	
4-Amino-2,6-dinitrotoluene	ND	U	0.099	0.016	1	02/04/14	02/08/14	KWG1400907	
2-Amino-4,6-dinitrotoluene	ND	U	0.099	0.0089	1	02/04/14	02/08/14	KWG1400907	
2,4,6-Trinitrotoluene	ND	U	0.099	0.026	1	02/04/14	02/08/14	KWG1400907	
2,6-Dinitrotoluene	ND	U	0.20	0.054	1	02/04/14	02/08/14	KWG1400907	
2,4-Dinitrotoluene	ND	U	0.099	0.0091	1	02/04/14	02/08/14	KWG1400907	
2-Nitrotoluene	ND	U	0.10	0.032	1	02/04/14	02/08/14	KWG1400907	
4-Nitrotoluene	ND	U	0.099	0.019	1	02/04/14	02/08/14	KWG1400907	
3-Nitrotoluene	ND	U	0.099	0.0064	1	02/04/14	02/08/14	KWG1400907	
Nitroglycerin	ND	U	0.99	0.39	1	02/04/14	02/08/14	KWG1400907	
Pentaerythritol Tetranitrate	ND	U	0.50	0.18	1	02/04/14	02/08/14	KWG1400907	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	87	23-98	02/08/14	Acceptable

Comments:

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1400991
Project:	14A1635	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Nitroaromatics and Nitramines (Explosives)

Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1400907-3	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.099	0.010	1	02/04/14	02/08/14	KWG1400907	
RDX	ND	U	0.099	0.017	1	02/04/14	02/08/14	KWG1400907	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/04/14	02/08/14	KWG1400907	
1,3-Dinitrobenzene	ND	U	0.099	0.0085	1	02/04/14	02/08/14	KWG1400907	
3,5-Dinitroaniline	ND	U	0.099	0.013	1	02/04/14	02/08/14	KWG1400907	
TETRYL	ND	U	0.10	0.042	1	02/04/14	02/08/14	KWG1400907	
Nitrobenzene	ND	U	0.099	0.013	1	02/04/14	02/08/14	KWG1400907	
4-Amino-2,6-dinitrotoluene	ND	U	0.099	0.016	1	02/04/14	02/08/14	KWG1400907	
2-Amino-4,6-dinitrotoluene	ND	U	0.099	0.0089	1	02/04/14	02/08/14	KWG1400907	
2,4,6-Trinitrotoluene	ND	U	0.099	0.026	1	02/04/14	02/08/14	KWG1400907	
2,6-Dinitrotoluene	ND	U	0.20	0.054	1	02/04/14	02/08/14	KWG1400907	
2,4-Dinitrotoluene	ND	U	0.099	0.0091	1	02/04/14	02/08/14	KWG1400907	
2-Nitrotoluene	ND	U	0.10	0.032	1	02/04/14	02/08/14	KWG1400907	
4-Nitrotoluene	ND	U	0.099	0.019	1	02/04/14	02/08/14	KWG1400907	
3-Nitrotoluene	ND	U	0.099	0.0064	1	02/04/14	02/08/14	KWG1400907	
Nitroglycerin	ND	U	0.99	0.39	1	02/04/14	02/08/14	KWG1400907	
Pentaerythritol Tetranitrate	ND	U	0.50	0.18	1	02/04/14	02/08/14	KWG1400907	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	68	23-98	02/08/14	Acceptable

Comments:

Client: Alpha Analytical Laboratories, Inc. (Uki
Service Request: K1400991
Project: 14A1635
Sample Matrix: Water

Surrogate Recovery Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method: METHOD
Units: Percent
Analysis Method: 8330B
Level: Low

Sample Name	Lab Code	Sur1
14A1635-01	K1400991-001	87
Method Blank	KWG1400907-3	68
Lab Control Sample	KWG1400907-1	70
Duplicate Lab Control Sample	KWG1400907-2	69

Surrogate Recovery Control Limits (%)

Sur1 = 1-Chloro-3-nitrobenzene 23-98

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1400991
Project:	14A1635	**Date Extracted:**	02/04/2014
Sample Matrix:	Water	**Date Analyzed:**	02/08/2014

Lab Control Spike/Duplicate Lab Control Spike Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method:	METHOD	**Units:**	ug/L
Analysis Method:	8330B	**Basis:**	NA
		Level:	Low
		Extraction Lot:	KWG1400907

	Lab Control Sample KWG1400907-1 Lab Control Spike			Duplicate Lab Control Sample KWG1400907-2 Duplicate Lab Control Spike					
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**	**RPD**	**RPD Limit**
HMX	6.40	8.00	80	6.33	8.00	79	11-147	1	30
RDX	6.20	8.00	77	6.17	8.00	77	10-142	0	30
1,3,5-Trinitrobenzene	5.95	8.00	74	5.93	8.00	74	16-137	0	30
1,3-Dinitrobenzene	6.03	8.00	75	6.01	8.00	75	26-125	0	30
3,5-Dinitroaniline	5.95	8.00	74	5.91	8.00	74	30-133	1	30
TETRYL	6.12	8.00	77	6.00	8.00	75	29-123	2	30
Nitrobenzene	5.92	8.00	74	5.88	8.00	74	10-116	1	30
4-Amino-2,6-dinitrotoluene	6.09	8.00	76	6.08	8.00	76	55-117	0	30
2-Amino-4,6-dinitrotoluene	5.98	8.00	75	5.95	8.00	74	54-116	0	30
2,4,6-Trinitrotoluene	5.93	8.00	74	5.90	8.00	74	47-118	1	30
2,6-Dinitrotoluene	5.98	8.00	75	5.95	8.00	74	40-108	1	30
2,4-Dinitrotoluene	5.89	8.00	74	5.85	8.00	73	50-111	1	30
2-Nitrotoluene	5.64	8.00	70	5.58	8.00	70	12-110	1	30
4-Nitrotoluene	5.64	8.00	71	5.57	8.00	70	16-113	1	30
3-Nitrotoluene	5.92	8.00	74	5.84	8.00	73	13-109	1	30
Nitroglycerin	6.30	8.00	79	6.13	8.00	77	15-136	3	30
Pentaerythritol Tetranitrate	6.19	8.00	77	6.18	8.00	77	66-103	0	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

WECK LABORATORIES, INC.
Analytical Laboratory Service - Since 1964

Certificate of Analysis

Report Date: 02/24/14 10:55
Received Date: 01/31/14 10:20
Turnaround Time: Normal

Project: 14A1635

Phones: (925) 872-9637
Fax: (707) 468-5267

P.O. #:

Attn: David S. Pingatore

Client: Alpha Analytical Laboratories - Ukiah
208 Mason St
Ukiah, CA 95482

Dear David S. Pingatore :

Enclosed are the results of analyses for samples received 1/31/2014 with the Chain of Custody document. The samples were received in good condition, at 2.4 °C and on ice. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Lab Sample ID: 4A31033-01 **Sample ID: 14A1635-01** **Matrix:** Water
Sampled by: Client **Sampled: 01/29/14 14:57** **Sample Note: PRTIW (At Mission Memorial)**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
N-Nitrosodiethylamine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 2:37	W4B0023	
N-Nitrosodimethylamine	**5.4**		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 2:37	W4B0023	
N-Nitrosodi-n-butylamine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 2:37	W4B0023	
N-Nitrosodi-n-propylamine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 2:37	W4B0023	
N-Nitrosomethylethylamine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 2:37	W4B0023	
N-Nitrosomorpholine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 2:37	W4B0023	
N-Nitrosopiperidine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 2:37	W4B0023	
N-Nitrosopyrrolidine	ND		2.0	ng/l	1	EPA 1625M	2/3/14	2/5/14 2:37	W4B0023	
17-a-Ethynylestradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:22	W4B0281	
17-b-Estradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:22	W4B0281	
Estrone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:22	W4B0281	
Progesterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:22	W4B0281	
Testosterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:22	W4B0281	
Bisphenol A	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:20	W4B0283	
Gemfibrozil	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:20	W4B0283	
Ibuprofen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:20	W4B0283	
Iopromide	ND		5.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:20	W4B0283	
Naproxen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:20	W4B0283	
Salicylic Acid	ND		50	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:20	W4B0283	
Triclosan	ND		2.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:20	W4B0283	

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Lab Sample ID: 4A31033-01 **Sample ID: 14A1635-01** **Matrix:** Water
Sampled by: Client **Sampled: 01/29/14 14:57** **Sample Note: PRTIW (At Mission Memorial)**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
Acetaminophen	ND		20	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Amoxicillin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Atenolol	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Atorvastatin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Azithromycin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Caffeine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Carbamazepine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Ciprofloxacin	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Cotinine	ND		2.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
DEET	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Diazepam	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Fluoxetine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Meprobamate	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Methadone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Oxybenzone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Phenytoin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Primidone	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	R-01
Sucralose	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Sulfamethoxazole	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
TCEP	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
TCPP	**3.2**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	B
TDCPP	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	
Trimethoprim	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/18/14 23:49	W4B0282	

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Quality Control Section

Nitrosamines by isotopic dilution GC/MS CI Mode - Quality Control

Batch W4B0023 - EPA 1625M

Blank (W4B0023-BLK1) — **Prepared: 02/03/14 Analyzed: 02/04/14 21:48**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		ND		ng/l					
N-Nitrosomethylethylamine		ND		ng/l					
N-Nitrosodiethylamine		ND		ng/l					
N-Nitrosodi-n-propylamine		ND		ng/l					
N-Nitrosomorpholine		ND		ng/l					
N-Nitrosopyrrolidine		ND		ng/l					
N-Nitrosopiperidine		ND		ng/l					
N-Nitrosodi-n-butylamine		ND		ng/l					

Blank (W4B0023-BLK2) — **Prepared: 02/03/14 Analyzed: 02/05/14 14:48**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		ND	QC-2	ng/l					
N-Nitrosomethylethylamine		ND	QC-2	ng/l					
N-Nitrosodiethylamine		ND	QC-2	ng/l					
N-Nitrosodi-n-propylamine		ND	QC-2	ng/l					
N-Nitrosomorpholine		ND	QC-2	ng/l					
N-Nitrosopyrrolidine		ND	QC-2	ng/l					
N-Nitrosopiperidine		ND	QC-2	ng/l					
N-Nitrosodi-n-butylamine		ND	QC-2	ng/l					

LCS (W4B0023-BS1) — **Prepared: 02/03/14 Analyzed: 02/04/14 22:17**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		3.47		ng/l	3.00	116	50-150		
N-Nitrosomethylethylamine		2.67		ng/l	3.00	89	50-150		
N-Nitrosodiethylamine		2.79		ng/l	3.00	93	50-150		
N-Nitrosodi-n-propylamine		1.94		ng/l	3.00	65	50-150		
N-Nitrosomorpholine		2.50		ng/l	3.00	83	50-150		
N-Nitrosopyrrolidine		2.91		ng/l	3.00	97	50-150		
N-Nitrosopiperidine		2.83		ng/l	3.00	94	50-150		
N-Nitrosodi-n-butylamine		3.49		ng/l	3.00	116	50-150		

LCS (W4B0023-BS2) — **Prepared: 02/03/14 Analyzed: 02/05/14 13:23**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		3.61	QC-2	ng/l	3.00	120	50-150		
N-Nitrosomethylethylamine		2.65	QC-2	ng/l	3.00	88	50-150		
N-Nitrosodiethylamine		2.20	QC-2	ng/l	3.00	73	50-150		
N-Nitrosodi-n-propylamine		1.95	QC-2	ng/l	3.00	65	50-150		
N-Nitrosomorpholine		3.06	QC-2	ng/l	3.00	102	50-150		
N-Nitrosopyrrolidine		2.94	QC-2	ng/l	3.00	98	50-150		
N-Nitrosopiperidine		3.14	QC-2	ng/l	3.00	105	50-150		
N-Nitrosodi-n-butylamine		4.29	QC-2	ng/l	3.00	143	50-150		

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Nitrosamines by isotopic dilution GC/MS CI Mode - Quality Control

Batch W4B0023 - EPA 1625M

Matrix Spike (W4B0023-MS1) **Source: 4A31028-01** **Prepared: 02/03/14** **Analyzed: 02/04/14 23:15**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine	ND	2.69		ng/l	3.00	90	50-150		
N-Nitrosomethylethylamine	ND	2.88		ng/l	3.00	96	50-150		
N-Nitrosodiethylamine	ND	3.34		ng/l	3.00	111	50-150		
N-Nitrosodi-n-propylamine	ND	2.40		ng/l	3.00	80	50-150		
N-Nitrosomorpholine	ND	2.95		ng/l	3.00	98	50-150		
N-Nitrosopyrrolidine	ND	3.14		ng/l	3.00	105	50-150		
N-Nitrosopiperidine	ND	2.87		ng/l	3.00	96	50-150		
N-Nitrosodi-n-butylamine	ND	3.46		ng/l	3.00	115	50-150		

Matrix Spike Dup (W4B0023-MSD1) **Source: 4A31028-01** **Prepared: 02/03/14** **Analyzed: 02/04/14 22:46**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine	ND	2.76		ng/l	3.00	92	50-150	3	30
N-Nitrosomethylethylamine	ND	2.78		ng/l	3.00	93	50-150	4	30
N-Nitrosodiethylamine	ND	4.40		ng/l	3.00	147	50-150	27	30
N-Nitrosodi-n-propylamine	ND	3.11		ng/l	3.00	104	50-150	26	30
N-Nitrosomorpholine	ND	2.92		ng/l	3.00	97	50-150	1	30
N-Nitrosopyrrolidine	ND	3.14		ng/l	3.00	105	50-150	0.3	30
N-Nitrosopiperidine	ND	3.28		ng/l	3.00	109	50-150	14	30
N-Nitrosodi-n-butylamine	ND	4.74	MS-05	ng/l	3.00	158	50-150	31	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) **Prepared: 02/07/14** **Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		ND		ng/l					
Caffeine		ND		ng/l					
Sulfamethoxazole		ND		ng/l					
Trimethoprim		ND		ng/l					
Azithromycin		ND		ng/l					
Cotinine		ND		ng/l					
Atenolol		ND		ng/l					
Ciprofloxacin		ND		ng/l					
Carbamazepine		ND		ng/l					
DEET		ND		ng/l					
Fluoxetine		ND		ng/l					
Atorvastatin		ND		ng/l					
Methadone		ND		ng/l					
Primidone		ND		ng/l					
Diazepam		ND		ng/l					
TCPP		2.23	B	ng/l					
TCEP		ND		ng/l					
TDCPP		ND		ng/l					
Phenytoin		ND		ng/l					

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Amoxicillin		ND		ng/l					
Meprobamate		ND		ng/l					
Sucralose		ND		ng/l					
Oxybenzone		ND		ng/l					

LCS (W4B0282-BS1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:53**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		435		ng/l	400	109	66-156		
Caffeine		17.4		ng/l	20.0	87	55-152		
Sulfamethoxazole		17.6		ng/l	20.0	88	60-133		
Trimethoprim		18.6		ng/l	20.0	93	67-139		
Azithromycin		199		ng/l	200	100	52-166		
Cotinine		22.6		ng/l	20.0	113	68-155		
Atenolol		21.0		ng/l	20.0	105	56-164		
Ciprofloxacin		83.8		ng/l	100	84	51-168		
Carbamazepine		19.3		ng/l	20.0	96	60-135		
DEET		15.5		ng/l	20.0	78	45-135		
Fluoxetine		23.8		ng/l	20.0	119	55-150		
Atorvastatin		16.3		ng/l	20.0	82	0.1-173		
Methadone		19.0		ng/l	20.0	95	62-137		
Primidone		17.1		ng/l	20.0	86	54-147		
Diazepam		18.3		ng/l	20.0	92	58-127		
TCPP		18.1		ng/l	20.0	90	24-149		
TCEP		17.5		ng/l	20.0	88	25-149		
TDCPP		17.7		ng/l	20.0	88	20-158		
Phenytoin		18.2		ng/l	20.0	91	69-138		
Amoxicillin		164		ng/l	200	82	14-167		
Meprobamate		20.5		ng/l	20.0	102	11-166		
Sucralose		95.7		ng/l	100	96	50-150		
Oxybenzone		15.4		ng/l	20.0	77	50-150		

LCS Dup (W4B0282-BSD1) — **Prepared: 02/07/14 Analyzed: 02/18/14 23:07**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		499		ng/l	400	125	66-156	14	30
Caffeine		18.2		ng/l	20.0	91	55-152	4	30
Sulfamethoxazole		19.4		ng/l	20.0	97	60-133	10	30
Trimethoprim		18.4		ng/l	20.0	92	67-139	1	30
Azithromycin		206		ng/l	200	103	52-166	3	30
Cotinine		26.7		ng/l	20.0	134	68-155	17	30
Atenolol		23.0		ng/l	20.0	115	56-164	9	30
Ciprofloxacin		83.4		ng/l	100	83	51-168	0.5	30
Carbamazepine		19.7		ng/l	20.0	98	60-135	2	30
DEET		16.4		ng/l	20.0	82	45-135	6	30
Fluoxetine		22.8		ng/l	20.0	114	55-150	4	30

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

LCS Dup (W4B0282-BSD1) — **Prepared: 02/07/14 Analyzed: 02/18/14 23:07**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Atorvastatin		15.1		ng/l	20.0	76	0.1-173	8	30
Methadone		19.1		ng/l	20.0	96	62-137	0.5	30
Primidone		16.2		ng/l	20.0	81	54-147	5	30
Diazepam		18.9		ng/l	20.0	94	58-127	3	30
TCPP		21.0		ng/l	20.0	105	24-149	15	30
TCEP		20.6		ng/l	20.0	103	25-149	16	30
TDCPP		18.9		ng/l	20.0	94	20-158	7	30
Phenytoin		18.4		ng/l	20.0	92	69-138	1	30
Amoxicillin		164		ng/l	200	82	14-167	0	30
Meprobamate		20.6		ng/l	20.0	103	11-166	0.5	30
Sucralose		93.0		ng/l	100	93	50-150	3	30
Oxybenzone		18.3		ng/l	20.0	92	50-150	17	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

Blank (W4B0283-BLK1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:08**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		1.99	B	ng/l					
Gemfibrozil		ND		ng/l					
Ibuprofen		ND		ng/l					
Naproxen		ND		ng/l					
Salicylic Acid		ND		ng/l					
Triclosan		ND		ng/l					
Iopromide		ND		ng/l					

LCS (W4B0283-BS1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:22**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		19.5		ng/l	20.0	98	53-168		
Gemfibrozil		18.0		ng/l	20.0	90	76-122		
Ibuprofen		17.7		ng/l	20.0	88	67-139		
Naproxen		17.3		ng/l	20.0	86	64-138		
Salicylic Acid		171		ng/l	200	86	56-229		
Triclosan		38.9		ng/l	40.0	97	76-139		
Iopromide		114		ng/l	100	114	0.1-163		

LCS Dup (W4B0283-BSD1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		18.4		ng/l	20.0	92	53-168	6	30
Gemfibrozil		18.3		ng/l	20.0	92	76-122	2	30
Ibuprofen		19.8		ng/l	20.0	99	67-139	11	30
Naproxen		19.1		ng/l	20.0	96	64-138	10	30
Salicylic Acid		183		ng/l	200	92	56-229	7	30
Triclosan		40.5		ng/l	40.0	101	76-139	4	30

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PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

LCS Dup (W4B0283-BSD1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Iopromide		104		ng/l	100	104	0.1-163	9	30

PPCPs - Hormones by LC/MSMS-APCI - Quality Control

Batch W4B0281 - EPA 1694M-APCI

Blank (W4B0281-BLK1) — **Prepared: 02/07/14 Analyzed: 02/19/14 16:58**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		ND		ng/l					
17-b-Estradiol		ND		ng/l					
Estrone		ND		ng/l					
Progesterone		ND		ng/l					
Testosterone		ND		ng/l					

LCS (W4B0281-BS1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:15**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		19.1		ng/l	20.0	96	68-159		
17-b-Estradiol		18.0		ng/l	20.0	90	65-146		
Estrone		17.6		ng/l	20.0	88	59-141		
Progesterone		17.8		ng/l	20.0	89	58-154		
Testosterone		24.8		ng/l	20.0	124	60-172		

LCS Dup (W4B0281-BSD1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:31**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		18.9		ng/l	20.0	94	68-159	1	30
17-b-Estradiol		18.4		ng/l	20.0	92	65-146	2	30
Estrone		18.3		ng/l	20.0	92	59-141	4	30
Progesterone		18.1		ng/l	20.0	90	58-154	2	30
Testosterone		26.0		ng/l	20.0	130	60-172	5	30

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Notes:
The Chain of Custody document is part of the analytical report.
Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
All results are expressed on wet weight basis unless otherwise specified.

An Absence of Total Coliform meets the drinking water standards as established by the State of California Department of Health Services.
The Reporting Limit (RL) is referenced as laboratory's Practical Quantitation Limit (PQL).
For Potable water analysis, the Reporting Limit (RL) is referenced as Detection Limit for reporting purposes (DLRs) defined by EPA.

If sample collected by Weck Laboratories, sampled in accordance to lab SOP MIS002

Authorized Signature
Contact: Kim G Tu
(Project Manager)

ELAP # 1132
LACSD # 10143
NELAC # 04229CA

The results in this report apply to the samples analyzed in accordance with the chain of custody document. Weck Laboratories certifies that the test results meet all requirements of NELAC unless noted in the Case Narrative. This analytical report must be reproduced in its entirety.

Flags for Data Qualifiers:

B	Blank contamination. The analyte was found in the associated blank as well as in the sample.
MS-05	The spike recovery and/or RPD were outside acceptance limits for the MS and/or MSD due to possible matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QC-2	This QC sample was reanalyzed to complement samples that require re-analysis on different date. See analysis date.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
ND	NOT DETECTED at or above the Reporting Limit. If J-value reported, then NOT DETECTED at or above the Method Detection Limit (MDL).
Sub	Subcontracted analysis, original report enclosed.
DL	Method Detection Limit
RL	Method Reporting Limit
MDA	Minimum Detectable Activity
NR	Not Reportable

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ISOTECH LABORATORIES INC

ANALYSIS REPORT

Water Analysis

Lab Number: 410665 Job Number: 24232 IS-69368

Sample Name: PRTIW (AT MISSION MEMORIAL)

Company Lab #:

Company Job #:

Company: Alpha Analytical, Inc.

API/Well:

Field or Site: WO 14A1635

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Date Sampled: 1/29/2014 Date Received 2/05/2014 Date Reported: 2/26/2014

δD of water	----------	na
$\delta^{18}O$ of water	----------	na
Tritium content of water	----------	0.75 ± 0.16 TU
$\delta^{13}C$ of DIC	----------	na
^{14}C content of DIC	----------	na
$\delta^{15}N$ of nitrate	----------	na
$\delta^{18}O$ of nitrate	----------	na
$\delta^{34}S$ of sulfate	----------	na
$\delta^{18}O$ of sulfate	----------	na

Remarks:

LABORATORY REPORT

This report contains ___7___ pages.
(including the cover page)

If you have any questions concerning this report, please do not hesitate to call us at (800) 332-4345 or (574) 233-4777.

This report may not be reproduced, except in full, without written approval from UL.

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

NELAC NARRATIVE PAGE

Client: Alpha Analytical Report #: 310986NP

Underwriters Laboratories is a NELAP accredited laboratory. All reported results meet the requirements of the NELAC standards, unless otherwise noted.

UL contact person: James Van Fleit

NELAP requires complete reporting of deviations from method requirements, regardless of the suspected impact on the data. Quality control failures not reported within the report summary are noted here.

There were no quality control failures.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature Title Date

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Laboratory Report

Client:	Alpha Analytical	Report:	310986
Attn:	David Pingatore 6398 Dougherty Road, Suite 35 Dublin, CA 94568	Priority:	Standard Written
		Status:	Final
		PWS ID:	Not Supplied
Copies to:	None		

Sample Information

UL ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
2967024	14A1635-01	905.0	01/29/14 14:57	Client	02/04/14 11:45
2967025	14A1635-01	7500-Ra B	01/29/14 14:57	Client	02/04/14 11:45
2967025	14A1635-01	7500-Ra D	01/29/14 14:57	Client	02/04/14 11:45
2967026	14A1635-01	7110 B	01/29/14 14:57	Client	02/04/14 11:45
2967027	14A1635-01	1613	01/29/14 14:57	Client	02/04/14 11:45
2967028	14A1635-01	300.0	01/29/14 14:57	Client	02/04/14 11:45
2967029	14A1635-01	300.1	01/29/14 14:57	Client	02/04/14 11:45

Report Summary

Note: See attached page for additional comments.

Note: Sample containers were provided by the client except for Methods 300.0 and 300.1.

Note: Strontium-90 analysis was performed by GEL Laboratories, Charleston, SC.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call James Van Fleit at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature | Title | Date

Client Name: Alpha Analytical
Report #: 310986

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Client Name: Alpha Analytical

Report #: 310986

Sampling Point: 14A1635-01

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
14998-27-7	Chlorite	300.0	1000 *	20	< 20	ug/L	---	02/06/14 23:12	2967028
15541-45-4	Bromate	300.1	10 *	5.0	< 5.0	ug/L	---	02/05/14 02:43	2967029

Radionuclides

Analyte ID #	Analyte	Method	Reg Limit	DL**	Result	Units	Preparation Date	Analyzed	UL ID #
---	Gross Alpha	7110 B	15 *	3.0	2.8 ± 1.1	pCi/L	02/21/14 07:49	02/27/14 10:40	2967026
---	Gross Beta	7110 B	50 *	4.0	**5.6 ± 1.0**	pCi/L	02/21/14 07:49	02/27/14 10:40	2967026
13982-63-3	Radium-226	7500-Ra B	3 *	1.00	0.73 ± 0.42	pCi/L	02/18/14 09:45	02/24/14 10:13	2967025
15262-20-1	Radium-228	7500-Ra D	2 *	1.00	0.45 ± 0.45	pCi/L	02/18/14 09:45	02/26/14 16:02	2967025
---	Combined Radium	calc.	5 *	1.00	**1.18 ± 0.62**	pCi/L	02/18/14 09:45	02/26/14 16:02	2967025

** Detection Limit (DL) shall be that concentration which can be counted with a precision of plus or minus 100% at the 95 % confidence level.

Semi-volatile Organic Chemicals

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	UL ID #
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	1613	30 *	5.0	< 5.0	pg/L	02/12/14 07:40	02/13/14 19:58	2967027

Reference Lab Tests

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	UL ID #
---	Strontium-90	905.0	8 *	2.00	**-0.863 ± 0.948**	pCi/L	---	02/20/14 11:39	2967024

† UL has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1635

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

Zymax
600 S. Andreasen Drive, Suite B
Escondido, CA 92029
Phone :(760) 781-3338
Fax: (760) 781-3339
Terms: Net 30

Analysis	Due	Expires	Comments
14A1635-01 PRTIW (At Mission Memorial) [Water] Sampled 01/29/14 14:57 Pacific			43450-1
Oxygen 18 - Isotope / Hydroger	02/13/14 12:00	07/28/14 14:57	
N and O Isotopes of Nitrate	02/13/14 12:00	02/05/14 14:57	

Containers Supplied:

250 mL Poly Unpres (AQ` 250 mL Poly Unpres (AR)

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
	1-30-14		2/5/14 9:05
Released By	Date	Received By	Date

David S. Pingatore
Project Manager
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482
Tel: 707.468.0401
Fax: 707.468.5267
Project: 14A1635
Email: david @ alpha.com

Dr. Yi Wang
Director of ZymaX Forensics Isotope
Senior Environmental Geochemist, PACE
600 S. Andreasen Dr., Suite B
Escondido, CA 92029
Tel: 760.781.3338 ext 202
Fax: 760.781.3339
Cell: 609.721.2843
Email: yi.wang@zymaxusa.com

REPORT OF ENVIRONMENTAL FORENSICS ISOTOPE ANALYSES

Date Received: February 5th, 2014
Date Reported: March 20th, 2014

Sample from Alpha Analytical Labs for $\delta^{15}N$ (‰ Air), $\delta^{18}O$ and δD (‰ VSMOW) stable isotope analysis

ZymaX ID	Client ID/Sample Description	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
43450-1	14A1635-01 PRTIW @ Mission Memorial	-6.14	-40.68	2.5	1.3
	Analytical precision (1σ)	0.06	0.32	0.2	0.4

ZymaX ID	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
QC-01	-5.89	-41.12	4.5	25.3
QC-02	-5.98	-41.57	4.8	25.9
Mean	-5.94	-41.35	4.7	25.6
Analytical Precision (1σ)	0.06	0.32	0.2	0.4

ZymaX Forensics Isotope Services

Product or Dissolved Organics: Chlorinated Solvents, Oil, Extract, Fraction and Kerogen
3D-CSIA of ^{13}C, ^{37}Cl, and ^{2}H for PCE, TCE, DCE, MTBE, BTEX, PAHs, Pesticides, Alkanes, Gasoline and Oil; Bulk ^{13}C, ^{2}H, ^{18}O, ^{34}S, and ^{15}N
Gas Sample
Gas Composition and 2D-CSIA of ^{13}C and ^{2}H of C1 to C5; ^{13}C of CO_2; ^{14}C of C1 and CO_2; ^{34}S of H_2S; ^{15}N and ^{18}O of N_2O gas
Water and Dissolved Inorganics
^{2}H, ^{3}H and ^{18}O; ^{34}S and ^{18}O of dissolved sulfate; ^{34}S of dissolved H_2S
^{15}N and ^{18}O of dissolved Nitrate; ^{15}N of Ammonia; ^{13}C of dissolved CO_2 and Carbonate/Bicarbonate
Soil and Minerals
^{13}C, ^{18}O, ^{15}N, ^{34}S, D/H; ^{14}C of carbonate or organics
Post-Analysis Forensic Isotope Data Interpretation

Laboratory Order - Summary

analytical chemistry for a better environment

Report To:	David S. Pingatore Alpha Analytical Laboratories, Inc. 208 Mason St. Ukiah, CA. 95482	Date Received: Date Due: Project:	02/05/2014 9:05AM 04/23/2014 12:00AM 14A1635
Phone: Fax:	(707) 468-0401 (707) 468-5267	Project Number:	

Lab Number	Description	Analysis	Dept
43450-1	14A1635-01 PRTIW	d15N and d18O of NO3	M6
		d18O+dD of H2O	M6

Notes/Special Instructions	SC Login/Computer Login CY/CY	DPRA PM: YW

ZymaX FORENSICS

Condition Upon Reciept

Lab Number: 43450 Client: AAL

Sample Temprature (should be 2-6 degrees C): 1.9°C

Do the sample descriptions on the containers match the discriptions on the COC?	☒ Yes	☐ No	
Do the sample dates on the containers match the sample dates on the COC?	☒ Yes	☐ No	
Are the samples within holding time for each analysis at time of reciept?	☒ Yes	☐ No	☐ N/A
Do the number of containers received match the number listed on the COC, and are all of the necessary containers for the required analysis available?	☒ Yes	☐ No	☐ N/A
Does the preservation of the samples match the notation on the COC, and is the preservation correct for requested analysis?	☐ Yes ☒ Zymax	☐ No	☐ N/A
Are all of the samples intact with no headspace, if required for analysis?	☒ Yes	☐ No	
Did samples arrive with custody seal intact?	☒ Yes	☐ No	☐ N/A

Sample Control Signature: [signature] Date: 2/5/14 Time: 9:05

Client Discrepancies

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14A1635

Signature below authorizes work under terms stated on reverse side.

Report to:
Company: Todd Engineers
Attn: Dr. Bill Motzer
Address: 2490 Mariner Square Loop, Suite 215, Alameda, CA 94501
Phone/Fax: 510.747.6920 / 510.747.6921
Email Address: bmotzer@toddengineers.com

Invoice to (if different):
Company:
Attn:
Address:
Phone/Fax:
Email Address:

Project Info for Report:
Project ID: Groundwater Reuse Project
Project No: Project # 60408
PO/Reference :

Samplers Signature:
Print: DOUG WHICHARD

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___days ○
Lab Approval Required For Rush TATs
Sample Notes (lab use only)
Temperature: DU 4.8/4.6 deg. C
Shipment Method:
Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	40ml VOA	Poly	Amber glass	Soil jar		NaOH	HNO3	H2SO4	Other	None	Water	Soil		Total Number of Containers	Inorganics Scan, DU-General Physical Scan	200.7 - Ca, K, Mg, Na	200.8 - Ag, B, Cu, Fe, Mn, Ni, V, Zn	Bicarbonate, Chloride, Conductivity	MBAS, Perchlorate, TDS, Sulfate	HAA5, TOC	507, 508, 515, 525 DHS, 531, 547, 548, 549	504.1, 524.2 Sample Traps scan	Asbestos DW (sub TEM Lab)	Cr6 218.6 DW (sub MAI)	Dioxin 2,3,7,8 TCDD DW (sub UL)	Sample Notes or CDPH Source Numbers:
PRTIW (at Mission Memorial)	1/29/14	1457		x	x			x	x			x	x			4	x	x	x	x	x							
			x		x						x		x			3						x						
				x	x						x	x	x			10							x					(507/508/515.1 = one 1L BRA ea)
			x								x		x			7								x				
					x							x	x			2									x			
				x							x		x			1										x		
					x							x	x			2											x	
Trip blank ($0.00 analysis)			x								x	x	x			2							x					

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	1/29/14	15:26
[signature]	Rodney Santillan	1/29/14	1745
Rodney Santillan	[signature]	1-29-14	1850
[signature]	[signature]	1-29-14	2115

CDPH Write On EDT Transmission? ○ Yes ○ No
State System Number:
If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No
Global ID:
Sampling Company Log Code:
EDF to (Email Address):

Travel and Site Time:
Mileage:
Misc. Supplies:

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14A1635

Signature below authorizes work under terms stated on reverse side.

Report to:	Invoice to (if different):	Project Info for Report:
Company: Todd Engineers	Company:	Project ID: Groundwater Reuse Project
Attn: Dr. Bill Motzer	Attn:	
Address: 2490 Mariner Square Loop, Suite 215 Alameda, CA 94501	Address:	Project No: Project # 60408
Phone/Fax: 510.747.6920 / 510.747.6921	Phone/Fax:	PO/Reference :
Email Address: bmotzer@toddengineers.com	Email Address:	

Samplers Signature: [signature]

Print: DOUG WHICHARD

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___ days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only)

Temperature: 4° deg. C

Shipment Method:

Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	Container: 40ml VOA	Poly	Amber glass	Soil jar		Preservative: HCL	HNO3	H2SO4	Other	None	Matrix: Water	Soil		Total Number of Containers	8330B Explosives (sub ALS)	PPCP Hormones 1694M (sub Weck)	PPCP Negative Pharmas 1694M (sub Weck)	PPCP Positive Pharmas 1694M (sub Weck)	Nitrosamines LL 1625M (sub Weck)	Gross A & B, R226 &R228, Sr 90 (sub UL)	Bromate 300.1, Chlorite 300.0 (sub UL)	Tritium, Enriched (sub Isotech)	Oxygen 18 Isotope (sub Zymax)	N and O Isotopes of NO3 (sub Zymax)	J-flag MDL reporting + Standard excel EDD	Sample Notes or CDPH Source Numbers:
PRTIW (at Mission Memorial)	1/29/14	1457			x							x	x			2	x										x	
					x						x		x			2		x	x	x								
					x							x	x			2					x							
				x					x				x			4						x						
				x							x		x			2							x					
				x								x	x			1								x				
				x								x	x			1									x			
				x								x	x			1										x		

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	1/29/14	15:26
[signature]	[signature]	1-29-14	1830
[signature]	LAB [signature]	1-29-14	2115

CDPH Write On EDT Transmission? ○ Yes ○ No

State System Number: _____

If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No

Global ID: Sampling Company Log Code:

EDF to (Email Address):

Travel and Site Time: Mileage: Misc. Supplies:

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

ELAP Certificate Numbers 1551 and 2728

18 February 2014

Todd Groundwater
Attn: Dr. Bill Motzer
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
RE: Groundwater Reuse Project
Work Order: 14A1713

Enclosed are the results of analyses for samples received by the laboratory on 01/30/14 21:25. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeanette Poplin

Jeanette L. Poplin For David S. Pingatore
Project Manager

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 11:14

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
FO-07 (Shallow)	14A1713-01	Water	01/30/14 13:40	01/30/14 21:25
Trip Blank	14A1713-02	Water	01/30/14 13:40	01/30/14 21:25

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Metals (Drinking Water) by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Mercury	**0.11**	0.060	1.0	ug/l	1	AA43136	02/05/14 09:00	02/05/14 13:39	EPA 245.1	J

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Metals by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Calcium	**29**	0.010	1.0	mg/l	1	AA43133	01/31/14 14:45	02/05/14 13:07	EPA 200.7	
Magnesium	**3.8**	0.0080	1.0	"	"	"	"	"	"	
Potassium	**3.6**	0.0080	1.0	"	"	"	"	"	"	
Sodium	**38**	0.020	1.0	"	"	"	"	"	"	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Metals by EPA Method 200.8 ICP/MS
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Aluminum	**3700**	20	500	ug/l	10	AB40328	02/03/14 09:47	02/11/14 16:59	EPA 200.8	
Antimony	**3.7**	0.020	6.0	"	1	"	"	02/05/14 14:42	"	J
Arsenic	**210**	0.70	20	"	10	"	"	02/11/14 16:59	"	
Barium	**1200**	0.30	1000	"	"	"	"	"	"	
Beryllium	**0.68**	0.020	1.0	"	1	"	"	02/05/14 14:42	"	J
Boron	**25**	6.0	50	"	"	"	"	"	"	J
Cadmium	**3.3**	0.020	1.0	"	"	"	"	"	"	
Chromium	**790**	8.0	100	"	100	"	"	02/11/14 16:53	"	
Copper	**14**	0.40	5.0	"	10	"	"	02/11/14 16:59	"	
Iron	**80000**	180	5000	"	100	"	"	02/11/14 16:53	"	
Lead	**42**	0.020	5.0	"	1	"	"	02/05/14 14:42	"	
Manganese	**20000**	3.0	500	"	100	"	"	02/11/14 16:53	"	
Nickel	**26**	0.060	10	"	1	"	"	02/05/14 14:42	"	
Selenium	**1.3**	0.70	50	"	10	"	"	02/11/14 16:59	"	R-01, J
Silver	**0.11**	0.020	0.10	"	1	"	"	02/05/14 14:42	"	
Thallium	**0.19**	0.020	1.0	"	"	"	"	"	"	J
Uranium	**0.62**	0.020	1.0	pCi/l	"	"	"	"	"	J
Vanadium	**34**	0.30	1.0	ug/l	"	"	"	"	"	
Zinc	**300**	5.0	50	"	10	"	"	02/11/14 16:59	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Conventional Chemistry Parameters by APHA/EPA Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Bicarbonate	**68**	0.060	5.0	mg/l	1	AA43121	02/11/14 10:19	02/11/14 17:00	SM2320B	
Color	**1700**	300	500	Color Units	100	AA43128	01/30/14 18:00	01/30/14 18:00	SM2120B	A-01a
Color	**4.0**	3.0	5.0	"	1	AA42421	02/05/14 11:15	02/05/14 11:15	"	A-01b, J
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l	"	AA43107	01/31/14 14:45	02/04/14 16:00	SM5540C	U
Odor	ND		1.0	T.O.N.	"	AA43128	01/30/14 18:00	01/30/14 18:00	EPA 140.1	U
Perchlorate	ND	0.90	4.0	ug/l	"	AB41141	02/11/14 09:49	02/11/14 13:31	EPA 314.0	U
Specific Conductance (EC)	**280**	1.0	20	umhos/cm	"	AA43147	01/31/14 17:00	01/31/14 17:00	SM2510B	
Total Dissolved Solids	**190**	5.0	10	mg/l	"	AB40322	02/03/14 09:00	02/05/14 08:30	SM2540C	
Turbidity	**550**	0.040	0.10	NTU	"	AA43129	01/30/14 18:00	01/30/14 18:00	SM2130B	
Nitrate + Nitrite as N	**0.55**	0.0086	0.40	mg/l	"	AB41339	02/13/14 10:39	02/13/14 11:18	EPA 300.0	
Total Organic Carbon	**0.768**	0.100	0.300	"	"	AB40803	02/08/14 12:46	02/08/14 22:25	SM5310C	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Miscellaneous Physical/Conventional Chemistry Parameters
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Cyanide (total)	ND	0.0020	0.10	mg/l	1	AB40428	02/04/14 09:46	02/05/14 15:19	10-204-00-1X	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Anions by EPA Method 300.0
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Nitrate as NO3	**2.4**	0.20	2.0	mg/l	1	AA43111	01/31/14 12:28	01/31/14 18:28	EPA 300.0	
Chloride	**44**	0.15	2.5	"	5	"	"	"	"	
Fluoride	ND	0.070	0.10	"	1	"	"	"	"	U
Nitrite as N	ND	0.020	0.40	"	"	"	"	"	"	U
Sulfate as SO4	**13**	0.090	0.50	"	"	"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Acetone	**2.0**	0.80	5.0	ug/l	1	AB40725	02/04/14 11:57	02/06/14 14:12	EPA 524.2	J
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
1,3-Dichloropropane	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 14:12	EPA 524.2	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
o-Xylene	ND	0.10	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 14:12	EPA 524.2	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*101 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*103 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*104 %*	*70-130*			"	"	"	"	
Trip Blank (14A1713-02) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Acetone	ND	0.80	5.0	ug/l	1	AB40725	02/04/14 11:57	02/06/14 14:49	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14A1713-02) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
1,2-Dichlorobenzene	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 14:49	EPA 524.2	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14A1713-02) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
1,2,4-Trichlorobenzene	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 14:49	EPA 524.2	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U
o-Xylene	ND	0.10	0.50	"	"	"	"	"	"	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*99.8 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*97.0 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*102 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Aldrin	ND	0.010	0.050	ug/l	1	AB40514	02/05/14 08:08	02/11/14 23:27	EPA 508	U
Chloroneb	ND	0.20	0.50	"	"	"	"	"	"	U
Chlorobenzilate	ND	2.0	5.0	"	"	"	"	"	"	U
Chlorothalonil	ND	0.030	0.10	"	"	"	"	"	"	U
DCPA	ND	0.020	0.040	"	"	"	"	"	"	U
4,4´-DDD	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDE	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDT	ND	0.020	0.020	"	"	"	"	"	"	U
Dieldrin	ND	0.010	0.010	"	"	"	"	"	"	U
Endosulfan I	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan II	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan sulfate	ND	0.020	0.020	"	"	"	"	"	"	U
Endrin	ND	0.030	0.10	"	"	"	"	"	"	U
Endrin aldehyde	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-alpha	ND	0.010	0.050	"	"	"	"	"	"	U
HCH-beta	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-delta	ND	0.030	0.050	"	"	"	"	"	"	U
HCH-gamma (Lindane)	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor epoxide	ND	0.010	0.010	"	"	"	"	"	"	U
Hexachlorobenzene	ND	0.010	0.040	"	"	"	"	"	"	U
Hexachlorocyclopentadiene	ND	0.040	0.40	"	"	"	"	"	"	U
Methoxychlor	ND	0.020	0.020	"	"	"	"	"	"	U
cis-Permethrin	ND	0.070	0.20	"	"	"	"	"	"	U
trans-Permethrin	ND	0.090	0.20	"	"	"	"	"	"	U
Propachlor	ND	0.070	0.20	"	"	"	"	"	"	U
Trifluralin	ND	0.020	0.040	"	"	"	"	"	"	U
PCB-1016	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1221	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1232	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1242	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1248	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1254	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1260	ND	0.030	0.50	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Total PCBs	ND	0.30	0.50	ug/l	1	AB40514	02/05/14 08:08	02/11/14 23:27	EPA 508	U
Toxaphene	ND	0.40	0.50	"	"	"	"	"	"	U
Chlordane (tech)	ND	0.030	0.050	"	"	"	"	"	"	U
Surrogate: Dibutylchlorendate		*98.0 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Nitrogen- and Phosphorus- Pesticides by EPA Method 507
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Alachlor	ND	0.50	0.50	ug/l	1	AB40730	02/08/14 15:03	02/11/14 08:20	EPA 507	U
Atrazine	ND	0.30	0.50	"	"	"	"	"	"	U
Bromacil	ND	0.50	5.0	"	"	"	"	"	"	U
Butachlor	ND	0.40	0.50	"	"	"	"	"	"	U
Dimethoate	ND	0.20	1.0	"	"	"	"	"	"	U
Metolachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Metribuzin	ND	0.40	0.50	"	"	"	"	"	"	U
Molinate	ND	0.20	0.50	"	"	"	"	"	"	U
Prometryn	ND	0.50	0.50	"	"	"	"	"	"	U
Propachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Simazine	ND	0.30	0.50	"	"	"	"	"	"	U
Thiobencarb	ND	0.20	1.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*97.8 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Organic Analytes by EPA Method 504.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40359	02/04/14 10:00	02/05/14 03:32	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U
Trip Blank (14A1713-02) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40359	02/04/14 10:00	02/05/14 04:07	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Chlorinated Acids by EPA Method 515.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Acifluorfen	ND	0.50	1.0	ug/l	1	AB40536	02/06/14 14:29	02/08/14 05:03	EPA 515.1	U
Bentazon	ND	0.40	0.40	"	"	"	"	"	"	U
2,4-D	ND	0.80	1.0	"	"	"	"	"	"	U
Dalapon	ND	6.0	6.0	"	"	"	"	"	"	U
2,4-DB	ND	4.0	5.0	"	"	"	"	"	"	U
Dicamba	ND	0.40	0.40	"	"	"	"	"	"	U
Dichlorprop	ND	1.0	1.0	"	"	"	"	"	"	U
Dinoseb	ND	0.80	1.0	"	"	"	"	"	"	U
4-Nitrophenol	ND	0.70	1.0	"	"	"	"	"	"	U
Pentachlorophenol	ND	0.20	0.20	"	"	"	"	"	"	U
Picloram	ND	0.50	1.0	"	"	"	"	"	"	U
2,4,5-T	ND	0.40	0.50	"	"	"	"	"	"	U
2,4,5-TP (Silvex)	ND	0.50	0.50	"	"	"	"	"	"	U
Surrogate: DCAA		*94.4 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Carbamates by EPA Method 531.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Aldicarb	ND	0.70	3.0	ug/l	1	AB41142	02/11/14 10:07	02/12/14 11:18	EPA 531.1	U
Aldicarb sulfone	ND	0.70	4.0	"	"	"	"	"	"	U
Aldicarb sulfoxide	ND	0.80	3.0	"	"	"	"	"	"	U
Carbaryl	ND	0.70	5.0	"	"	"	"	"	"	U
Carbofuran	ND	2.0	5.0	"	"	"	"	"	"	U
3-Hydroxycarbofuran	ND	0.90	3.0	"	"	"	"	"	"	U
Methiocarb	ND	2.0	5.0	"	"	"	"	"	"	U
Methomyl	ND	2.0	2.0	"	"	"	"	"	"	U
Oxamyl	ND	0.80	20	"	"	"	"	"	"	U
Propoxur	ND	2.0	5.0	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Endothall by EPA Method 548.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Endothall	ND	2.0	45	ug/l	1	AB40357	02/04/14 14:37	02/06/14 15:42	EPA 548.1	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Glyphosate by EPA Method 547
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Glyphosate	ND	3.0	10	ug/l	1	AB40427	02/04/14 09:22	02/05/14 00:02	EPA 547	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Diquat by EPA Method 549.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Diquat	ND	4.6	4.6	ug/l	2.3	AA43118	02/03/14 09:48	02/10/14 21:29	EPA 549.2	R-01, U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Haloacetic Acids by EPA Method 552.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										
Monobromoacetic Acid	ND	0.8	1.0	ug/l	1	AB41050	02/11/14 13:22	02/12/14 16:07	EPA 552.2	U
Monochloroacetic Acid	ND	1.1	2.0	"	"	"	"	"	"	U
Dibromoacetic Acid	ND	0.8	1.0	"	"	"	"	"	"	U
Dichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Trichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"	"	"	"	"	"	U
Surrogate: 2,3-Dibromopropionic Acid		*74.7 %*	*70-130*			"	"	"	"	
Surrogate: 2-Bromopropionic Acid		*82.4 %*	*70-130*			"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Semivolatile Organic Compounds by EPA Method 525.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Shallow) (14A1713-01) Water Sampled: 01/30/14 13:40 Received: 01/30/14 21:25										**A-01**
Benzo (a) pyrene	ND	0.80	1.0	ug/l	10	AB40727	02/08/14 13:35	02/13/14 18:29	EPA 525.2	U
Di(2-ethylhexyl)adipate	ND	4.0	50	"	"	"	"	"	"	U
Di(2-ethylhexyl)phthalate	ND	2.0	30	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*105 %*	*70-130*			"	"	"	"	
Surrogate: Perylene-d12		*81.4 %*	*70-130*			"	"	"	"	
Surrogate: Triphenyl phosphate		*101 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Metals (Drinking Water) by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43136 - EPA 245.1 Hg Water											
Blank (AA43136-BLK1)					Prepared & Analyzed: 02/05/14						
Mercury	ND	0.060	1.0	ug/l							U
LCS (AA43136-BS1)					Prepared & Analyzed: 02/05/14						
Mercury	2.30	0.060	1.0	ug/l	2.50		92.0	80-120			
Duplicate (AA43136-DUP1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	ND	0.060	1.0	ug/l		ND				20	U
Matrix Spike (AA43136-MS1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	2.26	0.060	1.0	ug/l	2.50	ND	90.4	60-140			
Matrix Spike (AA43136-MS2)		**Source: 14B0218-01**			Prepared & Analyzed: 02/05/14						
Mercury	2.32	0.060	1.0	ug/l	2.50	0.0600	90.4	60-140			
Matrix Spike Dup (AA43136-MSD1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	2.29	0.060	1.0	ug/l	2.50	ND	91.6	60-140	1.32	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43133 - Metals Digest											
Blank (AA43133-BLK1)					Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	ND	0.010	1.0	mg/l							U
Magnesium	ND	0.0080	1.0	"							U
Potassium	ND	0.0080	1.0	"							U
Sodium	ND	0.020	1.0	"							U
LCS (AA43133-BS1)					Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	5.36	0.010	1.0	mg/l	5.88		91.2	85-115			
Magnesium	7.09	0.0080	1.0	"	8.00		88.6	85-115			
Potassium	7.97	0.0080	1.0	"	8.00		99.6	85-115			
Sodium	7.75	0.020	1.0	"	8.00		96.8	85-115			
Duplicate (AA43133-DUP1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/12/14						
Calcium	18.2	0.010	1.0	mg/l		16.5			9.76	20	
Magnesium	6.86	0.0080	1.0	"		6.53			4.91	20	
Potassium	3.66	0.0080	1.0	"		3.35			8.82	20	
Sodium	52.8	0.020	1.0	"		50.2			5.03	20	
Matrix Spike (AA43133-MS1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	22.4	0.010	1.0	mg/l	5.88	16.5	100	70-130			
Magnesium	13.0	0.0080	1.0	"	8.00	6.53	81.3	70-130			
Potassium	10.8	0.0080	1.0	"	8.00	3.35	92.8	70-130			
Sodium	58.8	0.020	1.0	"	8.00	50.2	107	70-130			
Matrix Spike (AA43133-MS2)		**Source: 14A1713-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	35.4	0.010	1.0	mg/l	5.88	28.8	112	70-130			
Magnesium	11.0	0.0080	1.0	"	8.00	3.85	89.5	70-130			
Potassium	11.1	0.0080	1.0	"	8.00	3.56	94.7	70-130			
Sodium	47.2	0.020	1.0	"	8.00	38.1	114	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43133 - Metals Digest											
Matrix Spike Dup (AA43133-MSD1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	23.2	0.010	1.0	mg/l	5.88	16.5	113	70-130	3.39	20	
Magnesium	14.3	0.0080	1.0	"	8.00	6.53	97.1	70-130	9.24	20	
Potassium	11.0	0.0080	1.0	"	8.00	3.35	95.8	70-130	2.21	20	
Sodium	60.3	0.020	1.0	"	8.00	50.2	126	70-130	2.49	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Blank (AB40328-BLK1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	ND	2.0	50	ug/l							U
Antimony	ND	0.020	6.0	"							U
Arsenic	ND	0.070	2.0	"							U
Barium	ND	0.030	100	"							U
Beryllium	ND	0.020	1.0	"							U
Boron	17.8	6.0	50	"							J
Cadmium	ND	0.020	1.0	"							U
Chromium	ND	0.080	10	"							U
Copper	ND	0.040	0.50	"							U
Iron	ND	1.8	50	"							U
Lead	ND	0.020	5.0	"							U
Manganese	ND	0.030	5.0	"							U
Nickel	ND	0.060	10	"							U
Selenium	0.0754	0.070	5.0	"							J
Silver	ND	0.020	0.10	"							U
Thallium	ND	0.020	1.0	"							U
Uranium	ND	0.020	1.0	pCi/l							U
Vanadium	ND	0.30	1.0	ug/l							U
Zinc	1.13	0.50	5.0	"							J
LCS (AB40328-BS1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	483	2.0	50	ug/l	520		92.8	85-115			
Antimony	20.1	0.020	6.0	"	20.0		100	85-115			
Arsenic	19.7	0.070	2.0	"	20.0		98.7	85-115			
Barium	19.1	0.030	100	"	20.0		95.4	85-115			J
Beryllium	18.8	0.020	1.0	"	20.0		94.1	85-115			
Boron	110	6.0	50	"	100		110	85-115			
Cadmium	18.8	0.020	1.0	"	20.0		94.0	85-115			
Chromium	19.3	0.080	10	"	20.0		96.6	85-115			
Copper	19.0	0.040	0.50	"	20.0		95.1	85-115			
Iron	502	1.8	50	"	520		96.6	85-115			
Lead	17.5	0.020	5.0	"	20.0		87.5	85-115			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
LCS (AB40328-BS1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Manganese	18.8	0.030	5.0	ug/l	20.0		94.2	85-115			
Nickel	19.3	0.060	10	"	20.0		96.6	85-115			
Selenium	20.1	0.070	5.0	"	20.0		100	85-115			
Silver	18.1	0.020	0.10	"	20.0		90.4	85-115			
Thallium	17.1	0.020	1.0	"	20.0		85.6	85-115			
Uranium	11.5	0.020	1.0	pCi/l	13.4		85.5	85-115			
Vanadium	19.8	0.30	1.0	ug/l	20.0		99.0	85-115			
Zinc	98.6	0.50	5.0	"	100		98.6	85-115			
Duplicate (AB40328-DUP1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1120	2.0	50	ug/l		1150			1.98	20	
Antimony	0.0754	0.020	6.0	"		0.0744			1.34	20	J
Arsenic	1.08	0.070	2.0	"		1.15			6.89	20	J
Barium	70.3	0.030	100	"		68.3			2.85	20	J
Beryllium	0.0788	0.020	1.0	"		0.0838			6.24	20	J
Boron	37.9	6.0	50	"		36.2			4.75	20	J
Cadmium	0.0848	0.020	1.0	"		0.0857			1.11	20	J
Chromium	0.470	0.080	10	"		0.382			20.5	20	J
Copper	12.8	0.040	0.50	"		12.3			3.69	20	
Iron	412	1.8	50	"		408			0.910	20	
Lead	1.06	0.020	5.0	"		1.12			4.92	20	J
Manganese	6.46	0.030	5.0	"		7.23			11.3	20	
Nickel	1.21	0.060	10	"		1.20			1.54	20	J
Selenium	0.159	0.070	5.0	"		0.171			7.50	20	J
Silver	0.0362	0.020	0.10	"		0.0220			48.8	20	J
Thallium	0.105	0.020	1.0	"		0.0948			9.86	20	J
Uranium	0.249	0.020	1.0	pCi/l		0.265			6.25	20	J
Vanadium	1.52	0.30	1.0	ug/l		1.64			7.56	20	
Zinc	6.79	0.50	5.0	"		6.73			0.780	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Matrix Spike (AB40328-MS1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1570	2.0	50	ug/l	520	1150	81.5	70-130			
Antimony	18.9	0.020	6.0	"	20.0	0.0744	94.1	70-130			
Arsenic	19.9	0.070	2.0	"	20.0	1.15	93.5	70-130			
Barium	85.5	0.030	100	"	20.0	68.3	85.8	70-130			J
Beryllium	17.8	0.020	1.0	"	20.0	0.0838	88.5	70-130			
Boron	114	6.0	50	"	100	36.2	78.1	70-130			
Cadmium	18.7	0.020	1.0	"	20.0	0.0857	93.0	70-130			
Chromium	17.4	0.080	10	"	20.0	0.382	85.1	70-130			
Copper	29.6	0.040	0.50	"	20.0	12.3	86.4	70-130			
Iron	858	1.8	50	"	520	408	86.4	70-130			
Lead	19.8	0.020	5.0	"	20.0	1.12	93.4	70-130			
Manganese	23.4	0.030	5.0	"	20.0	7.23	80.7	70-130			
Nickel	18.2	0.060	10	"	20.0	1.20	85.0	70-130			
Selenium	18.7	0.070	5.0	"	20.0	0.171	92.7	70-130			
Silver	17.9	0.020	0.10	"	20.0	0.0220	89.3	70-130			
Thallium	18.5	0.020	1.0	"	20.0	0.0948	92.1	70-130			
Uranium	13.5	0.020	1.0	pCi/l	13.4	0.265	98.5	70-130			
Vanadium	19.1	0.30	1.0	ug/l	20.0	1.64	87.4	70-130			
Zinc	98.9	0.50	5.0	"	100	6.73	92.1	70-130			
Matrix Spike (AB40328-MS2)		**Source: 14B0124-02**			Prepared: 02/05/14 Analyzed: 02/06/14						
Aluminum	529	2.0	50	ug/l	520	70.3	88.1	70-130			
Antimony	20.4	0.020	6.0	"	20.0	0.0711	102	70-130			
Arsenic	21.4	0.070	2.0	"	20.0	2.13	96.2	70-130			
Barium	35.8	0.030	100	"	20.0	16.9	94.7	70-130			J
Beryllium	19.3	0.020	1.0	"	20.0	ND	96.4	70-130			
Boron	150	6.0	50	"	100	63.0	87.0	70-130			
Cadmium	19.4	0.020	1.0	"	20.0	ND	97.0	70-130			
Chromium	20.0	0.080	10	"	20.0	0.590	97.0	70-130			
Copper	19.6	0.040	0.50	"	20.0	1.39	90.9	70-130			
Iron	602	1.8	50	"	520	91.5	98.1	70-130			
Lead	20.2	0.020	5.0	"	20.0	0.0825	101	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Matrix Spike (AB40328-MS2)		**Source: 14B0124-02**			Prepared: 02/05/14 Analyzed: 02/06/14						
Manganese	26.7	0.030	5.0	ug/l	20.0	7.07	98.0	70-130			
Nickel	19.5	0.060	10	"	20.0	0.983	92.8	70-130			
Selenium	19.2	0.070	5.0	"	20.0	0.207	95.2	70-130			
Silver	19.4	0.020	0.10	"	20.0	ND	97.2	70-130			
Thallium	19.8	0.020	1.0	"	20.0	ND	99.0	70-130			
Uranium	14.2	0.020	1.0	pCi/l	13.4	0.107	105	70-130			
Vanadium	24.6	0.30	1.0	ug/l	20.0	5.40	95.9	70-130			
Zinc	99.9	0.50	5.0	"	100	3.69	96.2	70-130			
Matrix Spike Dup (AB40328-MSD1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1580	2.0	50	ug/l	520	1150	83.4	70-130	0.635	20	
Antimony	19.7	0.020	6.0	"	20.0	0.0744	98.1	70-130	4.13	20	
Arsenic	20.5	0.070	2.0	"	20.0	1.15	96.6	70-130	3.05	20	
Barium	88.4	0.030	100	"	20.0	68.3	100	70-130	3.29	20	J
Beryllium	19.1	0.020	1.0	"	20.0	0.0838	95.3	70-130	7.32	20	
Boron	125	6.0	50	"	100	36.2	88.8	70-130	8.99	20	
Cadmium	19.7	0.020	1.0	"	20.0	0.0857	98.0	70-130	5.25	20	
Chromium	18.0	0.080	10	"	20.0	0.382	88.1	70-130	3.40	20	
Copper	30.7	0.040	0.50	"	20.0	12.3	91.9	70-130	3.64	20	
Iron	860	1.8	50	"	520	408	86.8	70-130	0.291	20	
Lead	21.5	0.020	5.0	"	20.0	1.12	102	70-130	8.35	20	
Manganese	23.8	0.030	5.0	"	20.0	7.23	83.1	70-130	2.03	20	
Nickel	18.6	0.060	10	"	20.0	1.20	87.2	70-130	2.36	20	
Selenium	19.1	0.070	5.0	"	20.0	0.171	94.8	70-130	2.29	20	
Silver	19.1	0.020	0.10	"	20.0	0.0220	95.5	70-130	6.75	20	
Thallium	20.0	0.020	1.0	"	20.0	0.0948	99.5	70-130	7.72	20	
Uranium	14.5	0.020	1.0	pCi/l	13.4	0.265	107	70-130	7.74	20	
Vanadium	19.8	0.30	1.0	ug/l	20.0	1.64	91.0	70-130	3.68	20	
Zinc	105	0.50	5.0	"	100	6.73	97.9	70-130	5.71	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43107 - General Preparation											
Blank (AA43107-BLK1)					Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l							U
LCS (AA43107-BS1)					Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.205	0.030	0.050	mg/l	0.200		103	80-120			
Duplicate (AA43107-DUP1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l		ND				20	U
Matrix Spike (AA43107-MS1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.208	0.030	0.050	mg/l	0.200	ND	104	80-120			
Matrix Spike Dup (AA43107-MSD1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.210	0.030	0.050	mg/l	0.200	ND	105	80-120	0.826	20	
Batch AA43121 - General Preparation											
Duplicate (AA43121-DUP1)		**Source: 14B0229-03**			Prepared: 02/01/14 Analyzed: 02/11/14						
Bicarbonate	42.7	0.060	5.0	mg/l		42.7			0.00	20	
Batch AA43129 - General Preparation											
Blank (AA43129-BLK1)					Prepared & Analyzed: 01/30/14						
Turbidity	ND	0.040	0.10	NTU							U
Duplicate (AA43129-DUP1)		**Source: 14A1722-01**			Prepared & Analyzed: 01/30/14						
Turbidity	2.48	0.040	0.10	NTU		2.48			0.00	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43147 - General Preparation											
Duplicate (AA43147-DUP1)		**Source: 14A1739-01**			Prepared & Analyzed: 01/31/14						
Specific Conductance (EC)	143	1.0	20	umhos/cm		144			0.697	10	
Batch AB40322 - General Preparation											
Blank (AB40322-BLK1)					Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	ND	5.0	10	mg/l							U
Duplicate (AB40322-DUP1)		**Source: 14A1635-01**			Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	361	5.0	10	mg/l		352			2.52	30	
Duplicate (AB40322-DUP2)		**Source: 14A1730-01**			Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	1010	5.0	10	mg/l		964			4.46	30	
Batch AB40803 - General Prep											
Blank (AB40803-BLK1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	ND	0.100	0.300	mg/l							U
LCS (AB40803-BS1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.6	0.100	0.300	mg/l	10.0		106	85-115			
LCS Dup (AB40803-BSD1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.5	0.100	0.300	mg/l	10.0		105	85-115	1.20	20	
Duplicate (AB40803-DUP1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	ND	0.100	0.300	mg/l		0.112				20	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40803 - General Prep											
Matrix Spike (AB40803-MS1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.7	0.100	0.300	mg/l	10.0	0.112	106	70-130			
Matrix Spike Dup (AB40803-MSD1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.4	0.100	0.300	mg/l	10.0	0.112	102	70-130	3.54	20	
Batch AB41141 - General Preparation											
Blank (AB41141-BLK1)					Prepared & Analyzed: 02/11/14						
Perchlorate	0.967	0.90	4.0	ug/l							J
LCS (AB41141-BS1)					Prepared & Analyzed: 02/11/14						
Perchlorate	23.9	0.90	4.0	ug/l	25.0		95.5	85-115			
Duplicate (AB41141-DUP1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	ND	0.90	4.0	ug/l		ND				15	U
Matrix Spike (AB41141-MS1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130			
Matrix Spike Dup (AB41141-MSD1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130	0.00386	15	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Miscellaneous Physical/Conventional Chemistry Parameters - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40428 - General Preparation											
Blank (AB40428-BLK1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l							U
LCS (AB40428-BS1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.202	0.0020	0.10	mg/l	0.200		101	85-115			
Duplicate (AB40428-DUP1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l		ND				25	U
Matrix Spike (AB40428-MS1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.188	0.0020	0.10	mg/l	0.200	ND	93.9	85-115			
Matrix Spike (AB40428-MS2)		**Source: 14A1635-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.220	0.0020	0.10	mg/l	0.200	ND	110	85-115			
Matrix Spike Dup (AB40428-MSD1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.186	0.0020	0.10	mg/l	0.200	ND	92.8	85-115	1.23	25	

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43111 - General Preparation											
Blank (AA43111-BLK1)					Prepared & Analyzed: 01/31/14						
Nitrate as NO3	ND	0.20	2.0	mg/l							U
Nitrite as N	ND	0.020	0.40	"							U
Sulfate as SO4	ND	0.090	0.50	"							U
Fluoride	ND	0.070	0.10	"							U
Chloride	ND	0.030	0.50	"							U
LCS (AA43111-BS1)					Prepared & Analyzed: 01/31/14						
Nitrate as NO3	22	0.20	2.0	mg/l	22.2		101	90-110			
Chloride	10.2	0.030	0.50	"	10.0		102	90-110			
Sulfate as SO4	20.0	0.090	0.50	"	20.0		100	90-110			
Fluoride	5.25	0.070	0.10	"	5.00		105	90-110			
Nitrite as N	5.21	0.020	0.40	"	5.00		104	90-110			
Duplicate (AA43111-DUP1)		**Source: 14A1704-01**			Prepared & Analyzed: 01/31/14						
Nitrate as NO3	0.43	0.20	2.0	mg/l		0.43			1.40	20	J
Nitrite as N	ND	0.020	0.40	"		ND				20	U
Chloride	2.62	0.030	0.50	"		2.61			0.0765	20	
Sulfate as SO4	9.21	0.090	0.50	"		9.36			1.61	20	
Fluoride	ND	0.070	0.10	"		ND				20	U
Matrix Spike (AA43111-MS1)		**Source: 14A1704-01**			Prepared & Analyzed: 01/31/14						
Nitrate as NO3	25	0.20	2.0	mg/l	24.7	0.43	99.8	80-120			
Nitrite as N	5.79	0.020	0.40	"	5.56	ND	104	80-120			
Chloride	14.2	0.030	0.50	"	11.1	2.61	104	80-120			
Sulfate as SO4	32.0	0.090	0.50	"	22.2	9.36	102	80-120			
Fluoride	5.68	0.070	0.10	"	5.56	ND	102	80-120			
Matrix Spike (AA43111-MS2)		**Source: 14A1713-01**			Prepared & Analyzed: 01/31/14						
Nitrate as NO3	26	1.0	10	mg/l	24.7	2.4	96.0	80-120			
Fluoride	4.85	0.35	0.50	"	5.56	ND	87.3	80-120			
Chloride	54.8	0.15	2.5	"	11.1	43.7	100	80-120			
Nitrite as N	5.44	0.10	2.0	"	5.56	ND	98.0	80-120			
Sulfate as SO4	34.3	0.45	2.5	"	22.2	13.3	94.2	80-120			

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43111 - General Preparation											
Matrix Spike Dup (AA43111-MSD1)		**Source: 14A1704-01**		Prepared & Analyzed: 01/31/14							
Nitrate as NO3	25	0.20	2.0	mg/l	24.7	0.43	99.9	80-120	0.124	20	
Chloride	14.2	0.030	0.50	"	11.1	2.61	104	80-120	0.133	20	
Nitrite as N	5.79	0.020	0.40	"	5.56	ND	104	80-120	0.0768	20	
Sulfate as SO4	32.0	0.090	0.50	"	22.2	9.36	102	80-120	0.149	20	
Fluoride	5.69	0.070	0.10	"	5.56	ND	102	80-120	0.235	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
Acetone	ND	0.80	5.0	ug/l							U
Acrylonitrile	ND	0.20	5.0	"							U
Benzene	ND	0.20	0.30	"							U
Bromobenzene	ND	0.10	0.50	"							U
Bromochloromethane	ND	0.20	0.50	"							U
Bromodichloromethane	ND	0.50	0.50	"							U
Bromoform	ND	0.50	0.50	"							U
Bromomethane	ND	0.20	0.50	"							U
n-Butylbenzene	ND	0.10	0.50	"							U
sec-Butylbenzene	ND	0.10	0.50	"							U
tert-Butylbenzene	ND	0.10	0.50	"							U
Carbon disulfide	ND	0.20	0.50	"							U
Carbon tetrachloride	ND	0.30	0.50	"							U
Chlorobenzene	ND	0.20	0.50	"							U
Chloroethane	ND	0.10	0.50	"							U
Chloroform	ND	0.50	0.50	"							U
Chloromethane	ND	0.20	0.50	"							U
2-Chlorotoluene	ND	0.20	0.50	"							U
4-Chlorotoluene	ND	0.10	0.50	"							U
Dibromochloromethane	ND	0.50	0.50	"							U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"							U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"							U
Dibromomethane	ND	0.20	0.50	"							U
1,2-Dichlorobenzene	ND	0.20	0.50	"							U
1,3-Dichlorobenzene	ND	0.20	0.50	"							U
1,4-Dichlorobenzene	ND	0.10	0.50	"							U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"							U
Dichlorodifluoromethane	ND	0.20	0.50	"							U
1,1-Dichloroethane	ND	0.10	0.50	"							U
1,2-Dichloroethane	ND	0.20	0.50	"							U
1,1-Dichloroethene	ND	0.10	0.30	"							U
cis-1,2-Dichloroethene	ND	0.20	0.50	"							U

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
trans-1,2-Dichloroethene	ND	0.20	0.50	ug/l							U
1,2-Dichloropropane	ND	0.20	0.50	"							U
1,3-Dichloropropane	ND	0.20	0.50	"							U
2,2-Dichloropropane	ND	0.10	0.50	"							U
1,1-Dichloropropene	ND	0.10	0.50	"							U
cis-1,3-Dichloropropene	ND	0.20	0.50	"							U
trans-1,3-Dichloropropene	ND	0.20	0.50	"							U
2-Hexanone	ND	0.097	5.0	"							U
1,3-Dichloropropene (total)	ND	0.20	0.50	"							U
Ethylbenzene	ND	0.10	0.50	"							U
Hexachlorobutadiene	ND	0.30	0.50	"							U
Isopropylbenzene	ND	0.20	0.50	"							U
p-Isopropyltoluene	ND	0.10	0.50	"							U
Methyl ethyl ketone	ND	0.40	1.0	"							U
Methyl iodide	ND	0.12	2.0	"							U
Methyl isobutyl ketone	ND	0.30	1.0	"							U
Methylene chloride	ND	0.40	0.50	"							U
Naphthalene	ND	0.20	0.50	"							U
n-Propylbenzene	ND	0.20	0.50	"							U
Styrene	ND	0.10	0.50	"							U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"							U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"							U
Tetrachloroethene	ND	0.20	0.50	"							U
Toluene	ND	0.10	0.50	"							U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"							U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"							U
1,1,1-Trichloroethane	ND	0.20	0.50	"							U
1,1,2-Trichloroethane	ND	0.20	0.50	"							U
Trichloroethene	ND	0.20	0.50	"							U
Trichlorofluoromethane	ND	0.20	0.50	"							U
Trichlorotrifluoroethane	ND	0.20	0.50	"							U
1,2,3-Trichloropropane	ND	0.13	0.50	"							U

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2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
1,2,4-Trimethylbenzene	ND	0.10	0.50	ug/l							U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"							U
Vinyl chloride	ND	0.10	0.50	"							U
m,p-Xylene	ND	0.20	0.50	"							U
o-Xylene	ND	0.10	0.50	"							U
Xylenes (total)	ND	0.20	0.50	"							U
Trihalomethanes (total)	ND	0.50	0.50	"							U
Methyl tert-butyl ether	ND	0.50	0.50	"							U
Ethyl tert-butyl ether	ND	0.20	0.50	"							U
Tert-amyl methyl ether	ND	0.20	0.50	"							U
Surrogate: Bromofluorobenzene	*25.0*			*"*	*25.0*		*99.8*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*95.9*	*70-130*			
Surrogate: Toluene-d8	*25.4*			*"*	*25.0*		*102*	*70-130*			
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
Acetone	24.1	0.80	5.0	ug/l	20.0		120	70-130			
Acrylonitrile	5.73	0.20	5.0	"	5.00		115	70-130			
Benzene	4.88	0.20	0.30	"	5.00		97.6	70-130			
Bromobenzene	5.19	0.10	0.50	"	5.00		104	70-130			
Bromochloromethane	5.11	0.20	0.50	"	5.00		102	70-130			
Bromodichloromethane	4.65	0.50	0.50	"	5.00		93.0	70-130			
Bromoform	4.58	0.50	0.50	"	5.00		91.6	70-130			
Bromomethane	5.43	0.20	0.50	"	5.00		109	70-130			
n-Butylbenzene	5.09	0.10	0.50	"	5.00		102	70-130			
sec-Butylbenzene	5.06	0.10	0.50	"	5.00		101	70-130			
tert-Butylbenzene	5.24	0.10	0.50	"	5.00		105	70-130			
Carbon disulfide	4.99	0.20	0.50	"	5.00		99.8	70-130			
Carbon tetrachloride	4.76	0.30	0.50	"	5.00		95.2	70-130			
Chlorobenzene	5.07	0.20	0.50	"	5.00		101	70-130			
Chloroethane	5.33	0.10	0.50	"	5.00		107	70-130			
Chloroform	4.92	0.50	0.50	"	5.00		98.4	70-130			
Chloromethane	6.12	0.20	0.50	"	5.00		122	70-130			

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2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
2-Chlorotoluene	5.26	0.20	0.50	ug/l	5.00		105	70-130			
4-Chlorotoluene	4.99	0.10	0.50	"	5.00		99.8	70-130			
Dibromochloromethane	4.81	0.50	0.50	"	5.00		96.2	70-130			
1,2-Dibromo-3-chloropropane	4.94	0.36	0.50	"	5.00		98.8	70-130			
1,2-Dibromoethane (EDB)	5.23	0.14	0.50	"	5.00		105	70-130			
Dibromomethane	4.94	0.20	0.50	"	5.00		98.8	70-130			
1,2-Dichlorobenzene	4.86	0.20	0.50	"	5.00		97.2	70-130			
1,3-Dichlorobenzene	5.18	0.20	0.50	"	5.00		104	70-130			
trans-1,4-Dichloro-2-butene	4.74	0.095	5.0	"	5.00		94.8	70-130			J
1,4-Dichlorobenzene	4.96	0.10	0.50	"	5.00		99.2	70-130			
Dichlorodifluoromethane	6.14	0.20	0.50	"	5.00		123	70-130			
1,1-Dichloroethane	5.10	0.10	0.50	"	5.00		102	70-130			
1,2-Dichloroethane	4.93	0.20	0.50	"	5.00		98.6	70-130			
1,1-Dichloroethene	4.96	0.10	0.30	"	5.00		99.2	70-130			
cis-1,2-Dichloroethene	5.01	0.20	0.50	"	5.00		100	70-130			
trans-1,2-Dichloroethene	4.99	0.20	0.50	"	5.00		99.8	70-130			
1,2-Dichloropropane	4.83	0.20	0.50	"	5.00		96.6	70-130			
1,3-Dichloropropane	5.09	0.20	0.50	"	5.00		102	70-130			
2,2-Dichloropropane	4.57	0.10	0.50	"	5.00		91.4	70-130			
1,1-Dichloropropene	4.65	0.10	0.50	"	5.00		93.0	70-130			
cis-1,3-Dichloropropene	4.66	0.20	0.50	"	5.00		93.2	70-130			
trans-1,3-Dichloropropene	4.58	0.20	0.50	"	5.00		91.6	70-130			
2-Hexanone	5.38	0.097	5.0	"	5.00		108	70-130			
Ethylbenzene	5.06	0.10	0.50	"	5.00		101	70-130			
Hexachlorobutadiene	4.93	0.30	0.50	"	5.00		98.6	70-130			
Isopropylbenzene	5.33	0.20	0.50	"	5.00		107	70-130			
p-Isopropyltoluene	5.25	0.10	0.50	"	5.00		105	70-130			
Methyl ethyl ketone	10.5	0.40	1.0	"	10.0		105	70-130			
Methyl iodide	5.04	0.12	2.0	"	5.00		101	70-130			
Methyl isobutyl ketone	10.3	0.30	1.0	"	10.0		103	70-130			
Methylene chloride	4.10	0.40	0.50	"	5.00		82.0	70-130			
Naphthalene	5.01	0.20	0.50	"	5.00		100	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
n-Propylbenzene	5.43	0.20	0.50	ug/l	5.00		109	70-130			
Styrene	5.32	0.10	0.50	"	5.00		106	70-130			
1,1,1,2-Tetrachloroethane	4.86	0.20	0.50	"	5.00		97.2	70-130			
1,1,2,2-Tetrachloroethane	5.08	0.20	0.50	"	5.00		102	70-130			
Tetrachloroethene	5.11	0.20	0.50	"	5.00		102	70-130			
Toluene	5.21	0.10	0.50	"	5.00		104	70-130			
1,2,3-Trichlorobenzene	5.08	0.10	0.50	"	5.00		102	70-130			
1,2,4-Trichlorobenzene	5.00	0.20	0.50	"	5.00		100	70-130			
1,1,1-Trichloroethane	4.89	0.20	0.50	"	5.00		97.8	70-130			
1,1,2-Trichloroethane	5.09	0.20	0.50	"	5.00		102	70-130			
Trichloroethene	4.93	0.20	0.50	"	5.00		98.6	70-130			
Trichlorofluoromethane	5.14	0.20	0.50	"	5.00		103	70-130			
Trichlorotrifluoroethane	5.56	0.20	0.50	"	5.00		111	70-130			
1,2,3-Trichloropropane	5.03	0.13	0.50	"	5.00		101	70-130			
1,2,4-Trimethylbenzene	5.36	0.10	0.50	"	5.00		107	70-130			
1,3,5-Trimethylbenzene	5.36	0.10	0.50	"	5.00		107	70-130			
Vinyl chloride	5.40	0.10	0.50	"	5.00		108	70-130			
m,p-Xylene	10.2	0.20	0.50	"	10.0		102	70-130			
o-Xylene	5.24	0.10	0.50	"	5.00		105	70-130			
Xylenes (total)	15.4	0.20	0.50	"	15.0		103	70-130			
Methyl tert-butyl ether	4.89	0.50	0.50	"	5.00		97.8	70-130			
Ethyl tert-butyl ether	4.85	0.20	0.50	"	5.00		97.0	70-130			
Tert-amyl methyl ether	4.93	0.20	0.50	"	5.00		98.6	70-130			
Surrogate: Bromofluorobenzene	*25.6*			*"*	*25.0*		*102*	*70-130*			
Surrogate: Dibromofluoromethane	*24.7*			*"*	*25.0*		*98.7*	*70-130*			
Surrogate: Toluene-d8	*25.3*			*"*	*25.0*		*101*	*70-130*			
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Acetone	22.4	0.80	5.0	ug/l	20.0		112	70-130	7.28	30	
Acrylonitrile	5.77	0.20	5.0	"	5.00		115	70-130	0.696	30	
Benzene	4.70	0.20	0.30	"	5.00		94.0	70-130	3.76	30	
Bromobenzene	5.09	0.10	0.50	"	5.00		102	70-130	1.95	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Bromochloromethane	4.92	0.20	0.50	ug/l	5.00		98.4	70-130	3.79	30	
Bromodichloromethane	4.56	0.50	0.50	"	5.00		91.2	70-130	1.95	30	
Bromoform	4.71	0.50	0.50	"	5.00		94.2	70-130	2.80	30	
Bromomethane	5.46	0.20	0.50	"	5.00		109	70-130	0.551	30	
n-Butylbenzene	4.88	0.10	0.50	"	5.00		97.6	70-130	4.21	30	
sec-Butylbenzene	5.00	0.10	0.50	"	5.00		100	70-130	1.19	30	
tert-Butylbenzene	5.15	0.10	0.50	"	5.00		103	70-130	1.73	30	
Carbon disulfide	4.83	0.20	0.50	"	5.00		96.6	70-130	3.26	30	
Carbon tetrachloride	4.64	0.30	0.50	"	5.00		92.8	70-130	2.55	30	
Chlorobenzene	5.01	0.20	0.50	"	5.00		100	70-130	1.19	30	
Chloroethane	5.12	0.10	0.50	"	5.00		102	70-130	4.02	30	
Chloroform	4.84	0.50	0.50	"	5.00		96.8	70-130	1.64	30	
Chloromethane	5.86	0.20	0.50	"	5.00		117	70-130	4.34	30	
2-Chlorotoluene	5.27	0.20	0.50	"	5.00		105	70-130	0.190	30	
4-Chlorotoluene	5.07	0.10	0.50	"	5.00		101	70-130	1.59	30	
Dibromochloromethane	4.72	0.50	0.50	"	5.00		94.4	70-130	1.89	30	
1,2-Dibromo-3-chloropropane	4.95	0.36	0.50	"	5.00		99.0	70-130	0.202	25	
1,2-Dibromoethane (EDB)	5.17	0.14	0.50	"	5.00		103	70-130	1.15	25	
Dibromomethane	5.07	0.20	0.50	"	5.00		101	70-130	2.60	30	
1,2-Dichlorobenzene	4.70	0.20	0.50	"	5.00		94.0	70-130	3.35	30	
1,3-Dichlorobenzene	5.10	0.20	0.50	"	5.00		102	70-130	1.56	30	
trans-1,4-Dichloro-2-butene	4.90	0.095	5.0	"	5.00		98.0	70-130	3.32	25	J
1,4-Dichlorobenzene	4.87	0.10	0.50	"	5.00		97.4	70-130	1.83	30	
Dichlorodifluoromethane	5.94	0.20	0.50	"	5.00		119	70-130	3.31	30	
1,1-Dichloroethane	4.86	0.10	0.50	"	5.00		97.2	70-130	4.82	30	
1,2-Dichloroethane	4.84	0.20	0.50	"	5.00		96.8	70-130	1.84	30	
1,1-Dichloroethene	4.67	0.10	0.30	"	5.00		93.4	70-130	6.02	30	
cis-1,2-Dichloroethene	4.85	0.20	0.50	"	5.00		97.0	70-130	3.25	30	
trans-1,2-Dichloroethene	4.78	0.20	0.50	"	5.00		95.6	70-130	4.30	30	
1,2-Dichloropropane	4.88	0.20	0.50	"	5.00		97.6	70-130	1.03	30	
1,3-Dichloropropane	5.07	0.20	0.50	"	5.00		101	70-130	0.394	30	
2,2-Dichloropropane	4.36	0.10	0.50	"	5.00		87.2	70-130	4.70	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
1,1-Dichloropropene	4.56	0.10	0.50	ug/l	5.00		91.2	70-130	1.95	30	
cis-1,3-Dichloropropene	4.68	0.20	0.50	"	5.00		93.6	70-130	0.428	30	
trans-1,3-Dichloropropene	4.74	0.20	0.50	"	5.00		94.8	70-130	3.43	30	
Ethylbenzene	4.96	0.10	0.50	"	5.00		99.2	70-130	2.00	30	
2-Hexanone	5.44	0.097	5.0	"	5.00		109	70-130	1.11	25	
Hexachlorobutadiene	4.64	0.30	0.50	"	5.00		92.8	70-130	6.06	30	
Isopropylbenzene	5.24	0.20	0.50	"	5.00		105	70-130	1.70	30	
p-Isopropyltoluene	5.08	0.10	0.50	"	5.00		102	70-130	3.29	30	
Methyl ethyl ketone	11.0	0.40	1.0	"	10.0		110	70-130	4.74	30	
Methyl iodide	4.90	0.12	2.0	"	5.00		98.0	70-130	2.82	25	
Methyl isobutyl ketone	10.4	0.30	1.0	"	10.0		104	70-130	0.679	30	
Methylene chloride	4.06	0.40	0.50	"	5.00		81.2	70-130	0.980	30	
Naphthalene	4.96	0.20	0.50	"	5.00		99.2	70-130	1.00	30	
n-Propylbenzene	5.47	0.20	0.50	"	5.00		109	70-130	0.734	30	
Styrene	5.28	0.10	0.50	"	5.00		106	70-130	0.755	30	
1,1,1,2-Tetrachloroethane	4.77	0.20	0.50	"	5.00		95.4	70-130	1.87	30	
1,1,2,2-Tetrachloroethane	5.14	0.20	0.50	"	5.00		103	70-130	1.17	30	
Tetrachloroethene	4.82	0.20	0.50	"	5.00		96.4	70-130	5.84	30	
Toluene	5.15	0.10	0.50	"	5.00		103	70-130	1.16	30	
1,2,3-Trichlorobenzene	4.99	0.10	0.50	"	5.00		99.8	70-130	1.79	30	
1,2,4-Trichlorobenzene	4.83	0.20	0.50	"	5.00		96.6	70-130	3.46	30	
1,1,1-Trichloroethane	4.70	0.20	0.50	"	5.00		94.0	70-130	3.96	30	
1,1,2-Trichloroethane	5.20	0.20	0.50	"	5.00		104	70-130	2.14	30	
Trichloroethene	4.67	0.20	0.50	"	5.00		93.4	70-130	5.42	30	
Trichlorofluoromethane	5.01	0.20	0.50	"	5.00		100	70-130	2.56	30	
Trichlorotrifluoroethane	5.29	0.20	0.50	"	5.00		106	70-130	4.98	30	
1,2,3-Trichloropropane	5.09	0.13	0.50	"	5.00		102	70-130	1.19	25	
1,2,4-Trimethylbenzene	5.28	0.10	0.50	"	5.00		106	70-130	1.50	30	
1,3,5-Trimethylbenzene	5.28	0.10	0.50	"	5.00		106	70-130	1.50	30	
Vinyl chloride	5.27	0.10	0.50	"	5.00		105	70-130	2.44	30	
m,p-Xylene	10.1	0.20	0.50	"	10.0		101	70-130	0.888	30	
o-Xylene	5.11	0.10	0.50	"	5.00		102	70-130	2.51	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Xylenes (total)	15.2	0.20	0.50	ug/l	15.0		101	70-130	1.44	30	
Methyl tert-butyl ether	4.81	0.50	0.50	"	5.00		96.2	70-130	1.65	30	
Ethyl tert-butyl ether	5.20	0.20	0.50	"	5.00		104	70-130	6.97	30	
Tert-amyl methyl ether	4.85	0.20	0.50	"	5.00		97.0	70-130	1.64	30	
Surrogate: Bromofluorobenzene	*25.4*			*"*	*25.0*		*102*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*96.1*	*70-130*			
Surrogate: Toluene-d8	*25.2*			*"*	*25.0*		*101*	*70-130*			
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Acetone	26.9	0.80	5.0	ug/l	20.0	1.79	126	70-130			
Acrylonitrile	5.81	0.20	5.0	"	5.00	ND	116	70-130			
Benzene	5.43	0.20	0.30	"	5.00	ND	109	70-130			
Bromobenzene	5.48	0.10	0.50	"	5.00	ND	110	70-130			
Bromochloromethane	5.55	0.20	0.50	"	5.00	ND	111	70-130			
Bromodichloromethane	10.0	0.50	0.50	"	5.00	4.42	112	70-130			
Bromoform	4.44	0.50	0.50	"	5.00	ND	88.8	70-130			
Bromomethane	6.20	0.20	0.50	"	5.00	ND	124	70-130			
n-Butylbenzene	5.03	0.10	0.50	"	5.00	ND	101	70-130			
sec-Butylbenzene	5.41	0.10	0.50	"	5.00	ND	108	70-130			
tert-Butylbenzene	5.60	0.10	0.50	"	5.00	ND	112	70-130			
Carbon disulfide	5.36	0.20	0.50	"	5.00	ND	107	70-130			
Carbon tetrachloride	4.97	0.30	0.50	"	5.00	ND	99.4	70-130			
Chlorobenzene	5.35	0.20	0.50	"	5.00	ND	107	70-130			
Chloroethane	6.00	0.10	0.50	"	5.00	ND	120	70-130			
Chloroform	35.3	0.50	0.50	"	5.00	31.5	76.2	70-130			
Chloromethane	6.60	0.20	0.50	"	5.00	ND	132	70-130			QM-05
2-Chlorotoluene	5.65	0.20	0.50	"	5.00	ND	113	70-130			
4-Chlorotoluene	5.61	0.10	0.50	"	5.00	ND	112	70-130			
Dibromochloromethane	4.80	0.50	0.50	"	5.00	ND	96.0	70-130			
1,2-Dibromo-3-chloropropane	4.62	0.36	0.50	"	5.00	ND	92.4	70-130			
1,2-Dibromoethane (EDB)	5.29	0.14	0.50	"	5.00	ND	106	70-130			
Dibromomethane	5.47	0.20	0.50	"	5.00	ND	109	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
1,2-Dichlorobenzene	4.95	0.20	0.50	ug/l	5.00	ND	99.0	70-130			
1,3-Dichlorobenzene	5.47	0.20	0.50	"	5.00	ND	109	70-130			
trans-1,4-Dichloro-2-butene	5.53	0.095	5.0	"	5.00	ND	111	70-130			
1,4-Dichlorobenzene	5.16	0.10	0.50	"	5.00	ND	103	70-130			
Dichlorodifluoromethane	6.69	0.20	0.50	"	5.00	ND	134	70-130			QM-05
1,1-Dichloroethane	5.61	0.10	0.50	"	5.00	ND	112	70-130			
1,2-Dichloroethane	5.51	0.20	0.50	"	5.00	ND	110	70-130			
1,1-Dichloroethene	5.37	0.10	0.30	"	5.00	ND	107	70-130			
cis-1,2-Dichloroethene	5.51	0.20	0.50	"	5.00	ND	110	70-130			
trans-1,2-Dichloroethene	5.31	0.20	0.50	"	5.00	ND	106	70-130			
1,2-Dichloropropane	5.29	0.20	0.50	"	5.00	ND	106	70-130			
1,3-Dichloropropane	5.45	0.20	0.50	"	5.00	ND	109	70-130			
2,2-Dichloropropane	4.58	0.10	0.50	"	5.00	ND	91.6	70-130			
1,1-Dichloropropene	5.13	0.10	0.50	"	5.00	ND	103	70-130			
cis-1,3-Dichloropropene	4.84	0.20	0.50	"	5.00	ND	96.8	70-130			
trans-1,3-Dichloropropene	4.50	0.20	0.50	"	5.00	ND	90.0	70-130			
Ethylbenzene	5.30	0.10	0.50	"	5.00	ND	106	70-130			
2-Hexanone	5.62	0.097	5.0	"	5.00	ND	112	70-130			
Hexachlorobutadiene	4.84	0.30	0.50	"	5.00	ND	96.8	70-130			
Isopropylbenzene	5.74	0.20	0.50	"	5.00	ND	115	70-130			
p-Isopropyltoluene	5.59	0.10	0.50	"	5.00	ND	112	70-130			
Methyl ethyl ketone	12.3	0.40	1.0	"	10.0	ND	123	70-130			
Methyl iodide	5.66	0.12	2.0	"	5.00	ND	113	70-130			
Methyl isobutyl ketone	10.7	0.30	1.0	"	10.0	ND	107	70-130			
Methylene chloride	4.34	0.40	0.50	"	5.00	ND	86.8	70-130			
Naphthalene	5.02	0.20	0.50	"	5.00	ND	100	70-130			
n-Propylbenzene	5.74	0.20	0.50	"	5.00	ND	115	70-130			
Styrene	5.53	0.10	0.50	"	5.00	ND	111	70-130			
1,1,1,2-Tetrachloroethane	4.62	0.20	0.50	"	5.00	ND	92.4	70-130			
1,1,2,2-Tetrachloroethane	5.37	0.20	0.50	"	5.00	ND	107	70-130			
Tetrachloroethene	5.41	0.20	0.50	"	5.00	ND	108	70-130			
Toluene	5.51	0.10	0.50	"	5.00	ND	110	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
1,2,3-Trichlorobenzene	5.07	0.10	0.50	ug/l	5.00	ND	101	70-130			
1,2,4-Trichlorobenzene	4.77	0.20	0.50	"	5.00	ND	95.4	70-130			
1,1,1-Trichloroethane	5.12	0.20	0.50	"	5.00	ND	102	70-130			
1,1,2-Trichloroethane	5.46	0.20	0.50	"	5.00	ND	109	70-130			
Trichloroethene	5.13	0.20	0.50	"	5.00	ND	103	70-130			
Trichlorofluoromethane	5.52	0.20	0.50	"	5.00	ND	110	70-130			
Trichlorotrifluoroethane	6.04	0.20	0.50	"	5.00	ND	121	70-130			
1,2,3-Trichloropropane	5.35	0.13	0.50	"	5.00	ND	107	70-130			
1,2,4-Trimethylbenzene	5.57	0.10	0.50	"	5.00	ND	111	70-130			
1,3,5-Trimethylbenzene	5.57	0.10	0.50	"	5.00	ND	111	70-130			
Vinyl chloride	6.10	0.10	0.50	"	5.00	ND	122	70-130			
m,p-Xylene	11.0	0.20	0.50	"	10.0	ND	110	70-130			
o-Xylene	5.54	0.10	0.50	"	5.00	ND	111	70-130			
Xylenes (total)	16.6	0.20	0.50	"	15.0	ND	110	70-130			
Methyl tert-butyl ether	4.80	0.50	0.50	"	5.00	ND	96.0	70-130			
Ethyl tert-butyl ether	5.52	0.20	0.50	"	5.00	ND	110	70-130			
Tert-amyl methyl ether	4.93	0.20	0.50	"	5.00	ND	98.6	70-130			
Surrogate: Bromofluorobenzene	*25.3*			*"*	*25.0*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*24.5*			*"*	*25.0*		*98.1*	*70-130*			
Surrogate: Toluene-d8	*25.0*			*"*	*25.0*		*99.9*	*70-130*			
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Acetone	26.1	0.80	5.0	ug/l	20.0	1.79	122	70-130	2.87	30	
Acrylonitrile	5.35	0.20	5.0	"	5.00	ND	107	70-130	8.24	30	
Benzene	4.92	0.20	0.30	"	5.00	ND	98.4	70-130	9.86	30	
Bromobenzene	5.04	0.10	0.50	"	5.00	ND	101	70-130	8.37	30	
Bromochloromethane	5.02	0.20	0.50	"	5.00	ND	100	70-130	10.0	30	
Bromodichloromethane	9.77	0.50	0.50	"	5.00	4.42	107	70-130	2.43	30	
Bromoform	4.34	0.50	0.50	"	5.00	ND	86.8	70-130	2.28	30	
Bromomethane	5.65	0.20	0.50	"	5.00	ND	113	70-130	9.28	30	
n-Butylbenzene	4.55	0.10	0.50	"	5.00	ND	91.0	70-130	10.0	30	
sec-Butylbenzene	5.00	0.10	0.50	"	5.00	ND	100	70-130	7.88	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**		Prepared: 02/04/14 Analyzed: 02/06/14							
tert-Butylbenzene	5.08	0.10	0.50	ug/l	5.00	ND	102	70-130	9.74	30	
Carbon disulfide	4.92	0.20	0.50	"	5.00	ND	98.4	70-130	8.56	30	
Carbon tetrachloride	4.66	0.30	0.50	"	5.00	ND	93.2	70-130	6.44	30	
Chlorobenzene	5.02	0.20	0.50	"	5.00	ND	100	70-130	6.36	30	
Chloroethane	5.44	0.10	0.50	"	5.00	ND	109	70-130	9.79	30	
Chloroform	35.4	0.50	0.50	"	5.00	31.5	77.4	70-130	0.170	30	
Chloromethane	6.07	0.20	0.50	"	5.00	ND	121	70-130	8.37	30	
2-Chlorotoluene	5.19	0.20	0.50	"	5.00	ND	104	70-130	8.49	30	
4-Chlorotoluene	4.85	0.10	0.50	"	5.00	ND	97.0	70-130	14.5	30	
Dibromochloromethane	4.76	0.50	0.50	"	5.00	ND	95.2	70-130	0.837	30	
1,2-Dibromo-3-chloropropane	4.49	0.36	0.50	"	5.00	ND	89.8	70-130	2.85	25	
1,2-Dibromoethane (EDB)	4.82	0.14	0.50	"	5.00	ND	96.4	70-130	9.30	25	
Dibromomethane	5.04	0.20	0.50	"	5.00	ND	101	70-130	8.18	30	
1,2-Dichlorobenzene	4.59	0.20	0.50	"	5.00	ND	91.8	70-130	7.55	30	
1,3-Dichlorobenzene	5.02	0.20	0.50	"	5.00	ND	100	70-130	8.58	30	
1,4-Dichlorobenzene	4.76	0.10	0.50	"	5.00	ND	95.2	70-130	8.06	30	
trans-1,4-Dichloro-2-butene	5.09	0.095	5.0	"	5.00	ND	102	70-130	8.29	25	
Dichlorodifluoromethane	6.09	0.20	0.50	"	5.00	ND	122	70-130	9.39	30	
1,1-Dichloroethane	5.17	0.10	0.50	"	5.00	ND	103	70-130	8.16	30	
1,2-Dichloroethane	5.08	0.20	0.50	"	5.00	ND	102	70-130	8.12	30	
1,1-Dichloroethene	4.99	0.10	0.30	"	5.00	ND	99.8	70-130	7.34	30	
cis-1,2-Dichloroethene	5.09	0.20	0.50	"	5.00	ND	102	70-130	7.92	30	
trans-1,2-Dichloroethene	4.93	0.20	0.50	"	5.00	ND	98.6	70-130	7.42	30	
1,2-Dichloropropane	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	8.47	30	
1,3-Dichloropropane	5.15	0.20	0.50	"	5.00	ND	103	70-130	5.66	30	
2,2-Dichloropropane	4.28	0.10	0.50	"	5.00	ND	85.6	70-130	6.77	30	
1,1-Dichloropropene	4.75	0.10	0.50	"	5.00	ND	95.0	70-130	7.69	30	
cis-1,3-Dichloropropene	4.62	0.20	0.50	"	5.00	ND	92.4	70-130	4.65	30	
trans-1,3-Dichloropropene	4.22	0.20	0.50	"	5.00	ND	84.4	70-130	6.42	30	
2-Hexanone	5.28	0.097	5.0	"	5.00	ND	106	70-130	6.24	25	
Ethylbenzene	4.83	0.10	0.50	"	5.00	ND	96.6	70-130	9.28	30	
Hexachlorobutadiene	4.48	0.30	0.50	"	5.00	ND	89.6	70-130	7.73	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**		Prepared: 02/04/14 Analyzed: 02/06/14							
Isopropylbenzene	5.21	0.20	0.50	ug/l	5.00	ND	104	70-130	9.68	30	
p-Isopropyltoluene	4.91	0.10	0.50	"	5.00	ND	98.2	70-130	13.0	30	
Methyl ethyl ketone	11.8	0.40	1.0	"	10.0	ND	118	70-130	3.89	30	
Methyl iodide	5.13	0.12	2.0	"	5.00	ND	103	70-130	9.82	25	
Methyl isobutyl ketone	9.80	0.30	1.0	"	10.0	ND	98.0	70-130	8.69	30	
Methylene chloride	3.66	0.40	0.50	"	5.00	ND	73.2	70-130	17.0	30	
Naphthalene	4.66	0.20	0.50	"	5.00	ND	93.2	70-130	7.44	30	
n-Propylbenzene	5.17	0.20	0.50	"	5.00	ND	103	70-130	10.4	30	
Styrene	5.04	0.10	0.50	"	5.00	ND	101	70-130	9.27	30	
1,1,1,2-Tetrachloroethane	4.34	0.20	0.50	"	5.00	ND	86.8	70-130	6.25	30	
1,1,2,2-Tetrachloroethane	4.95	0.20	0.50	"	5.00	ND	99.0	70-130	8.14	30	
Tetrachloroethene	4.90	0.20	0.50	"	5.00	ND	98.0	70-130	9.89	30	
Toluene	5.03	0.10	0.50	"	5.00	ND	101	70-130	9.11	30	
1,2,3-Trichlorobenzene	4.89	0.10	0.50	"	5.00	ND	97.8	70-130	3.61	30	
1,2,4-Trichlorobenzene	4.38	0.20	0.50	"	5.00	ND	87.6	70-130	8.52	30	
1,1,1-Trichloroethane	4.75	0.20	0.50	"	5.00	ND	95.0	70-130	7.50	30	
1,1,2-Trichloroethane	5.07	0.20	0.50	"	5.00	ND	101	70-130	7.41	30	
Trichloroethene	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	5.41	30	
Trichlorofluoromethane	4.90	0.20	0.50	"	5.00	ND	98.0	70-130	11.9	30	
Trichlorotrifluoroethane	5.57	0.20	0.50	"	5.00	ND	111	70-130	8.10	30	
1,2,3-Trichloropropane	4.93	0.13	0.50	"	5.00	ND	98.6	70-130	8.17	25	
1,2,4-Trimethylbenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130	8.61	30	
1,3,5-Trimethylbenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130	8.61	30	
Vinyl chloride	5.41	0.10	0.50	"	5.00	ND	108	70-130	12.0	30	
m,p-Xylene	9.99	0.20	0.50	"	10.0	ND	99.9	70-130	9.71	30	
o-Xylene	5.07	0.10	0.50	"	5.00	ND	101	70-130	8.86	30	
Xylenes (total)	15.1	0.20	0.50	"	15.0	ND	100	70-130	9.43	30	
Methyl tert-butyl ether	4.31	0.50	0.50	"	5.00	ND	86.2	70-130	10.8	30	
Ethyl tert-butyl ether	5.09	0.20	0.50	"	5.00	ND	102	70-130	8.11	30	
Tert-amyl methyl ether	4.48	0.20	0.50	"	5.00	ND	89.6	70-130	9.56	30	
Surrogate: Bromofluorobenzene	*25.4*			*"*	*25.0*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*24.2*			*"*	*25.0*		*97.0*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Surrogate: Toluene-d8	*24.8*			*ug/l*	*25.0*		*99.0*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Blank (AB40514-BLK1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	ND	0.010	0.050	ug/l							U
Chloroneb	ND	0.20	0.50	"							U
Chlorobenzilate	ND	2.0	5.0	"							U
Chlorothalonil	ND	0.030	0.10	"							U
DCPA	ND	0.020	0.040	"							U
4,4´-DDD	ND	0.020	0.050	"							U
4,4´-DDE	ND	0.020	0.050	"							U
4,4´-DDT	ND	0.020	0.020	"							U
Dieldrin	ND	0.010	0.010	"							U
Endosulfan I	ND	0.020	0.050	"							U
Endosulfan II	ND	0.020	0.050	"							U
Endosulfan sulfate	ND	0.020	0.020	"							U
Endrin	ND	0.030	0.10	"							U
Endrin aldehyde	ND	0.020	0.050	"							U
HCH-alpha	ND	0.010	0.050	"							U
HCH-beta	ND	0.020	0.050	"							U
HCH-delta	ND	0.030	0.050	"							U
HCH-gamma (Lindane)	ND	0.010	0.010	"							U
Heptachlor	ND	0.010	0.010	"							U
Heptachlor epoxide	ND	0.010	0.010	"							U
Hexachlorocyclopentadiene	ND	0.040	0.40	"							U
Hexachlorobenzene	ND	0.010	0.040	"							U
Methoxychlor	ND	0.020	0.020	"							U
cis-Permethrin	ND	0.070	0.20	"							U
trans-Permethrin	ND	0.090	0.20	"							U
Propachlor	ND	0.070	0.20	"							U
Trifluralin	ND	0.020	0.040	"							U
PCB-1016	ND	0.030	0.50	"							U
PCB-1221	ND	0.030	0.50	"							U
PCB-1232	ND	0.030	0.50	"							U
PCB-1242	ND	0.030	0.50	"							U
PCB-1248	ND	0.030	0.50	"							U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Blank (AB40514-BLK1)					Prepared: 02/05/14 Analyzed: 02/11/14						
PCB-1254	ND	0.030	0.50	ug/l							U
PCB-1260	ND	0.030	0.50	"							U
Total PCBs	ND	0.30	0.50	"							U
Toxaphene	ND	0.40	0.50	"							U
Chlordane (tech)	ND	0.030	0.050	"							U
Surrogate: Dibutylchlorendate	*1.05*			*"*	*0.952*		*110*	*70-130*			
LCS (AB40514-BS1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	0.263	0.010	0.050	ug/l	0.280		94.1	70-130			
Chloroneb	2.73	0.20	0.50	"	2.80		97.5	70-130			
Chlorobenzilate	3.29	2.0	5.0	"	2.80		117	70-130			J
Chlorothalonil	0.313	0.030	0.10	"	0.280		112	70-130			
DCPA	0.289	0.020	0.040	"	0.280		103	70-130			
4,4´-DDD	0.203	0.020	0.050	"	0.280		72.3	70-130			
4,4´-DDE	0.279	0.020	0.050	"	0.280		99.6	70-130			
4,4´-DDT	0.290	0.020	0.020	"	0.280		104	70-130			
Dieldrin	0.283	0.010	0.010	"	0.280		101	70-130			
Endosulfan I	0.285	0.020	0.050	"	0.280		102	70-130			
Endosulfan II	0.277	0.020	0.050	"	0.280		98.9	70-130			
Endosulfan sulfate	0.306	0.020	0.020	"	0.280		109	70-130			
Endrin	0.319	0.030	0.10	"	0.280		114	70-130			
Endrin aldehyde	0.267	0.020	0.050	"	0.280		95.3	70-130			
HCH-alpha	0.269	0.010	0.050	"	0.280		96.1	70-130			
HCH-beta	0.279	0.020	0.050	"	0.280		99.7	70-130			
HCH-delta	0.286	0.030	0.050	"	0.280		102	70-130			
HCH-gamma (Lindane)	0.273	0.010	0.010	"	0.280		97.7	70-130			
Heptachlor	0.273	0.010	0.010	"	0.280		97.6	70-130			
Heptachlor epoxide	0.279	0.010	0.010	"	0.280		99.5	70-130			
Hexachlorocyclopentadiene	0.409	0.040	0.40	"	0.560		73.1	15-90			
Hexachlorobenzene	0.237	0.010	0.040	"	0.280		84.7	70-130			
Methoxychlor	0.301	0.020	0.020	"	0.280		107	70-130			
cis-Permethrin	1.59	0.070	0.20	"	1.40		114	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
LCS (AB40514-BS1)					Prepared: 02/05/14 Analyzed: 02/11/14						
trans-Permethrin	1.60	0.090	0.20	ug/l	1.40		114	70-130			
Propachlor	0.306	0.070	0.20	"	0.280		109	70-130			
Trifluralin	0.416	0.020	0.040	"	0.420		99.0	70-130			
Surrogate: Dibutylchlorendate	*1.05*			*"*	*0.952*		*110*	*70-130*			
LCS Dup (AB40514-BSD1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	0.276	0.010	0.050	ug/l	0.280		98.7	70-130	4.77	25	
Chloroneb	2.84	0.20	0.50	"	2.80		101	70-130	3.76	25	
Chlorobenzilate	3.51	2.0	5.0	"	2.80		125	70-130	6.58	25	J
Chlorothalonil	0.334	0.030	0.10	"	0.280		119	70-130	6.41	25	
DCPA	0.304	0.020	0.040	"	0.280		109	70-130	5.05	25	
4,4´-DDD	0.208	0.020	0.050	"	0.280		74.3	70-130	2.71	25	
4,4´-DDE	0.299	0.020	0.050	"	0.280		107	70-130	7.17	25	
4,4´-DDT	0.307	0.020	0.020	"	0.280		109	70-130	5.49	25	
Dieldrin	0.301	0.010	0.010	"	0.280		108	70-130	6.30	25	
Endosulfan I	0.300	0.020	0.050	"	0.280		107	70-130	5.34	25	
Endosulfan II	0.287	0.020	0.050	"	0.280		103	70-130	3.69	25	
Endosulfan sulfate	0.324	0.020	0.020	"	0.280		116	70-130	5.53	25	
Endrin	0.336	0.030	0.10	"	0.280		120	70-130	5.28	25	
Endrin aldehyde	0.309	0.020	0.050	"	0.280		110	70-130	14.8	25	
HCH-alpha	0.280	0.010	0.050	"	0.280		99.9	70-130	3.84	25	
HCH-beta	0.294	0.020	0.050	"	0.280		105	70-130	5.16	25	
HCH-delta	0.303	0.030	0.050	"	0.280		108	70-130	5.61	25	
HCH-gamma (Lindane)	0.286	0.010	0.010	"	0.280		102	70-130	4.33	25	
Heptachlor	0.282	0.010	0.010	"	0.280		101	70-130	3.11	25	
Heptachlor epoxide	0.289	0.010	0.010	"	0.280		103	70-130	3.81	25	
Hexachlorobenzene	0.243	0.010	0.040	"	0.280		86.8	70-130	2.40	25	
Hexachlorocyclopentadiene	0.434	0.040	0.40	"	0.560		77.6	15-90	5.97	50	
Methoxychlor	0.326	0.020	0.020	"	0.280		116	70-130	8.17	25	
cis-Permethrin	1.62	0.070	0.20	"	1.40		116	70-130	1.95	25	
trans-Permethrin	1.67	0.090	0.20	"	1.40		119	70-130	4.72	25	
Propachlor	0.334	0.070	0.20	"	0.280		119	70-130	8.68	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
LCS Dup (AB40514-BSD1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Trifluralin	0.437	0.020	0.040	ug/l	0.420		104	70-130	5.02	25	
Surrogate: Dibutylchlorendate	*1.07*			*"*	*0.952*		*112*	*70-130*			
Matrix Spike (AB40514-MS1)		**Source: 14A1713-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
Aldrin	0.269	0.010	0.050	ug/l	0.280	ND	96.0	70-130			
Chloroneb	2.86	0.20	0.50	"	2.80	ND	102	70-130			
Chlorobenzilate	3.57	2.0	5.0	"	2.80	ND	127	70-130			J
Chlorothalonil	0.329	0.030	0.10	"	0.280	ND	117	70-130			
DCPA	0.303	0.020	0.040	"	0.280	ND	108	70-130			
4,4´-DDD	0.212	0.020	0.050	"	0.280	ND	75.7	70-130			
4,4´-DDE	0.288	0.020	0.050	"	0.280	ND	103	70-130			
4,4´-DDT	0.300	0.020	0.020	"	0.280	ND	107	70-130			
Dieldrin	0.295	0.010	0.010	"	0.280	ND	105	70-130			
Endosulfan I	0.298	0.020	0.050	"	0.280	ND	106	70-130			
Endosulfan II	0.298	0.020	0.050	"	0.280	ND	106	70-130			
Endosulfan sulfate	0.318	0.020	0.020	"	0.280	ND	113	70-130			
Endrin	0.354	0.030	0.10	"	0.280	ND	126	70-130			
Endrin aldehyde	0.299	0.020	0.050	"	0.280	ND	107	70-130			
HCH-alpha	0.285	0.010	0.050	"	0.280	ND	102	70-130			
HCH-beta	0.290	0.020	0.050	"	0.280	ND	104	70-130			
HCH-delta	0.300	0.030	0.050	"	0.280	ND	107	70-130			
HCH-gamma (Lindane)	0.291	0.010	0.010	"	0.280	ND	104	70-130			
Heptachlor	0.280	0.010	0.010	"	0.280	ND	100	70-130			
Heptachlor epoxide	0.286	0.010	0.010	"	0.280	ND	102	70-130			
Hexachlorobenzene	0.255	0.010	0.040	"	0.280	ND	91.0	70-130			
Hexachlorocyclopentadiene	0.486	0.040	0.40	"	0.560	ND	86.7	15-90			
Methoxychlor	0.323	0.020	0.020	"	0.280	ND	116	70-130			
cis-Permethrin	1.78	0.070	0.20	"	1.40	ND	127	70-130			
trans-Permethrin	1.78	0.090	0.20	"	1.40	ND	127	70-130			
Propachlor	0.336	0.070	0.20	"	0.280	ND	120	70-130			
Trifluralin	0.436	0.020	0.040	"	0.420	ND	104	70-130			
Surrogate: Dibutylchlorendate	*1.09*			*"*	*0.952*		*115*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Matrix Spike Dup (AB40514-MSD1)		**Source: 14A1713-01**		Prepared: 02/05/14 Analyzed: 02/12/14							
Aldrin	0.260	0.010	0.050	ug/l	0.280	ND	92.8	70-130	3.40	25	
Chloroneb	2.76	0.20	0.50	"	2.80	ND	98.6	70-130	3.61	25	
Chlorobenzilate	3.40	2.0	5.0	"	2.80	ND	121	70-130	4.87	25	J
Chlorothalonil	0.313	0.030	0.10	"	0.280	ND	112	70-130	4.86	25	
DCPA	0.290	0.020	0.040	"	0.280	ND	103	70-130	4.52	25	
4,4´-DDD	0.210	0.020	0.050	"	0.280	ND	74.9	70-130	1.06	25	
4,4´-DDE	0.275	0.020	0.050	"	0.280	ND	98.1	70-130	4.80	25	
4,4´-DDT	0.289	0.020	0.020	"	0.280	ND	103	70-130	3.94	25	
Dieldrin	0.283	0.010	0.010	"	0.280	ND	101	70-130	4.34	25	
Endosulfan I	0.285	0.020	0.050	"	0.280	ND	102	70-130	4.19	25	
Endosulfan II	0.288	0.020	0.050	"	0.280	ND	103	70-130	3.14	25	
Endosulfan sulfate	0.302	0.020	0.020	"	0.280	ND	108	70-130	5.03	25	
Endrin	0.320	0.030	0.10	"	0.280	ND	114	70-130	10.1	25	
Endrin aldehyde	0.275	0.020	0.050	"	0.280	ND	98.2	70-130	8.56	25	
HCH-alpha	0.271	0.010	0.050	"	0.280	ND	96.8	70-130	4.94	25	
HCH-beta	0.282	0.020	0.050	"	0.280	ND	101	70-130	2.62	25	
HCH-delta	0.290	0.030	0.050	"	0.280	ND	104	70-130	3.17	25	
HCH-gamma (Lindane)	0.279	0.010	0.010	"	0.280	ND	99.5	70-130	4.43	25	
Heptachlor	0.267	0.010	0.010	"	0.280	ND	95.4	70-130	4.78	25	
Heptachlor epoxide	0.277	0.010	0.010	"	0.280	ND	99.0	70-130	3.09	25	
Hexachlorobenzene	0.238	0.010	0.040	"	0.280	ND	85.1	70-130	6.62	25	
Hexachlorocyclopentadiene	0.433	0.040	0.40	"	0.560	ND	77.3	15-90	11.5	50	
Methoxychlor	0.309	0.020	0.020	"	0.280	ND	110	70-130	4.66	25	
cis-Permethrin	1.72	0.070	0.20	"	1.40	ND	123	70-130	3.19	25	
trans-Permethrin	1.68	0.090	0.20	"	1.40	ND	120	70-130	5.53	25	
Propachlor	0.320	0.070	0.20	"	0.280	ND	114	70-130	4.81	25	
Trifluralin	0.420	0.020	0.040	"	0.420	ND	100	70-130	3.78	25	
Surrogate: Dibutylchlorendate	*1.03*			*"*	*0.952*		*108*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Blank (AB40730-BLK1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	ND	0.50	0.50	ug/l							U
Atrazine	ND	0.30	0.50	"							U
Bromacil	ND	0.50	5.0	"							U
Butachlor	ND	0.40	0.50	"							U
Dimethoate	ND	0.20	1.0	"							U
Metolachlor	ND	0.30	0.50	"							U
Metribuzin	ND	0.40	0.50	"							U
Molinate	ND	0.20	0.50	"							U
Prometryn	ND	0.50	0.50	"							U
Propachlor	ND	0.30	0.50	"							U
Simazine	ND	0.30	0.50	"							U
Thiobencarb	ND	0.20	1.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.69*			*"*	*2.00*		*84.3*	*70-130*			
LCS (AB40730-BS1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.88	0.50	0.50	ug/l	2.00		94.2	62-128			
Atrazine	1.92	0.30	0.50	"	2.00		96.1	62-122			
Bromacil	1.94	0.50	5.0	"	2.00		96.9	61-121			J
Butachlor	1.99	0.40	0.50	"	2.00		99.3	66-126			
Dimethoate	1.97	0.20	1.0	"	2.00		98.3	67-127			
Metolachlor	1.93	0.30	0.50	"	2.00		96.6	63-123			
Metribuzin	1.91	0.40	0.50	"	2.00		95.4	71-131			
Molinate	1.95	0.20	0.50	"	2.00		97.4	44-137			
Prometryn	1.95	0.50	0.50	"	2.00		97.6	63-123			
Propachlor	1.95	0.30	0.50	"	2.00		97.3	66-126			
Simazine	1.94	0.30	0.50	"	2.00		96.9	70-130			
Thiobencarb	2.01	0.20	1.0	"	2.00		100	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.80*			*"*	*2.00*		*89.8*	*70-130*			

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
LCS Dup (AB40730-BSD1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	2.02	0.50	0.50	ug/l	2.00		101	62-128	6.95	30	
Atrazine	2.01	0.30	0.50	"	2.00		100	62-122	4.47	30	
Bromacil	2.14	0.50	5.0	"	2.00		107	61-121	10.0	30	J
Butachlor	2.09	0.40	0.50	"	2.00		105	66-126	5.23	30	
Dimethoate	2.17	0.20	1.0	"	2.00		108	67-127	9.82	30	
Metolachlor	2.02	0.30	0.50	"	2.00		101	63-123	4.37	30	
Metribuzin	2.04	0.40	0.50	"	2.00		102	71-131	6.92	30	
Molinate	1.94	0.20	0.50	"	2.00		96.8	44-137	0.569	30	
Prometryn	2.07	0.50	0.50	"	2.00		103	63-123	5.75	30	
Propachlor	2.00	0.30	0.50	"	2.00		100	66-126	2.80	30	
Simazine	2.09	0.30	0.50	"	2.00		105	70-130	7.61	30	
Thiobencarb	2.19	0.20	1.0	"	2.00		109	69-129	8.57	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.85*			*"*	*2.00*		*92.6*	*70-130*			
Matrix Spike (AB40730-MS1)		**Source: 14A1588-01**			Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.81	0.50	0.50	ug/l	2.00	ND	90.7	62-128			
Atrazine	1.79	0.30	0.50	"	2.00	ND	89.7	62-122			
Bromacil	1.75	0.50	5.0	"	2.00	ND	87.5	61-121			J
Butachlor	1.85	0.40	0.50	"	2.00	ND	92.6	66-126			
Dimethoate	1.70	0.20	1.0	"	2.00	ND	84.9	67-127			
Metolachlor	1.82	0.30	0.50	"	2.00	ND	91.2	63-123			
Metribuzin	1.78	0.40	0.50	"	2.00	ND	89.2	71-131			
Molinate	1.87	0.20	0.50	"	2.00	ND	93.4	44-137			
Prometryn	1.68	0.50	0.50	"	2.00	ND	83.9	63-123			
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.6	66-126			
Simazine	1.85	0.30	0.50	"	2.00	ND	92.5	70-130			
Thiobencarb	1.90	0.20	1.0	"	2.00	ND	95.2	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.51*			*"*	*2.00*		*75.3*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Matrix Spike Dup (AB40730-MSD1)		**Source: 14A1588-01**		Prepared: 02/08/14 Analyzed: 02/11/14							
Alachlor	1.91	0.50	0.50	ug/l	2.00	ND	95.3	62-128	4.97	30	
Atrazine	1.96	0.30	0.50	"	2.00	ND	98.2	62-122	9.04	30	
Bromacil	2.13	0.50	5.0	"	2.00	ND	107	61-121	19.7	30	J
Butachlor	2.02	0.40	0.50	"	2.00	ND	101	66-126	8.67	30	
Dimethoate	2.14	0.20	1.0	"	2.00	ND	107	67-127	23.0	30	
Metolachlor	1.96	0.30	0.50	"	2.00	ND	97.9	63-123	7.12	30	
Metribuzin	2.02	0.40	0.50	"	2.00	ND	101	71-131	12.3	30	
Molinate	1.79	0.20	0.50	"	2.00	ND	89.6	44-137	4.16	30	
Prometryn	2.02	0.50	0.50	"	2.00	ND	101	63-123	18.4	30	
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.4	66-126	0.171	30	
Simazine	2.07	0.30	0.50	"	2.00	ND	104	70-130	11.3	30	
Thiobencarb	1.96	0.20	1.0	"	2.00	ND	97.8	69-129	2.64	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.60*			*"*	*2.00*		*79.9*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Organic Analytes by EPA Method 504.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40359 - EPA 504.1											
Blank (AB40359-BLK1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l							U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"							U
LCS (AB40359-BS1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.262	0.0040	0.010	ug/l	0.250		105	70-130			
1,2-Dibromoethane (EDB)	0.255	0.0050	0.020	"	0.250		102	70-130			
LCS Dup (AB40359-BSD1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.273	0.0040	0.010	ug/l	0.250		109	70-130	4.17	25	
1,2-Dibromoethane (EDB)	0.270	0.0050	0.020	"	0.250		108	70-130	5.47	25	
Matrix Spike (AB40359-MS1)		**Source: 14A1588-01**			Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.212	0.0040	0.010	ug/l	0.250	ND	84.8	70-130			
1,2-Dibromoethane (EDB)	0.214	0.0050	0.020	"	0.250	ND	85.5	70-130			
Matrix Spike Dup (AB40359-MSD1)		**Source: 14A1588-01**			Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.211	0.0040	0.010	ug/l	0.250	ND	84.2	70-130	0.698	25	
1,2-Dibromoethane (EDB)	0.212	0.0050	0.020	"	0.250	ND	84.8	70-130	0.771	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
Blank (AB40536-BLK1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	ND	0.50	1.0	ug/l							U
Bentazon	ND	0.40	0.40	"							U
2,4-D	ND	0.80	1.0	"							U
Dalapon	ND	6.0	6.0	"							U
2,4-DB	ND	4.0	5.0	"							U
Dicamba	ND	0.40	0.40	"							U
Dichlorprop	ND	1.0	1.0	"							U
Dinoseb	ND	0.80	1.0	"							U
4-Nitrophenol	ND	0.70	1.0	"							U
Pentachlorophenol	ND	0.20	0.20	"							U
Picloram	ND	0.50	1.0	"							U
2,4,5-T	ND	0.40	0.50	"							U
2,4,5-TP (Silvex)	ND	0.50	0.50	"							U
Surrogate: DCAA	*13.2*			*"*	*14.2*		*93.2*	*70-130*			
LCS (AB40536-BS1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	1.04	0.50	1.0	ug/l	0.960		109	70-130			
Bentazon	1.48	0.40	0.40	"	1.92		76.9	70-130			
2,4-D	1.68	0.80	1.0	"	1.92		87.8	48-124			
Dalapon	11.3	6.0	6.0	"	12.5		90.3	40-112			
2,4-DB	7.11	4.0	5.0	"	7.68		92.6	54-123			
Dicamba	0.876	0.40	0.40	"	0.960		91.3	70-130			
Dichlorprop	2.70	1.0	1.0	"	2.88		93.7	54-106			
Dinoseb	5.59	0.80	1.0	"	6.42		87.1	20-105			
4-Nitrophenol	1.13	0.70	1.0	"	0.960		117	60-202			
Pentachlorophenol	0.840	0.20	0.20	"	0.960		87.5	70-130			
Picloram	1.07	0.50	1.0	"	0.960		111	70-130			
2,4,5-T	0.892	0.40	0.50	"	0.960		93.0	68-166			
2,4,5-TP (Silvex)	0.900	0.50	0.50	"	0.960		93.7	70-130			
Surrogate: DCAA	*14.5*			*"*	*14.2*		*102*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
LCS Dup (AB40536-BSD1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	1.03	0.50	1.0	ug/l	0.960		108	70-130	0.944	50	
Bentazon	1.63	0.40	0.40	"	1.92		84.8	70-130	9.86	50	
2,4-D	1.69	0.80	1.0	"	1.92		88.0	48-124	0.327	50	
Dalapon	11.4	6.0	6.0	"	12.5		91.2	40-112	0.968	50	
2,4-DB	7.24	4.0	5.0	"	7.68		94.3	54-123	1.84	50	
Dicamba	0.877	0.40	0.40	"	0.960		91.4	70-130	0.0891	50	
Dichlorprop	2.69	1.0	1.0	"	2.88		93.5	54-106	0.220	50	
Dinoseb	5.77	0.80	1.0	"	6.42		89.9	20-105	3.18	50	
4-Nitrophenol	0.901	0.70	1.0	"	0.960		93.8	60-202	22.3	50	J
Pentachlorophenol	0.841	0.20	0.20	"	0.960		87.6	70-130	0.0986	50	
Picloram	0.964	0.50	1.0	"	0.960		100	70-130	10.5	50	J
2,4,5-T	0.931	0.40	0.50	"	0.960		96.9	68-166	4.18	50	
2,4,5-TP (Silvex)	0.964	0.50	0.50	"	0.960		100	70-130	6.85	50	
Surrogate: DCAA	*14.2*			*"*	*14.2*		*99.8*	*70-130*			
Matrix Spike (AB40536-MS1)		**Source: 14A1588-01**			Prepared: 02/06/14 Analyzed: 02/08/14						
Acifluorfen	0.696	0.50	1.0	ug/l	0.960	ND	72.5	70-130			J
Bentazon	1.79	0.40	0.40	"	1.92	ND	93.0	70-130			
2,4-D	1.50	0.80	1.0	"	1.92	ND	78.3	48-124			
Dalapon	11.1	6.0	6.0	"	12.5	ND	88.8	40-112			
2,4-DB	7.08	4.0	5.0	"	7.68	ND	92.2	54-123			
Dicamba	0.867	0.40	0.40	"	0.960	ND	90.3	70-130			
Dichlorprop	2.75	1.0	1.0	"	2.88	ND	95.6	54-106			
Dinoseb	5.23	0.80	1.0	"	6.42	ND	81.4	20-105			
4-Nitrophenol	0.969	0.70	1.0	"	0.960	ND	101	60-202			J
Pentachlorophenol	0.642	0.20	0.20	"	0.960	ND	66.9	70-130			QM-07
Picloram	0.973	0.50	1.0	"	0.960	ND	101	70-130			J
2,4,5-T	0.862	0.40	0.50	"	0.960	ND	89.8	68-166			
2,4,5-TP (Silvex)	0.911	0.50	0.50	"	0.960	ND	94.9	70-130			
Surrogate: DCAA	*13.8*			*"*	*14.2*		*97.5*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
Matrix Spike Dup (AB40536-MSD1)		**Source: 14A1588-01**		Prepared: 02/06/14 Analyzed: 02/08/14							
Acifluorfen	0.926	0.50	1.0	ug/l	0.960	ND	96.5	70-130	28.3	50	J
Bentazon	1.79	0.40	0.40	"	1.92	ND	93.5	70-130	0.474	50	
2,4-D	1.64	0.80	1.0	"	1.92	ND	85.2	48-124	8.45	50	
Dalapon	11.5	6.0	6.0	"	12.5	ND	92.3	40-112	3.86	50	
2,4-DB	7.32	4.0	5.0	"	7.68	ND	95.4	54-123	3.40	50	
Dicamba	0.910	0.40	0.40	"	0.960	ND	94.8	70-130	4.86	50	
Dichlorprop	2.90	1.0	1.0	"	2.88	ND	101	54-106	5.12	50	
Dinoseb	5.49	0.80	1.0	"	6.42	ND	85.5	20-105	4.84	50	
4-Nitrophenol	1.04	0.70	1.0	"	0.960	ND	108	60-202	6.64	50	
Pentachlorophenol	0.721	0.20	0.20	"	0.960	ND	75.1	70-130	11.5	50	
Picloram	1.16	0.50	1.0	"	0.960	ND	121	70-130	17.4	50	
2,4,5-T	0.945	0.40	0.50	"	0.960	ND	98.4	68-166	9.12	50	
2,4,5-TP (Silvex)	0.967	0.50	0.50	"	0.960	ND	101	70-130	5.94	50	
Surrogate: DCAA	*14.5*			*"*	*14.2*		*102*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41142 - HPLC											
Blank (AB41142-BLK1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	ND	0.70	3.0	ug/l							U
Aldicarb sulfone	ND	0.70	4.0	"							U
Aldicarb sulfoxide	ND	0.80	3.0	"							U
Carbaryl	ND	0.70	5.0	"							U
Carbofuran	ND	2.0	5.0	"							U
3-Hydroxycarbofuran	ND	0.90	3.0	"							U
Methiocarb	ND	2.0	5.0	"							U
Methomyl	ND	2.0	2.0	"							U
Oxamyl	ND	0.80	20	"							U
Propoxur	ND	2.0	5.0	"							U
LCS (AB41142-BS1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	20.0	0.70	3.0	ug/l	20.0		99.9	80-120			
Aldicarb sulfone	20.1	0.70	4.0	"	19.0		106	80-120			
Aldicarb sulfoxide	19.2	0.80	3.0	"	19.8		97.0	80-120			
Carbaryl	20.4	0.70	5.0	"	20.0		102	80-120			
Carbofuran	19.5	2.0	5.0	"	20.0		97.7	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0		103	80-120			
Methiocarb	18.6	2.0	5.0	"	20.0		93.2	80-120			
Methomyl	21.1	2.0	2.0	"	20.0		105	80-120			
Oxamyl	20.5	0.80	20	"	20.0		102	80-120			
Propoxur	20.2	2.0	5.0	"	20.0		101	80-120			
LCS Dup (AB41142-BSD1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	19.3	0.70	3.0	ug/l	20.0		96.6	80-120	3.34	20	
Aldicarb sulfone	19.3	0.70	4.0	"	19.0		102	80-120	3.93	20	
Aldicarb sulfoxide	18.6	0.80	3.0	"	19.8		93.7	80-120	3.45	20	
Carbaryl	18.8	0.70	5.0	"	20.0		94.1	80-120	8.11	20	
Carbofuran	19.4	2.0	5.0	"	20.0		97.1	80-120	0.645	20	
3-Hydroxycarbofuran	19.0	0.90	3.0	"	20.0		95.1	80-120	8.35	20	
Methiocarb	19.1	2.0	5.0	"	20.0		95.7	80-120	2.65	20	
Methomyl	19.5	2.0	2.0	"	20.0		97.7	80-120	7.69	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41142 - HPLC											
LCS Dup (AB41142-BSD1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Oxamyl	19.2	0.80	20	ug/l	20.0		95.8	80-120	6.62	20	J
Propoxur	19.0	2.0	5.0	"	20.0		94.8	80-120	6.54	20	
Matrix Spike (AB41142-MS1)		**Source: 14B0426-01**			Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	18.7	0.70	3.0	ug/l	20.0	ND	93.3	80-120			
Aldicarb sulfone	20.1	0.70	4.0	"	19.0	ND	106	80-120			
Aldicarb sulfoxide	20.1	0.80	3.0	"	19.8	ND	102	80-120			
Carbaryl	20.0	0.70	5.0	"	20.0	ND	99.8	80-120			
Carbofuran	19.3	2.0	5.0	"	20.0	ND	96.6	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0	ND	103	80-120			
Methiocarb	18.2	2.0	5.0	"	20.0	ND	91.2	80-120			
Methomyl	21.0	2.0	2.0	"	20.0	ND	105	80-120			
Oxamyl	20.3	0.80	20	"	20.0	ND	102	80-120			
Propoxur	19.2	2.0	5.0	"	20.0	ND	95.9	80-120			
Matrix Spike Dup (AB41142-MSD1)		**Source: 14B0426-01**			Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	17.4	0.70	3.0	ug/l	20.0	ND	87.1	80-120	6.84	20	
Aldicarb sulfone	19.0	0.70	4.0	"	19.0	ND	100	80-120	5.57	20	
Aldicarb sulfoxide	18.8	0.80	3.0	"	19.8	ND	94.8	80-120	6.85	20	
Carbaryl	19.4	0.70	5.0	"	20.0	ND	97.1	80-120	2.76	20	
Carbofuran	19.4	2.0	5.0	"	20.0	ND	96.9	80-120	0.339	20	
3-Hydroxycarbofuran	19.8	0.90	3.0	"	20.0	ND	98.9	80-120	4.29	20	
Methiocarb	18.9	2.0	5.0	"	20.0	ND	94.6	80-120	3.68	20	
Methomyl	20.6	2.0	2.0	"	20.0	ND	103	80-120	1.83	20	
Oxamyl	19.2	0.80	20	"	20.0	ND	95.8	80-120	5.89	20	J
Propoxur	19.5	2.0	5.0	"	20.0	ND	97.3	80-120	1.47	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Endothall by EPA Method 548.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40357 - EPA 548.1											
Blank (AB40357-BLK1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	ND	2.0	45	ug/l							U
LCS (AB40357-BS1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	209	2.0	45	ug/l	200		104	80-120			
LCS Dup (AB40357-BSD1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	217	2.0	45	ug/l	200		108	80-120	3.75	30	
Matrix Spike (AB40357-MS1)		**Source: 14A1588-01**			Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	187	2.0	45	ug/l	200	ND	93.7	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Glyphosate by EPA Method 547 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40427 - HPLC											
Blank (AB40427-BLK1)					Prepared & Analyzed: 02/04/14						
Glyphosate	ND	3.0	10	ug/l							U
LCS (AB40427-BS1)					Prepared & Analyzed: 02/04/14						
Glyphosate	111	3.0	10	ug/l	120		92.7	66-126			
LCS Dup (AB40427-BSD1)					Prepared & Analyzed: 02/04/14						
Glyphosate	112	3.0	10	ug/l	120		93.7	66-126	1.08	30	
Matrix Spike (AB40427-MS1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	111	3.0	10	ug/l	120	ND	92.7	66-126			
Matrix Spike Dup (AB40427-MSD1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	110	3.0	10	ug/l	120	ND	92.0	66-126	0.801	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Diquat by EPA Method 549.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43118 - HPLC											
Blank (AA43118-BLK1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	ND	2.0	2.0	ug/l							U
LCS (AA43118-BS1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	16.5	2.0	2.0	ug/l	19.8		83.3	70-130			
LCS Dup (AA43118-BSD1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	16.2	2.0	2.0	ug/l	19.8		81.6	70-130	2.03	25	
Matrix Spike (AA43118-MS1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	8.63	2.0	2.0	ug/l	19.8	ND	43.5	70-130			QM-05

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41050 - EPA 552.2											
Blank (AB41050-BLK1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	ND	0.8	1.0	ug/l							U
Monochloroacetic Acid	ND	1.1	2.0	"							U
Dibromoacetic Acid	ND	0.8	1.0	"							U
Dichloroacetic Acid	ND	1.0	1.0	"							U
Trichloroacetic Acid	ND	1.0	1.0	"							U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"							U
Surrogate: 2,3-Dibromopropionic Acid	*9.59*			*"*	*10.0*		*95.9*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*11.7*			*"*	*10.0*		*117*	*70-130*			
LCS (AB41050-BS1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	25.5	0.8	1.0	ug/l	25.0		102	70-130			
Monochloroacetic Acid	26.9	1.1	2.0	"	25.0		107	70-130			
Dibromoacetic Acid	26.8	0.8	1.0	"	25.0		107	70-130			
Dichloroacetic Acid	26.0	1.0	1.0	"	25.0		104	70-130			
Trichloroacetic Acid	26.6	1.0	1.0	"	25.0		106	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*11.0*			*"*	*10.0*		*110*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*10.1*			*"*	*10.0*		*101*	*70-130*			
MRL Check (AB41050-MRL1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	1.07	0.8	1.0	ug/l	1.00		107	0-200			
Monochloroacetic Acid	ND	1.1	2.0	"	1.00			0-200			U
Dibromoacetic Acid	1.37	0.8	1.0	"	1.00		137	0-200			
Dichloroacetic Acid	ND	1.0	1.0	"	1.00			0-200			U
Trichloroacetic Acid	1.05	1.0	1.0	"	1.00		105	0-200			
Surrogate: 2,3-Dibromopropionic Acid	*1.40*			*"*	*1.00*		*140*	*0-200*			
Surrogate: 2-Bromopropionic Acid	*1.14*			*"*	*1.00*		*114*	*0-200*			
Matrix Spike (AB41050-MS1)		**Source: 14A1713-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Monobromoacetic Acid	24.9	0.8	1.0	ug/l	25.0	ND	99.7	70-130			
Monochloroacetic Acid	26.6	1.1	2.0	"	25.0	ND	106	70-130			

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:14

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41050 - EPA 552.2											
Matrix Spike (AB41050-MS1)		**Source: 14A1713-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Dibromoacetic Acid	32.2	0.8	1.0	ug/l	25.0	ND	129	70-130			
Dichloroacetic Acid	25.1	1.0	1.0	"	25.0	ND	100	70-130			
Trichloroacetic Acid	29.9	1.0	1.0	"	25.0	ND	120	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*12.1*			*"*	*10.0*		*121*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.42*			*"*	*10.0*		*94.2*	*70-130*			
Matrix Spike (AB41050-MS2)		**Source: 14B0089-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Monobromoacetic Acid	24.4	0.8	1.0	ug/l	25.0	ND	97.6	70-130			
Monochloroacetic Acid	25.3	1.1	2.0	"	25.0	ND	101	70-130			
Dibromoacetic Acid	31.9	0.8	1.0	"	25.0	ND	128	70-130			
Dichloroacetic Acid	24.0	1.0	1.0	"	25.0	ND	96.0	70-130			
Trichloroacetic Acid	31.1	1.0	1.0	"	25.0	ND	124	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*13.9*			*"*	*10.0*		*139*	*70-130*			*S-GC*
Surrogate: 2-Bromopropionic Acid	*10.9*			*"*	*10.0*		*109*	*70-130*			
Reference (AB41050-SRM1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	25.1	0.8	1.0	ug/l	25.0		100	0-200			
Monochloroacetic Acid	26.7	1.1	2.0	"	25.0		107	0-200			
Dibromoacetic Acid	25.6	0.8	1.0	"	25.0		103	0-200			
Dichloroacetic Acid	24.9	1.0	1.0	"	25.0		99.7	0-200			
Trichloroacetic Acid	25.8	1.0	1.0	"	25.0		103	0-200			
Surrogate: 2,3-Dibromopropionic Acid	*10.6*			*"*	*10.0*		*106*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.92*			*"*	*10.0*		*99.2*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Blank (AB40727-BLK1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	ND	0.080	0.10	ug/l							U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"							U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.23*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*3.73*			*"*	*5.00*		*74.6*	*70-130*			
Surrogate: Triphenyl phosphate	*4.72*			*"*	*5.00*		*94.4*	*70-130*			
LCS (AB40727-BS1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.13	0.080	0.10	ug/l	3.00		71.0	70-130			
Di(2-ethylhexyl)adipate	2.49	0.40	5.0	"	3.00		83.0	70-130			J
Di(2-ethylhexyl)phthalate	2.40	0.20	3.0	"	3.00		80.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.36*			*"*	*5.00*		*107*	*70-130*			
Surrogate: Perylene-d12	*4.65*			*"*	*5.00*		*93.0*	*70-130*			
Surrogate: Triphenyl phosphate	*5.36*			*"*	*5.00*		*107*	*70-130*			
LCS Dup (AB40727-BSD1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.40	0.080	0.10	ug/l	3.00		80.0	70-130	11.9	20	
Di(2-ethylhexyl)adipate	2.70	0.40	5.0	"	3.00		90.0	70-130	8.09	20	J
Di(2-ethylhexyl)phthalate	2.57	0.20	3.0	"	3.00		85.7	70-130	6.84	20	J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.39*			*"*	*5.00*		*108*	*70-130*			
Surrogate: Perylene-d12	*4.84*			*"*	*5.00*		*96.8*	*70-130*			
Surrogate: Triphenyl phosphate	*5.47*			*"*	*5.00*		*109*	*70-130*			
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.79	0.080	0.10	ug/l	3.00	ND	93.0	70-130			
Di(2-ethylhexyl)adipate	3.11	0.40	5.0	"	3.00	ND	104	70-130			J
Di(2-ethylhexyl)phthalate	2.79	0.20	3.0	"	3.00	ND	93.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.27*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*5.52*			*"*	*5.00*		*110*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:14

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Surrogate: Triphenyl phosphate	*5.65*			*ug/l*	*5.00*		*113*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 11:14

Notes and Definitions

A-01	Dilution required due to high suspended solids. Client was notified.
A-01a	Sample analyzed within hold time but without filtration.
A-01b	Sample filtered but analyzed outside of EPA recommended 48-hour hold time.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ).
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
S-GC	Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogates.
U	Analyte included in analysis, but not detected at or above MDL.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

ASBESTOS TEM LABORATORIES, INC.

EPA 600/4-83 Drinking Water
Transmission Electron Microscopy
Analytical Report

Laboratory Job # 1288-00571

630 Bancroft Way
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

Certified by
CA DPH ELAP
Lab No. 1866

Feb/10/2014

David S. Pingatore
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482

RE: LABORATORY JOB # 1288-00571
Transmission electron microscopy analytical results for 1 water sample(s).
Job Site:
Job No.: 14A1713

Enclosed please find results for the TEM analysis of one or more water samples. The analytical procedures were performed according to EPA Method 100.2 for the analysis of asbestos in drinking water.

Prior to analysis, samples are checked for damage, disruption of any chain-of-custody seals, and completeness of accompanying paperwork. If no problems are found, samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

Preparation of water samples is performed within a HEPA filtered, Class 100 air, laminar flow clean bench environment. Prior to filtration, water sample containers are ultrasonicated, and the exterior surfaces cleaned. An aliquot of water is drawn from the sample container and drawn through a special filtration apparatus and collected onto a mixed cellulose ester (MCE) or polycarbonate (PC) filter. The filters are removed from the apparatus and dried. A portion of each sample filter is sectioned, placed onto a glass microscope slide, and carbon coated. The filters are further sectioned and placed carbon side up onto 200-mesh copper TEM sample grids in a solvent bath until all filter material is dissolved. The TEM grids are removed and placed into labeled grid storage boxes.

TEM analysis is performed on a Philips EM-300 or CM-12 transmission electron microscope operating at 80 or 100 kV. Initially, the grid is scanned at low and medium magnification to insure proper sample loading, and coherence of the carbon support film. Then TEM grid openings are analyzed at a magnification of 10,000X. All fibers >10 um in length and exhibiting an aspect ratio >3:1 are analyzed. Scanning continues until either 100 asbestiform fibers >10um in length are counted, or an analytical sensitivity of 0.2 million fibers per liter (MFL) is achieved. Analyzed fibers are subjected to detailed morphological and selected area diffraction (SAED) analysis. Fibers indicated as asbestos, or potentially asbestos, are further analyzed by energy dispersive X-ray (EDX) analysis as needed. The number of asbestos fibers detected, and other analytical parameters, are then used to calculate the concentration of asbestos in MFL. The results are entered into a standard report format and reviewed by the analyst and the laboratory manager before release to the client.

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

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www.asbestostemlabs.com *With Offices in Reno, NV (775) 359-3377*

TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL REPORT

Contact:	David S. Pingatore		
Address:	Alpha Analytical Laboratories, Inc. 208 Mason Street Ukiah, CA 95482	Report No.:	**323873**
		Date:	Feb-10-14
		Total Samples Analyzed:	1
Job Site / No.	14A1713	Sample Collector:	

CLIENT SAMPLE #	**14A1713-01**	**SAMPLE LOCATION/DESCRIPTION**	FO-07 (shallow)
Laboratory Sample #	1288-00571-001		

WATER SAMPLE DATA

Date/Time Collected	Jan-30-14 / 1:40 pm	Volume Submitted (ml)	1000
Date/Time Lab Received	Jan-30-14 / 3:55 pm	Volume Filtered (ml)	0.25
Date/Time Filtered	Feb-05-14 / 8:30 pm	Filter & Pore Size	MCE 0.22
Date/Time Analyzed	Feb-10-14 / 3:00 pm	UV/Ozone Treated:	YES

IDENTIFIED STRUCTURES (>10um)			
ASBESTOS		OTHER	
CHRYS	AMPH	AMBIG	NON-ASB
NSD	NSD	NSD	NSD

CALCULATED ASBESTOS STRUCTURE CONCENTRATION (>10um)		
CHRYS	AMPH	TOTAL
< 1.1 MFL	< 1.1 MFL	< 1.1 MFL

COMMENTS

No asbestos detected (heavy sample loading)

Filter Loading: HEAVY

SAED Photo ID Nos.

TEM / ANALYTICAL PARAMETERS

Grid Openings Scanned at 10,000X	40	Analytical Sensitivity	1.1 MFL
Grid Opening Area (mm2)	0.0094	95% UCL	4.00 MFL
Scan Area (mm2)	0.3760	95% LCL	0 MFL

WATER SAMPLE LAB BLANK RESULTS

Lab ID#	Blank 9477	Analytical Sensitivity	0.01 MFL
Grid Openings Scanned at 10,000X	8	Asbestos Structure Concentration	<0.01 MFL
Volume Filtered (ml)	300		

NOTATION KEY

Chrys. - Chrysotile Asbestos
Amph. - Amphibole Asbestos
NSD - No Structures Detected
1 mm = 1 millimeter

1 um = 1 micron = 0.001 mm
MFL = Millions of Fibers per Liter
UCL = Upper Confidence Level
LCL = Lower Confidence Level

ANALYST SIGNATURE

Stephanie Dunn

LAB QC REVIEWER SIGNATURE

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SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1713

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

Asbestos TEM Laboratories, Inc.
630 Bancroft Way
Berkeley, CA 94710
Phone :(510) 704-8930
Fax: (510) 704-8429
Terms: Net 30

Analysis	Due	Expires	Comments
14A1713-01 FO-07 (Shallow) [Water] Sampled 01/30/14 13:40 Pacific			
Asbestos-DW SUB	02/14/14 12:00	02/01/14 13:40	
Containers Supplied:			
1L Amber- Unpres. (Y)	1L Amber- Unpres. (Z)		

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+2C

Released By	Date	Received By	Date
[signature]	1-31-14	[signature]	02-03-14 P03:55 IN

Page 1 of 1

McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 1401903

Report Created for: Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Project Contact: David S. Pingatore
Project P.O.:
Project Name: #14A1713

Project Received: 01/31/2014

Analytical Report reviewed & approved for release on 02/06/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

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Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: Alpha Analytical Laboratories
Project: #14A1713
WorkOrder: 1401903

Glossary Abbreviation	Description
95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

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http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1401903
Project:	#14A1713	**Extraction Method**	E218.6
Date Received:	1/31/14 12:08	**Analytical Method:**	E218.6
Date Prepared:	1/31/14	**Unit:**	µg/L

Hexachrome by IC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
FO-07 (Shallow)	**1401903-001A**	**Water**	**01/30/2014 13:40**	**IC2**	**86616**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	**1.7**	0.050	1	01/31/2014 17:50

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Quality Control Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1401903
Date Prepared:	1/31/14	**BatchID:**	86616
Date Analyzed:	1/31/14	**Extraction Method**	E218.6
Instrument:	IC2	**Analytical Method:**	E218.6
Matrix:	Water	**Unit:**	µg/L
Project:	#14A1713	**Sample ID:**	MB/LCS-86616 1401905-001AMS/MSD

QC Summary Report for E218.6

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	ND	25.38	0.050	25	-	102	90-110

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	24.94	25.03	25	1.560	93.5	93.9	90-110	0.360	10

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1401903 **ClientCode: ALPU**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
David S. Pingatore
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482
(707) 468-0401 FAX: (707) 468-5267

Email: sspeaks@alpha-labs.com;david@alpha-lab
cc:
PO:
ProjectNo: #14A1713

Bill to:
Accounts Payable
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Requested TAT: 5 days

Date Received: **01/31/2014**
Date Printed: **01/31/2014**

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1401903-001	FO-07 (Shallow)	Water	1/30/2014 13:40	☐	A											

Test Legend:

1	218_6_DW	2		3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

McCampbell Analytical, Inc.
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Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

WORK ORDER SUMMARY

Client Name: ALPHA ANALYTICAL LABORATORIES
QC Level: LEVEL 2
Work Order: 1401903
Project: #14A1713
Client Contact: David S. Pingatore
Date Received: 1/31/2014
Comments:
Contact's Email: sspeaks@alpha-labs.com;david@alpha-labs.com

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Number of Containers	Bottle & Preservative	De-chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1401903-001A	FO-07 (Shallow)	Water	E218.6 (Hexachrome)	1	250mL HDPE w/ (NH4)2SO4	☐	1/30/2014 13:40	5 days	Present	☐	

*** NOTE: STLC and TCLP extractions require 48 hrs to complete; therefore, all TATs begin after the extraction is completed (i.e., 24hr TAT yields results in 72 hrs from sample submission).**

Bottle Legend:

250mL HDPE w/ (NH4)2SO4 = 250mL HDPE Bottle w/ Ammonium Sulfate

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

1401903

14A1713

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

McCampbell Analytical
1534 Willowpass Rd.
Pittsburg, CA 94565
Phone :(925) 252-9262
Fax: (925) 252-9269
Terms: Net 30

Analysis	Due	Expires	Comments
14A1713-01 FO-07 (Shallow) [Water] Sampled 01/30/14 13:40 Pacific			
Cr6 218.6 DW	02/14/14 12:00	02/04/14 13:40	
Containers Supplied:			
250ml Poly - (NH4)2SO4 (A			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

NO

ICE/t° 3.2
GOOD CONDITION_____
HEAD SPACE ABSENT_____
DECHLORINATED IN LAB_____
APPROPRIATE CONTAINERS_____
PRESERVED IN LAB_____

PRESERVATION	VOAS	O&G	METALS	OTHER

Released By	Date	Received By	Date
	01/31/14		1/31/14
	1/31/14		1/31/14 1150

Page 1 of 1

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Sample Receipt Checklist

Client Name:	**Alpha Analytical Laboratories**	Date and Time Received:	**1/31/2014 12:08:44 PM**
Project Name:	**#14A1713**	LogIn Reviewed by:	Maria Venegas
WorkOrder N°:	**1401903** Matrix: Water	Carrier:	Client Drop-In

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☐	No ☑

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp: 3.2°C		NA ☐
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	NA ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑
Samples Received on Ice?	Yes ☑	No ☐	

(Ice Type: BLUE ICE)

** NOTE: If the "No" box is checked, see comments below.*

Comments:

ALS Environmental
ALS Group USA, Corp.
1317 South 13th Avenue
Kelso, WA 98626
T: +1 360 577 7222
F: +1 360 636 1068
www.alsglobal.com

February 21, 2014 Analytical Report for Service Request No: K1401154

David Pingatore
Alpha Analytical Laboratories, Inc.
6398 Dougherty Road, Suite 35
Dublin, CA 94568

RE: 14A1713

Dear David:

Enclosed are the results of the sample submitted to our laboratory on February 05, 2014. For your reference, these analyses have been assigned our service request number K1401154.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3293. You may also contact me via Email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Shar Samy, Ph.D.
Project Manager

SS/mj

RIGHT SOLUTIONS | RIGHT PARTNER

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2286
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L12-28
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Georgia DNR	http://www.gaepd.org/Documents/techguide_pcb.html#cel	881
Hawaii DOH	Not available	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
Indiana DOH	http://www.in.gov/isdh/24859.htm	C-WA-01
ISO 17025	http://www.pjlabs.com/	L12-27
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	3016
Maine DHS	Not available	WA0035
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-368
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA35
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA200001
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	4704427-08-TX
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C1203
Wisconsin DNR	http://dnr.wi.gov/	998386840
Wyoming (EPA Region 8)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.caslab.com or at the accreditation bodies web site

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

ALS ENVIRONMENTAL

Client:	Alpha Analytical Laboratories, Inc.	**Service Request No.:**	K1401154
Project:	14A1713	**Date Received:**	02/05/14
Sample Matrix:	Water		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS), and Laboratory Control Sample (LCS).

Sample Receipt

One water sample was received for analysis at ALS Environmental on 02/05/14. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4ºC upon receipt at the laboratory.

Explosives by EPA Method 8330

Sample Notes and Discussion:
Insufficient sample volume was received to perform a Matrix Spike/Matrix Spike Duplicate (MS/MSD). A Laboratory Control Sample/Duplicate Laboratory Control Sample (LCS/DLCS) was analyzed and reported in lieu of the MS/MSD.

No other anomalies associated with the analysis of this sample were observed.

Approved by_____

K1401154

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1713

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

ALS Environmental - Kelso
1317 S. 13th Ave
Kelso, WA 98626
Phone :(360) 577-7222
Fax: -
Terms: Net 30

Analysis	Due	Expires	Comments
14A1713-01 FO-07 (Shallow) [Water] Sampled 01/30/14 13:40 Pacific			
8330B Explosives Water	02/14/14 12:00	02/06/14 13:40	
Containers Supplied:			
1L Amber- Unpres. (AD) 1L Amber- Unpres. (AE)			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
[signature]	1-31-14	[signature]	2/5/14 1020

PC Shar

Cooler Receipt and Preservation Form

Client / Project: Alpha Service Request K14 01154

Received: 2/5/14 Opened: 2/5/14 By: [illegible] Unloaded: 2/5/14 By: [illegible]

1. Samples were received via? *Mail* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? _____

   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
-0.9	-0.6	—	—	-0.1	308		1Z894250 01489473	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA Y N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

Page ____ *of* ____

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401154
Project:	14A1713	**Date Collected:**	01/30/2014
Sample Matrix:	Water	**Date Received:**	02/05/2014

Nitroaromatics and Nitramines (Explosives)

Sample Name:	14A1713-01 FO-07(Shallow)	**Units:**	ug/L
Lab Code:	K1401154-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.10	0.010	1	02/06/14	02/07/14	KWG1400979	
RDX	ND	U	0.10	0.017	1	02/06/14	02/07/14	KWG1400979	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/06/14	02/07/14	KWG1400979	
1,3-Dinitrobenzene	ND	U	0.10	0.0085	1	02/06/14	02/07/14	KWG1400979	
3,5-Dinitroaniline	ND	U	0.10	0.013	1	02/06/14	02/07/14	KWG1400979	
TETRYL	ND	U	0.10	0.042	1	02/06/14	02/07/14	KWG1400979	
Nitrobenzene	ND	U	0.10	0.013	1	02/06/14	02/07/14	KWG1400979	
4-Amino-2,6-dinitrotoluene	ND	U	0.10	0.016	1	02/06/14	02/07/14	KWG1400979	
2-Amino-4,6-dinitrotoluene	ND	U	0.10	0.0089	1	02/06/14	02/07/14	KWG1400979	
2,4,6-Trinitrotoluene	ND	U	0.10	0.026	1	02/06/14	02/07/14	KWG1400979	
2,6-Dinitrotoluene	**0.070**	JN	0.20	0.054	1	02/06/14	02/07/14	KWG1400979	
2,4-Dinitrotoluene	ND	U	0.10	0.0091	1	02/06/14	02/07/14	KWG1400979	
2-Nitrotoluene	ND	U	0.10	0.032	1	02/06/14	02/07/14	KWG1400979	
4-Nitrotoluene	ND	U	0.10	0.019	1	02/06/14	02/07/14	KWG1400979	
3-Nitrotoluene	ND	U	0.10	0.0064	1	02/06/14	02/07/14	KWG1400979	
Nitroglycerin	ND	U	1.0	0.39	1	02/06/14	02/07/14	KWG1400979	
Pentaerythritol Tetranitrate	ND	U	0.50	0.18	1	02/06/14	02/07/14	KWG1400979	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	77	23-98	02/07/14	Acceptable

Comments:

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401154
Project:	14A1713	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Nitroaromatics and Nitramines (Explosives)

Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1400979-3	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.098	0.010	1	02/06/14	02/07/14	KWG1400979	
RDX	ND	U	0.098	0.017	1	02/06/14	02/07/14	KWG1400979	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/06/14	02/07/14	KWG1400979	
1,3-Dinitrobenzene	ND	U	0.098	0.0085	1	02/06/14	02/07/14	KWG1400979	
3,5-Dinitroaniline	ND	U	0.098	0.013	1	02/06/14	02/07/14	KWG1400979	
TETRYL	ND	U	0.10	0.042	1	02/06/14	02/07/14	KWG1400979	
Nitrobenzene	ND	U	0.098	0.013	1	02/06/14	02/07/14	KWG1400979	
4-Amino-2,6-dinitrotoluene	ND	U	0.098	0.016	1	02/06/14	02/07/14	KWG1400979	
2-Amino-4,6-dinitrotoluene	ND	U	0.098	0.0089	1	02/06/14	02/07/14	KWG1400979	
2,4,6-Trinitrotoluene	ND	U	0.098	0.026	1	02/06/14	02/07/14	KWG1400979	
2,6-Dinitrotoluene	**0.068**	JN	0.20	0.054	1	02/06/14	02/07/14	KWG1400979	
2,4-Dinitrotoluene	ND	U	0.098	0.0091	1	02/06/14	02/07/14	KWG1400979	
2-Nitrotoluene	ND	U	0.10	0.032	1	02/06/14	02/07/14	KWG1400979	
4-Nitrotoluene	ND	U	0.098	0.019	1	02/06/14	02/07/14	KWG1400979	
3-Nitrotoluene	ND	U	0.098	0.0064	1	02/06/14	02/07/14	KWG1400979	
Nitroglycerin	ND	U	0.98	0.39	1	02/06/14	02/07/14	KWG1400979	
Pentaerythritol Tetranitrate	ND	U	0.49	0.18	1	02/06/14	02/07/14	KWG1400979	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	75	23-98	02/07/14	Acceptable

Comments:

Client: Alpha Analytical Laboratories, Inc. (Uki
Service Request: K1401154
Project: 14A1713
Sample Matrix: Water

Surrogate Recovery Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method: METHOD
Units: Percent
Analysis Method: 8330B
Level: Low

Sample Name	Lab Code	Sur1
14A1713-01 FO-07(Shallow)	K1401154-001	77
Method Blank	KWG1400979-3	75
Duplicate Lab Control Sample	KWG1400979-1	82
Lab Control Sample	KWG1400979-2	91

Surrogate Recovery Control Limits (%)

Sur1 = 1-Chloro-3-nitrobenzene 23-98

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401154
Project:	14A1713	**Date Extracted:**	02/06/2014
Sample Matrix:	Water	**Date Analyzed:**	02/07/2014

Lab Control Spike/Duplicate Lab Control Spike Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method:	METHOD	**Units:**	ug/L
Analysis Method:	8330B	**Basis:**	NA
		Level:	Low
		Extraction Lot:	KWG1400979

	Lab Control Sample KWG1400979-2 Lab Control Spike			Duplicate Lab Control Sample KWG1400979-1 Duplicate Lab Control Spike					
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**	**RPD**	**RPD Limit**
HMX	7.75	8.00	97	7.46	8.00	93	11-147	4	30
RDX	7.53	8.00	94	7.26	8.00	91	10-142	4	30
1,3,5-Trinitrobenzene	7.54	8.00	94	7.01	8.00	88	16-137	7	30
1,3-Dinitrobenzene	7.51	8.00	94	7.03	8.00	88	26-125	7	30
3,5-Dinitroaniline	7.48	8.00	93	7.09	8.00	89	30-133	5	30
TETRYL	7.71	8.00	96	7.26	8.00	91	29-123	6	30
Nitrobenzene	7.43	8.00	93	6.93	8.00	87	10-116	7	30
4-Amino-2,6-dinitrotoluene	7.57	8.00	95	7.11	8.00	89	55-117	6	30
2-Amino-4,6-dinitrotoluene	7.47	8.00	93	7.00	8.00	88	54-116	6	30
2,4,6-Trinitrotoluene	7.53	8.00	94	6.93	8.00	87	47-118	8	30
2,6-Dinitrotoluene	7.57	8.00	95	6.95	8.00	87	40-108	9	30
2,4-Dinitrotoluene	7.46	8.00	93	6.83	8.00	85	50-111	9	30
2-Nitrotoluene	7.18	8.00	90	6.55	8.00	82	12-110	9	30
4-Nitrotoluene	7.21	8.00	90	6.58	8.00	82	16-113	9	30
3-Nitrotoluene	7.51	8.00	94	6.83	8.00	85	13-109	10	30
Nitroglycerin	7.71	8.00	96	7.43	8.00	93	15-136	4	30
Pentaerythritol Tetranitrate	7.81	8.00	98	7.35	8.00	92	66-103	6	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

WECK LABORATORIES, INC.
Analytical Laboratory Service - Since 1964

Certificate of Analysis

Report Date: 02/24/14 15:32
Received Date: 02/05/14 08:30
Turnaround Time: Normal

Project: 14A1713

Phones: (925) 872-9637
Fax: (707) 468-5267

P.O. #:

Attn: David S. Pingatore

Client: Alpha Analytical Laboratories - Ukiah
208 Mason St
Ukiah, CA 95482

Dear David S. Pingatore :

Enclosed are the results of analyses for samples received 2/5/2014 with the Chain of Custody document. The samples were received in good condition, at 1.7 °C and on ice. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Lab Sample ID: 4B05032-01 **Sample ID: 14A1713-01 FO-07 (Shallow)** **Matrix:** Water
Sampled by: Client **Sampled: 01/30/14 13:40**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
17-a-Ethynylestradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:55	W4B0281	
17-b-Estradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:55	W4B0281	
Estrone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:55	W4B0281	
Progesterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:55	W4B0281	
Testosterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 18:55	W4B0281	
Bisphenol A	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:35	W4B0283	
Gemfibrozil	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:35	W4B0283	
Ibuprofen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:35	W4B0283	
Iopromide	ND		5.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:35	W4B0283	
Naproxen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:35	W4B0283	
Salicylic Acid	ND		50	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:35	W4B0283	
Triclosan	ND		2.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/14/14 23:35	W4B0283	
Acetaminophen	ND		20	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Amoxicillin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Atenolol	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Atorvastatin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Azithromycin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	

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Lab Sample ID: 4B05032-01 **Sample ID:** 14A1713-01 FO-07 (Shallow) **Matrix:** Water
Sampled by: Client **Sampled:** 01/30/14 13:40

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
Caffeine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Carbamazepine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Ciprofloxacin	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Cotinine	ND		2.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
DEET	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Diazepam	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Fluoxetine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Meprobamate	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Methadone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Oxybenzone	**1.2**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Phenytoin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Primidone	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	R-01
Sucralose	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Sulfamethoxazole	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
TCEP	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
TCPP	**2.6**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	B
TDCPP	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	
Trimethoprim	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:03	W4B0282	

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Quality Control Section

PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		ND		ng/l					
Caffeine		ND		ng/l					
Sulfamethoxazole		ND		ng/l					
Trimethoprim		ND		ng/l					
Azithromycin		ND		ng/l					
Cotinine		ND		ng/l					
Atenolol		ND		ng/l					
Ciprofloxacin		ND		ng/l					
Carbamazepine		ND		ng/l					
DEET		ND		ng/l					
Fluoxetine		ND		ng/l					
Atorvastatin		ND		ng/l					
Methadone		ND		ng/l					
Primidone		ND		ng/l					
Diazepam		ND		ng/l					
TCPP		2.23	B	ng/l					
TCEP		ND		ng/l					
TDCPP		ND		ng/l					
Phenytoin		ND		ng/l					
Amoxicillin		ND		ng/l					
Meprobamate		ND		ng/l					
Sucralose		ND		ng/l					
Oxybenzone		ND		ng/l					

LCS (W4B0282-BS1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:53**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		435		ng/l	400	109	66-156		
Caffeine		17.4		ng/l	20.0	87	55-152		
Sulfamethoxazole		17.6		ng/l	20.0	88	60-133		
Trimethoprim		18.6		ng/l	20.0	93	67-139		
Azithromycin		199		ng/l	200	100	52-166		
Cotinine		22.6		ng/l	20.0	113	68-155		
Atenolol		21.0		ng/l	20.0	105	56-164		
Ciprofloxacin		83.8		ng/l	100	84	51-168		
Carbamazepine		19.3		ng/l	20.0	96	60-135		
DEET		15.5		ng/l	20.0	78	45-135		
Fluoxetine		23.8		ng/l	20.0	119	55-150		
Atorvastatin		16.3		ng/l	20.0	82	0.1-173		
Methadone		19.0		ng/l	20.0	95	62-137		
Primidone		17.1		ng/l	20.0	86	54-147		
Diazepam		18.3		ng/l	20.0	92	58-127		

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

LCS (W4B0282-BS1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:53**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
TCPP		18.1		ng/l	20.0	90	24-149		
TCEP		17.5		ng/l	20.0	88	25-149		
TDCPP		17.7		ng/l	20.0	88	20-158		
Phenytoin		18.2		ng/l	20.0	91	69-138		
Amoxicillin		164		ng/l	200	82	14-167		
Meprobamate		20.5		ng/l	20.0	102	11-166		
Sucralose		95.7		ng/l	100	96	50-150		
Oxybenzone		15.4		ng/l	20.0	77	50-150		

LCS Dup (W4B0282-BSD1) — **Prepared: 02/07/14 Analyzed: 02/18/14 23:07**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		499		ng/l	400	125	66-156	14	30
Caffeine		18.2		ng/l	20.0	91	55-152	4	30
Sulfamethoxazole		19.4		ng/l	20.0	97	60-133	10	30
Trimethoprim		18.4		ng/l	20.0	92	67-139	1	30
Azithromycin		206		ng/l	200	103	52-166	3	30
Cotinine		26.7		ng/l	20.0	134	68-155	17	30
Atenolol		23.0		ng/l	20.0	115	56-164	9	30
Ciprofloxacin		83.4		ng/l	100	83	51-168	0.5	30
Carbamazepine		19.7		ng/l	20.0	98	60-135	2	30
DEET		16.4		ng/l	20.0	82	45-135	6	30
Fluoxetine		22.8		ng/l	20.0	114	55-150	4	30
Atorvastatin		15.1		ng/l	20.0	76	0.1-173	8	30
Methadone		19.1		ng/l	20.0	96	62-137	0.5	30
Primidone		16.2		ng/l	20.0	81	54-147	5	30
Diazepam		18.9		ng/l	20.0	94	58-127	3	30
TCPP		21.0		ng/l	20.0	105	24-149	15	30
TCEP		20.6		ng/l	20.0	103	25-149	16	30
TDCPP		18.9		ng/l	20.0	94	20-158	7	30
Phenytoin		18.4		ng/l	20.0	92	69-138	1	30
Amoxicillin		164		ng/l	200	82	14-167	0	30
Meprobamate		20.6		ng/l	20.0	103	11-166	0.5	30
Sucralose		93.0		ng/l	100	93	50-150	3	30
Oxybenzone		18.3		ng/l	20.0	92	50-150	17	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

Blank (W4B0283-BLK1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:08**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		1.99	B	ng/l					
Gemfibrozil		ND		ng/l					
Ibuprofen		ND		ng/l					
Naproxen		ND		ng/l					

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PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

Blank (W4B0283-BLK1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:08**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Salicylic Acid		ND		ng/l					
Triclosan		ND		ng/l					
Iopromide		ND		ng/l					

LCS (W4B0283-BS1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:22**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		19.5		ng/l	20.0	98	53-168		
Gemfibrozil		18.0		ng/l	20.0	90	76-122		
Ibuprofen		17.7		ng/l	20.0	88	67-139		
Naproxen		17.3		ng/l	20.0	86	64-138		
Salicylic Acid		171		ng/l	200	86	56-229		
Triclosan		38.9		ng/l	40.0	97	76-139		
Iopromide		114		ng/l	100	114	0.1-163		

LCS Dup (W4B0283-BSD1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		18.4		ng/l	20.0	92	53-168	6	30
Gemfibrozil		18.3		ng/l	20.0	92	76-122	2	30
Ibuprofen		19.8		ng/l	20.0	99	67-139	11	30
Naproxen		19.1		ng/l	20.0	96	64-138	10	30
Salicylic Acid		183		ng/l	200	92	56-229	7	30
Triclosan		40.5		ng/l	40.0	101	76-139	4	30
Iopromide		104		ng/l	100	104	0.1-163	9	30

PPCPs - Hormones by LC/MSMS-APCI - Quality Control

Batch W4B0281 - EPA 1694M-APCI

Blank (W4B0281-BLK1) — **Prepared: 02/07/14 Analyzed: 02/19/14 16:58**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		ND		ng/l					
17-b-Estradiol		ND		ng/l					
Estrone		ND		ng/l					
Progesterone		ND		ng/l					
Testosterone		ND		ng/l					

LCS (W4B0281-BS1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:15**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		19.1		ng/l	20.0	96	68-159		
17-b-Estradiol		18.0		ng/l	20.0	90	65-146		
Estrone		17.6		ng/l	20.0	88	59-141		
Progesterone		17.8		ng/l	20.0	89	58-154		
Testosterone		24.8		ng/l	20.0	124	60-172		

LCS Dup (W4B0281-BSD1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:31**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit

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PPCPs - Hormones by LC/MSMS-APCI - Quality Control

Batch W4B0281 - EPA 1694M-APCI

LCS Dup (W4B0281-BSD1) **Prepared: 02/07/14 Analyzed: 02/19/14 17:31**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		18.9		ng/l	20.0	94	68-159	1	30
17-b-Estradiol		18.4		ng/l	20.0	92	65-146	2	30
Estrone		18.3		ng/l	20.0	92	59-141	4	30
Progesterone		18.1		ng/l	20.0	90	58-154	2	30
Testosterone		26.0		ng/l	20.0	130	60-172	5	30

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Notes:
The Chain of Custody document is part of the analytical report.
Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
All results are expressed on wet weight basis unless otherwise specified.

An Absence of Total Coliform meets the drinking water standards as established by the State of California Department of Health Services.
The Reporting Limit (RL) is referenced as laboratory's Practical Quantitation Limit (PQL).
For Potable water analysis, the Reporting Limit (RL) is referenced as Detection Limit for reporting purposes (DLRs) defined by EPA.

If sample collected by Weck Laboratories, sampled in accordance to lab SOP MIS002

Authorized Signature
Contact: Kim G Tu
(Project Manager)

ELAP # 1132
LACSD # 10143
NELAC # 04229CA

The results in this report apply to the samples analyzed in accordance with the chain of custody document. Weck Laboratories certifies that the test results meet all requirements of NELAC unless noted in the Case Narrative. This analytical report must be reproduced in its entirety.

Flags for Data Qualifiers:

B	Blank contamination. The analyte was found in the associated blank as well as in the sample.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
ND	NOT DETECTED at or above the Reporting Limit. If J-value reported, then NOT DETECTED at or above the Method Detection Limit (MDL).
Sub	Subcontracted analysis, original report enclosed.
DL	Method Detection Limit
RL	Method Reporting Limit
MDA	Minimum Detectable Activity
NR	Not Reportable

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ISOTECH
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Water Analysis

Lab Number: 410666 Job Number: 24232 IS-69368

Sample Name: FO-07 (SHALLOW)

Company Lab #:

Company Job #:

Company: Alpha Analytical, Inc.

API/Well:

Field or Site: WO 14A1713

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Date Sampled: 1/30/2014 Date Received 2/05/2014 Date Reported: 2/26/2014

δD of water	----------	na
$\delta^{18}O$ of water	----------	na
Tritium content of water	----------	< 1.00 TU
$\delta^{13}C$ of DIC	----------	na
^{14}C content of DIC	----------	na
$\delta^{15}N$ of nitrate	----------	na
$\delta^{18}O$ of nitrate	----------	na
$\delta^{34}S$ of sulfate	----------	na
$\delta^{18}O$ of sulfate	----------	na

Remarks:

NELAC NARRATIVE PAGE

Client: Alpha Analytical Report #: 310985NP

Underwriters Laboratories is a NELAP accredited laboratory. All reported results meet the requirements of the NELAC standards, unless otherwise noted.

UL contact person: James Van Fleit

NELAP requires complete reporting of deviations from method requirements, regardless of the suspected impact on the data. Quality control failures not reported within the report summary are noted here.

There were no quality control failures.

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Authorized Signature Title Date

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Laboratory Report

Client:	Alpha Analytical	Report:	310985
Attn:	David Pingatore 6398 Dougherty Road, Suite 35 Dublin, CA 94568	Priority:	Standard Written
		Status:	Final
		PWS ID:	Not Supplied
Copies to:	None		

Sample Information

UL ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
2967017	14A1713-01	905.0	01/30/14 13:40	Client	02/04/14 11:45
2967018	14A1713-01	1613	01/30/14 13:40	Client	02/04/14 11:45
2967019	14A1713-01	7110 B	01/30/14 13:40	Client	02/04/14 11:45
2967020	14A1713-01	7500-Ra B	01/30/14 13:40	Client	02/04/14 11:45
2967020	14A1713-01	7500-Ra D	01/30/14 13:40	Client	02/04/14 11:45
2967021	14A1713-01	300.1	01/30/14 13:40	Client	02/04/14 11:45
2967022	14A1713-01	300.0	01/30/14 13:40	Client	02/04/14 11:45

Report Summary

Note: See attached page for additional comments.

Note: Sample containers were provided by the client except for Methods 300.0 and 300.1.

Note: Strontium-90 analysis was performed by General Engineering Laboratories, Charleston, SC.

Note: Dioxin analysis was performed by Pace Analytical, Minneapolis, MN.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call James Van Fleit at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature | Title | Date

Client Name: Alpha Analytical
Report #: 310985

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Client Name: Alpha Analytical

Report #: 310985

Sampling Point: 14A1713-01

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
14998-27-7	Chlorite	300.0	1000 *	20	< 20	ug/L	---	02/06/14 22:50	2967022
15541-45-4	Bromate	300.1	10 *	5.0	< 5.0	ug/L	---	02/05/14 02:08	2967021

Radionuclides

Analyte ID #	Analyte	Method	Reg Limit	DL**	Result	Units	Preparation Date	Analyzed	UL ID #
---	Gross Alpha	7110 B	15 *	3	**125 ± 5**	pCi/L	02/21/14 07:49	02/27/14 10:40	2967019
---	Gross Beta	7110 B	50 *	4	**114 ± 2**	pCi/L	02/21/14 07:49	02/27/14 10:40	2967019
13982-63-3	Radium-226	7500-Ra B	3 *	1.0	**22.0 ± 2.2**	pCi/L	02/18/14 09:45	03/02/14 11:36	2967020
15262-20-1	Radium-228	7500-Ra D	2 *	1.0	**16.3 ± 1.2**	pCi/L	02/18/14 09:45	02/26/14 16:02	2967020
---	Combined Radium	calc.	5 *	1.0	**38.3 ± 2.4**	pCi/L	02/18/14 09:45	03/02/14 11:36	2967020

** Detection Limit (DL) shall be that concentration which can be counted with a precision of plus or minus 100% at the 95 % confidence level.

Reference Lab Tests

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	UL ID #
1746-01-6	Dioxin	1613	30 *	5	< 5	pg/L	03/03/14 00:00	03/04/14 13:42	2967018
---	Strontium-90	905.0	8 *	2.00	**0.748 ± 1.140**	pCi/L	---	02/20/14 08:05	2967017

† UL has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1713

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

Zymax
600 S. Andreasen Drive, Suite B
Escondido, CA 92029
Phone :(760) 781-3338
Fax: (760) 781-3339
Terms: Net 30

Analysis	Due	Expires	Comments
14A1713-01 FO-07 (Shallow) [Water] Sampled 01/30/14 13:40 Pacific			43451-1
Oxygen 18 - Isotope / Hydroger	02/14/14 12:00	07/29/14 13:40	
N and O Isotopes of Nitrate	02/14/14 12:00	02/06/14 13:40	

Containers Supplied:

250 mL Poly Unpres (AQ), 250 mL Poly Unpres (AR)

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
			2/5/14 9:05
Released By	Date	Received By	Date

David S. Pingatore
Project Manager
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482
Tel: 707.468.0401
Fax: 707.468.5267
Project: 14A1713
Email: david @ alpha.com

Dr. Yi Wang
Director of ZymaX Forensics Isotope
Senior Environmental Geochemist, PACE
600 S. Andreasen Dr., Suite B
Escondido, CA 92029
Tel: 760.781.3338 ext 202
Fax: 760.781.3339
Cell: 609.721.2843
Email: yi.wang@zymaxusa.com

REPORT OF ENVIRONMENTAL FORENSICS ISOTOPE ANALYSES

Date Received: February 5th, 2014
Date Reported: March 20th, 2014

Sample from Alpha Analytical Labs for $\delta^{15}N$ (‰ Air), $\delta^{18}O$ and δD (‰ VSMOW) stable isotope analysis

ZymaX ID	Client ID/Sample Description	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
43451-1	14A1713-01 FO-07 (Shallow)	-6.36	-45.44	8.7	4.2
	Analytical precision (1σ)	0.06	0.32	0.2	0.4

ZymaX ID	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
QC-01	-5.89	-41.12	4.5	25.3
QC-02	-5.98	-41.57	4.8	25.9
Mean	-5.94	-41.35	4.7	25.6
Analytical Precision (1σ)	0.06	0.32	0.2	0.4

ZymaX Forensics Isotope Services

Product or Dissolved Organics: Chlorinated Solvents, Oil, Extract, Fraction and Kerogen
3D-CSIA of ^{13}C, ^{37}Cl, and ^{2}H for PCE, TCE, DCE, MTBE, BTEX, PAHs, Pesticides, Alkanes, Gasoline and Oil; Bulk ^{13}C, ^{2}H, ^{18}O, ^{34}S, and ^{15}N
Gas Sample
Gas Composition and 2D-CSIA of ^{13}C and ^{2}H of C1 to C5; ^{13}C of CO_2; ^{14}C of C1 and CO_2; ^{34}S of H_2S; ^{15}N and ^{18}O of N_2O gas
Water and Dissolved Inorganics
^{2}H, ^{3}H and ^{18}O; ^{34}S and ^{18}O of dissolved sulfate; ^{34}S of dissolved H_2S
^{15}N and ^{18}O of dissolved Nitrate; ^{15}N of Ammonia; ^{13}C of dissolved CO_2 and Carbonate/Bicarbonate
Soil and Minerals
^{13}C, ^{18}O, ^{15}N, ^{34}S, D/H; ^{14}C of carbonate or organics
Post-Analysis Forensic Isotope Data Interpretation

Laboratory Order - Summary

analytical chemistry for a better environment

Report To:	David S. Pingatore Alpha Analytical Laboratories, Inc. 208 Mason St. Ukiah, CA. 95482	Date Received: Date Due: Project:	02/05/2014 9:05AM 04/24/2014 12:00AM 14A1713	
Phone: Fax:	(707) 468-0401 (707) 468-5267	Project Number:		

Lab Number	Description	Analysis	Dept
43451-1	14A1713-01 FO-07	d15N and d18O of NO3	M6
		d18O+dD of H2O	M6

Notes/Special Instructions	SC Login/Computer Login CY/CY	DPRA PM: YW

ZymaX FORENSICS

Condition Upon Reciept

Lab Number: 43451 Client: AAL

Sample Temprature (should be 2-6 degrees C): 1.9°C

Do the sample descriptions on the containers match the discriptions on the COC?	☒ Yes	☐ No	
Do the sample dates on the containers match the sample dates on the COC?	☒ Yes	☐ No	
Are the samples within holding time for each analysis at time of reciept?	☒ Yes	☐ No	☐ N/A
Do the number of containers received match the number listed on the COC, and are all of the necessary containers for the required analysis available?	☒ Yes	☐ No	☐ N/A
Does the preservation of the samples match the notation on the COC, and is the preservation correct for requested analysis?	☐ Yes ☒ Zymax	☐ No	☐ N/A
Are all of the samples intact with no headspace, if required for analysis?	☒ Yes	☐ No	
Did samples arrive with custody seal intact?	☒ Yes	☐ No	☐ N/A

Sample Control Signature: [signature] Date: 2/5/14 Time: 9:05

Client Discrepancies

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Chain of Custody Record

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14A1713

Signature below authorizes work under terms stated on reverse side.

Report to:
Company: Todd Engineers
Attn: Dr. Bill Motzer
Address: 2490 Mariner Square Loop, Suite 215, Alameda, CA 94501
Phone/Fax: 510.747.6920 / 510.747.6921
Email Address: bmotzer@toddengineers.com

Invoice to (if different):
Company:
Attn:
Address:
Phone/Fax:
Email Address:

Project Info for Report:
Project ID: Groundwater Reuse Project
Project No: Project # 60408
PO/Reference :

Samplers Signature:
Print:

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___ days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only)
Temperature: 1.2° deg. C
Shipment Method:
Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	40ml VOA	Poly	Amber glass	Soil jar		NaOH	HNO3	H2SO4	Other	None	Water	Soil		Total Number of Containers	Inorganics Scan, DU-General Physical Scan	200.7 - Ca, K, Mg, Na	200.8 - Ag, B, Cu, Fe, Mn, U, V, Zn	Bicarbonate, Chloride, Conductivity	MBAS, Perchlorate, TDS, Sulfate	HAA5, TOC	507, 508, 515, 525 DHS, 531, 547, 548, 549	504.1, 524.2 Sample Traps scan	Asbestos DW (sub TEM Lab)	Cr6 218.6 DW (sub MAI) DU Peter	Dioxin 2,3,7,8 TCDD DW (sub UL)	Sample Notes or CDPH Source Numbers
FO-07 (shallow)	1-30-14	1340		x	x			x	x			x	x			4	x	x	x	x	x							
			x		x						x		x			3						x						
				x	x						x	x	x			10							x					(507/508/515.1 = one 1L BRA ea)
			x								x		x			7								x				
					x							x	x			2									x			
				x							x		x			1										x		
					x							x	x			2											x	
																								x				
Trip blank ($0.00 analysis)			x								x	x	x			2												

Relinquished by:	Received by:	Date:	Time:
Jim Johnson	Jim Johnson	1-30-14	15:00
Jim Johnson		1/30/14	1725
		1-30-14	1900
	LAB	1-30-14	2125

CDPH Write On EDT Transmission? ○ Yes ○ No
State System Number:
If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No
Sampling Company Log Code:
Global ID:
EDF to (Email Address):
Travel and Site Time: | Mileage: | Misc. Supplies:

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 1471713

Signature below authorizes work under terms stated on reverse side.

Report to:
Company: Todd Engineers
Attn: Dr. Bill Motzer
Address: 2490 Mariner Square Loop, Suite 215, Alameda, CA 94501
Phone/Fax: 510.747.6920 / 510.747.6921
Email Address: bmotzer@toddengineers.com

Invoice to (if different):
Company:
Attn:
Address:
Phone/Fax:
Email Address:

Project Info for Report:
Project ID: Groundwater Reuse Project
Project No: Project # 60408
PO/Reference :

Samplers Signature:
Print:

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only)
Temperature: 4 deg. C
Shipment Method:
Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	Container: 40ml VOA	Poly	Amber glass	Soil jar		Preservative: HCL	HNO3	H2SO4	Other	None	Matrix: Water	Soil		Total Number of Containers	8330B Explosives (sub ALS)	PPCP Hormones 1694M (sub Weck)	PPCP Negative Pharmas 1694M (sub Weck)	PPCP Positive Pharmas 1694M (sub Weck)	Nitrosamines LL 1625M (sub Weck)	Gross A & B, R226 &R228, Sr 90 (sub UL)	Bromate 300.1, Chlorite 300.0 (sub UL)	Tritium, Enriched (sub Isotech)	Oxygen 18 Isotope (sub Zymax)	N and O Isotopes of NO3 (sub Zymax)	j-flag MDL reporting + Standard excel EDD	Sample Notes or CDPH Source Numbers:
FO-07 (shallow)	1-30-14	1340			x							x	x			2	x										x	
					x						x		x			2		x	x	x								
					x							x	x			2					x							
				x					x				x			4						x						
				x							x		x			2							x					
				x								x	x			1								x				
				x								x	x			1									x			
				x								x	x			1										x		

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	1-30-14	15:00
[signature] LATA	LATA	1-30-14	19:00
	LAB LATA	1-30-14	2125

CDPH Write On EDT Transmission? ○ Yes ○ No
State System Number:
If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No
Global ID: Sampling Company Log Code:
EDF to (Email Address):

Travel and Site Time:	Mileage:	Misc. Supplies:

Alpha Analytical Laboratories Inc.
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ELAP Certificate Numbers 1551 and 2728

18 February 2014

Todd Groundwater
Attn: Dr. Bill Motzer
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
RE: Groundwater Reuse Project
Work Order: 14B0089

Enclosed are the results of analyses for samples received by the laboratory on 02/03/14 21:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeanette Poplin

Jeanette L. Poplin For David S. Pingatore
Project Manager

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 14:32

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
FO-07 (Deep)	14B0089-01	Water	02/03/14 14:05	02/03/14 21:30
Trip Blank	14B0089-02	Water	02/03/14 14:05	02/03/14 21:30

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Metals (Drinking Water) by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Mercury	ND	0.060	1.0	ug/l	1	AB40532	02/06/14 10:00	02/07/14 11:31	EPA 245.1	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Metals by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Calcium	**53**	0.010	1.0	mg/l	1	AB40524	02/05/14 10:04	02/10/14 12:46	EPA 200.7	
Magnesium	**6.8**	0.0080	1.0	"	"	"	"	"	"	
Potassium	**3.7**	0.0080	1.0	"	"	"	"	"	"	
Sodium	**86**	0.020	1.0	"	"	"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Metals by EPA Method 200.8 ICP/MS
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Aluminum	**170**	8.0	50	ug/l	4	AB40726	02/07/14 13:19	02/12/14 17:54	EPA 200.8	
Antimony	**0.75**	0.080	6.0	"	"	"	"	"	"	J
Arsenic	**7.6**	0.28	2.0	"	"	"	"	"	"	
Barium	**72**	0.12	100	"	"	"	"	"	"	J
Beryllium	ND	0.080	1.0	"	"	"	"	"	"	U
Boron	**140**	24	50	"	"	"	"	"	"	
Cadmium	ND	0.080	1.0	"	"	"	"	"	"	U
Chromium	**1.7**	0.32	10	"	"	"	"	"	"	J
Copper	**1.6**	0.16	2.0	"	"	"	"	"	"	R-01, J
Iron	**1100**	7.2	200	"	"	"	"	"	"	
Lead	**1.3**	0.080	5.0	"	"	"	"	"	"	J
Manganese	**83**	0.12	20	"	"	"	"	"	"	
Nickel	**2.8**	0.24	10	"	"	"	"	"	"	J
Selenium	**1.8**	0.28	5.0	"	"	"	"	"	"	J
Silver	ND	0.080	0.40	"	"	"	"	"	"	R-01, U
Thallium	ND	0.080	1.0	"	"	"	"	"	"	U
Uranium	**1.6**	0.080	1.0	pCi/l	"	"	"	"	"	
Vanadium	**5.8**	1.2	4.0	ug/l	"	"	"	"	"	
Zinc	**52**	2.0	20	"	"	"	"	"	"	

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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Conventional Chemistry Parameters by APHA/EPA Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Bicarbonate	**210**	0.060	5.0	mg/l	1	AB41221	02/12/14 07:35	02/12/14 17:00	SM2320B	
Color	**4.0**	3.0	5.0	Color Units	"	AB40438	02/03/14 18:30	02/03/14 18:30	SM2120B	J
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l	"	AB40528	02/05/14 11:20	02/12/14 12:02	SM5540C	U
Odor	ND		1.0	T.O.N.	"	AB40438	02/03/14 18:30	02/03/14 18:30	EPA 140.1	U
Perchlorate	**1.9**	0.90	4.0	ug/l	"	AB41141	02/11/14 09:49	02/11/14 14:19	EPA 314.0	J
Specific Conductance (EC)	**660**	1.0	20	umhos/cm	"	AB40448	02/04/14 13:00	02/04/14 17:00	SM2510B	
Total Dissolved Solids	**460**	5.0	10	mg/l	"	AB40515	02/05/14 09:15	02/10/14 13:00	SM2540C	
Turbidity	**10**	0.040	0.10	NTU	"	AB40440	02/03/14 18:30	02/03/14 18:30	SM2130B	
Nitrate + Nitrite as N	**0.13**	0.0086	0.40	mg/l	"	AB41339	02/13/14 10:39	02/13/14 11:18	EPA 300.0	J
Total Organic Carbon	**0.190**	0.100	0.300	"	"	AB40803	02/08/14 12:46	02/08/14 22:51	SM5310C	J

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Miscellaneous Physical/Conventional Chemistry Parameters
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Cyanide (total)	**0.0023**	0.0020	0.10	mg/l	1	AB40428	02/04/14 09:46	02/05/14 15:27	10-204-00-1X	J

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Anions by EPA Method 300.0
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Nitrate as NO3	**0.60**	0.20	2.0	mg/l	1	AB40426	02/04/14 09:20	02/04/14 13:51	EPA 300.0	J
Chloride	**100**	0.30	5.0	"	10	"	"	02/04/14 13:36	"	
Fluoride	ND	0.070	0.10	"	1	"	"	02/04/14 13:51	"	U
Nitrite as N	ND	0.020	0.40	"	"	"	"	"	"	U
Sulfate as SO4	**24**	0.090	0.50	"	"	"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Acetone	ND	0.80	5.0	ug/l	1	AB40725	02/04/14 11:57	02/06/14 16:39	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
1,3-Dichloropropane	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 16:39	EPA 524.2	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U

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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
o-Xylene	ND	0.10	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 16:39	EPA 524.2	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*97.0 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*95.8 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*99.6 %*	*70-130*			"	"	"	"	
Trip Blank (14B0089-02) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Acetone	ND	0.80	5.0	ug/l	1	AB40725	02/04/14 11:57	02/06/14 17:16	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14B0089-02) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
1,2-Dichlorobenzene	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 17:16	EPA 524.2	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14B0089-02) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
1,2,4-Trichlorobenzene	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 17:16	EPA 524.2	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U
o-Xylene	ND	0.10	0.50	"	"	"	"	"	"	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*98.8 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*96.5 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*98.8 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Aldrin	ND	0.010	0.050	ug/l	1	AB40514	02/05/14 08:08	02/12/14 01:17	EPA 508	U
Chloroneb	ND	0.20	0.50	"	"	"	"	"	"	U
Chlorobenzilate	ND	2.0	5.0	"	"	"	"	"	"	U
Chlorothalonil	ND	0.030	0.10	"	"	"	"	"	"	U
DCPA	ND	0.020	0.040	"	"	"	"	"	"	U
4,4´-DDD	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDE	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDT	ND	0.020	0.020	"	"	"	"	"	"	U
Dieldrin	ND	0.010	0.010	"	"	"	"	"	"	U
Endosulfan I	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan II	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan sulfate	ND	0.020	0.020	"	"	"	"	"	"	U
Endrin	ND	0.030	0.10	"	"	"	"	"	"	U
Endrin aldehyde	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-alpha	ND	0.010	0.050	"	"	"	"	"	"	U
HCH-beta	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-delta	ND	0.030	0.050	"	"	"	"	"	"	U
HCH-gamma (Lindane)	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor epoxide	ND	0.010	0.010	"	"	"	"	"	"	U
Hexachlorobenzene	ND	0.010	0.040	"	"	"	"	"	"	U
Hexachlorocyclopentadiene	ND	0.040	0.40	"	"	"	"	"	"	U
Methoxychlor	ND	0.020	0.020	"	"	"	"	"	"	U
cis-Permethrin	ND	0.070	0.20	"	"	"	"	"	"	U
trans-Permethrin	ND	0.090	0.20	"	"	"	"	"	"	U
Propachlor	ND	0.070	0.20	"	"	"	"	"	"	U
Trifluralin	ND	0.020	0.040	"	"	"	"	"	"	U
PCB-1016	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1221	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1232	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1242	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1248	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1254	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1260	ND	0.030	0.50	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Total PCBs	ND	0.30	0.50	ug/l	1	AB40514	02/05/14 08:08	02/12/14 01:17	EPA 508	U
Toxaphene	ND	0.40	0.50	"	"	"	"	"	"	U
Chlordane (tech)	ND	0.030	0.050	"	"	"	"	"	"	U
Surrogate: Dibutylchlorendate		*104 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Nitrogen- and Phosphorus- Pesticides by EPA Method 507
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Alachlor	ND	0.50	0.50	ug/l	1	AB40730	02/08/14 15:03	02/11/14 13:08	EPA 507	U
Atrazine	ND	0.30	0.50	"	"	"	"	"	"	U
Bromacil	ND	0.50	5.0	"	"	"	"	"	"	U
Butachlor	ND	0.40	0.50	"	"	"	"	"	"	U
Dimethoate	ND	0.20	1.0	"	"	"	"	"	"	U
Metolachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Metribuzin	ND	0.40	0.50	"	"	"	"	"	"	U
Molinate	ND	0.20	0.50	"	"	"	"	"	"	U
Prometryn	ND	0.50	0.50	"	"	"	"	"	"	U
Propachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Simazine	ND	0.30	0.50	"	"	"	"	"	"	U
Thiobencarb	ND	0.20	1.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*74.3 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Organic Analytes by EPA Method 504.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40703	02/07/14 08:14	02/07/14 23:22	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U
Trip Blank (14B0089-02) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40703	02/07/14 08:14	02/07/14 23:57	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Chlorinated Acids by EPA Method 515.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Acifluorfen	ND	0.50	1.0	ug/l	1	AB41155	02/12/14 14:27	02/15/14 00:23	EPA 515.1	U
Bentazon	ND	0.40	0.40	"	"	"	"	"	"	U
2,4-D	ND	0.80	1.0	"	"	"	"	"	"	U
Dalapon	ND	6.0	6.0	"	"	"	"	"	"	U
2,4-DB	ND	4.0	5.0	"	"	"	"	"	"	U
Dicamba	ND	0.40	0.40	"	"	"	"	"	"	U
Dichlorprop	ND	1.0	1.0	"	"	"	"	"	"	U
Dinoseb	ND	0.80	1.0	"	"	"	"	"	"	U
4-Nitrophenol	ND	0.70	1.0	"	"	"	"	"	"	U
Pentachlorophenol	ND	0.20	0.20	"	"	"	"	"	"	U
Picloram	ND	0.50	1.0	"	"	"	"	"	"	U
2,4,5-T	ND	0.40	0.50	"	"	"	"	"	"	U
2,4,5-TP (Silvex)	ND	0.50	0.50	"	"	"	"	"	"	U
Surrogate: DCAA		*93.2 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Carbamates by EPA Method 531.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Aldicarb	ND	0.70	3.0	ug/l	1	AB41142	02/11/14 10:07	02/12/14 14:07	EPA 531.1	U
Aldicarb sulfone	ND	0.70	4.0	"	"	"	"	"	"	U
Aldicarb sulfoxide	ND	0.80	3.0	"	"	"	"	"	"	U
Carbaryl	ND	0.70	5.0	"	"	"	"	"	"	U
Carbofuran	ND	2.0	5.0	"	"	"	"	"	"	U
3-Hydroxycarbofuran	ND	0.90	3.0	"	"	"	"	"	"	U
Methiocarb	ND	2.0	5.0	"	"	"	"	"	"	U
Methomyl	ND	2.0	2.0	"	"	"	"	"	"	U
Oxamyl	ND	0.80	20	"	"	"	"	"	"	U
Propoxur	ND	2.0	5.0	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Endothall by EPA Method 548.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Endothall	ND	2.0	45	ug/l	1	AB40801	02/10/14 09:16	02/11/14 14:18	EPA 548.1	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Glyphosate by EPA Method 547
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Glyphosate	ND	3.0	10	ug/l	1	AB40427	02/04/14 09:22	02/05/14 05:30	EPA 547	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Diquat by EPA Method 549.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Diquat	ND	2.0	2.0	ug/l	1	AB40717	02/07/14 10:11	02/11/14 00:55	EPA 549.2	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Haloacetic Acids by EPA Method 552.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Monobromoacetic Acid	ND	0.8	1.0	ug/l	1	AB41050	02/11/14 13:22	02/12/14 18:58	EPA 552.2	U
Monochloroacetic Acid	ND	1.1	2.0	"	"	"	"	"	"	U
Dibromoacetic Acid	ND	0.8	1.0	"	"	"	"	"	"	U
Dichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Trichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"	"	"	"	"	"	U
Surrogate: 2,3-Dibromopropionic Acid		*106 %*	*70-130*			*"*	*"*	*"*	*"*	
Surrogate: 2-Bromopropionic Acid		*82.7 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Semivolatile Organic Compounds by EPA Method 525.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
FO-07 (Deep) (14B0089-01) Water Sampled: 02/03/14 14:05 Received: 02/03/14 21:30										
Benzo (a) pyrene	ND	0.080	0.10	ug/l	1	AB40727	02/08/14 13:35	02/13/14 19:30	EPA 525.2	U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"	"	"	"	"	"	U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*103 %*	*70-130*			"	"	"	"	
Surrogate: Perylene-d12		*61.2 %*	*70-130*			"	"	"	"	*S-05*
Surrogate: Triphenyl phosphate		*106 %*	*70-130*			"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Metals (Drinking Water) by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40532 - EPA 245.1 Hg Water											
Blank (AB40532-BLK1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Mercury	ND	0.060	1.0	ug/l							U
LCS (AB40532-BS1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Mercury	2.32	0.060	1.0	ug/l	2.50		92.8	80-120			
Duplicate (AB40532-DUP1)		**Source: 14B0232-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Mercury	ND	0.060	1.0	ug/l		ND				20	U
Matrix Spike (AB40532-MS1)		**Source: 14B0232-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Mercury	2.54	0.060	1.0	ug/l	2.50	ND	102	60-140			
Matrix Spike (AB40532-MS2)		**Source: 14B0093-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Mercury	2.52	0.060	1.0	ug/l	2.50	ND	101	60-140			
Matrix Spike Dup (AB40532-MSD1)		**Source: 14B0232-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Mercury	2.55	0.060	1.0	ug/l	2.50	ND	102	60-140	0.393	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40524 - Metals Digest											
Blank (AB40524-BLK1)					Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	ND	0.010	1.0	mg/l							U
Magnesium	ND	0.0080	1.0	"							U
Potassium	0.0126	0.0080	1.0	"							J
Sodium	0.0265	0.020	1.0	"							J
LCS (AB40524-BS1)					Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	5.56	0.010	1.0	mg/l	5.88		94.5	85-115			
Magnesium	7.59	0.0080	1.0	"	8.00		94.9	85-115			
Potassium	7.84	0.0080	1.0	"	8.00		98.0	85-115			
Sodium	7.76	0.020	1.0	"	8.00		97.0	85-115			
Duplicate (AB40524-DUP1)		**Source: 14B0094-01**			Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	17.9	0.010	1.0	mg/l		19.2			7.01	20	
Magnesium	8.60	0.0080	1.0	"		7.91			8.38	20	
Potassium	10.5	0.0080	1.0	"		11.1			5.86	20	
Sodium	66.8	0.020	1.0	"		74.1			10.5	20	
Matrix Spike (AB40524-MS1)		**Source: 14B0094-01**			Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	22.6	0.010	1.0	mg/l	5.88	19.2	58.3	70-130			QM-01
Magnesium	14.5	0.0080	1.0	"	8.00	7.91	82.2	70-130			
Potassium	17.1	0.0080	1.0	"	8.00	11.1	74.7	70-130			
Sodium	73.2	0.020	1.0	"	8.00	74.1	NR	70-130			QM-4X
Matrix Spike (AB40524-MS2)		**Source: 14B0174-01**			Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	5.85	0.010	1.0	mg/l	5.88	0.483	91.3	70-130			
Magnesium	8.39	0.0080	1.0	"	8.00	1.19	89.9	70-130			
Potassium	8.03	0.0080	1.0	"	8.00	0.312	96.5	70-130			
Sodium	13.9	0.020	1.0	"	8.00	6.35	94.9	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40524 - Metals Digest											
Matrix Spike Dup (AB40524-MSD1)		**Source: 14B0094-01**		Prepared: 02/05/14 Analyzed: 02/07/14							
Calcium	22.0	0.010	1.0	mg/l	5.88	19.2	48.1	70-130	2.69	20	QM-01
Magnesium	13.5	0.0080	1.0	"	8.00	7.91	69.6	70-130	7.22	20	
Potassium	16.9	0.0080	1.0	"	8.00	11.1	71.9	70-130	1.29	20	
Sodium	68.2	0.020	1.0	"	8.00	74.1	NR	70-130	6.98	20	QM-4X

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40726 - EPA 200.8											
Blank (AB40726-BLK1)					Prepared: 02/07/14 Analyzed: 02/12/14						
Aluminum	ND	2.0	50	ug/l							U
Antimony	ND	0.020	6.0	"							U
Arsenic	ND	0.070	2.0	"							U
Barium	ND	0.030	100	"							U
Beryllium	ND	0.020	1.0	"							U
Boron	9.55	6.0	50	"							J
Cadmium	ND	0.020	1.0	"							U
Chromium	ND	0.080	10	"							U
Copper	ND	0.040	0.50	"							U
Iron	ND	1.8	50	"							U
Lead	ND	0.020	5.0	"							U
Manganese	ND	0.030	5.0	"							U
Nickel	ND	0.060	10	"							U
Selenium	ND	0.070	5.0	"							U
Silver	ND	0.020	0.10	"							U
Thallium	ND	0.020	1.0	"							U
Uranium	ND	0.020	1.0	pCi/l							U
Vanadium	ND	0.30	1.0	ug/l							U
Zinc	1.22	0.50	5.0	"							J
LCS (AB40726-BS1)					Prepared: 02/07/14 Analyzed: 02/12/14						
Aluminum	495	2.0	50	ug/l	520		95.2	85-115			
Antimony	21.3	0.020	6.0	"	20.0		107	85-115			
Arsenic	20.2	0.070	2.0	"	20.0		101	85-115			
Barium	20.4	0.030	100	"	20.0		102	85-115			J
Beryllium	18.8	0.020	1.0	"	20.0		93.8	85-115			
Boron	103	6.0	50	"	100		103	85-115			
Cadmium	20.5	0.020	1.0	"	20.0		103	85-115			
Chromium	20.6	0.080	10	"	20.0		103	85-115			
Copper	19.9	0.040	0.50	"	20.0		99.5	85-115			
Iron	519	1.8	50	"	520		99.9	85-115			
Lead	19.9	0.020	5.0	"	20.0		99.6	85-115			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40726 - EPA 200.8											
LCS (AB40726-BS1)					Prepared: 02/07/14 Analyzed: 02/12/14						
Manganese	19.6	0.030	5.0	ug/l	20.0		98.0	85-115			
Nickel	20.0	0.060	10	"	20.0		100	85-115			
Selenium	20.2	0.070	5.0	"	20.0		101	85-115			
Silver	19.9	0.020	0.10	"	20.0		99.5	85-115			
Thallium	19.5	0.020	1.0	"	20.0		97.3	85-115			
Uranium	13.3	0.020	1.0	pCi/l	13.4		99.0	85-115			
Vanadium	21.2	0.30	1.0	ug/l	20.0		106	85-115			
Zinc	103	0.50	5.0	"	100		103	85-115			
Duplicate (AB40726-DUP1)		**Source: 14B0232-03**			Prepared: 02/07/14 Analyzed: 02/12/14						
Aluminum	19.5	2.0	50	ug/l		21.2			8.39	20	J
Antimony	0.0245	0.020	6.0	"		ND				20	J
Arsenic	0.177	0.070	2.0	"		0.282			46.0	20	J
Barium	115	0.030	100	"		109			5.21	20	
Beryllium	ND	0.020	1.0	"		ND				20	U
Boron	86.2	6.0	50	"		81.2			5.97	20	
Cadmium	0.0302	0.020	1.0	"		0.0263			13.8	20	J
Chromium	2.92	0.080	10	"		2.77			5.15	20	J
Copper	4.97	0.040	0.50	"		4.85			2.38	20	
Iron	39.0	1.8	50	"		40.4			3.68	20	J
Lead	0.260	0.020	5.0	"		0.237			9.27	20	J
Manganese	0.583	0.030	5.0	"		0.540			7.53	20	J
Nickel	2.33	0.060	10	"		2.42			4.00	20	J
Selenium	0.824	0.070	5.0	"		0.983			17.6	20	J
Silver	0.0411	0.020	0.10	"		ND				20	J
Thallium	ND	0.020	1.0	"		ND				20	U
Uranium	0.735	0.020	1.0	pCi/l		0.685			7.04	20	J
Vanadium	2.43	0.30	1.0	ug/l		2.37			2.73	20	
Zinc	5.83	0.50	5.0	"		5.95			2.04	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40726 - EPA 200.8											
Matrix Spike (AB40726-MS1)		**Source: 14B0232-03**			Prepared: 02/07/14 Analyzed: 02/12/14						
Aluminum	484	2.0	50	ug/l	520	21.2	88.9	70-130			
Antimony	20.8	0.020	6.0	"	20.0	ND	104	70-130			
Arsenic	20.1	0.070	2.0	"	20.0	0.282	98.9	70-130			
Barium	131	0.030	100	"	20.0	109	112	70-130			
Beryllium	18.3	0.020	1.0	"	20.0	ND	91.4	70-130			
Boron	160	6.0	50	"	100	81.2	78.8	70-130			
Cadmium	19.3	0.020	1.0	"	20.0	0.0263	96.1	70-130			
Chromium	21.7	0.080	10	"	20.0	2.77	94.6	70-130			
Copper	22.6	0.040	0.50	"	20.0	4.85	88.9	70-130			
Iron	521	1.8	50	"	520	40.4	92.4	70-130			
Lead	18.3	0.020	5.0	"	20.0	0.237	90.2	70-130			
Manganese	18.5	0.030	5.0	"	20.0	0.540	90.0	70-130			
Nickel	20.0	0.060	10	"	20.0	2.42	88.1	70-130			
Selenium	19.9	0.070	5.0	"	20.0	0.983	94.4	70-130			
Silver	18.6	0.020	0.10	"	20.0	ND	93.0	70-130			
Thallium	18.1	0.020	1.0	"	20.0	ND	90.5	70-130			
Uranium	13.3	0.020	1.0	pCi/l	13.4	0.685	94.0	70-130			
Vanadium	21.7	0.30	1.0	ug/l	20.0	2.37	96.9	70-130			
Zinc	96.9	0.50	5.0	"	100	5.95	91.0	70-130			
Matrix Spike (AB40726-MS2)		**Source: 14B0330-01**			Prepared: 02/07/14 Analyzed: 02/12/14						
Aluminum	545	2.0	50	ug/l	520	57.9	93.7	70-130			
Antimony	21.7	0.020	6.0	"	20.0	0.139	108	70-130			
Arsenic	22.6	0.070	2.0	"	20.0	1.84	104	70-130			
Barium	118	0.030	100	"	20.0	93.6	120	70-130			
Beryllium	20.0	0.020	1.0	"	20.0	ND	100	70-130			
Cadmium	20.2	0.020	1.0	"	20.0	ND	101	70-130			
Chromium	19.9	0.080	10	"	20.0	0.205	98.6	70-130			
Copper	19.4	0.040	0.50	"	20.0	0.544	94.3	70-130			
Iron	687	1.8	50	"	520	176	98.3	70-130			
Lead	18.8	0.020	5.0	"	20.0	0.0775	93.6	70-130			
Manganese	36.1	0.030	5.0	"	20.0	16.0	101	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40726 - EPA 200.8											
Matrix Spike (AB40726-MS2)		**Source: 14B0330-01**			Prepared: 02/07/14 Analyzed: 02/12/14						
Nickel	21.3	0.060	10	ug/l	20.0	2.33	94.9	70-130			
Selenium	20.2	0.070	5.0	"	20.0	0.0863	100	70-130			
Silver	19.5	0.020	0.10	"	20.0	ND	97.7	70-130			
Thallium	18.9	0.020	1.0	"	20.0	ND	94.3	70-130			
Uranium	12.9	0.020	1.0	pCi/l	13.4	0.0495	95.7	70-130			
Vanadium	21.4	0.30	1.0	ug/l	20.0	1.10	102	70-130			
Zinc	98.4	0.50	5.0	"	100	1.65	96.7	70-130			
Matrix Spike Dup (AB40726-MSD1)		**Source: 14B0232-03**			Prepared: 02/07/14 Analyzed: 02/12/14						
Aluminum	500	2.0	50	ug/l	520	21.2	92.1	70-130	3.42	20	
Antimony	21.5	0.020	6.0	"	20.0	ND	108	70-130	3.44	20	
Arsenic	20.7	0.070	2.0	"	20.0	0.282	102	70-130	3.08	20	
Barium	134	0.030	100	"	20.0	109	126	70-130	2.17	20	
Beryllium	18.8	0.020	1.0	"	20.0	ND	94.2	70-130	3.07	20	
Boron	162	6.0	50	"	100	81.2	81.2	70-130	1.55	20	
Cadmium	19.9	0.020	1.0	"	20.0	0.0263	99.4	70-130	3.34	20	
Chromium	22.3	0.080	10	"	20.0	2.77	97.6	70-130	2.72	20	
Copper	23.4	0.040	0.50	"	20.0	4.85	92.5	70-130	3.11	20	
Iron	537	1.8	50	"	520	40.4	95.5	70-130	3.02	20	
Lead	18.9	0.020	5.0	"	20.0	0.237	93.2	70-130	3.25	20	
Manganese	19.0	0.030	5.0	"	20.0	0.540	92.3	70-130	2.38	20	
Nickel	20.9	0.060	10	"	20.0	2.42	92.6	70-130	4.33	20	
Selenium	20.3	0.070	5.0	"	20.0	0.983	96.7	70-130	2.31	20	
Silver	19.0	0.020	0.10	"	20.0	ND	95.1	70-130	2.25	20	
Thallium	18.5	0.020	1.0	"	20.0	ND	92.4	70-130	2.01	20	
Uranium	13.7	0.020	1.0	pCi/l	13.4	0.685	97.0	70-130	3.01	20	
Vanadium	22.8	0.30	1.0	ug/l	20.0	2.37	102	70-130	4.69	20	
Zinc	100	0.50	5.0	"	100	5.95	94.2	70-130	3.33	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40440 - General Preparation											
Blank (AB40440-BLK1)					Prepared & Analyzed: 02/03/14						
Turbidity	ND	0.040	0.10	NTU							U
Duplicate (AB40440-DUP1)		**Source: 14B0115-02**			Prepared & Analyzed: 02/03/14						
Turbidity	2.42	0.040	0.10	NTU		2.42			0.00	30	
Batch AB40448 - General Preparation											
Duplicate (AB40448-DUP1)		**Source: 14B0118-01**			Prepared & Analyzed: 02/04/14						
Specific Conductance (EC)	197	1.0	20	umhos/cm		200			1.51	10	
Batch AB40515 - General Preparation											
Blank (AB40515-BLK1)					Prepared: 02/05/14 Analyzed: 02/10/14						
Total Dissolved Solids	ND	5.0	10	mg/l							U
Duplicate (AB40515-DUP1)		**Source: 14B0089-01**			Prepared: 02/05/14 Analyzed: 02/10/14						
Total Dissolved Solids	464	5.0	10	mg/l		464			0.00	30	
Duplicate (AB40515-DUP2)		**Source: 14B0098-03**			Prepared: 02/05/14 Analyzed: 02/10/14						
Total Dissolved Solids	496	5.0	10	mg/l		526			5.87	30	
Batch AB40528 - General Preparation											
Blank (AB40528-BLK1)					Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l							U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40528 - General Preparation											
LCS (AB40528-BS1)					Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	0.215	0.030	0.050	mg/l	0.200		108	80-120			
Duplicate (AB40528-DUP1)		**Source: 14B0089-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l		ND				20	U
Matrix Spike (AB40528-MS1)		**Source: 14B0089-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	0.212	0.030	0.050	mg/l	0.200	ND	106	80-120			
Matrix Spike Dup (AB40528-MSD1)		**Source: 14B0089-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	0.208	0.030	0.050	mg/l	0.200	ND	104	80-120	1.63	20	
Batch AB40803 - General Prep											
Blank (AB40803-BLK1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	ND	0.100	0.300	mg/l							U
LCS (AB40803-BS1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.6	0.100	0.300	mg/l	10.0		106	85-115			
LCS Dup (AB40803-BSD1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.5	0.100	0.300	mg/l	10.0		105	85-115	1.20	20	
Duplicate (AB40803-DUP1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	ND	0.100	0.300	mg/l		0.112				20	U
Matrix Spike (AB40803-MS1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.7	0.100	0.300	mg/l	10.0	0.112	106	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40803 - General Prep											
Matrix Spike Dup (AB40803-MSD1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.4	0.100	0.300	mg/l	10.0	0.112	102	70-130	3.54	20	
Batch AB41141 - General Preparation											
Blank (AB41141-BLK1)					Prepared & Analyzed: 02/11/14						
Perchlorate	0.967	0.90	4.0	ug/l							J
LCS (AB41141-BS1)					Prepared & Analyzed: 02/11/14						
Perchlorate	23.9	0.90	4.0	ug/l	25.0		95.5	85-115			
Duplicate (AB41141-DUP1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	ND	0.90	4.0	ug/l		ND				15	U
Matrix Spike (AB41141-MS1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130			
Matrix Spike Dup (AB41141-MSD1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130	0.00386	15	
Batch AB41221 - General Preparation											
Duplicate (AB41221-DUP1)		**Source: 14B0313-04**			Prepared & Analyzed: 02/12/14						
Bicarbonate	354	0.060	5.0	mg/l		360			1.71	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Miscellaneous Physical/Conventional Chemistry Parameters - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40428 - General Preparation											
Blank (AB40428-BLK1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l							U
LCS (AB40428-BS1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.202	0.0020	0.10	mg/l	0.200		101	85-115			
Duplicate (AB40428-DUP1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l		ND				25	U
Matrix Spike (AB40428-MS1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.188	0.0020	0.10	mg/l	0.200	ND	93.9	85-115			
Matrix Spike (AB40428-MS2)		**Source: 14A1635-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.220	0.0020	0.10	mg/l	0.200	ND	110	85-115			
Matrix Spike Dup (AB40428-MSD1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.186	0.0020	0.10	mg/l	0.200	ND	92.8	85-115	1.23	25	

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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40426 - General Preparation											
Blank (AB40426-BLK1)					Prepared & Analyzed: 02/04/14						
Nitrate as NO3	ND	0.20	2.0	mg/l							U
Sulfate as SO4	ND	0.090	0.50	"							U
Chloride	ND	0.030	0.50	"							U
Nitrite as N	ND	0.020	0.40	"							U
Fluoride	ND	0.070	0.10	"							U
LCS (AB40426-BS1)					Prepared & Analyzed: 02/04/14						
Nitrate as NO3	23	0.20	2.0	mg/l	22.2		102	90-110			
Nitrite as N	5.22	0.020	0.40	"	5.00		104	90-110			
Fluoride	5.18	0.070	0.10	"	5.00		104	90-110			
Chloride	10.2	0.030	0.50	"	10.0		102	90-110			
Sulfate as SO4	20.2	0.090	0.50	"	20.0		101	90-110			
Duplicate (AB40426-DUP1)		**Source: 14B0093-01**			Prepared & Analyzed: 02/04/14						
Nitrate as NO3	13	0.20	2.0	mg/l		13			0.107	20	
Nitrite as N	ND	0.020	0.40	"		ND				20	U
Chloride	59.0	0.15	2.5	"		59.0			0.0678	20	
Fluoride	ND	0.070	0.10	"		ND				20	U
Sulfate as SO4	13.8	0.090	0.50	"		13.8			0.0434	20	
Matrix Spike (AB40426-MS1)		**Source: 14B0093-01**			Prepared & Analyzed: 02/04/14						
Nitrate as NO3	37	1.0	10	mg/l	24.7	13	95.4	80-120			
Fluoride	4.92	0.35	0.50	"	5.56	ND	88.6	80-120			
Chloride	70.5	0.15	2.5	"	11.1	59.0	104	80-120			
Sulfate as SO4	34.8	0.45	2.5	"	22.2	13.8	94.4	80-120			
Nitrite as N	5.39	0.10	2.0	"	5.56	ND	97.0	80-120			
Matrix Spike (AB40426-MS2)		**Source: 14B0115-02**			Prepared & Analyzed: 02/04/14						
Nitrate as NO3	24	1.0	10	mg/l	24.7	0.67	96.5	80-120			
Chloride	20.9	0.15	2.5	"	11.1	9.42	103	80-120			
Nitrite as N	5.44	0.10	2.0	"	5.56	ND	98.0	80-120			
Sulfate as SO4	53.5	0.45	2.5	"	22.2	32.9	92.7	80-120			
Fluoride	5.07	0.35	0.50	"	5.56	0.107	89.4	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40426 - General Preparation											
Matrix Spike Dup (AB40426-MSD1)		**Source: 14B0093-01**		Prepared & Analyzed: 02/04/14							
Nitrate as NO3	37	1.0	10	mg/l	24.7	13	95.6	80-120	0.136	20	
Sulfate as SO4	34.9	0.45	2.5	"	22.2	13.8	94.7	80-120	0.223	20	
Nitrite as N	5.42	0.10	2.0	"	5.56	ND	97.5	80-120	0.514	20	
Fluoride	4.94	0.35	0.50	"	5.56	ND	89.0	80-120	0.450	20	
Chloride	70.5	0.15	2.5	"	11.1	59.0	104	80-120	0.0473	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
Acetone	ND	0.80	5.0	ug/l							U
Acrylonitrile	ND	0.20	5.0	"							U
Benzene	ND	0.20	0.30	"							U
Bromobenzene	ND	0.10	0.50	"							U
Bromochloromethane	ND	0.20	0.50	"							U
Bromodichloromethane	ND	0.50	0.50	"							U
Bromoform	ND	0.50	0.50	"							U
Bromomethane	ND	0.20	0.50	"							U
n-Butylbenzene	ND	0.10	0.50	"							U
sec-Butylbenzene	ND	0.10	0.50	"							U
tert-Butylbenzene	ND	0.10	0.50	"							U
Carbon disulfide	ND	0.20	0.50	"							U
Carbon tetrachloride	ND	0.30	0.50	"							U
Chlorobenzene	ND	0.20	0.50	"							U
Chloroethane	ND	0.10	0.50	"							U
Chloroform	ND	0.50	0.50	"							U
Chloromethane	ND	0.20	0.50	"							U
2-Chlorotoluene	ND	0.20	0.50	"							U
4-Chlorotoluene	ND	0.10	0.50	"							U
Dibromochloromethane	ND	0.50	0.50	"							U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"							U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"							U
Dibromomethane	ND	0.20	0.50	"							U
1,2-Dichlorobenzene	ND	0.20	0.50	"							U
1,3-Dichlorobenzene	ND	0.20	0.50	"							U
1,4-Dichlorobenzene	ND	0.10	0.50	"							U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"							U
Dichlorodifluoromethane	ND	0.20	0.50	"							U
1,1-Dichloroethane	ND	0.10	0.50	"							U
1,2-Dichloroethane	ND	0.20	0.50	"							U
1,1-Dichloroethene	ND	0.10	0.30	"							U
cis-1,2-Dichloroethene	ND	0.20	0.50	"							U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
trans-1,2-Dichloroethene	ND	0.20	0.50	ug/l							U
1,2-Dichloropropane	ND	0.20	0.50	"							U
1,3-Dichloropropane	ND	0.20	0.50	"							U
2,2-Dichloropropane	ND	0.10	0.50	"							U
1,1-Dichloropropene	ND	0.10	0.50	"							U
cis-1,3-Dichloropropene	ND	0.20	0.50	"							U
trans-1,3-Dichloropropene	ND	0.20	0.50	"							U
1,3-Dichloropropene (total)	ND	0.20	0.50	"							U
Ethylbenzene	ND	0.10	0.50	"							U
2-Hexanone	ND	0.097	5.0	"							U
Hexachlorobutadiene	ND	0.30	0.50	"							U
Isopropylbenzene	ND	0.20	0.50	"							U
p-Isopropyltoluene	ND	0.10	0.50	"							U
Methyl ethyl ketone	ND	0.40	1.0	"							U
Methyl iodide	ND	0.12	2.0	"							U
Methyl isobutyl ketone	ND	0.30	1.0	"							U
Methylene chloride	ND	0.40	0.50	"							U
Naphthalene	ND	0.20	0.50	"							U
n-Propylbenzene	ND	0.20	0.50	"							U
Styrene	ND	0.10	0.50	"							U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"							U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"							U
Tetrachloroethene	ND	0.20	0.50	"							U
Toluene	ND	0.10	0.50	"							U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"							U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"							U
1,1,1-Trichloroethane	ND	0.20	0.50	"							U
1,1,2-Trichloroethane	ND	0.20	0.50	"							U
Trichloroethene	ND	0.20	0.50	"							U
Trichlorofluoromethane	ND	0.20	0.50	"							U
Trichlorotrifluoroethane	ND	0.20	0.50	"							U
1,2,3-Trichloropropane	ND	0.13	0.50	"							U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
1,2,4-Trimethylbenzene	ND	0.10	0.50	ug/l							U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"							U
Vinyl chloride	ND	0.10	0.50	"							U
m,p-Xylene	ND	0.20	0.50	"							U
o-Xylene	ND	0.10	0.50	"							U
Xylenes (total)	ND	0.20	0.50	"							U
Trihalomethanes (total)	ND	0.50	0.50	"							U
Methyl tert-butyl ether	ND	0.50	0.50	"							U
Ethyl tert-butyl ether	ND	0.20	0.50	"							U
Tert-amyl methyl ether	ND	0.20	0.50	"							U
Surrogate: Bromofluorobenzene	*25.0*			*"*	*25.0*		*99.8*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*95.9*	*70-130*			
Surrogate: Toluene-d8	*25.4*			*"*	*25.0*		*102*	*70-130*			
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
Acetone	24.1	0.80	5.0	ug/l	20.0		120	70-130			
Acrylonitrile	5.73	0.20	5.0	"	5.00		115	70-130			
Benzene	4.88	0.20	0.30	"	5.00		97.6	70-130			
Bromobenzene	5.19	0.10	0.50	"	5.00		104	70-130			
Bromochloromethane	5.11	0.20	0.50	"	5.00		102	70-130			
Bromodichloromethane	4.65	0.50	0.50	"	5.00		93.0	70-130			
Bromoform	4.58	0.50	0.50	"	5.00		91.6	70-130			
Bromomethane	5.43	0.20	0.50	"	5.00		109	70-130			
n-Butylbenzene	5.09	0.10	0.50	"	5.00		102	70-130			
sec-Butylbenzene	5.06	0.10	0.50	"	5.00		101	70-130			
tert-Butylbenzene	5.24	0.10	0.50	"	5.00		105	70-130			
Carbon disulfide	4.99	0.20	0.50	"	5.00		99.8	70-130			
Carbon tetrachloride	4.76	0.30	0.50	"	5.00		95.2	70-130			
Chlorobenzene	5.07	0.20	0.50	"	5.00		101	70-130			
Chloroethane	5.33	0.10	0.50	"	5.00		107	70-130			
Chloroform	4.92	0.50	0.50	"	5.00		98.4	70-130			
Chloromethane	6.12	0.20	0.50	"	5.00		122	70-130			

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
2-Chlorotoluene	5.26	0.20	0.50	ug/l	5.00		105	70-130			
4-Chlorotoluene	4.99	0.10	0.50	"	5.00		99.8	70-130			
Dibromochloromethane	4.81	0.50	0.50	"	5.00		96.2	70-130			
1,2-Dibromo-3-chloropropane	4.94	0.36	0.50	"	5.00		98.8	70-130			
1,2-Dibromoethane (EDB)	5.23	0.14	0.50	"	5.00		105	70-130			
Dibromomethane	4.94	0.20	0.50	"	5.00		98.8	70-130			
1,2-Dichlorobenzene	4.86	0.20	0.50	"	5.00		97.2	70-130			
1,3-Dichlorobenzene	5.18	0.20	0.50	"	5.00		104	70-130			
1,4-Dichlorobenzene	4.96	0.10	0.50	"	5.00		99.2	70-130			
trans-1,4-Dichloro-2-butene	4.74	0.095	5.0	"	5.00		94.8	70-130			J
Dichlorodifluoromethane	6.14	0.20	0.50	"	5.00		123	70-130			
1,1-Dichloroethane	5.10	0.10	0.50	"	5.00		102	70-130			
1,2-Dichloroethane	4.93	0.20	0.50	"	5.00		98.6	70-130			
1,1-Dichloroethene	4.96	0.10	0.30	"	5.00		99.2	70-130			
cis-1,2-Dichloroethene	5.01	0.20	0.50	"	5.00		100	70-130			
trans-1,2-Dichloroethene	4.99	0.20	0.50	"	5.00		99.8	70-130			
1,2-Dichloropropane	4.83	0.20	0.50	"	5.00		96.6	70-130			
1,3-Dichloropropane	5.09	0.20	0.50	"	5.00		102	70-130			
2,2-Dichloropropane	4.57	0.10	0.50	"	5.00		91.4	70-130			
1,1-Dichloropropene	4.65	0.10	0.50	"	5.00		93.0	70-130			
cis-1,3-Dichloropropene	4.66	0.20	0.50	"	5.00		93.2	70-130			
trans-1,3-Dichloropropene	4.58	0.20	0.50	"	5.00		91.6	70-130			
Ethylbenzene	5.06	0.10	0.50	"	5.00		101	70-130			
2-Hexanone	5.38	0.097	5.0	"	5.00		108	70-130			
Hexachlorobutadiene	4.93	0.30	0.50	"	5.00		98.6	70-130			
Isopropylbenzene	5.33	0.20	0.50	"	5.00		107	70-130			
p-Isopropyltoluene	5.25	0.10	0.50	"	5.00		105	70-130			
Methyl ethyl ketone	10.5	0.40	1.0	"	10.0		105	70-130			
Methyl iodide	5.04	0.12	2.0	"	5.00		101	70-130			
Methyl isobutyl ketone	10.3	0.30	1.0	"	10.0		103	70-130			
Methylene chloride	4.10	0.40	0.50	"	5.00		82.0	70-130			
Naphthalene	5.01	0.20	0.50	"	5.00		100	70-130			

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
n-Propylbenzene	5.43	0.20	0.50	ug/l	5.00		109	70-130			
Styrene	5.32	0.10	0.50	"	5.00		106	70-130			
1,1,1,2-Tetrachloroethane	4.86	0.20	0.50	"	5.00		97.2	70-130			
1,1,2,2-Tetrachloroethane	5.08	0.20	0.50	"	5.00		102	70-130			
Tetrachloroethene	5.11	0.20	0.50	"	5.00		102	70-130			
Toluene	5.21	0.10	0.50	"	5.00		104	70-130			
1,2,3-Trichlorobenzene	5.08	0.10	0.50	"	5.00		102	70-130			
1,2,4-Trichlorobenzene	5.00	0.20	0.50	"	5.00		100	70-130			
1,1,1-Trichloroethane	4.89	0.20	0.50	"	5.00		97.8	70-130			
1,1,2-Trichloroethane	5.09	0.20	0.50	"	5.00		102	70-130			
Trichloroethene	4.93	0.20	0.50	"	5.00		98.6	70-130			
Trichlorofluoromethane	5.14	0.20	0.50	"	5.00		103	70-130			
Trichlorotrifluoroethane	5.56	0.20	0.50	"	5.00		111	70-130			
1,2,3-Trichloropropane	5.03	0.13	0.50	"	5.00		101	70-130			
1,2,4-Trimethylbenzene	5.36	0.10	0.50	"	5.00		107	70-130			
1,3,5-Trimethylbenzene	5.36	0.10	0.50	"	5.00		107	70-130			
Vinyl chloride	5.40	0.10	0.50	"	5.00		108	70-130			
m,p-Xylene	10.2	0.20	0.50	"	10.0		102	70-130			
o-Xylene	5.24	0.10	0.50	"	5.00		105	70-130			
Xylenes (total)	15.4	0.20	0.50	"	15.0		103	70-130			
Methyl tert-butyl ether	4.89	0.50	0.50	"	5.00		97.8	70-130			
Ethyl tert-butyl ether	4.85	0.20	0.50	"	5.00		97.0	70-130			
Tert-amyl methyl ether	4.93	0.20	0.50	"	5.00		98.6	70-130			
Surrogate: Bromofluorobenzene	*25.6*			*"*	*25.0*		*102*	*70-130*			
Surrogate: Dibromofluoromethane	*24.7*			*"*	*25.0*		*98.7*	*70-130*			
Surrogate: Toluene-d8	*25.3*			*"*	*25.0*		*101*	*70-130*			
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Acetone	22.4	0.80	5.0	ug/l	20.0		112	70-130	7.28	30	
Acrylonitrile	5.77	0.20	5.0	"	5.00		115	70-130	0.696	30	
Benzene	4.70	0.20	0.30	"	5.00		94.0	70-130	3.76	30	
Bromobenzene	5.09	0.10	0.50	"	5.00		102	70-130	1.95	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Bromochloromethane	4.92	0.20	0.50	ug/l	5.00		98.4	70-130	3.79	30	
Bromodichloromethane	4.56	0.50	0.50	"	5.00		91.2	70-130	1.95	30	
Bromoform	4.71	0.50	0.50	"	5.00		94.2	70-130	2.80	30	
Bromomethane	5.46	0.20	0.50	"	5.00		109	70-130	0.551	30	
n-Butylbenzene	4.88	0.10	0.50	"	5.00		97.6	70-130	4.21	30	
sec-Butylbenzene	5.00	0.10	0.50	"	5.00		100	70-130	1.19	30	
tert-Butylbenzene	5.15	0.10	0.50	"	5.00		103	70-130	1.73	30	
Carbon disulfide	4.83	0.20	0.50	"	5.00		96.6	70-130	3.26	30	
Carbon tetrachloride	4.64	0.30	0.50	"	5.00		92.8	70-130	2.55	30	
Chlorobenzene	5.01	0.20	0.50	"	5.00		100	70-130	1.19	30	
Chloroethane	5.12	0.10	0.50	"	5.00		102	70-130	4.02	30	
Chloroform	4.84	0.50	0.50	"	5.00		96.8	70-130	1.64	30	
Chloromethane	5.86	0.20	0.50	"	5.00		117	70-130	4.34	30	
2-Chlorotoluene	5.27	0.20	0.50	"	5.00		105	70-130	0.190	30	
4-Chlorotoluene	5.07	0.10	0.50	"	5.00		101	70-130	1.59	30	
Dibromochloromethane	4.72	0.50	0.50	"	5.00		94.4	70-130	1.89	30	
1,2-Dibromo-3-chloropropane	4.95	0.36	0.50	"	5.00		99.0	70-130	0.202	25	
1,2-Dibromoethane (EDB)	5.17	0.14	0.50	"	5.00		103	70-130	1.15	25	
Dibromomethane	5.07	0.20	0.50	"	5.00		101	70-130	2.60	30	
1,2-Dichlorobenzene	4.70	0.20	0.50	"	5.00		94.0	70-130	3.35	30	
1,3-Dichlorobenzene	5.10	0.20	0.50	"	5.00		102	70-130	1.56	30	
1,4-Dichlorobenzene	4.87	0.10	0.50	"	5.00		97.4	70-130	1.83	30	
trans-1,4-Dichloro-2-butene	4.90	0.095	5.0	"	5.00		98.0	70-130	3.32	25	J
Dichlorodifluoromethane	5.94	0.20	0.50	"	5.00		119	70-130	3.31	30	
1,1-Dichloroethane	4.86	0.10	0.50	"	5.00		97.2	70-130	4.82	30	
1,2-Dichloroethane	4.84	0.20	0.50	"	5.00		96.8	70-130	1.84	30	
1,1-Dichloroethene	4.67	0.10	0.30	"	5.00		93.4	70-130	6.02	30	
cis-1,2-Dichloroethene	4.85	0.20	0.50	"	5.00		97.0	70-130	3.25	30	
trans-1,2-Dichloroethene	4.78	0.20	0.50	"	5.00		95.6	70-130	4.30	30	
1,2-Dichloropropane	4.88	0.20	0.50	"	5.00		97.6	70-130	1.03	30	
1,3-Dichloropropane	5.07	0.20	0.50	"	5.00		101	70-130	0.394	30	
2,2-Dichloropropane	4.36	0.10	0.50	"	5.00		87.2	70-130	4.70	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
1,1-Dichloropropene	4.56	0.10	0.50	ug/l	5.00		91.2	70-130	1.95	30	
cis-1,3-Dichloropropene	4.68	0.20	0.50	"	5.00		93.6	70-130	0.428	30	
trans-1,3-Dichloropropene	4.74	0.20	0.50	"	5.00		94.8	70-130	3.43	30	
2-Hexanone	5.44	0.097	5.0	"	5.00		109	70-130	1.11	25	
Ethylbenzene	4.96	0.10	0.50	"	5.00		99.2	70-130	2.00	30	
Hexachlorobutadiene	4.64	0.30	0.50	"	5.00		92.8	70-130	6.06	30	
Isopropylbenzene	5.24	0.20	0.50	"	5.00		105	70-130	1.70	30	
p-Isopropyltoluene	5.08	0.10	0.50	"	5.00		102	70-130	3.29	30	
Methyl ethyl ketone	11.0	0.40	1.0	"	10.0		110	70-130	4.74	30	
Methyl iodide	4.90	0.12	2.0	"	5.00		98.0	70-130	2.82	25	
Methyl isobutyl ketone	10.4	0.30	1.0	"	10.0		104	70-130	0.679	30	
Methylene chloride	4.06	0.40	0.50	"	5.00		81.2	70-130	0.980	30	
Naphthalene	4.96	0.20	0.50	"	5.00		99.2	70-130	1.00	30	
n-Propylbenzene	5.47	0.20	0.50	"	5.00		109	70-130	0.734	30	
Styrene	5.28	0.10	0.50	"	5.00		106	70-130	0.755	30	
1,1,1,2-Tetrachloroethane	4.77	0.20	0.50	"	5.00		95.4	70-130	1.87	30	
1,1,2,2-Tetrachloroethane	5.14	0.20	0.50	"	5.00		103	70-130	1.17	30	
Tetrachloroethene	4.82	0.20	0.50	"	5.00		96.4	70-130	5.84	30	
Toluene	5.15	0.10	0.50	"	5.00		103	70-130	1.16	30	
1,2,3-Trichlorobenzene	4.99	0.10	0.50	"	5.00		99.8	70-130	1.79	30	
1,2,4-Trichlorobenzene	4.83	0.20	0.50	"	5.00		96.6	70-130	3.46	30	
1,1,1-Trichloroethane	4.70	0.20	0.50	"	5.00		94.0	70-130	3.96	30	
1,1,2-Trichloroethane	5.20	0.20	0.50	"	5.00		104	70-130	2.14	30	
Trichloroethene	4.67	0.20	0.50	"	5.00		93.4	70-130	5.42	30	
Trichlorofluoromethane	5.01	0.20	0.50	"	5.00		100	70-130	2.56	30	
Trichlorotrifluoroethane	5.29	0.20	0.50	"	5.00		106	70-130	4.98	30	
1,2,3-Trichloropropane	5.09	0.13	0.50	"	5.00		102	70-130	1.19	25	
1,2,4-Trimethylbenzene	5.28	0.10	0.50	"	5.00		106	70-130	1.50	30	
1,3,5-Trimethylbenzene	5.28	0.10	0.50	"	5.00		106	70-130	1.50	30	
Vinyl chloride	5.27	0.10	0.50	"	5.00		105	70-130	2.44	30	
m,p-Xylene	10.1	0.20	0.50	"	10.0		101	70-130	0.888	30	
o-Xylene	5.11	0.10	0.50	"	5.00		102	70-130	2.51	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Xylenes (total)	15.2	0.20	0.50	ug/l	15.0		101	70-130	1.44	30	
Methyl tert-butyl ether	4.81	0.50	0.50	"	5.00		96.2	70-130	1.65	30	
Ethyl tert-butyl ether	5.20	0.20	0.50	"	5.00		104	70-130	6.97	30	
Tert-amyl methyl ether	4.85	0.20	0.50	"	5.00		97.0	70-130	1.64	30	
Surrogate: Bromofluorobenzene	*25.4*			*"*	*25.0*		*102*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*96.1*	*70-130*			
Surrogate: Toluene-d8	*25.2*			*"*	*25.0*		*101*	*70-130*			
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Acetone	26.9	0.80	5.0	ug/l	20.0	1.79	126	70-130			
Acrylonitrile	5.81	0.20	5.0	"	5.00	ND	116	70-130			
Benzene	5.43	0.20	0.30	"	5.00	ND	109	70-130			
Bromobenzene	5.48	0.10	0.50	"	5.00	ND	110	70-130			
Bromochloromethane	5.55	0.20	0.50	"	5.00	ND	111	70-130			
Bromodichloromethane	10.0	0.50	0.50	"	5.00	4.42	112	70-130			
Bromoform	4.44	0.50	0.50	"	5.00	ND	88.8	70-130			
Bromomethane	6.20	0.20	0.50	"	5.00	ND	124	70-130			
n-Butylbenzene	5.03	0.10	0.50	"	5.00	ND	101	70-130			
sec-Butylbenzene	5.41	0.10	0.50	"	5.00	ND	108	70-130			
tert-Butylbenzene	5.60	0.10	0.50	"	5.00	ND	112	70-130			
Carbon disulfide	5.36	0.20	0.50	"	5.00	ND	107	70-130			
Carbon tetrachloride	4.97	0.30	0.50	"	5.00	ND	99.4	70-130			
Chlorobenzene	5.35	0.20	0.50	"	5.00	ND	107	70-130			
Chloroethane	6.00	0.10	0.50	"	5.00	ND	120	70-130			
Chloroform	35.3	0.50	0.50	"	5.00	31.5	76.2	70-130			
Chloromethane	6.60	0.20	0.50	"	5.00	ND	132	70-130			QM-05
2-Chlorotoluene	5.65	0.20	0.50	"	5.00	ND	113	70-130			
4-Chlorotoluene	5.61	0.10	0.50	"	5.00	ND	112	70-130			
Dibromochloromethane	4.80	0.50	0.50	"	5.00	ND	96.0	70-130			
1,2-Dibromo-3-chloropropane	4.62	0.36	0.50	"	5.00	ND	92.4	70-130			
1,2-Dibromoethane (EDB)	5.29	0.14	0.50	"	5.00	ND	106	70-130			
Dibromomethane	5.47	0.20	0.50	"	5.00	ND	109	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
1,2-Dichlorobenzene	4.95	0.20	0.50	ug/l	5.00	ND	99.0	70-130			
1,3-Dichlorobenzene	5.47	0.20	0.50	"	5.00	ND	109	70-130			
1,4-Dichlorobenzene	5.16	0.10	0.50	"	5.00	ND	103	70-130			
trans-1,4-Dichloro-2-butene	5.53	0.095	5.0	"	5.00	ND	111	70-130			
Dichlorodifluoromethane	6.69	0.20	0.50	"	5.00	ND	134	70-130			QM-05
1,1-Dichloroethane	5.61	0.10	0.50	"	5.00	ND	112	70-130			
1,2-Dichloroethane	5.51	0.20	0.50	"	5.00	ND	110	70-130			
1,1-Dichloroethene	5.37	0.10	0.30	"	5.00	ND	107	70-130			
cis-1,2-Dichloroethene	5.51	0.20	0.50	"	5.00	ND	110	70-130			
trans-1,2-Dichloroethene	5.31	0.20	0.50	"	5.00	ND	106	70-130			
1,2-Dichloropropane	5.29	0.20	0.50	"	5.00	ND	106	70-130			
1,3-Dichloropropane	5.45	0.20	0.50	"	5.00	ND	109	70-130			
2,2-Dichloropropane	4.58	0.10	0.50	"	5.00	ND	91.6	70-130			
1,1-Dichloropropene	5.13	0.10	0.50	"	5.00	ND	103	70-130			
cis-1,3-Dichloropropene	4.84	0.20	0.50	"	5.00	ND	96.8	70-130			
trans-1,3-Dichloropropene	4.50	0.20	0.50	"	5.00	ND	90.0	70-130			
2-Hexanone	5.62	0.097	5.0	"	5.00	ND	112	70-130			
Ethylbenzene	5.30	0.10	0.50	"	5.00	ND	106	70-130			
Hexachlorobutadiene	4.84	0.30	0.50	"	5.00	ND	96.8	70-130			
Isopropylbenzene	5.74	0.20	0.50	"	5.00	ND	115	70-130			
p-Isopropyltoluene	5.59	0.10	0.50	"	5.00	ND	112	70-130			
Methyl ethyl ketone	12.3	0.40	1.0	"	10.0	ND	123	70-130			
Methyl iodide	5.66	0.12	2.0	"	5.00	ND	113	70-130			
Methyl isobutyl ketone	10.7	0.30	1.0	"	10.0	ND	107	70-130			
Methylene chloride	4.34	0.40	0.50	"	5.00	ND	86.8	70-130			
Naphthalene	5.02	0.20	0.50	"	5.00	ND	100	70-130			
n-Propylbenzene	5.74	0.20	0.50	"	5.00	ND	115	70-130			
Styrene	5.53	0.10	0.50	"	5.00	ND	111	70-130			
1,1,1,2-Tetrachloroethane	4.62	0.20	0.50	"	5.00	ND	92.4	70-130			
1,1,2,2-Tetrachloroethane	5.37	0.20	0.50	"	5.00	ND	107	70-130			
Tetrachloroethene	5.41	0.20	0.50	"	5.00	ND	108	70-130			
Toluene	5.51	0.10	0.50	"	5.00	ND	110	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
1,2,3-Trichlorobenzene	5.07	0.10	0.50	ug/l	5.00	ND	101	70-130			
1,2,4-Trichlorobenzene	4.77	0.20	0.50	"	5.00	ND	95.4	70-130			
1,1,1-Trichloroethane	5.12	0.20	0.50	"	5.00	ND	102	70-130			
1,1,2-Trichloroethane	5.46	0.20	0.50	"	5.00	ND	109	70-130			
Trichloroethene	5.13	0.20	0.50	"	5.00	ND	103	70-130			
Trichlorofluoromethane	5.52	0.20	0.50	"	5.00	ND	110	70-130			
Trichlorotrifluoroethane	6.04	0.20	0.50	"	5.00	ND	121	70-130			
1,2,3-Trichloropropane	5.35	0.13	0.50	"	5.00	ND	107	70-130			
1,2,4-Trimethylbenzene	5.57	0.10	0.50	"	5.00	ND	111	70-130			
1,3,5-Trimethylbenzene	5.57	0.10	0.50	"	5.00	ND	111	70-130			
Vinyl chloride	6.10	0.10	0.50	"	5.00	ND	122	70-130			
m,p-Xylene	11.0	0.20	0.50	"	10.0	ND	110	70-130			
o-Xylene	5.54	0.10	0.50	"	5.00	ND	111	70-130			
Xylenes (total)	16.6	0.20	0.50	"	15.0	ND	110	70-130			
Methyl tert-butyl ether	4.80	0.50	0.50	"	5.00	ND	96.0	70-130			
Ethyl tert-butyl ether	5.52	0.20	0.50	"	5.00	ND	110	70-130			
Tert-amyl methyl ether	4.93	0.20	0.50	"	5.00	ND	98.6	70-130			
Surrogate: Bromofluorobenzene	*25.3*			*"*	*25.0*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*24.5*			*"*	*25.0*		*98.1*	*70-130*			
Surrogate: Toluene-d8	*25.0*			*"*	*25.0*		*99.9*	*70-130*			
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Acetone	26.1	0.80	5.0	ug/l	20.0	1.79	122	70-130	2.87	30	
Acrylonitrile	5.35	0.20	5.0	"	5.00	ND	107	70-130	8.24	30	
Benzene	4.92	0.20	0.30	"	5.00	ND	98.4	70-130	9.86	30	
Bromobenzene	5.04	0.10	0.50	"	5.00	ND	101	70-130	8.37	30	
Bromochloromethane	5.02	0.20	0.50	"	5.00	ND	100	70-130	10.0	30	
Bromodichloromethane	9.77	0.50	0.50	"	5.00	4.42	107	70-130	2.43	30	
Bromoform	4.34	0.50	0.50	"	5.00	ND	86.8	70-130	2.28	30	
Bromomethane	5.65	0.20	0.50	"	5.00	ND	113	70-130	9.28	30	
n-Butylbenzene	4.55	0.10	0.50	"	5.00	ND	91.0	70-130	10.0	30	
sec-Butylbenzene	5.00	0.10	0.50	"	5.00	ND	100	70-130	7.88	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**		Prepared: 02/04/14 Analyzed: 02/06/14							
tert-Butylbenzene	5.08	0.10	0.50	ug/l	5.00	ND	102	70-130	9.74	30	
Carbon disulfide	4.92	0.20	0.50	"	5.00	ND	98.4	70-130	8.56	30	
Carbon tetrachloride	4.66	0.30	0.50	"	5.00	ND	93.2	70-130	6.44	30	
Chlorobenzene	5.02	0.20	0.50	"	5.00	ND	100	70-130	6.36	30	
Chloroethane	5.44	0.10	0.50	"	5.00	ND	109	70-130	9.79	30	
Chloroform	35.4	0.50	0.50	"	5.00	31.5	77.4	70-130	0.170	30	
Chloromethane	6.07	0.20	0.50	"	5.00	ND	121	70-130	8.37	30	
2-Chlorotoluene	5.19	0.20	0.50	"	5.00	ND	104	70-130	8.49	30	
4-Chlorotoluene	4.85	0.10	0.50	"	5.00	ND	97.0	70-130	14.5	30	
Dibromochloromethane	4.76	0.50	0.50	"	5.00	ND	95.2	70-130	0.837	30	
1,2-Dibromo-3-chloropropane	4.49	0.36	0.50	"	5.00	ND	89.8	70-130	2.85	25	
1,2-Dibromoethane (EDB)	4.82	0.14	0.50	"	5.00	ND	96.4	70-130	9.30	25	
Dibromomethane	5.04	0.20	0.50	"	5.00	ND	101	70-130	8.18	30	
1,2-Dichlorobenzene	4.59	0.20	0.50	"	5.00	ND	91.8	70-130	7.55	30	
1,3-Dichlorobenzene	5.02	0.20	0.50	"	5.00	ND	100	70-130	8.58	30	
trans-1,4-Dichloro-2-butene	5.09	0.095	5.0	"	5.00	ND	102	70-130	8.29	25	
1,4-Dichlorobenzene	4.76	0.10	0.50	"	5.00	ND	95.2	70-130	8.06	30	
Dichlorodifluoromethane	6.09	0.20	0.50	"	5.00	ND	122	70-130	9.39	30	
1,1-Dichloroethane	5.17	0.10	0.50	"	5.00	ND	103	70-130	8.16	30	
1,2-Dichloroethane	5.08	0.20	0.50	"	5.00	ND	102	70-130	8.12	30	
1,1-Dichloroethene	4.99	0.10	0.30	"	5.00	ND	99.8	70-130	7.34	30	
cis-1,2-Dichloroethene	5.09	0.20	0.50	"	5.00	ND	102	70-130	7.92	30	
trans-1,2-Dichloroethene	4.93	0.20	0.50	"	5.00	ND	98.6	70-130	7.42	30	
1,2-Dichloropropane	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	8.47	30	
1,3-Dichloropropane	5.15	0.20	0.50	"	5.00	ND	103	70-130	5.66	30	
2,2-Dichloropropane	4.28	0.10	0.50	"	5.00	ND	85.6	70-130	6.77	30	
1,1-Dichloropropene	4.75	0.10	0.50	"	5.00	ND	95.0	70-130	7.69	30	
cis-1,3-Dichloropropene	4.62	0.20	0.50	"	5.00	ND	92.4	70-130	4.65	30	
trans-1,3-Dichloropropene	4.22	0.20	0.50	"	5.00	ND	84.4	70-130	6.42	30	
2-Hexanone	5.28	0.097	5.0	"	5.00	ND	106	70-130	6.24	25	
Ethylbenzene	4.83	0.10	0.50	"	5.00	ND	96.6	70-130	9.28	30	
Hexachlorobutadiene	4.48	0.30	0.50	"	5.00	ND	89.6	70-130	7.73	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**		Prepared: 02/04/14 Analyzed: 02/06/14							
Isopropylbenzene	5.21	0.20	0.50	ug/l	5.00	ND	104	70-130	9.68	30	
p-Isopropyltoluene	4.91	0.10	0.50	"	5.00	ND	98.2	70-130	13.0	30	
Methyl ethyl ketone	11.8	0.40	1.0	"	10.0	ND	118	70-130	3.89	30	
Methyl iodide	5.13	0.12	2.0	"	5.00	ND	103	70-130	9.82	25	
Methyl isobutyl ketone	9.80	0.30	1.0	"	10.0	ND	98.0	70-130	8.69	30	
Methylene chloride	3.66	0.40	0.50	"	5.00	ND	73.2	70-130	17.0	30	
Naphthalene	4.66	0.20	0.50	"	5.00	ND	93.2	70-130	7.44	30	
n-Propylbenzene	5.17	0.20	0.50	"	5.00	ND	103	70-130	10.4	30	
Styrene	5.04	0.10	0.50	"	5.00	ND	101	70-130	9.27	30	
1,1,1,2-Tetrachloroethane	4.34	0.20	0.50	"	5.00	ND	86.8	70-130	6.25	30	
1,1,2,2-Tetrachloroethane	4.95	0.20	0.50	"	5.00	ND	99.0	70-130	8.14	30	
Tetrachloroethene	4.90	0.20	0.50	"	5.00	ND	98.0	70-130	9.89	30	
Toluene	5.03	0.10	0.50	"	5.00	ND	101	70-130	9.11	30	
1,2,3-Trichlorobenzene	4.89	0.10	0.50	"	5.00	ND	97.8	70-130	3.61	30	
1,2,4-Trichlorobenzene	4.38	0.20	0.50	"	5.00	ND	87.6	70-130	8.52	30	
1,1,1-Trichloroethane	4.75	0.20	0.50	"	5.00	ND	95.0	70-130	7.50	30	
1,1,2-Trichloroethane	5.07	0.20	0.50	"	5.00	ND	101	70-130	7.41	30	
Trichloroethene	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	5.41	30	
Trichlorofluoromethane	4.90	0.20	0.50	"	5.00	ND	98.0	70-130	11.9	30	
Trichlorotrifluoroethane	5.57	0.20	0.50	"	5.00	ND	111	70-130	8.10	30	
1,2,3-Trichloropropane	4.93	0.13	0.50	"	5.00	ND	98.6	70-130	8.17	25	
1,2,4-Trimethylbenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130	8.61	30	
1,3,5-Trimethylbenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130	8.61	30	
Vinyl chloride	5.41	0.10	0.50	"	5.00	ND	108	70-130	12.0	30	
m,p-Xylene	9.99	0.20	0.50	"	10.0	ND	99.9	70-130	9.71	30	
o-Xylene	5.07	0.10	0.50	"	5.00	ND	101	70-130	8.86	30	
Xylenes (total)	15.1	0.20	0.50	"	15.0	ND	100	70-130	9.43	30	
Methyl tert-butyl ether	4.31	0.50	0.50	"	5.00	ND	86.2	70-130	10.8	30	
Ethyl tert-butyl ether	5.09	0.20	0.50	"	5.00	ND	102	70-130	8.11	30	
Tert-amyl methyl ether	4.48	0.20	0.50	"	5.00	ND	89.6	70-130	9.56	30	
Surrogate: Bromofluorobenzene	*25.4*			*"*	*25.0*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*24.2*			*"*	*25.0*		*97.0*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Surrogate: Toluene-d8	*24.8*			*ug/l*	*25.0*		*99.0*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Blank (AB40514-BLK1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	ND	0.010	0.050	ug/l							U
Chloroneb	ND	0.20	0.50	"							U
Chlorobenzilate	ND	2.0	5.0	"							U
Chlorothalonil	ND	0.030	0.10	"							U
DCPA	ND	0.020	0.040	"							U
4,4´-DDD	ND	0.020	0.050	"							U
4,4´-DDE	ND	0.020	0.050	"							U
4,4´-DDT	ND	0.020	0.020	"							U
Dieldrin	ND	0.010	0.010	"							U
Endosulfan I	ND	0.020	0.050	"							U
Endosulfan II	ND	0.020	0.050	"							U
Endosulfan sulfate	ND	0.020	0.020	"							U
Endrin	ND	0.030	0.10	"							U
Endrin aldehyde	ND	0.020	0.050	"							U
HCH-alpha	ND	0.010	0.050	"							U
HCH-beta	ND	0.020	0.050	"							U
HCH-delta	ND	0.030	0.050	"							U
HCH-gamma (Lindane)	ND	0.010	0.010	"							U
Heptachlor	ND	0.010	0.010	"							U
Heptachlor epoxide	ND	0.010	0.010	"							U
Hexachlorobenzene	ND	0.010	0.040	"							U
Hexachlorocyclopentadiene	ND	0.040	0.40	"							U
Methoxychlor	ND	0.020	0.020	"							U
cis-Permethrin	ND	0.070	0.20	"							U
trans-Permethrin	ND	0.090	0.20	"							U
Propachlor	ND	0.070	0.20	"							U
Trifluralin	ND	0.020	0.040	"							U
PCB-1016	ND	0.030	0.50	"							U
PCB-1221	ND	0.030	0.50	"							U
PCB-1232	ND	0.030	0.50	"							U
PCB-1242	ND	0.030	0.50	"							U
PCB-1248	ND	0.030	0.50	"							U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Blank (AB40514-BLK1)					Prepared: 02/05/14 Analyzed: 02/11/14						
PCB-1254	ND	0.030	0.50	ug/l							U
PCB-1260	ND	0.030	0.50	"							U
Total PCBs	ND	0.30	0.50	"							U
Toxaphene	ND	0.40	0.50	"							U
Chlordane (tech)	ND	0.030	0.050	"							U
Surrogate: Dibutylchlorendate	*1.05*			*"*	*0.952*		*110*	*70-130*			
LCS (AB40514-BS1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	0.263	0.010	0.050	ug/l	0.280		94.1	70-130			
Chloroneb	2.73	0.20	0.50	"	2.80		97.5	70-130			
Chlorobenzilate	3.29	2.0	5.0	"	2.80		117	70-130			J
Chlorothalonil	0.313	0.030	0.10	"	0.280		112	70-130			
DCPA	0.289	0.020	0.040	"	0.280		103	70-130			
4,4´-DDD	0.203	0.020	0.050	"	0.280		72.3	70-130			
4,4´-DDE	0.279	0.020	0.050	"	0.280		99.6	70-130			
4,4´-DDT	0.290	0.020	0.020	"	0.280		104	70-130			
Dieldrin	0.283	0.010	0.010	"	0.280		101	70-130			
Endosulfan I	0.285	0.020	0.050	"	0.280		102	70-130			
Endosulfan II	0.277	0.020	0.050	"	0.280		98.9	70-130			
Endosulfan sulfate	0.306	0.020	0.020	"	0.280		109	70-130			
Endrin	0.319	0.030	0.10	"	0.280		114	70-130			
Endrin aldehyde	0.267	0.020	0.050	"	0.280		95.3	70-130			
HCH-alpha	0.269	0.010	0.050	"	0.280		96.1	70-130			
HCH-beta	0.279	0.020	0.050	"	0.280		99.7	70-130			
HCH-delta	0.286	0.030	0.050	"	0.280		102	70-130			
HCH-gamma (Lindane)	0.273	0.010	0.010	"	0.280		97.7	70-130			
Heptachlor	0.273	0.010	0.010	"	0.280		97.6	70-130			
Heptachlor epoxide	0.279	0.010	0.010	"	0.280		99.5	70-130			
Hexachlorocyclopentadiene	0.409	0.040	0.40	"	0.560		73.1	15-90			
Hexachlorobenzene	0.237	0.010	0.040	"	0.280		84.7	70-130			
Methoxychlor	0.301	0.020	0.020	"	0.280		107	70-130			
cis-Permethrin	1.59	0.070	0.20	"	1.40		114	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
LCS (AB40514-BS1)					Prepared: 02/05/14 Analyzed: 02/11/14						
trans-Permethrin	1.60	0.090	0.20	ug/l	1.40		114	70-130			
Propachlor	0.306	0.070	0.20	"	0.280		109	70-130			
Trifluralin	0.416	0.020	0.040	"	0.420		99.0	70-130			
Surrogate: Dibutylchlorendate	*1.05*			*"*	*0.952*		*110*	*70-130*			
LCS Dup (AB40514-BSD1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	0.276	0.010	0.050	ug/l	0.280		98.7	70-130	4.77	25	
Chloroneb	2.84	0.20	0.50	"	2.80		101	70-130	3.76	25	
Chlorobenzilate	3.51	2.0	5.0	"	2.80		125	70-130	6.58	25	J
Chlorothalonil	0.334	0.030	0.10	"	0.280		119	70-130	6.41	25	
DCPA	0.304	0.020	0.040	"	0.280		109	70-130	5.05	25	
4,4´-DDD	0.208	0.020	0.050	"	0.280		74.3	70-130	2.71	25	
4,4´-DDE	0.299	0.020	0.050	"	0.280		107	70-130	7.17	25	
4,4´-DDT	0.307	0.020	0.020	"	0.280		109	70-130	5.49	25	
Dieldrin	0.301	0.010	0.010	"	0.280		108	70-130	6.30	25	
Endosulfan I	0.300	0.020	0.050	"	0.280		107	70-130	5.34	25	
Endosulfan II	0.287	0.020	0.050	"	0.280		103	70-130	3.69	25	
Endosulfan sulfate	0.324	0.020	0.020	"	0.280		116	70-130	5.53	25	
Endrin	0.336	0.030	0.10	"	0.280		120	70-130	5.28	25	
Endrin aldehyde	0.309	0.020	0.050	"	0.280		110	70-130	14.8	25	
HCH-alpha	0.280	0.010	0.050	"	0.280		99.9	70-130	3.84	25	
HCH-beta	0.294	0.020	0.050	"	0.280		105	70-130	5.16	25	
HCH-delta	0.303	0.030	0.050	"	0.280		108	70-130	5.61	25	
HCH-gamma (Lindane)	0.286	0.010	0.010	"	0.280		102	70-130	4.33	25	
Heptachlor	0.282	0.010	0.010	"	0.280		101	70-130	3.11	25	
Heptachlor epoxide	0.289	0.010	0.010	"	0.280		103	70-130	3.81	25	
Hexachlorocyclopentadiene	0.434	0.040	0.40	"	0.560		77.6	15-90	5.97	50	
Hexachlorobenzene	0.243	0.010	0.040	"	0.280		86.8	70-130	2.40	25	
Methoxychlor	0.326	0.020	0.020	"	0.280		116	70-130	8.17	25	
cis-Permethrin	1.62	0.070	0.20	"	1.40		116	70-130	1.95	25	
trans-Permethrin	1.67	0.090	0.20	"	1.40		119	70-130	4.72	25	
Propachlor	0.334	0.070	0.20	"	0.280		119	70-130	8.68	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
LCS Dup (AB40514-BSD1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Trifluralin	0.437	0.020	0.040	ug/l	0.420		104	70-130	5.02	25	
Surrogate: Dibutylchlorendate	*1.07*			*"*	*0.952*		*112*	*70-130*			
Matrix Spike (AB40514-MS1)		**Source: 14A1713-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
Aldrin	0.269	0.010	0.050	ug/l	0.280	ND	96.0	70-130			
Chloroneb	2.86	0.20	0.50	"	2.80	ND	102	70-130			
Chlorobenzilate	3.57	2.0	5.0	"	2.80	ND	127	70-130			J
Chlorothalonil	0.329	0.030	0.10	"	0.280	ND	117	70-130			
DCPA	0.303	0.020	0.040	"	0.280	ND	108	70-130			
4,4´-DDD	0.212	0.020	0.050	"	0.280	ND	75.7	70-130			
4,4´-DDE	0.288	0.020	0.050	"	0.280	ND	103	70-130			
4,4´-DDT	0.300	0.020	0.020	"	0.280	ND	107	70-130			
Dieldrin	0.295	0.010	0.010	"	0.280	ND	105	70-130			
Endosulfan I	0.298	0.020	0.050	"	0.280	ND	106	70-130			
Endosulfan II	0.298	0.020	0.050	"	0.280	ND	106	70-130			
Endosulfan sulfate	0.318	0.020	0.020	"	0.280	ND	113	70-130			
Endrin	0.354	0.030	0.10	"	0.280	ND	126	70-130			
Endrin aldehyde	0.299	0.020	0.050	"	0.280	ND	107	70-130			
HCH-alpha	0.285	0.010	0.050	"	0.280	ND	102	70-130			
HCH-beta	0.290	0.020	0.050	"	0.280	ND	104	70-130			
HCH-delta	0.300	0.030	0.050	"	0.280	ND	107	70-130			
HCH-gamma (Lindane)	0.291	0.010	0.010	"	0.280	ND	104	70-130			
Heptachlor	0.280	0.010	0.010	"	0.280	ND	100	70-130			
Heptachlor epoxide	0.286	0.010	0.010	"	0.280	ND	102	70-130			
Hexachlorobenzene	0.255	0.010	0.040	"	0.280	ND	91.0	70-130			
Hexachlorocyclopentadiene	0.486	0.040	0.40	"	0.560	ND	86.7	15-90			
Methoxychlor	0.323	0.020	0.020	"	0.280	ND	116	70-130			
cis-Permethrin	1.78	0.070	0.20	"	1.40	ND	127	70-130			
trans-Permethrin	1.78	0.090	0.20	"	1.40	ND	127	70-130			
Propachlor	0.336	0.070	0.20	"	0.280	ND	120	70-130			
Trifluralin	0.436	0.020	0.040	"	0.420	ND	104	70-130			
Surrogate: Dibutylchlorendate	*1.09*			*"*	*0.952*		*115*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Matrix Spike Dup (AB40514-MSD1)		**Source: 14A1713-01**		Prepared: 02/05/14 Analyzed: 02/12/14							
Aldrin	0.260	0.010	0.050	ug/l	0.280	ND	92.8	70-130	3.40	25	
Chloroneb	2.76	0.20	0.50	"	2.80	ND	98.6	70-130	3.61	25	
Chlorobenzilate	3.40	2.0	5.0	"	2.80	ND	121	70-130	4.87	25	J
Chlorothalonil	0.313	0.030	0.10	"	0.280	ND	112	70-130	4.86	25	
DCPA	0.290	0.020	0.040	"	0.280	ND	103	70-130	4.52	25	
4,4´-DDD	0.210	0.020	0.050	"	0.280	ND	74.9	70-130	1.06	25	
4,4´-DDE	0.275	0.020	0.050	"	0.280	ND	98.1	70-130	4.80	25	
4,4´-DDT	0.289	0.020	0.020	"	0.280	ND	103	70-130	3.94	25	
Dieldrin	0.283	0.010	0.010	"	0.280	ND	101	70-130	4.34	25	
Endosulfan I	0.285	0.020	0.050	"	0.280	ND	102	70-130	4.19	25	
Endosulfan II	0.288	0.020	0.050	"	0.280	ND	103	70-130	3.14	25	
Endosulfan sulfate	0.302	0.020	0.020	"	0.280	ND	108	70-130	5.03	25	
Endrin	0.320	0.030	0.10	"	0.280	ND	114	70-130	10.1	25	
Endrin aldehyde	0.275	0.020	0.050	"	0.280	ND	98.2	70-130	8.56	25	
HCH-alpha	0.271	0.010	0.050	"	0.280	ND	96.8	70-130	4.94	25	
HCH-beta	0.282	0.020	0.050	"	0.280	ND	101	70-130	2.62	25	
HCH-delta	0.290	0.030	0.050	"	0.280	ND	104	70-130	3.17	25	
HCH-gamma (Lindane)	0.279	0.010	0.010	"	0.280	ND	99.5	70-130	4.43	25	
Heptachlor	0.267	0.010	0.010	"	0.280	ND	95.4	70-130	4.78	25	
Heptachlor epoxide	0.277	0.010	0.010	"	0.280	ND	99.0	70-130	3.09	25	
Hexachlorocyclopentadiene	0.433	0.040	0.40	"	0.560	ND	77.3	15-90	11.5	50	
Hexachlorobenzene	0.238	0.010	0.040	"	0.280	ND	85.1	70-130	6.62	25	
Methoxychlor	0.309	0.020	0.020	"	0.280	ND	110	70-130	4.66	25	
cis-Permethrin	1.72	0.070	0.20	"	1.40	ND	123	70-130	3.19	25	
trans-Permethrin	1.68	0.090	0.20	"	1.40	ND	120	70-130	5.53	25	
Propachlor	0.320	0.070	0.20	"	0.280	ND	114	70-130	4.81	25	
Trifluralin	0.420	0.020	0.040	"	0.420	ND	100	70-130	3.78	25	
Surrogate: Dibutylchlorendate	*1.03*			*"*	*0.952*		*108*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Blank (AB40730-BLK1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	ND	0.50	0.50	ug/l							U
Atrazine	ND	0.30	0.50	"							U
Bromacil	ND	0.50	5.0	"							U
Butachlor	ND	0.40	0.50	"							U
Dimethoate	ND	0.20	1.0	"							U
Metolachlor	ND	0.30	0.50	"							U
Metribuzin	ND	0.40	0.50	"							U
Molinate	ND	0.20	0.50	"							U
Prometryn	ND	0.50	0.50	"							U
Propachlor	ND	0.30	0.50	"							U
Simazine	ND	0.30	0.50	"							U
Thiobencarb	ND	0.20	1.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.69*			*"*	*2.00*		*84.3*	*70-130*			
LCS (AB40730-BS1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.88	0.50	0.50	ug/l	2.00		94.2	62-128			
Atrazine	1.92	0.30	0.50	"	2.00		96.1	62-122			
Bromacil	1.94	0.50	5.0	"	2.00		96.9	61-121			J
Butachlor	1.99	0.40	0.50	"	2.00		99.3	66-126			
Dimethoate	1.97	0.20	1.0	"	2.00		98.3	67-127			
Metolachlor	1.93	0.30	0.50	"	2.00		96.6	63-123			
Metribuzin	1.91	0.40	0.50	"	2.00		95.4	71-131			
Molinate	1.95	0.20	0.50	"	2.00		97.4	44-137			
Prometryn	1.95	0.50	0.50	"	2.00		97.6	63-123			
Propachlor	1.95	0.30	0.50	"	2.00		97.3	66-126			
Simazine	1.94	0.30	0.50	"	2.00		96.9	70-130			
Thiobencarb	2.01	0.20	1.0	"	2.00		100	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.80*			*"*	*2.00*		*89.8*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
LCS Dup (AB40730-BSD1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	2.02	0.50	0.50	ug/l	2.00		101	62-128	6.95	30	
Atrazine	2.01	0.30	0.50	"	2.00		100	62-122	4.47	30	
Bromacil	2.14	0.50	5.0	"	2.00		107	61-121	10.0	30	J
Butachlor	2.09	0.40	0.50	"	2.00		105	66-126	5.23	30	
Dimethoate	2.17	0.20	1.0	"	2.00		108	67-127	9.82	30	
Metolachlor	2.02	0.30	0.50	"	2.00		101	63-123	4.37	30	
Metribuzin	2.04	0.40	0.50	"	2.00		102	71-131	6.92	30	
Molinate	1.94	0.20	0.50	"	2.00		96.8	44-137	0.569	30	
Prometryn	2.07	0.50	0.50	"	2.00		103	63-123	5.75	30	
Propachlor	2.00	0.30	0.50	"	2.00		100	66-126	2.80	30	
Simazine	2.09	0.30	0.50	"	2.00		105	70-130	7.61	30	
Thiobencarb	2.19	0.20	1.0	"	2.00		109	69-129	8.57	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.85*			*"*	*2.00*		*92.6*	*70-130*			
Matrix Spike (AB40730-MS1)		**Source: 14A1588-01**			Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.81	0.50	0.50	ug/l	2.00	ND	90.7	62-128			
Atrazine	1.79	0.30	0.50	"	2.00	ND	89.7	62-122			
Bromacil	1.75	0.50	5.0	"	2.00	ND	87.5	61-121			J
Butachlor	1.85	0.40	0.50	"	2.00	ND	92.6	66-126			
Dimethoate	1.70	0.20	1.0	"	2.00	ND	84.9	67-127			
Metolachlor	1.82	0.30	0.50	"	2.00	ND	91.2	63-123			
Metribuzin	1.78	0.40	0.50	"	2.00	ND	89.2	71-131			
Molinate	1.87	0.20	0.50	"	2.00	ND	93.4	44-137			
Prometryn	1.68	0.50	0.50	"	2.00	ND	83.9	63-123			
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.6	66-126			
Simazine	1.85	0.30	0.50	"	2.00	ND	92.5	70-130			
Thiobencarb	1.90	0.20	1.0	"	2.00	ND	95.2	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.51*			*"*	*2.00*		*75.3*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Matrix Spike Dup (AB40730-MSD1)		**Source: 14A1588-01**		Prepared: 02/08/14 Analyzed: 02/11/14							
Alachlor	1.91	0.50	0.50	ug/l	2.00	ND	95.3	62-128	4.97	30	
Atrazine	1.96	0.30	0.50	"	2.00	ND	98.2	62-122	9.04	30	
Bromacil	2.13	0.50	5.0	"	2.00	ND	107	61-121	19.7	30	J
Butachlor	2.02	0.40	0.50	"	2.00	ND	101	66-126	8.67	30	
Dimethoate	2.14	0.20	1.0	"	2.00	ND	107	67-127	23.0	30	
Metolachlor	1.96	0.30	0.50	"	2.00	ND	97.9	63-123	7.12	30	
Metribuzin	2.02	0.40	0.50	"	2.00	ND	101	71-131	12.3	30	
Molinate	1.79	0.20	0.50	"	2.00	ND	89.6	44-137	4.16	30	
Prometryn	2.02	0.50	0.50	"	2.00	ND	101	63-123	18.4	30	
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.4	66-126	0.171	30	
Simazine	2.07	0.30	0.50	"	2.00	ND	104	70-130	11.3	30	
Thiobencarb	1.96	0.20	1.0	"	2.00	ND	97.8	69-129	2.64	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.60*			*"*	*2.00*		*79.9*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Organic Analytes by EPA Method 504.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40703 - EPA 504.1											
Blank (AB40703-BLK1)					Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l							U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"							U
LCS (AB40703-BS1)					Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	0.299	0.0040	0.010	ug/l	0.250		119	70-130			
1,2-Dibromoethane (EDB)	0.279	0.0050	0.020	"	0.250		112	70-130			
LCS Dup (AB40703-BSD1)					Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	0.314	0.0040	0.010	ug/l	0.250		126	70-130	5.15	25	
1,2-Dibromoethane (EDB)	0.292	0.0050	0.020	"	0.250		117	70-130	4.42	25	
Matrix Spike (AB40703-MS1)		**Source: 14B0336-01**			Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	0.381	0.0040	0.010	ug/l	0.250	0.111	108	70-130			
1,2-Dibromoethane (EDB)	0.265	0.0050	0.020	"	0.250	ND	106	70-130			
Matrix Spike Dup (AB40703-MSD1)		**Source: 14B0336-01**			Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	0.357	0.0040	0.010	ug/l	0.250	0.111	98.0	70-130	6.77	25	
1,2-Dibromoethane (EDB)	0.235	0.0050	0.020	"	0.250	ND	94.0	70-130	12.0	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41155 - EPA 515.1											
Blank (AB41155-BLK1)					Prepared: 02/12/14 Analyzed: 02/14/14						
Acifluorfen	ND	0.50	1.0	ug/l							U
Bentazon	ND	0.40	0.40	"							U
2,4-D	ND	0.80	1.0	"							U
Dalapon	ND	6.0	6.0	"							U
2,4-DB	ND	4.0	5.0	"							U
Dicamba	ND	0.40	0.40	"							U
Dichlorprop	ND	1.0	1.0	"							U
Dinoseb	ND	0.80	1.0	"							U
4-Nitrophenol	ND	0.70	1.0	"							U
Pentachlorophenol	ND	0.20	0.20	"							U
Picloram	ND	0.50	1.0	"							U
2,4,5-T	ND	0.40	0.50	"							U
2,4,5-TP (Silvex)	ND	0.50	0.50	"							U
Surrogate: DCAA	*13.8*			*"*	*14.2*		*97.0*	*70-130*			
LCS (AB41155-BS1)					Prepared: 02/12/14 Analyzed: 02/14/14						
Acifluorfen	0.895	0.50	1.0	ug/l	0.960		93.2	70-130			J
Bentazon	1.68	0.40	0.40	"	1.92		87.7	70-130			
2,4-D	1.62	0.80	1.0	"	1.92		84.5	48-124			
Dalapon	10.9	6.0	6.0	"	12.5		87.5	40-112			
2,4-DB	7.43	4.0	5.0	"	7.68		96.8	54-123			
Dicamba	0.861	0.40	0.40	"	0.960		89.7	70-130			
Dichlorprop	2.88	1.0	1.0	"	2.88		100	54-106			
Dinoseb	5.06	0.80	1.0	"	6.42		78.7	20-105			
4-Nitrophenol	0.759	0.70	1.0	"	0.960		79.0	60-202			J
Pentachlorophenol	0.816	0.20	0.20	"	0.960		85.0	70-130			
Picloram	0.929	0.50	1.0	"	0.960		96.7	70-130			J
2,4,5-T	0.918	0.40	0.50	"	0.960		95.6	68-166			
2,4,5-TP (Silvex)	0.969	0.50	0.50	"	0.960		101	70-130			
Surrogate: DCAA	*14.7*			*"*	*14.2*		*103*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41155 - EPA 515.1											
LCS Dup (AB41155-BSD1)					Prepared: 02/12/14 Analyzed: 02/14/14						
Acifluorfen	0.947	0.50	1.0	ug/l	0.960		98.7	70-130	5.68	50	J
Bentazon	1.74	0.40	0.40	"	1.92		90.5	70-130	3.16	50	
2,4-D	1.34	0.80	1.0	"	1.92		69.7	48-124	19.2	50	
Dalapon	10.6	6.0	6.0	"	12.5		85.2	40-112	2.63	50	
2,4-DB	7.11	4.0	5.0	"	7.68		92.6	54-123	4.37	50	
Dicamba	0.872	0.40	0.40	"	0.960		90.8	70-130	1.23	50	
Dichlorprop	2.46	1.0	1.0	"	2.88		85.2	54-106	15.9	50	
Dinoseb	5.84	0.80	1.0	"	6.42		90.9	20-105	14.4	50	
4-Nitrophenol	0.982	0.70	1.0	"	0.960		102	60-202	25.6	50	J
Pentachlorophenol	0.871	0.20	0.20	"	0.960		90.7	70-130	6.49	50	
Picloram	0.976	0.50	1.0	"	0.960		102	70-130	4.94	50	J
2,4,5-T	0.681	0.40	0.50	"	0.960		70.9	68-166	29.7	50	
2,4,5-TP (Silvex)	0.783	0.50	0.50	"	0.960		81.5	70-130	21.3	50	
Surrogate: DCAA	*13.7*			*"*	*14.2*		*96.4*	*70-130*			
Matrix Spike (AB41155-MS1)		**Source: 14B0093-01**			Prepared: 02/12/14 Analyzed: 02/15/14						
Acifluorfen	0.842	0.50	1.0	ug/l	0.960	ND	87.7	70-130			J
Bentazon	1.55	0.40	0.40	"	1.92	ND	80.9	70-130			
2,4-D	1.44	0.80	1.0	"	1.92	ND	75.1	48-124			
Dalapon	11.9	6.0	6.0	"	12.5	ND	95.4	40-112			
2,4-DB	5.89	4.0	5.0	"	7.68	ND	76.7	54-123			
Dicamba	0.889	0.40	0.40	"	0.960	ND	92.6	70-130			
Dichlorprop	2.46	1.0	1.0	"	2.88	ND	85.2	54-106			
Dinoseb	4.86	0.80	1.0	"	6.42	ND	75.7	20-105			
4-Nitrophenol	1.02	0.70	1.0	"	0.960	ND	107	60-202			
Pentachlorophenol	0.822	0.20	0.20	"	0.960	ND	85.6	70-130			
Picloram	0.865	0.50	1.0	"	0.960	ND	90.1	70-130			J
2,4,5-T	0.730	0.40	0.50	"	0.960	ND	76.0	68-166			
2,4,5-TP (Silvex)	0.805	0.50	0.50	"	0.960	ND	83.9	70-130			
Surrogate: DCAA	*12.7*			*"*	*14.2*		*89.6*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41155 - EPA 515.1											
Matrix Spike Dup (AB41155-MSD1)		**Source: 14B0093-01**		Prepared: 02/12/14 Analyzed: 02/15/14							
Acifluorfen	0.798	0.50	1.0	ug/l	0.960	ND	83.2	70-130	5.34	50	J
Bentazon	1.71	0.40	0.40	"	1.92	ND	89.0	70-130	9.58	50	
2,4-D	1.27	0.80	1.0	"	1.92	ND	66.0	48-124	12.8	50	
Dalapon	11.2	6.0	6.0	"	12.5	ND	89.6	40-112	6.23	50	
2,4-DB	5.76	4.0	5.0	"	7.68	ND	75.0	54-123	2.16	50	
Dicamba	0.837	0.40	0.40	"	0.960	ND	87.2	70-130	6.01	50	
Dichlorprop	2.39	1.0	1.0	"	2.88	ND	83.0	54-106	2.62	50	
Dinoseb	4.47	0.80	1.0	"	6.42	ND	69.6	20-105	8.43	50	
4-Nitrophenol	1.42	0.70	1.0	"	0.960	ND	148	60-202	32.4	50	
Pentachlorophenol	0.808	0.20	0.20	"	0.960	ND	84.2	70-130	1.62	50	
Picloram	0.847	0.50	1.0	"	0.960	ND	88.2	70-130	2.10	50	J
2,4,5-T	0.628	0.40	0.50	"	0.960	ND	65.5	68-166	14.9	50	QM-07
2,4,5-TP (Silvex)	0.725	0.50	0.50	"	0.960	ND	75.5	70-130	10.5	50	
Surrogate: DCAA	*12.5*			*"*	*14.2*		*88.2*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41142 - HPLC											
Blank (AB41142-BLK1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	ND	0.70	3.0	ug/l							U
Aldicarb sulfone	ND	0.70	4.0	"							U
Aldicarb sulfoxide	ND	0.80	3.0	"							U
Carbaryl	ND	0.70	5.0	"							U
Carbofuran	ND	2.0	5.0	"							U
3-Hydroxycarbofuran	ND	0.90	3.0	"							U
Methiocarb	ND	2.0	5.0	"							U
Methomyl	ND	2.0	2.0	"							U
Oxamyl	ND	0.80	20	"							U
Propoxur	ND	2.0	5.0	"							U
LCS (AB41142-BS1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	20.0	0.70	3.0	ug/l	20.0		99.9	80-120			
Aldicarb sulfone	20.1	0.70	4.0	"	19.0		106	80-120			
Aldicarb sulfoxide	19.2	0.80	3.0	"	19.8		97.0	80-120			
Carbaryl	20.4	0.70	5.0	"	20.0		102	80-120			
Carbofuran	19.5	2.0	5.0	"	20.0		97.7	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0		103	80-120			
Methiocarb	18.6	2.0	5.0	"	20.0		93.2	80-120			
Methomyl	21.1	2.0	2.0	"	20.0		105	80-120			
Oxamyl	20.5	0.80	20	"	20.0		102	80-120			
Propoxur	20.2	2.0	5.0	"	20.0		101	80-120			
LCS Dup (AB41142-BSD1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	19.3	0.70	3.0	ug/l	20.0		96.6	80-120	3.34	20	
Aldicarb sulfone	19.3	0.70	4.0	"	19.0		102	80-120	3.93	20	
Aldicarb sulfoxide	18.6	0.80	3.0	"	19.8		93.7	80-120	3.45	20	
Carbaryl	18.8	0.70	5.0	"	20.0		94.1	80-120	8.11	20	
Carbofuran	19.4	2.0	5.0	"	20.0		97.1	80-120	0.645	20	
3-Hydroxycarbofuran	19.0	0.90	3.0	"	20.0		95.1	80-120	8.35	20	
Methiocarb	19.1	2.0	5.0	"	20.0		95.7	80-120	2.65	20	
Methomyl	19.5	2.0	2.0	"	20.0		97.7	80-120	7.69	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41142 - HPLC											
LCS Dup (AB41142-BSD1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Oxamyl	19.2	0.80	20	ug/l	20.0		95.8	80-120	6.62	20	J
Propoxur	19.0	2.0	5.0	"	20.0		94.8	80-120	6.54	20	
Matrix Spike (AB41142-MS1)		**Source: 14B0426-01**			Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	18.7	0.70	3.0	ug/l	20.0	ND	93.3	80-120			
Aldicarb sulfone	20.1	0.70	4.0	"	19.0	ND	106	80-120			
Aldicarb sulfoxide	20.1	0.80	3.0	"	19.8	ND	102	80-120			
Carbaryl	20.0	0.70	5.0	"	20.0	ND	99.8	80-120			
Carbofuran	19.3	2.0	5.0	"	20.0	ND	96.6	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0	ND	103	80-120			
Methiocarb	18.2	2.0	5.0	"	20.0	ND	91.2	80-120			
Methomyl	21.0	2.0	2.0	"	20.0	ND	105	80-120			
Oxamyl	20.3	0.80	20	"	20.0	ND	102	80-120			
Propoxur	19.2	2.0	5.0	"	20.0	ND	95.9	80-120			
Matrix Spike Dup (AB41142-MSD1)		**Source: 14B0426-01**			Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	17.4	0.70	3.0	ug/l	20.0	ND	87.1	80-120	6.84	20	
Aldicarb sulfone	19.0	0.70	4.0	"	19.0	ND	100	80-120	5.57	20	
Aldicarb sulfoxide	18.8	0.80	3.0	"	19.8	ND	94.8	80-120	6.85	20	
Carbaryl	19.4	0.70	5.0	"	20.0	ND	97.1	80-120	2.76	20	
Carbofuran	19.4	2.0	5.0	"	20.0	ND	96.9	80-120	0.339	20	
3-Hydroxycarbofuran	19.8	0.90	3.0	"	20.0	ND	98.9	80-120	4.29	20	
Methiocarb	18.9	2.0	5.0	"	20.0	ND	94.6	80-120	3.68	20	
Methomyl	20.6	2.0	2.0	"	20.0	ND	103	80-120	1.83	20	
Oxamyl	19.2	0.80	20	"	20.0	ND	95.8	80-120	5.89	20	J
Propoxur	19.5	2.0	5.0	"	20.0	ND	97.3	80-120	1.47	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Endothall by EPA Method 548.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40801 - EPA 548.1											
Blank (AB40801-BLK1)					Prepared: 02/10/14 Analyzed: 02/11/14						
Endothall	ND	2.0	45	ug/l							U
LCS (AB40801-BS1)					Prepared: 02/10/14 Analyzed: 02/11/14						
Endothall	201	2.0	45	ug/l	200		100	80-120			
LCS Dup (AB40801-BSD1)					Prepared: 02/10/14 Analyzed: 02/11/14						
Endothall	204	2.0	45	ug/l	200		102	80-120	1.53	30	
Matrix Spike (AB40801-MS1)		**Source: 14B0089-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Endothall	190	2.0	45	ug/l	200	ND	94.8	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Glyphosate by EPA Method 547 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40427 - HPLC											
Blank (AB40427-BLK1)					Prepared & Analyzed: 02/04/14						
Glyphosate	ND	3.0	10	ug/l							U
LCS (AB40427-BS1)					Prepared & Analyzed: 02/04/14						
Glyphosate	111	3.0	10	ug/l	120		92.7	66-126			
LCS Dup (AB40427-BSD1)					Prepared & Analyzed: 02/04/14						
Glyphosate	112	3.0	10	ug/l	120		93.7	66-126	1.08	30	
Matrix Spike (AB40427-MS1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	111	3.0	10	ug/l	120	ND	92.7	66-126			
Matrix Spike Dup (AB40427-MSD1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	110	3.0	10	ug/l	120	ND	92.0	66-126	0.801	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Diquat by EPA Method 549.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40717 - HPLC											
Blank (AB40717-BLK1)					Prepared: 02/07/14 Analyzed: 02/10/14						
Diquat	ND	2.0	2.0	ug/l							U
LCS (AB40717-BS1)					Prepared: 02/07/14 Analyzed: 02/11/14						
Diquat	17.4	2.0	2.0	ug/l	19.8		87.8	70-130			
LCS Dup (AB40717-BSD1)					Prepared: 02/07/14 Analyzed: 02/11/14						
Diquat	18.0	2.0	2.0	ug/l	19.8		90.5	70-130	3.10	25	
Matrix Spike (AB40717-MS1)		**Source: 14B0426-01**			Prepared: 02/07/14 Analyzed: 02/11/14						
Diquat	19.8	2.0	2.0	ug/l	19.8	ND	99.9	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41050 - EPA 552.2											
Blank (AB41050-BLK1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	ND	0.8	1.0	ug/l							U
Monochloroacetic Acid	ND	1.1	2.0	"							U
Dibromoacetic Acid	ND	0.8	1.0	"							U
Dichloroacetic Acid	ND	1.0	1.0	"							U
Trichloroacetic Acid	ND	1.0	1.0	"							U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"							U
Surrogate: 2,3-Dibromopropionic Acid	*9.59*			*"*	*10.0*		*95.9*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*11.7*			*"*	*10.0*		*117*	*70-130*			
LCS (AB41050-BS1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	25.5	0.8	1.0	ug/l	25.0		102	70-130			
Monochloroacetic Acid	26.9	1.1	2.0	"	25.0		107	70-130			
Dibromoacetic Acid	26.8	0.8	1.0	"	25.0		107	70-130			
Dichloroacetic Acid	26.0	1.0	1.0	"	25.0		104	70-130			
Trichloroacetic Acid	26.6	1.0	1.0	"	25.0		106	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*11.0*			*"*	*10.0*		*110*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*10.1*			*"*	*10.0*		*101*	*70-130*			
MRL Check (AB41050-MRL1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	1.07	0.8	1.0	ug/l	1.00		107	0-200			
Monochloroacetic Acid	ND	1.1	2.0	"	1.00			0-200			U
Dibromoacetic Acid	1.37	0.8	1.0	"	1.00		137	0-200			
Dichloroacetic Acid	ND	1.0	1.0	"	1.00			0-200			U
Trichloroacetic Acid	1.05	1.0	1.0	"	1.00		105	0-200			
Surrogate: 2,3-Dibromopropionic Acid	*1.40*			*"*	*1.00*		*140*	*0-200*			
Surrogate: 2-Bromopropionic Acid	*1.14*			*"*	*1.00*		*114*	*0-200*			
Matrix Spike (AB41050-MS1)		**Source: 14A1713-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Monobromoacetic Acid	24.9	0.8	1.0	ug/l	25.0	ND	99.7	70-130			
Monochloroacetic Acid	26.6	1.1	2.0	"	25.0	ND	106	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:32

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41050 - EPA 552.2											
Matrix Spike (AB41050-MS1)		**Source: 14A1713-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Dibromoacetic Acid	32.2	0.8	1.0	ug/l	25.0	ND	129	70-130			
Dichloroacetic Acid	25.1	1.0	1.0	"	25.0	ND	100	70-130			
Trichloroacetic Acid	29.9	1.0	1.0	"	25.0	ND	120	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*12.1*			*"*	*10.0*		*121*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.42*			*"*	*10.0*		*94.2*	*70-130*			
Matrix Spike (AB41050-MS2)		**Source: 14B0089-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Monobromoacetic Acid	24.4	0.8	1.0	ug/l	25.0	ND	97.6	70-130			
Monochloroacetic Acid	25.3	1.1	2.0	"	25.0	ND	101	70-130			
Dibromoacetic Acid	31.9	0.8	1.0	"	25.0	ND	128	70-130			
Dichloroacetic Acid	24.0	1.0	1.0	"	25.0	ND	96.0	70-130			
Trichloroacetic Acid	31.1	1.0	1.0	"	25.0	ND	124	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*13.9*			*"*	*10.0*		*139*	*70-130*			*S-GC*
Surrogate: 2-Bromopropionic Acid	*10.9*			*"*	*10.0*		*109*	*70-130*			
Reference (AB41050-SRM1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	25.1	0.8	1.0	ug/l	25.0		100	0-200			
Monochloroacetic Acid	26.7	1.1	2.0	"	25.0		107	0-200			
Dibromoacetic Acid	25.6	0.8	1.0	"	25.0		103	0-200			
Dichloroacetic Acid	24.9	1.0	1.0	"	25.0		99.7	0-200			
Trichloroacetic Acid	25.8	1.0	1.0	"	25.0		103	0-200			
Surrogate: 2,3-Dibromopropionic Acid	*10.6*			*"*	*10.0*		*106*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.92*			*"*	*10.0*		*99.2*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Blank (AB40727-BLK1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	ND	0.080	0.10	ug/l							U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"							U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.23*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*3.73*			*"*	*5.00*		*74.6*	*70-130*			
Surrogate: Triphenyl phosphate	*4.72*			*"*	*5.00*		*94.4*	*70-130*			
LCS (AB40727-BS1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.13	0.080	0.10	ug/l	3.00		71.0	70-130			
Di(2-ethylhexyl)adipate	2.49	0.40	5.0	"	3.00		83.0	70-130			J
Di(2-ethylhexyl)phthalate	2.40	0.20	3.0	"	3.00		80.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.36*			*"*	*5.00*		*107*	*70-130*			
Surrogate: Perylene-d12	*4.65*			*"*	*5.00*		*93.0*	*70-130*			
Surrogate: Triphenyl phosphate	*5.36*			*"*	*5.00*		*107*	*70-130*			
LCS Dup (AB40727-BSD1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.40	0.080	0.10	ug/l	3.00		80.0	70-130	11.9	20	
Di(2-ethylhexyl)adipate	2.70	0.40	5.0	"	3.00		90.0	70-130	8.09	20	J
Di(2-ethylhexyl)phthalate	2.57	0.20	3.0	"	3.00		85.7	70-130	6.84	20	J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.39*			*"*	*5.00*		*108*	*70-130*			
Surrogate: Perylene-d12	*4.84*			*"*	*5.00*		*96.8*	*70-130*			
Surrogate: Triphenyl phosphate	*5.47*			*"*	*5.00*		*109*	*70-130*			
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.79	0.080	0.10	ug/l	3.00	ND	93.0	70-130			
Di(2-ethylhexyl)adipate	3.11	0.40	5.0	"	3.00	ND	104	70-130			J
Di(2-ethylhexyl)phthalate	2.79	0.20	3.0	"	3.00	ND	93.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.27*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*5.52*			*"*	*5.00*		*110*	*70-130*			

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:32

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Surrogate: Triphenyl phosphate	*5.65*			*ug/l*	*5.00*		*113*	*70-130*			

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e-mail: clientservices@alpha-labs.com
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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 14:32

Notes and Definitions

J	Detected but below the Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ).
QM-01	The spike recovery for this QC sample is outside of established control limits possibly due to a sample matrix interference.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
QM-4X	The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
S-05	Surrogate recovery for this sample is outside of control limits. Client notified to re-sample if analyte is required for regulatory purposes.
S-GC	Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogates.
U	Analyte included in analysis, but not detected at or above MDL.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

ASBESTOS TEM LABORATORIES, INC.

EPA 600/4-83 Drinking Water
Transmission Electron Microscopy
Analytical Report

Laboratory Job # 1288-00574

630 Bancroft Way
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

Certified by
CA DPH ELAP
Lab No. 1866

Feb/12/2014

David S. Pingatore
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482

RE: LABORATORY JOB # 1288-00574
Transmission electron microscopy analytical results for 1 water sample(s).
Job Site:
Job No.: 14B0089

Enclosed please find results for the TEM analysis of one or more water samples. The analytical procedures were performed according to EPA Method 100.2 for the analysis of asbestos in drinking water.

Prior to analysis, samples are checked for damage, disruption of any chain-of-custody seals, and completeness of accompanying paperwork. If no problems are found, samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

Preparation of water samples is performed within a HEPA filtered, Class 100 air, laminar flow clean bench environment. Prior to filtration, water sample containers are ultrasonicated, and the exterior surfaces cleaned. An aliquot of water is drawn from the sample container and drawn through a special filtration apparatus and collected onto a mixed cellulose ester (MCE) or polycarbonate (PC) filter. The filters are removed from the apparatus and dried. A portion of each sample filter is sectioned, placed onto a glass microscope slide, and carbon coated. The filters are further sectioned and placed carbon side up onto 200-mesh copper TEM sample grids in a solvent bath until all filter material is dissolved. The TEM grids are removed and placed into labeled grid storage boxes.

TEM analysis is performed on a Philips EM-300 or CM-12 transmission electron microscope operating at 80 or 100 kV. Initially, the grid is scanned at low and medium magnification to insure proper sample loading, and coherence of the carbon support film. Then TEM grid openings are analyzed at a magnification of 10,000X. All fibers >10 um in length and exhibiting an aspect ratio >3:1 are analyzed. Scanning continues until either 100 asbestiform fibers >10um in length are counted, or an analytical sensitivity of 0.2 million fibers per liter (MFL) is achieved. Analyzed fibers are subjected to detailed morphological and selected area diffraction (SAED) analysis. Fibers indicated as asbestos, or potentially asbestos, are further analyzed by energy dispersive X-ray (EDX) analysis as needed. The number of asbestos fibers detected, and other analytical parameters, are then used to calculate the concentration of asbestos in MFL. The results are entered into a standard report format and reviewed by the analyst and the laboratory manager before release to the client.

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

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TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL REPORT

Contact:	David S. Pingatore		
Address:	Alpha Analytical Laboratories, Inc. 208 Mason Street Ukiah, CA 95482	Report No.:	**323884**
		Date:	Feb-12-14
		Total Samples Analyzed:	1
Job Site / No.	14B0089	Sample Collector:	

CLIENT SAMPLE #	**14B0089-01**	**SAMPLE LOCATION/DESCRIPTION**	FO-07
Laboratory Sample #	1288-00574-001		

WATER SAMPLE DATA

Date/Time Collected	Feb-03-14 / 2:05 pm	Volume Submitted (ml)	1000
Date/Time Lab Received	Feb-04-14 / 4:48 pm	Volume Filtered (ml)	5
Date/Time Filtered	Feb-04-14 / 5:00 pm	Filter & Pore Size	MCE 0.22
Date/Time Analyzed	Feb-12-14 / 10:55 am	UV/Ozone Treated:	NO

IDENTIFIED STRUCTURES (>10um)			
ASBESTOS		OTHER	
CHRYS	AMPH	AMBIG	NON-ASB
NSD	NSD	NSD	NSD

CALCULATED ASBESTOS STRUCTURE CONCENTRATION (>10um)		
CHRYS	AMPH	TOTAL
< 0.1 MFL	< 0.1 MFL	< 0.1 MFL

COMMENTS

No asbestos detected

Filter Loading: MODERATE

SAED Photo ID Nos.

TEM / ANALYTICAL PARAMETERS

Grid Openings Scanned at 10,000X	24	Analytical Sensitivity	0.1 MFL
Grid Opening Area (mm2)	0.0094	95% UCL	0.33 MFL
Scan Area (mm2)	0.2256	95% LCL	0 MFL

WATER SAMPLE LAB BLANK RESULTS

Lab ID#	Blank 9483	Analytical Sensitivity	0.01 MFL
Grid Openings Scanned at 10,000X	8	Asbestos Structure Concentration	<0.01 MFL
Volume Filtered (ml)	300		

NOTATION KEY

Chrys. - Chrysotile Asbestos
Amph. - Amphibole Asbestos
NSD - No Structures Detected
1 mm = 1 millimeter

1 um = 1 micron = 0.001 mm
MFL = Millions of Fibers per Liter
UCL = Upper Confidence Level
LCL = Lower Confidence Level

ANALYST SIGNATURE

Stephanie Dunn
LAB QC REVIEWER SIGNATURE

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McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 1402035

Report Created for: Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Project Contact: David S. Pingatore
Project P.O.:
Project Name: #14B0089

Project Received: 02/04/2014

Analytical Report reviewed & approved for release on 02/10/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.

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NELAP: 12283CA ♦ ELAP: 1644 ♦ ISO/IEC: 17025:2005 ♦ WSDE: C972-11 ♦ ADEC: UST-098 ♦ UCMR3

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http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: Alpha Analytical Laboratories
Project: #14B0089
WorkOrder: 1402035

Glossary Abbreviation	Description
95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

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Analytical Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1402035
Project:	#14B0089	**Extraction Method**	E218.6
Date Received:	2/4/14 9:21	**Analytical Method:**	E218.6
Date Prepared:	2/4/14	**Unit:**	µg/L

Hexachrome by IC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
FO-07 (Deep)	**1402035-001A**	**Water**	**02/03/2014 14:05**	**IC2**	**86689**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	0.050	1	02/04/2014 14:03

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Quality Control Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1402035
Date Prepared:	2/4/14	**BatchID:**	86689
Date Analyzed:	2/4/14	**Extraction Method**	E218.6
Instrument:	IC2	**Analytical Method:**	E218.6
Matrix:	Water	**Unit:**	µg/L
Project:	#14B0089	**Sample ID:**	MB/LCS-86689 1402035-001AMS/MSD

QC Summary Report for E218.6

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	ND	24.04	0.050	25	-	96.2	90-110

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	23.52	24.27	25	ND	94.1	97.1	90-110	3.14	10

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1402035 **ClientCode: ALPU**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
David S. Pingatore
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482
(707) 468-0401 FAX: (707) 468-5267

Email: sspeaks@alpha-labs.com;david@alpha-lab
cc:
PO:
ProjectNo: #14B0089

Bill to:
Accounts Payable
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Requested TAT: 5 days

Date Received: 02/04/2014
Date Printed: 02/04/2014

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1402035-001	FO-07 (Deep)	Water	2/3/2014 14:05	☐	A											

Test Legend:

1	218_6_DW	2		3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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WORK ORDER SUMMARY

Client Name: ALPHA ANALYTICAL LABORATORIES
QC Level: LEVEL 2
Work Order: 1402035
Project: #14B0089
Client Contact: David S. Pingatore
Date Received: 2/4/2014
Comments:
Contact's Email: sspeaks@alpha-labs.com;david@alpha-labs.com

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Number of Containers	Bottle & Preservative	De-chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1402035-001A	FO-07 (Deep)	Water	E218.6 (Hexachrome)	1	250mL HDPE w/ (NH4)2SO4	☐	2/3/2014 14:05	5 days	Present	☐	

*** NOTE: STLC and TCLP extractions require 48 hrs to complete; therefore, all TATs begin after the extraction is completed (i.e., 24hr TAT yields results in 72 hrs from sample submission).**

Bottle Legend:

250mL HDPE w/ (NH4)2SO4 = 250mL HDPE Bottle w/ Ammonium Sulfate

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

1402035

14B0089

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

McCampbell Analytical
1534 Willowpass Rd.
Pittsburg, CA 94565
Phone :(925) 252-9262
Fax: (925) 252-9269
Terms: Net 30

Analysis	Due	Expires	Comments
14B0089-01 FO-07 (Deep) [Water] Sampled 02/03/14 14:05 Pacific			
Cr6 218.6 DW	02/18/14 12:00	02/08/14 14:05	
Containers Supplied:			
250ml Poly - (NH4)2SO4 (A			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

NO

ICE/T° 1.3
GOOD CONDITION_____ APPROPRIATE
HEAD SPACE ABSENT_____ CONTAINERS_____
DECHLORINATED IN LAB_____ PRESERVED IN LAB_____

PRESERVATION	VOAS	O&G	METALS	OTHER

Released By	Date	Received By	Date
	02/04/14		2/4/14 0916
Released By	Date	Received By	Date

Page 1 of 1

McCampbell Analytical, Inc.
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Sample Receipt Checklist

Client Name:	**Alpha Analytical Laboratories**	Date and Time Received:	**2/4/2014 9:21:13 AM**
Project Name:	**#14B0089**	LogIn Reviewed by:	Maria Venegas
WorkOrder N°:	**1402035** Matrix: Water	Carrier:	Client Drop-In

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☐	No ☑

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp: 1.3°C		NA ☐
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	NA ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑
Samples Received on Ice?	Yes ☑	No ☐	

(Ice Type: BLUE ICE)

** NOTE: If the "No" box is checked, see comments below.*

Comments:

ALS Environmental
ALS Group USA, Corp.
1317 South 13th Avenue
Kelso, WA 98626
T: +1 360 577 7222
F: +1 360 636 1068
www.alsglobal.com

February 21, 2014 Analytical Report for Service Request No: K1401157

David Pingatore
Alpha Analytical Laboratories, Inc.
6398 Dougherty Road, Suite 35
Dublin, CA 94568

RE: 14B0089

Dear David:

Enclosed are the results of the sample submitted to our laboratory on February 05, 2014. For your reference, these analyses have been assigned our service request number K1401157.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3293. You may also contact me via Email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Shar Samy, Ph.D.
Project Manager

SS/mj

RIGHT SOLUTIONS | RIGHT PARTNER

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2286
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L12-28
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Georgia DNR	http://www.gaepd.org/Documents/techguide_pcb.html#cel	881
Hawaii DOH	Not available	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
Indiana DOH	http://www.in.gov/isdh/24859.htm	C-WA-01
ISO 17025	http://www.pjlabs.com/	L12-27
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	3016
Maine DHS	Not available	WA0035
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-368
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA35
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA200001
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	4704427-08-TX
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C1203
Wisconsin DNR	http://dnr.wi.gov/	998386840
Wyoming (EPA Region 8)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.caslab.com or at the accreditation bodies web site

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

ALS ENVIRONMENTAL

Client:	Alpha Analytical Laboratories, Inc.	**Service Request No.:**	K1401157
Project:	14B0089	**Date Received:**	02/05/14
Sample Matrix:	Water		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS), and Laboratory Control Sample (LCS).

Sample Receipt

One water sample was received for analysis at ALS Environmental on 02/05/14. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4ºC upon receipt at the laboratory.

Explosives by EPA Method 8330

Sample Notes and Discussion:
Insufficient sample volume was received to perform a Matrix Spike/Matrix Spike Duplicate (MS/MSD). A Laboratory Control Sample/Duplicate Laboratory Control Sample (LCS/DLCS) was analyzed and reported in lieu of the MS/MSD.

No other anomalies associated with the analysis of this sample were observed.

Approved by_____

K1401157

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14B0089

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

ALS Environmental - Kelso
1317 S. 13th Ave
Kelso, WA 98626
Phone :(360) 577-7222
Fax: -
Terms: Net 30

Analysis	Due	Expires	Comments
14B0089-01 FO-07 (Deep) [Water] Sampled 02/03/14 14:05 Pacific			
8330B Explosives Water	02/18/14 12:00	02/10/14 14:05	
Containers Supplied:			
1L Amber- Unpres. (AD) 1L Amber- Unpres. (AE)			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
[signature]	2-4-14	[signature]	2/5/14 1020
Released By	Date	Received By	Date

ALS

PC Shar

Cooler Receipt and Preservation Form

Client / Project: Alpha Service Request K14 01157

Received: 2/5/14 Opened: 2/5/14 By: [illegible] Unloaded: 2/5/14 By: [illegible]

1. Samples were received via? *Mail* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? _____

   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
-0.9	-0.6	—	—	-0.1	308		1Z894250 0148947738	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA Y N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

Page ____ *of* ____

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401157
Project:	14B0089	**Date Collected:**	02/03/2014
Sample Matrix:	Water	**Date Received:**	02/05/2014

Nitroaromatics and Nitramines (Explosives)

Sample Name:	14B0089-01 FO-07 (Deep)	**Units:**	ug/L
Lab Code:	K1401157-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.12	0.012	1	02/06/14	02/08/14	KWG1400979	
RDX	ND	U	0.12	0.019	1	02/06/14	02/08/14	KWG1400979	
1,3,5-Trinitrobenzene	ND	U	0.23	0.056	1	02/06/14	02/08/14	KWG1400979	
1,3-Dinitrobenzene	ND	U	0.12	0.0095	1	02/06/14	02/08/14	KWG1400979	
3,5-Dinitroaniline	ND	U	0.12	0.015	1	02/06/14	02/08/14	KWG1400979	
TETRYL	ND	U	0.12	0.047	1	02/06/14	02/08/14	KWG1400979	
Nitrobenzene	ND	U	0.12	0.015	1	02/06/14	02/08/14	KWG1400979	
4-Amino-2,6-dinitrotoluene	ND	U	0.12	0.018	1	02/06/14	02/08/14	KWG1400979	
2-Amino-4,6-dinitrotoluene	ND	U	0.12	0.0099	1	02/06/14	02/08/14	KWG1400979	
2,4,6-Trinitrotoluene	ND	U	0.12	0.029	1	02/06/14	02/08/14	KWG1400979	
2,6-Dinitrotoluene	**0.064**	JN	0.23	0.060	1	02/06/14	02/08/14	KWG1400979	
2,4-Dinitrotoluene	ND	U	0.12	0.011	1	02/06/14	02/08/14	KWG1400979	
2-Nitrotoluene	ND	U	0.12	0.036	1	02/06/14	02/08/14	KWG1400979	
4-Nitrotoluene	ND	U	0.12	0.022	1	02/06/14	02/08/14	KWG1400979	
3-Nitrotoluene	ND	U	0.12	0.0072	1	02/06/14	02/08/14	KWG1400979	
Nitroglycerin	ND	U	1.2	0.44	1	02/06/14	02/08/14	KWG1400979	
Pentaerythritol Tetranitrate	ND	U	0.56	0.20	1	02/06/14	02/08/14	KWG1400979	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	85	23-98	02/08/14	Acceptable

Comments:

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401157
Project:	14B0089	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Nitroaromatics and Nitramines (Explosives)

Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1400979-3	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.098	0.010	1	02/06/14	02/07/14	KWG1400979	
RDX	ND	U	0.098	0.017	1	02/06/14	02/07/14	KWG1400979	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/06/14	02/07/14	KWG1400979	
1,3-Dinitrobenzene	ND	U	0.098	0.0085	1	02/06/14	02/07/14	KWG1400979	
3,5-Dinitroaniline	ND	U	0.098	0.013	1	02/06/14	02/07/14	KWG1400979	
TETRYL	ND	U	0.10	0.042	1	02/06/14	02/07/14	KWG1400979	
Nitrobenzene	ND	U	0.098	0.013	1	02/06/14	02/07/14	KWG1400979	
4-Amino-2,6-dinitrotoluene	ND	U	0.098	0.016	1	02/06/14	02/07/14	KWG1400979	
2-Amino-4,6-dinitrotoluene	ND	U	0.098	0.0089	1	02/06/14	02/07/14	KWG1400979	
2,4,6-Trinitrotoluene	ND	U	0.098	0.026	1	02/06/14	02/07/14	KWG1400979	
2,6-Dinitrotoluene	**0.068**	JN	0.20	0.054	1	02/06/14	02/07/14	KWG1400979	
2,4-Dinitrotoluene	ND	U	0.098	0.0091	1	02/06/14	02/07/14	KWG1400979	
2-Nitrotoluene	ND	U	0.10	0.032	1	02/06/14	02/07/14	KWG1400979	
4-Nitrotoluene	ND	U	0.098	0.019	1	02/06/14	02/07/14	KWG1400979	
3-Nitrotoluene	ND	U	0.098	0.0064	1	02/06/14	02/07/14	KWG1400979	
Nitroglycerin	ND	U	0.98	0.39	1	02/06/14	02/07/14	KWG1400979	
Pentaerythritol Tetranitrate	ND	U	0.49	0.18	1	02/06/14	02/07/14	KWG1400979	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	75	23-98	02/07/14	Acceptable

Comments:

Client: Alpha Analytical Laboratories, Inc. (Uki
Service Request: K1401157
Project: 14B0089
Sample Matrix: Water

Surrogate Recovery Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method: METHOD
Units: Percent
Analysis Method: 8330B
Level: Low

Sample Name	Lab Code	Sur1
14B0089-01 FO-07 (Deep)	K1401157-001	85
Method Blank	KWG1400979-3	75
Duplicate Lab Control Sample	KWG1400979-1	82
Lab Control Sample	KWG1400979-2	91

Surrogate Recovery Control Limits (%)

Sur1 = 1-Chloro-3-nitrobenzene 23-98

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401157
Project:	14B0089	**Date Extracted:**	02/06/2014
Sample Matrix:	Water	**Date Analyzed:**	02/07/2014

Lab Control Spike/Duplicate Lab Control Spike Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method:	METHOD	**Units:**	ug/L
Analysis Method:	8330B	**Basis:**	NA
		Level:	Low
		Extraction Lot:	KWG1400979

	Lab Control Sample KWG1400979-2 Lab Control Spike			Duplicate Lab Control Sample KWG1400979-1 Duplicate Lab Control Spike					
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**	**RPD**	**RPD Limit**
HMX	7.75	8.00	97	7.46	8.00	93	11-147	4	30
RDX	7.53	8.00	94	7.26	8.00	91	10-142	4	30
1,3,5-Trinitrobenzene	7.54	8.00	94	7.01	8.00	88	16-137	7	30
1,3-Dinitrobenzene	7.51	8.00	94	7.03	8.00	88	26-125	7	30
3,5-Dinitroaniline	7.48	8.00	93	7.09	8.00	89	30-133	5	30
TETRYL	7.71	8.00	96	7.26	8.00	91	29-123	6	30
Nitrobenzene	7.43	8.00	93	6.93	8.00	87	10-116	7	30
4-Amino-2,6-dinitrotoluene	7.57	8.00	95	7.11	8.00	89	55-117	6	30
2-Amino-4,6-dinitrotoluene	7.47	8.00	93	7.00	8.00	88	54-116	6	30
2,4,6-Trinitrotoluene	7.53	8.00	94	6.93	8.00	87	47-118	8	30
2,6-Dinitrotoluene	7.57	8.00	95	6.95	8.00	87	40-108	9	30
2,4-Dinitrotoluene	7.46	8.00	93	6.83	8.00	85	50-111	9	30
2-Nitrotoluene	7.18	8.00	90	6.55	8.00	82	12-110	9	30
4-Nitrotoluene	7.21	8.00	90	6.58	8.00	82	16-113	9	30
3-Nitrotoluene	7.51	8.00	94	6.83	8.00	85	13-109	10	30
Nitroglycerin	7.71	8.00	96	7.43	8.00	93	15-136	4	30
Pentaerythritol Tetranitrate	7.81	8.00	98	7.35	8.00	92	66-103	6	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ASBESTOS TEM LABORATORIES, INC.

EPA 600/4-83 Drinking Water
Transmission Electron Microscopy
Analytical Report

Laboratory Job # 1288-00574

630 Bancroft Way
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

Certified by
CA DPH ELAP
Lab No. 1866

Feb/12/2014

David S. Pingatore
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482

RE: LABORATORY JOB # 1288-00574
Transmission electron microscopy analytical results for 1 water sample(s).
Job Site:
Job No.: 14B0089

Enclosed please find results for the TEM analysis of one or more water samples. The analytical procedures were performed according to EPA Method 100.2 for the analysis of asbestos in drinking water.

Prior to analysis, samples are checked for damage, disruption of any chain-of-custody seals, and completeness of accompanying paperwork. If no problems are found, samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

Preparation of water samples is performed within a HEPA filtered, Class 100 air, laminar flow clean bench environment. Prior to filtration, water sample containers are ultrasonicated, and the exterior surfaces cleaned. An aliquot of water is drawn from the sample container and drawn through a special filtration apparatus and collected onto a mixed cellulose ester (MCE) or polycarbonate (PC) filter. The filters are removed from the apparatus and dried. A portion of each sample filter is sectioned, placed onto a glass microscope slide, and carbon coated. The filters are further sectioned and placed carbon side up onto 200-mesh copper TEM sample grids in a solvent bath until all filter material is dissolved. The TEM grids are removed and placed into labeled grid storage boxes.

TEM analysis is performed on a Philips EM-300 or CM-12 transmission electron microscope operating at 80 or 100 kV. Initially, the grid is scanned at low and medium magnification to insure proper sample loading, and coherence of the carbon support film. Then TEM grid openings are analyzed at a magnification of 10,000X. All fibers >10 um in length and exhibiting an aspect ratio >3:1 are analyzed. Scanning continues until either 100 asbestiform fibers >10um in length are counted, or an analytical sensitivity of 0.2 million fibers per liter (MFL) is achieved. Analyzed fibers are subjected to detailed morphological and selected area diffraction (SAED) analysis. Fibers indicated as asbestos, or potentially asbestos, are further analyzed by energy dispersive X-ray (EDX) analysis as needed. The number of asbestos fibers detected, and other analytical parameters, are then used to calculate the concentration of asbestos in MFL. The results are entered into a standard report format and reviewed by the analyst and the laboratory manager before release to the client.

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

630 Bancroft Way ▪ BERKELEY, CA 94710 ▪ (510) 704-8930 ▪ FAX (510) 704-8429
www.asbestostemlabs.com *With Offices in Reno, NV (775) 359-3377*

TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL REPORT

Contact:	David S. Pingatore		
Address:	Alpha Analytical Laboratories, Inc. 208 Mason Street Ukiah, CA 95482	Report No.:	**323884**
		Date:	Feb-12-14
		Total Samples Analyzed:	1
Job Site / No.	14B0089	Sample Collector:	

CLIENT SAMPLE #	**14B0089-01**	**SAMPLE LOCATION/DESCRIPTION**	FO-07
Laboratory Sample #	1288-00574-001		

WATER SAMPLE DATA

Date/Time Collected	Feb-03-14 / 2:05 pm	Volume Submitted (ml)	1000
Date/Time Lab Received	Feb-04-14 / 4:48 pm	Volume Filtered (ml)	5
Date/Time Filtered	Feb-04-14 / 5:00 pm	Filter & Pore Size	MCE 0.22
Date/Time Analyzed	Feb-12-14 / 10:55 am	UV/Ozone Treated:	NO

IDENTIFIED STRUCTURES (>10um)			
ASBESTOS		OTHER	
CHRYS	AMPH	AMBIG	NON-ASB
NSD	NSD	NSD	NSD

CALCULATED ASBESTOS STRUCTURE CONCENTRATION (>10um)		
CHRYS	AMPH	TOTAL
< 0.1 MFL	< 0.1 MFL	< 0.1 MFL

COMMENTS

No asbestos detected

Filter Loading: MODERATE

SAED Photo ID Nos.

TEM / ANALYTICAL PARAMETERS

Grid Openings Scanned at 10,000X	24	Analytical Sensitivity	0.1 MFL
Grid Opening Area (mm2)	0.0094	95% UCL	0.33 MFL
Scan Area (mm2)	0.2256	95% LCL	0 MFL

WATER SAMPLE LAB BLANK RESULTS

Lab ID#	Blank 9483	Analytical Sensitivity	0.01 MFL
Grid Openings Scanned at 10,000X	8	Asbestos Structure Concentration	<0.01 MFL
Volume Filtered (ml)	300		

NOTATION KEY

Chrys. - Chrysotile Asbestos
Amph. - Amphibole Asbestos
NSD - No Structures Detected
1 mm = 1 millimeter

1 um = 1 micron = 0.001 mm
MFL = Millions of Fibers per Liter
UCL = Upper Confidence Level
LCL = Lower Confidence Level

ANALYST SIGNATURE

Stephanie Dunn
LAB QC REVIEWER SIGNATURE

WECK LABORATORIES, INC.
Analytical Laboratory Service - Since 1964

Certificate of Analysis

Report Date: 02/24/14 10:55
Received Date: 02/05/14 08:30
Turnaround Time: Normal

Project: 14B0089

Phones: (925) 872-9637
Fax: (707) 468-5267

P.O. #:

Attn: David S. Pingatore

Client: Alpha Analytical Laboratories - Ukiah
208 Mason St
Ukiah, CA 95482

Dear David S. Pingatore :

Enclosed are the results of analyses for samples received 2/5/2014 with the Chain of Custody document. The samples were received in good condition, at 1.7 °C and on ice. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Lab Sample ID: 4B05035-01 **Sample ID: 14B0089-01 FO-07 (Deep)** **Matrix:** Water
Sampled by: Client **Sampled: 02/03/14 14:05**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
N-Nitrosodiethylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 22:56	W4B0362	
N-Nitrosodimethylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 22:56	W4B0362	
N-Nitrosodi-n-butylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 22:56	W4B0362	
N-Nitrosodi-n-propylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 22:56	W4B0362	
N-Nitrosomethylethylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 22:56	W4B0362	
N-Nitrosomorpholine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 22:56	W4B0362	
N-Nitrosopiperidine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 22:56	W4B0362	
N-Nitrosopyrrolidine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 22:56	W4B0362	
17-a-Ethynylestradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:03	W4B0281	
17-b-Estradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:03	W4B0281	
Estrone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:03	W4B0281	
Progesterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:03	W4B0281	
Testosterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:03	W4B0281	
Bisphenol A	**62**		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:33	W4B0283	
Gemfibrozil	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:33	W4B0283	
Ibuprofen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:33	W4B0283	
Iopromide	ND		5.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:33	W4B0283	
Naproxen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:33	W4B0283	
Salicylic Acid	ND		50	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:33	W4B0283	
Triclosan	ND		2.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:33	W4B0283	

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Lab Sample ID: 4B05035-01 **Sample ID: 14B0089-01 FO-07 (Deep)** **Matrix:** Water
Sampled by: Client **Sampled: 02/03/14 14:05**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
Acetaminophen	ND		20	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Amoxicillin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Atenolol	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Atorvastatin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Azithromycin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Caffeine	**2.7**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Carbamazepine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Ciprofloxacin	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Cotinine	ND		2.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
DEET	**2.3**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Diazepam	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Fluoxetine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Meprobamate	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Methadone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Oxybenzone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Phenytoin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Primidone	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	R-01
Sucralose	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Sulfamethoxazole	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
TCEP	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
TCPP	**2.5**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	B
TDCPP	**3.1**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	
Trimethoprim	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:59	W4B0282	

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Quality Control Section

Nitrosamines by isotopic dilution GC/MS CI Mode - Quality Control

Batch W4B0362 - EPA 1625M

Blank (W4B0362-BLK1) — **Prepared: 02/10/14 Analyzed: 02/11/14 19:08**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		4.01	B-06	ng/l					
N-Nitrosomethylethylamine		ND		ng/l					
N-Nitrosodiethylamine		ND		ng/l					
N-Nitrosodi-n-propylamine		ND		ng/l					
N-Nitrosomorpholine		ND		ng/l					
N-Nitrosopyrrolidine		ND		ng/l					
N-Nitrosopiperidine		ND		ng/l					
N-Nitrosodi-n-butylamine		ND		ng/l					

LCS (W4B0362-BS1) — **Prepared: 02/10/14 Analyzed: 02/11/14 19:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		2.87		ng/l	3.00	96	50-150		
N-Nitrosomethylethylamine		2.86		ng/l	3.00	95	50-150		
N-Nitrosodiethylamine		2.97		ng/l	3.00	99	50-150		
N-Nitrosodi-n-propylamine		3.77		ng/l	3.00	126	50-150		
N-Nitrosomorpholine		2.95		ng/l	3.00	98	50-150		
N-Nitrosopyrrolidine		3.15		ng/l	3.00	105	50-150		
N-Nitrosopiperidine		3.42		ng/l	3.00	114	50-150		
N-Nitrosodi-n-butylamine		5.24	Q-08	ng/l	3.00	175	50-150		

LCS Dup (W4B0362-BSD1) — **Prepared: 02/10/14 Analyzed: 02/11/14 20:05**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		2.81		ng/l	3.00	94	50-150	2	30
N-Nitrosomethylethylamine		3.25		ng/l	3.00	108	50-150	13	30
N-Nitrosodiethylamine		4.22	Q-12	ng/l	3.00	141	50-150	35	30
N-Nitrosodi-n-propylamine		3.89		ng/l	3.00	130	50-150	3	30
N-Nitrosomorpholine		3.41		ng/l	3.00	114	50-150	15	30
N-Nitrosopyrrolidine		4.24		ng/l	3.00	141	50-150	29	30
N-Nitrosopiperidine		3.84		ng/l	3.00	128	50-150	12	30
N-Nitrosodi-n-butylamine		6.63	Q-08	ng/l	3.00	221	50-150	23	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		ND		ng/l					
Caffeine		ND		ng/l					
Sulfamethoxazole		ND		ng/l					
Trimethoprim		ND		ng/l					
Azithromycin		ND		ng/l					
Cotinine		ND		ng/l					

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Atenolol		ND		ng/l					
Ciprofloxacin		ND		ng/l					
Carbamazepine		ND		ng/l					
DEET		ND		ng/l					
Fluoxetine		ND		ng/l					
Atorvastatin		ND		ng/l					
Methadone		ND		ng/l					
Primidone		ND		ng/l					
Diazepam		ND		ng/l					
TCPP		2.23	B	ng/l					
TCEP		ND		ng/l					
TDCPP		ND		ng/l					
Phenytoin		ND		ng/l					
Amoxicillin		ND		ng/l					
Meprobamate		ND		ng/l					
Sucralose		ND		ng/l					
Oxybenzone		ND		ng/l					

LCS (W4B0282-BS1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:53**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		435		ng/l	400	109	66-156		
Caffeine		17.4		ng/l	20.0	87	55-152		
Sulfamethoxazole		17.6		ng/l	20.0	88	60-133		
Trimethoprim		18.6		ng/l	20.0	93	67-139		
Azithromycin		199		ng/l	200	100	52-166		
Cotinine		22.6		ng/l	20.0	113	68-155		
Atenolol		21.0		ng/l	20.0	105	56-164		
Ciprofloxacin		83.8		ng/l	100	84	51-168		
Carbamazepine		19.3		ng/l	20.0	96	60-135		
DEET		15.5		ng/l	20.0	78	45-135		
Fluoxetine		23.8		ng/l	20.0	119	55-150		
Atorvastatin		16.3		ng/l	20.0	82	0.1-173		
Methadone		19.0		ng/l	20.0	95	62-137		
Primidone		17.1		ng/l	20.0	86	54-147		
Diazepam		18.3		ng/l	20.0	92	58-127		
TCPP		18.1		ng/l	20.0	90	24-149		
TCEP		17.5		ng/l	20.0	88	25-149		
TDCPP		17.7		ng/l	20.0	88	20-158		
Phenytoin		18.2		ng/l	20.0	91	69-138		
Amoxicillin		164		ng/l	200	82	14-167		
Meprobamate		20.5		ng/l	20.0	102	11-166		
Sucralose		95.7		ng/l	100	96	50-150		
Oxybenzone		15.4		ng/l	20.0	77	50-150		

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

LCS Dup (W4B0282-BSD1) — **Prepared: 02/07/14 Analyzed: 02/18/14 23:07**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		499		ng/l	400	125	66-156	14	30
Caffeine		18.2		ng/l	20.0	91	55-152	4	30
Sulfamethoxazole		19.4		ng/l	20.0	97	60-133	10	30
Trimethoprim		18.4		ng/l	20.0	92	67-139	1	30
Azithromycin		206		ng/l	200	103	52-166	3	30
Cotinine		26.7		ng/l	20.0	134	68-155	17	30
Atenolol		23.0		ng/l	20.0	115	56-164	9	30
Ciprofloxacin		83.4		ng/l	100	83	51-168	0.5	30
Carbamazepine		19.7		ng/l	20.0	98	60-135	2	30
DEET		16.4		ng/l	20.0	82	45-135	6	30
Fluoxetine		22.8		ng/l	20.0	114	55-150	4	30
Atorvastatin		15.1		ng/l	20.0	76	0.1-173	8	30
Methadone		19.1		ng/l	20.0	96	62-137	0.5	30
Primidone		16.2		ng/l	20.0	81	54-147	5	30
Diazepam		18.9		ng/l	20.0	94	58-127	3	30
TCPP		21.0		ng/l	20.0	105	24-149	15	30
TCEP		20.6		ng/l	20.0	103	25-149	16	30
TDCPP		18.9		ng/l	20.0	94	20-158	7	30
Phenytoin		18.4		ng/l	20.0	92	69-138	1	30
Amoxicillin		164		ng/l	200	82	14-167	0	30
Meprobamate		20.6		ng/l	20.0	103	11-166	0.5	30
Sucralose		93.0		ng/l	100	93	50-150	3	30
Oxybenzone		18.3		ng/l	20.0	92	50-150	17	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

Blank (W4B0283-BLK1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:08**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		1.99	B	ng/l					
Gemfibrozil		ND		ng/l					
Ibuprofen		ND		ng/l					
Naproxen		ND		ng/l					
Salicylic Acid		ND		ng/l					
Triclosan		ND		ng/l					
Iopromide		ND		ng/l					

LCS (W4B0283-BS1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:22**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		19.5		ng/l	20.0	98	53-168		
Gemfibrozil		18.0		ng/l	20.0	90	76-122		
Ibuprofen		17.7		ng/l	20.0	88	67-139		
Naproxen		17.3		ng/l	20.0	86	64-138		
Salicylic Acid		171		ng/l	200	86	56-229		

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PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

LCS (W4B0283-BS1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:22**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Triclosan		38.9		ng/l	40.0	97	76-139		
Iopromide		114		ng/l	100	114	0.1-163		

LCS Dup (W4B0283-BSD1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		18.4		ng/l	20.0	92	53-168	6	30
Gemfibrozil		18.3		ng/l	20.0	92	76-122	2	30
Ibuprofen		19.8		ng/l	20.0	99	67-139	11	30
Naproxen		19.1		ng/l	20.0	96	64-138	10	30
Salicylic Acid		183		ng/l	200	92	56-229	7	30
Triclosan		40.5		ng/l	40.0	101	76-139	4	30
Iopromide		104		ng/l	100	104	0.1-163	9	30

PPCPs - Hormones by LC/MSMS-APCI - Quality Control

Batch W4B0281 - EPA 1694M-APCI

Blank (W4B0281-BLK1) — **Prepared: 02/07/14 Analyzed: 02/19/14 16:58**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		ND		ng/l					
17-b-Estradiol		ND		ng/l					
Estrone		ND		ng/l					
Progesterone		ND		ng/l					
Testosterone		ND		ng/l					

LCS (W4B0281-BS1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:15**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		19.1		ng/l	20.0	96	68-159		
17-b-Estradiol		18.0		ng/l	20.0	90	65-146		
Estrone		17.6		ng/l	20.0	88	59-141		
Progesterone		17.8		ng/l	20.0	89	58-154		
Testosterone		24.8		ng/l	20.0	124	60-172		

LCS Dup (W4B0281-BSD1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:31**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		18.9		ng/l	20.0	94	68-159	1	30
17-b-Estradiol		18.4		ng/l	20.0	92	65-146	2	30
Estrone		18.3		ng/l	20.0	92	59-141	4	30
Progesterone		18.1		ng/l	20.0	90	58-154	2	30
Testosterone		26.0		ng/l	20.0	130	60-172	5	30

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Notes:
The Chain of Custody document is part of the analytical report.
Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
All results are expressed on wet weight basis unless otherwise specified.

An Absence of Total Coliform meets the drinking water standards as established by the State of California Department of Health Services.
The Reporting Limit (RL) is referenced as laboratory's Practical Quantitation Limit (PQL).
For Potable water analysis, the Reporting Limit (RL) is referenced as Detection Limit for reporting purposes (DLRs) defined by EPA.

If sample collected by Weck Laboratories, sampled in accordance to lab SOP MIS002

Authorized Signature
Contact: Kim G Tu
(Project Manager)

ELAP # 1132
LACSD # 10143
NELAC # 04229CA

The results in this report apply to the samples analyzed in accordance with the chain of custody document. Weck Laboratories certifies that the test results meet all requirements of NELAC unless noted in the Case Narrative. This analytical report must be reproduced in its entirety.

Flags for Data Qualifiers:

B	Blank contamination. The analyte was found in the associated blank as well as in the sample.
B-06	This analyte was found in the method blank, which was possibly contaminated during sample preparation. The batch was accepted since this analyte was either not detected or more than 10 times of the blank value for all the samples in the batch.
Q-08	High bias in the QC sample does not affect sample result since analyte was not detected or below the reporting limit.
Q-12	The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on the percent recoveries and/or other acceptable QC data.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
ND	NOT DETECTED at or above the Reporting Limit. If J-value reported, then NOT DETECTED at or above the Method Detection Limit (MDL).
Sub	Subcontracted analysis, original report enclosed.
DL	Method Detection Limit
RL	Method Reporting Limit
MDA	Minimum Detectable Activity
NR	Not Reportable

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ISOTECH

ISOTECH LABORATORIES INC

ANALYSIS REPORT

Water Analysis

Lab Number: 410668 Job Number: 24232 IS-69368

Sample Name: FO-07 (DEEP)

Company Lab #:

Company Job #:

Company: Alpha Analytical, Inc.

API/Well:

Field or Site: WO 14B0089

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Date Sampled: 2/03/2014 Date Received 2/05/2014 Date Reported: 2/26/2014

δD of water	----------	na
$\delta^{18}O$ of water	----------	na
Tritium content of water	----------	< 1.00 TU
$\delta^{13}C$ of DIC	----------	na
^{14}C content of DIC	----------	na
$\delta^{15}N$ of nitrate	----------	na
$\delta^{18}O$ of nitrate	----------	na
$\delta^{34}S$ of sulfate	----------	na
$\delta^{18}O$ of sulfate	----------	na

Remarks:

LABORATORY REPORT

This report contains 7 pages.
(including the cover page)

If you have any questions concerning this report, please do not hesitate to call us at (800) 332-4345 or (574) 233-4777.

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UL LLC
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T: 800.332.4345 / F: 574.233.8207 / W: UL.com

NELAC NARRATIVE PAGE

Client: Alpha Analytical Report #: 311112NP

Underwriters Laboratories is a NELAP accredited laboratory. All reported results meet the requirements of the NELAC standards, unless otherwise noted.

UL contact person: James Van Fleit

NELAP requires complete reporting of deviations from method requirements, regardless of the suspected impact on the data. Quality control failures not reported within the report summary are noted here.

There were no quality control failures.

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Authorized Signature Title Date

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Laboratory Report

Client: Alpha Analytical

Attn: David Pingatore
6398 Dougherty Road, Suite 35
Dublin, CA 94568

Report: 311112
Priority: Standard Written
Status: Final
PWS ID: Not Supplied

Copies to: None

Sample Information

UL ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
2968123	14B0089-01	905.0	02/03/14 14:05	Client	02/06/14 09:45
2968124	14B0089-01	7500-Ra B	02/03/14 14:05	Client	02/06/14 09:45
2968124	14B0089-01	7500-Ra D	02/03/14 14:05	Client	02/06/14 09:45
2968125	14B0089-01	7110 B	02/03/14 14:05	Client	02/06/14 09:45
2968126	14B0089-01	1613	02/03/14 14:05	Client	02/06/14 09:45
2968127	14B0089-01	300.1	02/03/14 14:05	Client	02/06/14 09:45
2968128	14B0089-01	300.0	02/03/14 14:05	Client	02/06/14 09:45

Report Summary

Note: See attached page for additional comments.

Note: Sample containers were provided by the client except for Methods 300.0 and 300.1.

Note: Dioxin analysis was performed by Pace Analytical Services, Minneapolis, MN.

Note: Strontium-90 analysis was performed by GEL Laboratories, Charleston, SC.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call James Van Fleit at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature | Title | Date

Client Name: Alpha Analytical
Report #: 311112

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Client Name: Alpha Analytical

Report #: 311112

Sampling Point: 14B0089-01

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
14998-27-7	Chlorite	300.0	1000 *	20	< 20	ug/L	---	02/07/14 07:05	2968128
15541-45-4	Bromate	300.1	10 *	5.0	< 5.0	ug/L	---	02/07/14 18:21	2968127

Radionuclides

Analyte ID #	Analyte	Method	Reg Limit	DL**	Result	Units	Preparation Date	Analyzed	UL ID #
---	Gross Alpha	7110 B	15 *	3.0	**3.0 ± 0.5**	pCi/L	02/24/14 09:07	02/27/14 13:25	2968125
---	Gross Beta	7110 B	50 *	4.0	**4.5 ± 0.5**	pCi/L	02/24/14 09:07	02/27/14 13:25	2968125
13982-63-3	Radium-226	7500-Ra B	3 *	1.00	0.47 ± 0.43	pCi/L	02/21/14 09:22	02/27/14 15:45	2968124
15262-20-1	Radium-228	7500-Ra D	2 *	1.00	0.44 ± 0.38	pCi/L	02/21/14 09:22	03/03/14 14:08	2968124
---	Combined Radium	calc.	5 *	1.00	0.91 ± 0.57	pCi/L	02/21/14 09:22	03/03/14 14:08	2968124

** Detection Limit (DL) shall be that concentration which can be counted with a precision of plus or minus 100% at the 95 % confidence level.

Reference Lab Tests

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	UL ID #
1746-01-6	Dioxin	1613	30 *	5	< 5	pg/L	03/03/14 00:00	03/04/14 14:37	2968126
---	Strontium-90	905.0	8 *	2.00	**-0.439 ± 0.720**	pCi/L	---	02/24/14 09:53	2968123

† UL has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14B0089

SENDING LABORATORY:	**RECEIVING LABORATORY:**
Alpha Analytical Laboratories, Inc.	Zymax
208 Mason St.	600 S. Andreasen Drive, Suite B
Ukiah, CA 95482	Escondido, CA 92029
Phone: (707)468-0401	Phone :(760) 781-3338
Fax: (707)468-5267	Fax: (760) 781-3339
Project Manager: David S. Pingatore	**Terms: Net 30**

Analysis	Due	Expires	Comments
14B0089-01 FO-07 (Deep) [Water] Sampled 02/03/14 14:05 Pacific			43453-1
N and O Isotopes of Nitrate	02/18/14 12:00	02/10/14 14:05	
Oxygen 18 - Isotope / Hydroger	02/18/14 12:00	08/02/14 14:05	

Containers Supplied:

250 mL Poly Unpres (AQ) 250 mL Poly Unpres (AR)

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
[signature]	2-4-14	[signature]	2/5/14 9:05
Released By	Date	Received By	Date

David S. Pingatore
Project Manager
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482
Tel: 707.468.0401
Fax: 707.468.5267
Project: 14B0089
Email: david @ alpha.com

Dr. Yi Wang
Director of ZymaX Forensics Isotope
Senior Environmental Geochemist, PACE
600 S. Andreasen Dr., Suite B
Escondido, CA 92029
Tel: 760.781.3338 ext 202
Fax: 760.781.3339
Cell: 609.721.2843
Email: yi.wang@zymaxusa.com

REPORT OF ENVIRONMENTAL FORENSICS ISOTOPE ANALYSES

Date Received: February 5th, 2014
Date Reported: March 20th, 2014

Sample from Alpha Analytical Labs for $\delta^{15}N$ (‰ Air), $\delta^{18}O$ and δD (‰ VSMOW) stable isotope analysis

ZymaX ID	Client ID/Sample Description	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
43453-1	14B0089-01 FO-07 (Deep)	-7.18	-48.55	U -	U -
	Analytical precision (1σ)	0.06	0.32	0.2	0.4

U - Either there was no peak corresponding to the target analyte or that such a peak did not produce a reliable CSIA result

ZymaX ID	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
QC-01	-5.89	-41.12	4.5	25.3
QC-02	-5.98	-41.57	4.8	25.9
Mean	-5.94	-41.35	4.7	25.6
Analytical Precision (1σ)	0.06	0.32	0.2	0.4

ZymaX Forensics Isotope Services

Product or Dissolved Organics: Chlorinated Solvents, Oil, Extract, Fraction and Kerogen
3D-CSIA of ^{13}C, ^{37}Cl, and ^{2}H for PCE, TCE, DCE, MTBE, BTEX, PAHs, Pesticides, Alkanes, Gasoline and Oil; Bulk ^{13}C, ^{2}H, ^{18}O, ^{34}S, and ^{15}N
Gas Sample
Gas Composition and 2D-CSIA of ^{13}C and ^{2}H of C1 to C5; ^{13}C of CO_2; ^{14}C of C1 and CO_2; ^{34}S of H_2S; ^{15}N and ^{18}O of N_2O gas
Water and Dissolved Inorganics
^{2}H, ^{3}H and ^{18}O; ^{34}S and ^{18}O of dissolved sulfate; ^{34}S of dissolved H_2S
^{15}N and ^{18}O of dissolved Nitrate; ^{15}N of Ammonia; ^{13}C of dissolved CO_2 and Carbonate/Bicarbonate
Soil and Minerals
^{13}C, ^{18}O, ^{15}N, ^{34}S, D/H; ^{14}C of carbonate or organics
Post-Analysis Forensic Isotope Data Interpretation

Laboratory Order - Summary

analytical chemistry for a better environment

Report To:	David S. Pingatore Alpha Analytical Laboratories, Inc. 208 Mason St. Ukiah, CA. 95482	Date Received: Date Due: Project:	02/05/2014 9:05AM 04/28/2014 12:00AM 14B0089
Phone: Fax:	(707) 468-0401 (707) 468-5267	Project Number:	

Lab Number	Description	Analysis	Dept
43453-1	14B0089-01 FO-07	d15N and d18O of NO3	M6
		d18O+dD of H2O	M6

Notes/Special Instructions	SC Login/Computer Login CY/CY	DPRA PM: YW

ZymaX FORENSICS

Condition Upon Reciept

Lab Number: 43453 Client: AAL

Sample Temprature (should be 2-6 degrees C): 1.9°C

Do the sample descriptions on the containers match the discriptions on the COC? ☒ Yes ☐ No

Do the sample dates on the containers match the sample dates on the COC? ☒ Yes ☐ No

Are the samples within holding time for each analysis at time of reciept? ☒ Yes ☐ No ☐ N/A

Do the number of containers received match the number listed on the COC, and are all of the necessary containers for the required analysis available? ☒ Yes ☐ No ☐ N/A

Does the preservation of the samples match the notation on the COC, and is the preservation correct for requested analysis? ☐ Yes ☐ No ☐ N/A ☒ Zymax

Are all of the samples intact with no headspace, if required for analysis? ☒ Yes ☐ No

Did samples arrive with custody seal intact? ☒ Yes ☐ No ☐ N/A

Sample Control Signature: [signature] Date: 2/5/14 Time: 9:05

Client Discrepancies

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14B0089

Signature below authorizes work under terms stated on reverse side.

Report to:
Company: Todd Engineers
Attn: Dr. Bill Motzer
Address: 2490 Mariner Square Loop, Suite 215, Alameda, CA 94501
Phone/Fax: 510.747.6920 / 510.747.6921
Email Address: bmotzer@toddengineers.com

Invoice to (if different):
Company:
Attn:
Address:
Phone/Fax:
Email Address:

Project Info for Report:
Project ID: Groundwater Reuse Project
Project No: Project # 60408
PO/Reference :

Samplers Signature:
Print: Jesse Ortiz

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___ days ○
Lab Approval Required For Rush TATs
Sample Notes (lab use only)
Temperature: 1.9 deg. C
Shipment Method:
Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	Container: 40ml VOA	Poly	Amber glass	Soil jar	Preservative: NaOH	HNO3	H2SO4	Other	None	Matrix: Water	Soil	Total Number of Containers	Inorganics Scan, DU-General Physical Scan	200.7 - Ca, K, Mg, Na	200.8 - Ag, B, Cu, Fe, Mn, U, V, Zn	Bicarbonate, Chloride, Conductivity	MBAS, Perchlorate, TDS, Sulfate	HAA5, TOC	507, 508, 515, 525 DHS, 531, 547, 548, 549	504.1, 524.2 Sample Traps scan	Asbestos DW (sub TEM Lab) ~~B-45~~	Cr6 218.6 DW (sub MAI) - DU Refer	Dioxin 2,3,7,8 TCDD DW (sub UL)	Sample Notes or CDPH Source Numbers:
FO-07 (deep)	2-3-14	1405		x	x		x	x			x	x		4	x	x	x	x	x							
			x		x					x		x		3						x						
				x	x					x	x	x		10							x					(507/508/515.1 = one 1L BRA ea)
			x							x		x		7								x				
					x						x	x		2									x			
				x						x		x		1										x		
					x						x	x		2											x	
Trip blank ($0.00 analysis)	2-3-14	1405	x							x	x	x		2							x					

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	2-3-14	15:10
[signature]	[signature]	2-3-14	1700
Lucci	Lucci	2-3-14	1930
	LAB Lucci	2-3-14	2130

CDPH Write On EDT Transmission? ○ Yes ○ No
State System Number:
If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No
Global ID: Sampling Company Log Code:
EDF to (Email Address):
Travel and Site Time: Mileage: Misc. Supplies:

Chain of Custody Record

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Reports and Invoices will be delivered by email in .pdf format

Lab No. 14B0089

Signature below authorizes work under terms stated on reverse side.

Report to:	Invoice to (if different):	Project Info for Report:
Company: Todd Engineers	Company:	Project ID: Groundwater Reuse Project
Attn: Dr. Bill Motzer	Attn:	
Address: 2490 Mariner Square Loop, Suite 215 Alameda, CA 94501	Address:	Project No: Project # 60408
Phone/Fax: 510.747.6920 / 510.747.6921	Phone/Fax:	PO/Reference :
Email Address: bmotzer@toddengineers.com	Email Address:	

Samplers Signature:

Print: Jose Ortiz

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only): Temperature: 4 deg. C; Shipment Method:; Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	Container: 40ml VOA	Container: Poly	Container: Amber glass	Container: Soil jar	Preservative: HCL	Preservative: HNO3	Preservative: H2SO4	Preservative: Other	Preservative: None	Matrix: Water	Matrix: Soil	Total Number of Containers	8330B Explosives (sub ALS)	PPCP Hormones 1694M (sub Weck)	PPCP Negative Pharmas 1694M (sub Weck)	PPCP Positive Pharmas 1694M (sub Weck)	Nitrosamines LL 1625M (sub Weck)	Gross A & B, R226 &R228, Sr 90 (sub UL)	Bromate 300.1, Chlorite 300.0 (sub UL)	Tritium, Enriched (sub Isotech)	Oxygen 18 Isotope (sub Zymax)	N and O Isotopes of NO3 (sub Zymax)	j-flag MDL reporting + Standard excel EDD	Sample Notes or CDPH Source Numbers:
FO-07 (deep)	2-3-14	1405			x						x	x		2	x										x	
					x					x		x		2		x	x	x								
					x						x	x		2					x							
				x				x				x		4						x						
				x						x		x		2							x					
				x							x	x		1								x				
				x							x	x		1									x			
				x							x	x		1										x		

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	2-3-14	15:10
[signature]	[signature]	2-3-14	1850
[signature]	[signature]	2-3-14	2130

CDPH Write On EDT Transmission? ○ Yes ○ No

State System Number:

If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No

Global ID: Sampling Company Log Code:

EDF to (Email Address):

Travel and Site Time: Mileage: Misc. Supplies:

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

ELAP Certificate Numbers 1551 and 2728

18 February 2014

Todd Groundwater
Attn: Dr. Bill Motzer
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
RE: Groundwater Reuse Project
Work Order: 14A1714

Enclosed are the results of analyses for samples received by the laboratory on 01/30/14 21:25. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeanette Poplin

Jeanette L. Poplin For David S. Pingatore
Project Manager

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 11:18

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Santa Margarita ASR MW-1	14A1714-01	Water	01/30/14 14:50	01/30/14 21:25
Trip Blank	14A1714-02	Water	01/30/14 14:50	01/30/14 21:25

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Metals (Drinking Water) by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Mercury	**0.85**	0.060	1.0	ug/l	1	AA43136	02/05/14 09:00	02/05/14 13:41	EPA 245.1	J

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Metals by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Calcium	**76**	0.010	1.0	mg/l	1	AA43133	01/31/14 14:45	02/05/14 14:13	EPA 200.7	
Magnesium	**22**	0.0080	1.0	"	"	"	"	"	"	
Potassium	**5.1**	0.0080	1.0	"	"	"	"	"	"	
Sodium	**91**	0.020	1.0	"	"	"	"	"	"	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Metals by EPA Method 200.8 ICP/MS
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Aluminum	**4.8**	2.0	50	ug/l	1	AB40328	02/03/14 09:47	02/05/14 14:55	EPA 200.8	J
Antimony	**0.34**	0.020	6.0	"	"	"	"	"	"	J
Arsenic	**1.6**	0.070	2.0	"	"	"	"	"	"	J
Barium	**66**	0.030	100	"	"	"	"	"	"	J
Beryllium	ND	0.020	1.0	"	"	"	"	"	"	U
Boron	**90**	6.0	50	"	"	"	"	"	"	
Cadmium	**0.51**	0.020	1.0	"	"	"	"	"	"	J
Chromium	ND	0.080	10	"	"	"	"	"	"	U
Copper	**4.3**	0.040	0.50	"	"	"	"	"	"	
Iron	**21**	1.8	50	"	"	"	"	"	"	J
Lead	**0.78**	0.020	5.0	"	"	"	"	"	"	J
Manganese	**23**	0.030	5.0	"	"	"	"	"	"	
Nickel	**4.0**	0.060	10	"	"	"	"	"	"	J
Selenium	**1.8**	0.070	5.0	"	"	"	"	"	"	J
Silver	ND	0.020	0.10	"	"	"	"	"	"	U
Thallium	ND	0.020	1.0	"	"	"	"	"	"	U
Uranium	**1.3**	0.020	1.0	pCi/l	"	"	"	"	"	
Vanadium	**0.76**	0.30	1.0	ug/l	"	"	"	"	"	J
Zinc	**25**	0.50	5.0	"	"	"	"	"	"	

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Alpha Analytical Laboratories Inc.
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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Conventional Chemistry Parameters by APHA/EPA Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Bicarbonate	**270**	0.060	5.0	mg/l	1	AA43121	02/11/14 10:19	02/11/14 17:00	SM2320B	
Color	**3.0**	3.0	5.0	Color Units	"	AA43128	01/30/14 18:00	01/30/14 18:00	SM2120B	J
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l	"	AA43107	01/31/14 14:45	02/04/14 16:00	SM5540C	U
Odor	ND		1.0	T.O.N.	"	AA43128	01/30/14 18:00	01/30/14 18:00	EPA 140.1	U
Perchlorate	ND	0.90	4.0	ug/l	"	AB41141	02/11/14 09:49	02/11/14 13:47	EPA 314.0	U
Specific Conductance (EC)	**900**	1.0	20	umhos/cm	"	AA43147	01/31/14 17:00	01/31/14 17:00	SM2510B	
Total Dissolved Solids	**560**	5.0	10	mg/l	"	AB40322	02/03/14 09:00	02/05/14 08:30	SM2540C	
Turbidity	**0.37**	0.040	0.10	NTU	"	AA43129	01/30/14 18:00	01/30/14 18:00	SM2130B	
Nitrate + Nitrite as N	**0.094**	0.0086	0.40	mg/l	"	AB41339	02/13/14 10:39	02/13/14 11:18	EPA 300.0	J
Total Organic Carbon	**0.627**	0.100	0.300	"	"	AB40803	02/08/14 12:46	02/08/14 22:38	SM5310C	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Miscellaneous Physical/Conventional Chemistry Parameters
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Cyanide (total)	ND	0.0020	0.10	mg/l	1	AB40428	02/04/14 09:46	02/05/14 15:20	10-204-00-1X	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Anions by EPA Method 300.0
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Nitrate as NO3	**0.42**	0.20	2.0	mg/l	1	AA43111	01/31/14 12:28	01/31/14 19:43	EPA 300.0	J
Chloride	**120**	0.30	5.0	"	10	"	"	01/31/14 19:28	"	
Fluoride	**0.15**	0.070	0.10	"	1	"	"	01/31/14 19:43	"	
Nitrite as N	ND	0.020	0.40	"	"	"	"	"	"	U
Sulfate as SO4	**73**	0.90	5.0	"	10	"	"	01/31/14 19:28	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Acetone	ND	0.80	5.0	ug/l	1	AB40725	02/04/14 11:57	02/06/14 15:25	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	**0.87**	0.50	0.50	"	"	"	"	"	"	
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
1,3-Dichloropropane	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 15:25	EPA 524.2	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
o-Xylene	ND	0.10	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 15:25	EPA 524.2	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	**0.87**	0.50	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*97.7 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*95.1 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*100 %*	*70-130*			"	"	"	"	
Trip Blank (14A1714-02) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Acetone	ND	0.80	5.0	ug/l	1	AB40725	02/04/14 11:57	02/06/14 16:02	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14A1714-02) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
1,2-Dichlorobenzene	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 16:02	EPA 524.2	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14A1714-02) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
1,2,4-Trichlorobenzene	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 16:02	EPA 524.2	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U
o-Xylene	ND	0.10	0.50	"	"	"	"	"	"	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*98.6 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*97.0 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*101 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Aldrin	ND	0.010	0.050	ug/l	1	AB40514	02/05/14 08:08	02/12/14 00:22	EPA 508	U
Chloroneb	ND	0.20	0.50	"	"	"	"	"	"	U
Chlorobenzilate	ND	2.0	5.0	"	"	"	"	"	"	U
Chlorothalonil	ND	0.030	0.10	"	"	"	"	"	"	U
DCPA	ND	0.020	0.040	"	"	"	"	"	"	U
4,4´-DDD	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDE	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDT	ND	0.020	0.020	"	"	"	"	"	"	U
Dieldrin	ND	0.010	0.010	"	"	"	"	"	"	U
Endosulfan I	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan II	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan sulfate	ND	0.020	0.020	"	"	"	"	"	"	U
Endrin	ND	0.030	0.10	"	"	"	"	"	"	U
Endrin aldehyde	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-alpha	ND	0.010	0.050	"	"	"	"	"	"	U
HCH-beta	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-delta	ND	0.030	0.050	"	"	"	"	"	"	U
HCH-gamma (Lindane)	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor epoxide	ND	0.010	0.010	"	"	"	"	"	"	U
Hexachlorobenzene	ND	0.010	0.040	"	"	"	"	"	"	U
Hexachlorocyclopentadiene	ND	0.040	0.40	"	"	"	"	"	"	U
Methoxychlor	ND	0.020	0.020	"	"	"	"	"	"	U
cis-Permethrin	ND	0.070	0.20	"	"	"	"	"	"	U
trans-Permethrin	ND	0.090	0.20	"	"	"	"	"	"	U
Propachlor	ND	0.070	0.20	"	"	"	"	"	"	U
Trifluralin	ND	0.020	0.040	"	"	"	"	"	"	U
PCB-1016	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1221	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1232	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1242	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1248	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1254	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1260	ND	0.030	0.50	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Total PCBs	ND	0.30	0.50	ug/l	1	AB40514	02/05/14 08:08	02/12/14 00:22	EPA 508	U
Toxaphene	ND	0.40	0.50	"	"	"	"	"	"	U
Chlordane (tech)	ND	0.030	0.050	"	"	"	"	"	"	U
Surrogate: Dibutylchlorendate		*110 %*	*70-130*			"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Nitrogen- and Phosphorus- Pesticides by EPA Method 507
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Alachlor	ND	0.50	0.50	ug/l	1	AB40730	02/08/14 15:03	02/11/14 09:17	EPA 507	U
Atrazine	ND	0.30	0.50	"	"	"	"	"	"	U
Bromacil	ND	0.50	5.0	"	"	"	"	"	"	U
Butachlor	ND	0.40	0.50	"	"	"	"	"	"	U
Dimethoate	ND	0.20	1.0	"	"	"	"	"	"	U
Metolachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Metribuzin	ND	0.40	0.50	"	"	"	"	"	"	U
Molinate	ND	0.20	0.50	"	"	"	"	"	"	U
Prometryn	ND	0.50	0.50	"	"	"	"	"	"	U
Propachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Simazine	ND	0.30	0.50	"	"	"	"	"	"	U
Thiobencarb	ND	0.20	1.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*94.0 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Organic Analytes by EPA Method 504.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40359	02/04/14 10:00	02/05/14 04:42	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U
Trip Blank (14A1714-02) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40359	02/04/14 10:00	02/05/14 05:17	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Chlorinated Acids by EPA Method 515.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Acifluorfen	ND	0.50	1.0	ug/l	1	AB40536	02/06/14 14:29	02/08/14 05:47	EPA 515.1	U
Bentazon	ND	0.40	0.40	"	"	"	"	"	"	U
2,4-D	ND	0.80	1.0	"	"	"	"	"	"	U
Dalapon	ND	6.0	6.0	"	"	"	"	"	"	U
2,4-DB	ND	4.0	5.0	"	"	"	"	"	"	U
Dicamba	ND	0.40	0.40	"	"	"	"	"	"	U
Dichlorprop	ND	1.0	1.0	"	"	"	"	"	"	U
Dinoseb	ND	0.80	1.0	"	"	"	"	"	"	U
4-Nitrophenol	ND	0.70	1.0	"	"	"	"	"	"	U
Pentachlorophenol	ND	0.20	0.20	"	"	"	"	"	"	U
Picloram	ND	0.50	1.0	"	"	"	"	"	"	U
2,4,5-T	ND	0.40	0.50	"	"	"	"	"	"	U
2,4,5-TP (Silvex)	ND	0.50	0.50	"	"	"	"	"	"	U
Surrogate: DCAA		*94.2 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Carbamates by EPA Method 531.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Aldicarb	ND	0.70	3.0	ug/l	1	AB41142	02/11/14 10:07	02/12/14 12:15	EPA 531.1	U
Aldicarb sulfone	ND	0.70	4.0	"	"	"	"	"	"	U
Aldicarb sulfoxide	ND	0.80	3.0	"	"	"	"	"	"	U
Carbaryl	ND	0.70	5.0	"	"	"	"	"	"	U
Carbofuran	ND	2.0	5.0	"	"	"	"	"	"	U
3-Hydroxycarbofuran	ND	0.90	3.0	"	"	"	"	"	"	U
Methiocarb	ND	2.0	5.0	"	"	"	"	"	"	U
Methomyl	ND	2.0	2.0	"	"	"	"	"	"	U
Oxamyl	ND	0.80	20	"	"	"	"	"	"	U
Propoxur	ND	2.0	5.0	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Endothall by EPA Method 548.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Endothall	ND	2.0	45	ug/l	1	AB40357	02/04/14 14:37	02/06/14 16:10	EPA 548.1	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Glyphosate by EPA Method 547
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Glyphosate	ND	3.0	10	ug/l	1	AB40427	02/04/14 09:22	02/05/14 00:34	EPA 547	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Diquat by EPA Method 549.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Diquat	ND	2.0	2.0	ug/l	1	AA43118	02/03/14 09:48	02/10/14 21:54	EPA 549.2	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Haloacetic Acids by EPA Method 552.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Monobromoacetic Acid	ND	0.8	1.0	ug/l	1	AB41050	02/11/14 13:22	02/12/14 17:04	EPA 552.2	U
Monochloroacetic Acid	ND	1.1	2.0	"	"	"	"	"	"	U
Dibromoacetic Acid	ND	0.8	1.0	"	"	"	"	"	"	U
Dichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Trichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"	"	"	"	"	"	U
Surrogate: 2,3-Dibromopropionic Acid		*80.8 %*	*70-130*			*"*	*"*	*"*	*"*	
Surrogate: 2-Bromopropionic Acid		*88.0 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Semivolatile Organic Compounds by EPA Method 525.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Santa Margarita ASR MW-1 (14A1714-01) Water Sampled: 01/30/14 14:50 Received: 01/30/14 21:25										
Benzo (a) pyrene	ND	0.080	0.10	ug/l	1	AB40727	02/08/14 13:35	02/13/14 19:00	EPA 525.2	U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"	"	"	"	"	"	U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*106 %*	*70-130*			"	"	"	"	
Surrogate: Perylene-d12		*100 %*	*70-130*			"	"	"	"	
Surrogate: Triphenyl phosphate		*112 %*	*70-130*			"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Metals (Drinking Water) by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43136 - EPA 245.1 Hg Water											
Blank (AA43136-BLK1)					Prepared & Analyzed: 02/05/14						
Mercury	ND	0.060	1.0	ug/l							U
LCS (AA43136-BS1)					Prepared & Analyzed: 02/05/14						
Mercury	2.30	0.060	1.0	ug/l	2.50		92.0	80-120			
Duplicate (AA43136-DUP1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	ND	0.060	1.0	ug/l		ND				20	U
Matrix Spike (AA43136-MS1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	2.26	0.060	1.0	ug/l	2.50	ND	90.4	60-140			
Matrix Spike (AA43136-MS2)		**Source: 14B0218-01**			Prepared & Analyzed: 02/05/14						
Mercury	2.32	0.060	1.0	ug/l	2.50	0.0600	90.4	60-140			
Matrix Spike Dup (AA43136-MSD1)		**Source: 14A1575-02**			Prepared & Analyzed: 02/05/14						
Mercury	2.29	0.060	1.0	ug/l	2.50	ND	91.6	60-140	1.32	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43133 - Metals Digest											
Blank (AA43133-BLK1)					Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	ND	0.010	1.0	mg/l							U
Magnesium	ND	0.0080	1.0	"							U
Potassium	ND	0.0080	1.0	"							U
Sodium	ND	0.020	1.0	"							U
LCS (AA43133-BS1)					Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	5.36	0.010	1.0	mg/l	5.88		91.2	85-115			
Magnesium	7.09	0.0080	1.0	"	8.00		88.6	85-115			
Potassium	7.97	0.0080	1.0	"	8.00		99.6	85-115			
Sodium	7.75	0.020	1.0	"	8.00		96.8	85-115			
Duplicate (AA43133-DUP1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/12/14						
Calcium	18.2	0.010	1.0	mg/l		16.5			9.76	20	
Magnesium	6.86	0.0080	1.0	"		6.53			4.91	20	
Potassium	3.66	0.0080	1.0	"		3.35			8.82	20	
Sodium	52.8	0.020	1.0	"		50.2			5.03	20	
Matrix Spike (AA43133-MS1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	22.4	0.010	1.0	mg/l	5.88	16.5	100	70-130			
Magnesium	13.0	0.0080	1.0	"	8.00	6.53	81.3	70-130			
Potassium	10.8	0.0080	1.0	"	8.00	3.35	92.8	70-130			
Sodium	58.8	0.020	1.0	"	8.00	50.2	107	70-130			
Matrix Spike (AA43133-MS2)		**Source: 14A1713-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	35.4	0.010	1.0	mg/l	5.88	28.8	112	70-130			
Magnesium	11.0	0.0080	1.0	"	8.00	3.85	89.5	70-130			
Potassium	11.1	0.0080	1.0	"	8.00	3.56	94.7	70-130			
Sodium	47.2	0.020	1.0	"	8.00	38.1	114	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43133 - Metals Digest											
Matrix Spike Dup (AA43133-MSD1)		**Source: 14A1643-01**			Prepared: 01/31/14 Analyzed: 02/05/14						
Calcium	23.2	0.010	1.0	mg/l	5.88	16.5	113	70-130	3.39	20	
Magnesium	14.3	0.0080	1.0	"	8.00	6.53	97.1	70-130	9.24	20	
Potassium	11.0	0.0080	1.0	"	8.00	3.35	95.8	70-130	2.21	20	
Sodium	60.3	0.020	1.0	"	8.00	50.2	126	70-130	2.49	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Blank (AB40328-BLK1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	ND	2.0	50	ug/l							U
Antimony	ND	0.020	6.0	"							U
Arsenic	ND	0.070	2.0	"							U
Barium	ND	0.030	100	"							U
Beryllium	ND	0.020	1.0	"							U
Boron	17.8	6.0	50	"							J
Cadmium	ND	0.020	1.0	"							U
Chromium	ND	0.080	10	"							U
Copper	ND	0.040	0.50	"							U
Iron	ND	1.8	50	"							U
Lead	ND	0.020	5.0	"							U
Manganese	ND	0.030	5.0	"							U
Nickel	ND	0.060	10	"							U
Selenium	0.0754	0.070	5.0	"							J
Silver	ND	0.020	0.10	"							U
Thallium	ND	0.020	1.0	"							U
Uranium	ND	0.020	1.0	pCi/l							U
Vanadium	ND	0.30	1.0	ug/l							U
Zinc	1.13	0.50	5.0	"							J
LCS (AB40328-BS1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	483	2.0	50	ug/l	520		92.8	85-115			
Antimony	20.1	0.020	6.0	"	20.0		100	85-115			
Arsenic	19.7	0.070	2.0	"	20.0		98.7	85-115			
Barium	19.1	0.030	100	"	20.0		95.4	85-115			J
Beryllium	18.8	0.020	1.0	"	20.0		94.1	85-115			
Boron	110	6.0	50	"	100		110	85-115			
Cadmium	18.8	0.020	1.0	"	20.0		94.0	85-115			
Chromium	19.3	0.080	10	"	20.0		96.6	85-115			
Copper	19.0	0.040	0.50	"	20.0		95.1	85-115			
Iron	502	1.8	50	"	520		96.6	85-115			
Lead	17.5	0.020	5.0	"	20.0		87.5	85-115			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
LCS (AB40328-BS1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Manganese	18.8	0.030	5.0	ug/l	20.0		94.2	85-115			
Nickel	19.3	0.060	10	"	20.0		96.6	85-115			
Selenium	20.1	0.070	5.0	"	20.0		100	85-115			
Silver	18.1	0.020	0.10	"	20.0		90.4	85-115			
Thallium	17.1	0.020	1.0	"	20.0		85.6	85-115			
Uranium	11.5	0.020	1.0	pCi/l	13.4		85.5	85-115			
Vanadium	19.8	0.30	1.0	ug/l	20.0		99.0	85-115			
Zinc	98.6	0.50	5.0	"	100		98.6	85-115			
Duplicate (AB40328-DUP1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1120	2.0	50	ug/l		1150			1.98	20	
Antimony	0.0754	0.020	6.0	"		0.0744			1.34	20	J
Arsenic	1.08	0.070	2.0	"		1.15			6.89	20	J
Barium	70.3	0.030	100	"		68.3			2.85	20	J
Beryllium	0.0788	0.020	1.0	"		0.0838			6.24	20	J
Boron	37.9	6.0	50	"		36.2			4.75	20	J
Cadmium	0.0848	0.020	1.0	"		0.0857			1.11	20	J
Chromium	0.470	0.080	10	"		0.382			20.5	20	J
Copper	12.8	0.040	0.50	"		12.3			3.69	20	
Iron	412	1.8	50	"		408			0.910	20	
Lead	1.06	0.020	5.0	"		1.12			4.92	20	J
Manganese	6.46	0.030	5.0	"		7.23			11.3	20	
Nickel	1.21	0.060	10	"		1.20			1.54	20	J
Selenium	0.159	0.070	5.0	"		0.171			7.50	20	J
Silver	0.0362	0.020	0.10	"		0.0220			48.8	20	J
Thallium	0.105	0.020	1.0	"		0.0948			9.86	20	J
Uranium	0.249	0.020	1.0	pCi/l		0.265			6.25	20	J
Vanadium	1.52	0.30	1.0	ug/l		1.64			7.56	20	
Zinc	6.79	0.50	5.0	"		6.73			0.780	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Matrix Spike (AB40328-MS1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1570	2.0	50	ug/l	520	1150	81.5	70-130			
Antimony	18.9	0.020	6.0	"	20.0	0.0744	94.1	70-130			
Arsenic	19.9	0.070	2.0	"	20.0	1.15	93.5	70-130			
Barium	85.5	0.030	100	"	20.0	68.3	85.8	70-130			J
Beryllium	17.8	0.020	1.0	"	20.0	0.0838	88.5	70-130			
Boron	114	6.0	50	"	100	36.2	78.1	70-130			
Cadmium	18.7	0.020	1.0	"	20.0	0.0857	93.0	70-130			
Chromium	17.4	0.080	10	"	20.0	0.382	85.1	70-130			
Copper	29.6	0.040	0.50	"	20.0	12.3	86.4	70-130			
Iron	858	1.8	50	"	520	408	86.4	70-130			
Lead	19.8	0.020	5.0	"	20.0	1.12	93.4	70-130			
Manganese	23.4	0.030	5.0	"	20.0	7.23	80.7	70-130			
Nickel	18.2	0.060	10	"	20.0	1.20	85.0	70-130			
Selenium	18.7	0.070	5.0	"	20.0	0.171	92.7	70-130			
Silver	17.9	0.020	0.10	"	20.0	0.0220	89.3	70-130			
Thallium	18.5	0.020	1.0	"	20.0	0.0948	92.1	70-130			
Uranium	13.5	0.020	1.0	pCi/l	13.4	0.265	98.5	70-130			
Vanadium	19.1	0.30	1.0	ug/l	20.0	1.64	87.4	70-130			
Zinc	98.9	0.50	5.0	"	100	6.73	92.1	70-130			
Matrix Spike (AB40328-MS2)		**Source: 14B0124-02**			Prepared: 02/05/14 Analyzed: 02/06/14						
Aluminum	529	2.0	50	ug/l	520	70.3	88.1	70-130			
Antimony	20.4	0.020	6.0	"	20.0	0.0711	102	70-130			
Arsenic	21.4	0.070	2.0	"	20.0	2.13	96.2	70-130			
Barium	35.8	0.030	100	"	20.0	16.9	94.7	70-130			J
Beryllium	19.3	0.020	1.0	"	20.0	ND	96.4	70-130			
Boron	150	6.0	50	"	100	63.0	87.0	70-130			
Cadmium	19.4	0.020	1.0	"	20.0	ND	97.0	70-130			
Chromium	20.0	0.080	10	"	20.0	0.590	97.0	70-130			
Copper	19.6	0.040	0.50	"	20.0	1.39	90.9	70-130			
Iron	602	1.8	50	"	520	91.5	98.1	70-130			
Lead	20.2	0.020	5.0	"	20.0	0.0825	101	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Matrix Spike (AB40328-MS2)		**Source: 14B0124-02**			Prepared: 02/05/14 Analyzed: 02/06/14						
Manganese	26.7	0.030	5.0	ug/l	20.0	7.07	98.0	70-130			
Nickel	19.5	0.060	10	"	20.0	0.983	92.8	70-130			
Selenium	19.2	0.070	5.0	"	20.0	0.207	95.2	70-130			
Silver	19.4	0.020	0.10	"	20.0	ND	97.2	70-130			
Thallium	19.8	0.020	1.0	"	20.0	ND	99.0	70-130			
Uranium	14.2	0.020	1.0	pCi/l	13.4	0.107	105	70-130			
Vanadium	24.6	0.30	1.0	ug/l	20.0	5.40	95.9	70-130			
Zinc	99.9	0.50	5.0	"	100	3.69	96.2	70-130			
Matrix Spike Dup (AB40328-MSD1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1580	2.0	50	ug/l	520	1150	83.4	70-130	0.635	20	
Antimony	19.7	0.020	6.0	"	20.0	0.0744	98.1	70-130	4.13	20	
Arsenic	20.5	0.070	2.0	"	20.0	1.15	96.6	70-130	3.05	20	
Barium	88.4	0.030	100	"	20.0	68.3	100	70-130	3.29	20	J
Beryllium	19.1	0.020	1.0	"	20.0	0.0838	95.3	70-130	7.32	20	
Boron	125	6.0	50	"	100	36.2	88.8	70-130	8.99	20	
Cadmium	19.7	0.020	1.0	"	20.0	0.0857	98.0	70-130	5.25	20	
Chromium	18.0	0.080	10	"	20.0	0.382	88.1	70-130	3.40	20	
Copper	30.7	0.040	0.50	"	20.0	12.3	91.9	70-130	3.64	20	
Iron	860	1.8	50	"	520	408	86.8	70-130	0.291	20	
Lead	21.5	0.020	5.0	"	20.0	1.12	102	70-130	8.35	20	
Manganese	23.8	0.030	5.0	"	20.0	7.23	83.1	70-130	2.03	20	
Nickel	18.6	0.060	10	"	20.0	1.20	87.2	70-130	2.36	20	
Selenium	19.1	0.070	5.0	"	20.0	0.171	94.8	70-130	2.29	20	
Silver	19.1	0.020	0.10	"	20.0	0.0220	95.5	70-130	6.75	20	
Thallium	20.0	0.020	1.0	"	20.0	0.0948	99.5	70-130	7.72	20	
Uranium	14.5	0.020	1.0	pCi/l	13.4	0.265	107	70-130	7.74	20	
Vanadium	19.8	0.30	1.0	ug/l	20.0	1.64	91.0	70-130	3.68	20	
Zinc	105	0.50	5.0	"	100	6.73	97.9	70-130	5.71	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43107 - General Preparation											
Blank (AA43107-BLK1)					Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l							U
LCS (AA43107-BS1)					Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.205	0.030	0.050	mg/l	0.200		103	80-120			
Duplicate (AA43107-DUP1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l		ND				20	U
Matrix Spike (AA43107-MS1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.208	0.030	0.050	mg/l	0.200	ND	104	80-120			
Matrix Spike Dup (AA43107-MSD1)		**Source: 14A1588-02**			Prepared: 01/31/14 Analyzed: 02/04/14						
MBAS, calculated as LAS, mw 340	0.210	0.030	0.050	mg/l	0.200	ND	105	80-120	0.826	20	
Batch AA43121 - General Preparation											
Duplicate (AA43121-DUP1)		**Source: 14B0229-03**			Prepared: 02/01/14 Analyzed: 02/11/14						
Bicarbonate	42.7	0.060	5.0	mg/l		42.7			0.00	20	
Batch AA43129 - General Preparation											
Blank (AA43129-BLK1)					Prepared & Analyzed: 01/30/14						
Turbidity	ND	0.040	0.10	NTU							U
Duplicate (AA43129-DUP1)		**Source: 14A1722-01**			Prepared & Analyzed: 01/30/14						
Turbidity	2.48	0.040	0.10	NTU		2.48			0.00	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43147 - General Preparation											
Duplicate (AA43147-DUP1)		**Source: 14A1739-01**			Prepared & Analyzed: 01/31/14						
Specific Conductance (EC)	143	1.0	20	umhos/cm		144			0.697	10	
Batch AB40322 - General Preparation											
Blank (AB40322-BLK1)					Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	ND	5.0	10	mg/l							U
Duplicate (AB40322-DUP1)		**Source: 14A1635-01**			Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	361	5.0	10	mg/l		352			2.52	30	
Duplicate (AB40322-DUP2)		**Source: 14A1730-01**			Prepared: 02/03/14 Analyzed: 02/05/14						
Total Dissolved Solids	1010	5.0	10	mg/l		964			4.46	30	
Batch AB40803 - General Prep											
Blank (AB40803-BLK1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	ND	0.100	0.300	mg/l							U
LCS (AB40803-BS1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.6	0.100	0.300	mg/l	10.0		106	85-115			
LCS Dup (AB40803-BSD1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.5	0.100	0.300	mg/l	10.0		105	85-115	1.20	20	
Duplicate (AB40803-DUP1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	ND	0.100	0.300	mg/l		0.112				20	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40803 - General Prep											
Matrix Spike (AB40803-MS1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.7	0.100	0.300	mg/l	10.0	0.112	106	70-130			
Matrix Spike Dup (AB40803-MSD1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.4	0.100	0.300	mg/l	10.0	0.112	102	70-130	3.54	20	
Batch AB41141 - General Preparation											
Blank (AB41141-BLK1)					Prepared & Analyzed: 02/11/14						
Perchlorate	0.967	0.90	4.0	ug/l							J
LCS (AB41141-BS1)					Prepared & Analyzed: 02/11/14						
Perchlorate	23.9	0.90	4.0	ug/l	25.0		95.5	85-115			
Duplicate (AB41141-DUP1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	ND	0.90	4.0	ug/l		ND				15	U
Matrix Spike (AB41141-MS1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130			
Matrix Spike Dup (AB41141-MSD1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130	0.00386	15	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Miscellaneous Physical/Conventional Chemistry Parameters - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40428 - General Preparation											
Blank (AB40428-BLK1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l							U
LCS (AB40428-BS1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.202	0.0020	0.10	mg/l	0.200		101	85-115			
Duplicate (AB40428-DUP1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l		ND				25	U
Matrix Spike (AB40428-MS1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.188	0.0020	0.10	mg/l	0.200	ND	93.9	85-115			
Matrix Spike (AB40428-MS2)		**Source: 14A1635-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.220	0.0020	0.10	mg/l	0.200	ND	110	85-115			
Matrix Spike Dup (AB40428-MSD1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.186	0.0020	0.10	mg/l	0.200	ND	92.8	85-115	1.23	25	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43111 - General Preparation											
Blank (AA43111-BLK1)					Prepared & Analyzed: 01/31/14						
Nitrate as NO3	ND	0.20	2.0	mg/l							U
Chloride	ND	0.030	0.50	"							U
Nitrite as N	ND	0.020	0.40	"							U
Sulfate as SO4	ND	0.090	0.50	"							U
Fluoride	ND	0.070	0.10	"							U
LCS (AA43111-BS1)					Prepared & Analyzed: 01/31/14						
Nitrate as NO3	22	0.20	2.0	mg/l	22.2		101	90-110			
Chloride	10.2	0.030	0.50	"	10.0		102	90-110			
Fluoride	5.25	0.070	0.10	"	5.00		105	90-110			
Nitrite as N	5.21	0.020	0.40	"	5.00		104	90-110			
Sulfate as SO4	20.0	0.090	0.50	"	20.0		100	90-110			
Duplicate (AA43111-DUP1)		**Source: 14A1704-01**			Prepared & Analyzed: 01/31/14						
Nitrate as NO3	0.43	0.20	2.0	mg/l		0.43			1.40	20	J
Sulfate as SO4	9.21	0.090	0.50	"		9.36			1.61	20	
Chloride	2.62	0.030	0.50	"		2.61			0.0765	20	
Fluoride	ND	0.070	0.10	"		ND				20	U
Nitrite as N	ND	0.020	0.40	"		ND				20	U
Matrix Spike (AA43111-MS1)		**Source: 14A1704-01**			Prepared & Analyzed: 01/31/14						
Nitrate as NO3	25	0.20	2.0	mg/l	24.7	0.43	99.8	80-120			
Nitrite as N	5.79	0.020	0.40	"	5.56	ND	104	80-120			
Chloride	14.2	0.030	0.50	"	11.1	2.61	104	80-120			
Fluoride	5.68	0.070	0.10	"	5.56	ND	102	80-120			
Sulfate as SO4	32.0	0.090	0.50	"	22.2	9.36	102	80-120			
Matrix Spike (AA43111-MS2)		**Source: 14A1713-01**			Prepared & Analyzed: 01/31/14						
Nitrate as NO3	26	1.0	10	mg/l	24.7	2.4	96.0	80-120			
Nitrite as N	5.44	0.10	2.0	"	5.56	ND	98.0	80-120			
Chloride	54.8	0.15	2.5	"	11.1	43.7	100	80-120			
Fluoride	4.85	0.35	0.50	"	5.56	ND	87.3	80-120			
Sulfate as SO4	34.3	0.45	2.5	"	22.2	13.3	94.2	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43111 - General Preparation											
Matrix Spike Dup (AA43111-MSD1)		**Source: 14A1704-01**		Prepared & Analyzed: 01/31/14							
Nitrate as NO3	25	0.20	2.0	mg/l	24.7	0.43	99.9	80-120	0.124	20	
Nitrite as N	5.79	0.020	0.40	"	5.56	ND	104	80-120	0.0768	20	
Fluoride	5.69	0.070	0.10	"	5.56	ND	102	80-120	0.235	20	
Chloride	14.2	0.030	0.50	"	11.1	2.61	104	80-120	0.133	20	
Sulfate as SO4	32.0	0.090	0.50	"	22.2	9.36	102	80-120	0.149	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
Acetone	ND	0.80	5.0	ug/l							U
Acrylonitrile	ND	0.20	5.0	"							U
Benzene	ND	0.20	0.30	"							U
Bromobenzene	ND	0.10	0.50	"							U
Bromochloromethane	ND	0.20	0.50	"							U
Bromodichloromethane	ND	0.50	0.50	"							U
Bromoform	ND	0.50	0.50	"							U
Bromomethane	ND	0.20	0.50	"							U
n-Butylbenzene	ND	0.10	0.50	"							U
sec-Butylbenzene	ND	0.10	0.50	"							U
tert-Butylbenzene	ND	0.10	0.50	"							U
Carbon disulfide	ND	0.20	0.50	"							U
Carbon tetrachloride	ND	0.30	0.50	"							U
Chlorobenzene	ND	0.20	0.50	"							U
Chloroethane	ND	0.10	0.50	"							U
Chloroform	ND	0.50	0.50	"							U
Chloromethane	ND	0.20	0.50	"							U
2-Chlorotoluene	ND	0.20	0.50	"							U
4-Chlorotoluene	ND	0.10	0.50	"							U
Dibromochloromethane	ND	0.50	0.50	"							U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"							U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"							U
Dibromomethane	ND	0.20	0.50	"							U
1,2-Dichlorobenzene	ND	0.20	0.50	"							U
1,3-Dichlorobenzene	ND	0.20	0.50	"							U
1,4-Dichlorobenzene	ND	0.10	0.50	"							U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"							U
Dichlorodifluoromethane	ND	0.20	0.50	"							U
1,1-Dichloroethane	ND	0.10	0.50	"							U
1,2-Dichloroethane	ND	0.20	0.50	"							U
1,1-Dichloroethene	ND	0.10	0.30	"							U
cis-1,2-Dichloroethene	ND	0.20	0.50	"							U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
trans-1,2-Dichloroethene	ND	0.20	0.50	ug/l							U
1,2-Dichloropropane	ND	0.20	0.50	"							U
1,3-Dichloropropane	ND	0.20	0.50	"							U
2,2-Dichloropropane	ND	0.10	0.50	"							U
1,1-Dichloropropene	ND	0.10	0.50	"							U
cis-1,3-Dichloropropene	ND	0.20	0.50	"							U
trans-1,3-Dichloropropene	ND	0.20	0.50	"							U
2-Hexanone	ND	0.097	5.0	"							U
1,3-Dichloropropene (total)	ND	0.20	0.50	"							U
Ethylbenzene	ND	0.10	0.50	"							U
Hexachlorobutadiene	ND	0.30	0.50	"							U
Isopropylbenzene	ND	0.20	0.50	"							U
p-Isopropyltoluene	ND	0.10	0.50	"							U
Methyl ethyl ketone	ND	0.40	1.0	"							U
Methyl iodide	ND	0.12	2.0	"							U
Methyl isobutyl ketone	ND	0.30	1.0	"							U
Methylene chloride	ND	0.40	0.50	"							U
Naphthalene	ND	0.20	0.50	"							U
n-Propylbenzene	ND	0.20	0.50	"							U
Styrene	ND	0.10	0.50	"							U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"							U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"							U
Tetrachloroethene	ND	0.20	0.50	"							U
Toluene	ND	0.10	0.50	"							U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"							U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"							U
1,1,1-Trichloroethane	ND	0.20	0.50	"							U
1,1,2-Trichloroethane	ND	0.20	0.50	"							U
Trichloroethene	ND	0.20	0.50	"							U
Trichlorofluoromethane	ND	0.20	0.50	"							U
Trichlorotrifluoroethane	ND	0.20	0.50	"							U
1,2,3-Trichloropropane	ND	0.13	0.50	"							U

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
1,2,4-Trimethylbenzene	ND	0.10	0.50	ug/l							U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"							U
Vinyl chloride	ND	0.10	0.50	"							U
m,p-Xylene	ND	0.20	0.50	"							U
o-Xylene	ND	0.10	0.50	"							U
Xylenes (total)	ND	0.20	0.50	"							U
Trihalomethanes (total)	ND	0.50	0.50	"							U
Methyl tert-butyl ether	ND	0.50	0.50	"							U
Ethyl tert-butyl ether	ND	0.20	0.50	"							U
Tert-amyl methyl ether	ND	0.20	0.50	"							U
Surrogate: Bromofluorobenzene	*25.0*			*"*	*25.0*		*99.8*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*95.9*	*70-130*			
Surrogate: Toluene-d8	*25.4*			*"*	*25.0*		*102*	*70-130*			
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
Acetone	24.1	0.80	5.0	ug/l	20.0		120	70-130			
Acrylonitrile	5.73	0.20	5.0	"	5.00		115	70-130			
Benzene	4.88	0.20	0.30	"	5.00		97.6	70-130			
Bromobenzene	5.19	0.10	0.50	"	5.00		104	70-130			
Bromochloromethane	5.11	0.20	0.50	"	5.00		102	70-130			
Bromodichloromethane	4.65	0.50	0.50	"	5.00		93.0	70-130			
Bromoform	4.58	0.50	0.50	"	5.00		91.6	70-130			
Bromomethane	5.43	0.20	0.50	"	5.00		109	70-130			
n-Butylbenzene	5.09	0.10	0.50	"	5.00		102	70-130			
sec-Butylbenzene	5.06	0.10	0.50	"	5.00		101	70-130			
tert-Butylbenzene	5.24	0.10	0.50	"	5.00		105	70-130			
Carbon disulfide	4.99	0.20	0.50	"	5.00		99.8	70-130			
Carbon tetrachloride	4.76	0.30	0.50	"	5.00		95.2	70-130			
Chlorobenzene	5.07	0.20	0.50	"	5.00		101	70-130			
Chloroethane	5.33	0.10	0.50	"	5.00		107	70-130			
Chloroform	4.92	0.50	0.50	"	5.00		98.4	70-130			
Chloromethane	6.12	0.20	0.50	"	5.00		122	70-130			

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
2-Chlorotoluene	5.26	0.20	0.50	ug/l	5.00		105	70-130			
4-Chlorotoluene	4.99	0.10	0.50	"	5.00		99.8	70-130			
Dibromochloromethane	4.81	0.50	0.50	"	5.00		96.2	70-130			
1,2-Dibromo-3-chloropropane	4.94	0.36	0.50	"	5.00		98.8	70-130			
1,2-Dibromoethane (EDB)	5.23	0.14	0.50	"	5.00		105	70-130			
Dibromomethane	4.94	0.20	0.50	"	5.00		98.8	70-130			
1,2-Dichlorobenzene	4.86	0.20	0.50	"	5.00		97.2	70-130			
1,3-Dichlorobenzene	5.18	0.20	0.50	"	5.00		104	70-130			
1,4-Dichlorobenzene	4.96	0.10	0.50	"	5.00		99.2	70-130			
trans-1,4-Dichloro-2-butene	4.74	0.095	5.0	"	5.00		94.8	70-130			J
Dichlorodifluoromethane	6.14	0.20	0.50	"	5.00		123	70-130			
1,1-Dichloroethane	5.10	0.10	0.50	"	5.00		102	70-130			
1,2-Dichloroethane	4.93	0.20	0.50	"	5.00		98.6	70-130			
1,1-Dichloroethene	4.96	0.10	0.30	"	5.00		99.2	70-130			
cis-1,2-Dichloroethene	5.01	0.20	0.50	"	5.00		100	70-130			
trans-1,2-Dichloroethene	4.99	0.20	0.50	"	5.00		99.8	70-130			
1,2-Dichloropropane	4.83	0.20	0.50	"	5.00		96.6	70-130			
1,3-Dichloropropane	5.09	0.20	0.50	"	5.00		102	70-130			
2,2-Dichloropropane	4.57	0.10	0.50	"	5.00		91.4	70-130			
1,1-Dichloropropene	4.65	0.10	0.50	"	5.00		93.0	70-130			
cis-1,3-Dichloropropene	4.66	0.20	0.50	"	5.00		93.2	70-130			
trans-1,3-Dichloropropene	4.58	0.20	0.50	"	5.00		91.6	70-130			
2-Hexanone	5.38	0.097	5.0	"	5.00		108	70-130			
Ethylbenzene	5.06	0.10	0.50	"	5.00		101	70-130			
Hexachlorobutadiene	4.93	0.30	0.50	"	5.00		98.6	70-130			
Isopropylbenzene	5.33	0.20	0.50	"	5.00		107	70-130			
p-Isopropyltoluene	5.25	0.10	0.50	"	5.00		105	70-130			
Methyl ethyl ketone	10.5	0.40	1.0	"	10.0		105	70-130			
Methyl iodide	5.04	0.12	2.0	"	5.00		101	70-130			
Methyl isobutyl ketone	10.3	0.30	1.0	"	10.0		103	70-130			
Methylene chloride	4.10	0.40	0.50	"	5.00		82.0	70-130			
Naphthalene	5.01	0.20	0.50	"	5.00		100	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
n-Propylbenzene	5.43	0.20	0.50	ug/l	5.00		109	70-130			
Styrene	5.32	0.10	0.50	"	5.00		106	70-130			
1,1,1,2-Tetrachloroethane	4.86	0.20	0.50	"	5.00		97.2	70-130			
1,1,2,2-Tetrachloroethane	5.08	0.20	0.50	"	5.00		102	70-130			
Tetrachloroethene	5.11	0.20	0.50	"	5.00		102	70-130			
Toluene	5.21	0.10	0.50	"	5.00		104	70-130			
1,2,3-Trichlorobenzene	5.08	0.10	0.50	"	5.00		102	70-130			
1,2,4-Trichlorobenzene	5.00	0.20	0.50	"	5.00		100	70-130			
1,1,1-Trichloroethane	4.89	0.20	0.50	"	5.00		97.8	70-130			
1,1,2-Trichloroethane	5.09	0.20	0.50	"	5.00		102	70-130			
Trichloroethene	4.93	0.20	0.50	"	5.00		98.6	70-130			
Trichlorofluoromethane	5.14	0.20	0.50	"	5.00		103	70-130			
Trichlorotrifluoroethane	5.56	0.20	0.50	"	5.00		111	70-130			
1,2,3-Trichloropropane	5.03	0.13	0.50	"	5.00		101	70-130			
1,2,4-Trimethylbenzene	5.36	0.10	0.50	"	5.00		107	70-130			
1,3,5-Trimethylbenzene	5.36	0.10	0.50	"	5.00		107	70-130			
Vinyl chloride	5.40	0.10	0.50	"	5.00		108	70-130			
m,p-Xylene	10.2	0.20	0.50	"	10.0		102	70-130			
o-Xylene	5.24	0.10	0.50	"	5.00		105	70-130			
Xylenes (total)	15.4	0.20	0.50	"	15.0		103	70-130			
Methyl tert-butyl ether	4.89	0.50	0.50	"	5.00		97.8	70-130			
Ethyl tert-butyl ether	4.85	0.20	0.50	"	5.00		97.0	70-130			
Tert-amyl methyl ether	4.93	0.20	0.50	"	5.00		98.6	70-130			
Surrogate: Bromofluorobenzene	*25.6*			*"*	*25.0*		*102*	*70-130*			
Surrogate: Dibromofluoromethane	*24.7*			*"*	*25.0*		*98.7*	*70-130*			
Surrogate: Toluene-d8	*25.3*			*"*	*25.0*		*101*	*70-130*			
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Acetone	22.4	0.80	5.0	ug/l	20.0		112	70-130	7.28	30	
Acrylonitrile	5.77	0.20	5.0	"	5.00		115	70-130	0.696	30	
Benzene	4.70	0.20	0.30	"	5.00		94.0	70-130	3.76	30	
Bromobenzene	5.09	0.10	0.50	"	5.00		102	70-130	1.95	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Bromochloromethane	4.92	0.20	0.50	ug/l	5.00		98.4	70-130	3.79	30	
Bromodichloromethane	4.56	0.50	0.50	"	5.00		91.2	70-130	1.95	30	
Bromoform	4.71	0.50	0.50	"	5.00		94.2	70-130	2.80	30	
Bromomethane	5.46	0.20	0.50	"	5.00		109	70-130	0.551	30	
n-Butylbenzene	4.88	0.10	0.50	"	5.00		97.6	70-130	4.21	30	
sec-Butylbenzene	5.00	0.10	0.50	"	5.00		100	70-130	1.19	30	
tert-Butylbenzene	5.15	0.10	0.50	"	5.00		103	70-130	1.73	30	
Carbon disulfide	4.83	0.20	0.50	"	5.00		96.6	70-130	3.26	30	
Carbon tetrachloride	4.64	0.30	0.50	"	5.00		92.8	70-130	2.55	30	
Chlorobenzene	5.01	0.20	0.50	"	5.00		100	70-130	1.19	30	
Chloroethane	5.12	0.10	0.50	"	5.00		102	70-130	4.02	30	
Chloroform	4.84	0.50	0.50	"	5.00		96.8	70-130	1.64	30	
Chloromethane	5.86	0.20	0.50	"	5.00		117	70-130	4.34	30	
2-Chlorotoluene	5.27	0.20	0.50	"	5.00		105	70-130	0.190	30	
4-Chlorotoluene	5.07	0.10	0.50	"	5.00		101	70-130	1.59	30	
Dibromochloromethane	4.72	0.50	0.50	"	5.00		94.4	70-130	1.89	30	
1,2-Dibromo-3-chloropropane	4.95	0.36	0.50	"	5.00		99.0	70-130	0.202	25	
1,2-Dibromoethane (EDB)	5.17	0.14	0.50	"	5.00		103	70-130	1.15	25	
Dibromomethane	5.07	0.20	0.50	"	5.00		101	70-130	2.60	30	
1,2-Dichlorobenzene	4.70	0.20	0.50	"	5.00		94.0	70-130	3.35	30	
1,3-Dichlorobenzene	5.10	0.20	0.50	"	5.00		102	70-130	1.56	30	
trans-1,4-Dichloro-2-butene	4.90	0.095	5.0	"	5.00		98.0	70-130	3.32	25	J
1,4-Dichlorobenzene	4.87	0.10	0.50	"	5.00		97.4	70-130	1.83	30	
Dichlorodifluoromethane	5.94	0.20	0.50	"	5.00		119	70-130	3.31	30	
1,1-Dichloroethane	4.86	0.10	0.50	"	5.00		97.2	70-130	4.82	30	
1,2-Dichloroethane	4.84	0.20	0.50	"	5.00		96.8	70-130	1.84	30	
1,1-Dichloroethene	4.67	0.10	0.30	"	5.00		93.4	70-130	6.02	30	
cis-1,2-Dichloroethene	4.85	0.20	0.50	"	5.00		97.0	70-130	3.25	30	
trans-1,2-Dichloroethene	4.78	0.20	0.50	"	5.00		95.6	70-130	4.30	30	
1,2-Dichloropropane	4.88	0.20	0.50	"	5.00		97.6	70-130	1.03	30	
1,3-Dichloropropane	5.07	0.20	0.50	"	5.00		101	70-130	0.394	30	
2,2-Dichloropropane	4.36	0.10	0.50	"	5.00		87.2	70-130	4.70	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
1,1-Dichloropropene	4.56	0.10	0.50	ug/l	5.00		91.2	70-130	1.95	30	
cis-1,3-Dichloropropene	4.68	0.20	0.50	"	5.00		93.6	70-130	0.428	30	
trans-1,3-Dichloropropene	4.74	0.20	0.50	"	5.00		94.8	70-130	3.43	30	
Ethylbenzene	4.96	0.10	0.50	"	5.00		99.2	70-130	2.00	30	
2-Hexanone	5.44	0.097	5.0	"	5.00		109	70-130	1.11	25	
Hexachlorobutadiene	4.64	0.30	0.50	"	5.00		92.8	70-130	6.06	30	
Isopropylbenzene	5.24	0.20	0.50	"	5.00		105	70-130	1.70	30	
p-Isopropyltoluene	5.08	0.10	0.50	"	5.00		102	70-130	3.29	30	
Methyl ethyl ketone	11.0	0.40	1.0	"	10.0		110	70-130	4.74	30	
Methyl iodide	4.90	0.12	2.0	"	5.00		98.0	70-130	2.82	25	
Methyl isobutyl ketone	10.4	0.30	1.0	"	10.0		104	70-130	0.679	30	
Methylene chloride	4.06	0.40	0.50	"	5.00		81.2	70-130	0.980	30	
Naphthalene	4.96	0.20	0.50	"	5.00		99.2	70-130	1.00	30	
n-Propylbenzene	5.47	0.20	0.50	"	5.00		109	70-130	0.734	30	
Styrene	5.28	0.10	0.50	"	5.00		106	70-130	0.755	30	
1,1,1,2-Tetrachloroethane	4.77	0.20	0.50	"	5.00		95.4	70-130	1.87	30	
1,1,2,2-Tetrachloroethane	5.14	0.20	0.50	"	5.00		103	70-130	1.17	30	
Tetrachloroethene	4.82	0.20	0.50	"	5.00		96.4	70-130	5.84	30	
Toluene	5.15	0.10	0.50	"	5.00		103	70-130	1.16	30	
1,2,3-Trichlorobenzene	4.99	0.10	0.50	"	5.00		99.8	70-130	1.79	30	
1,2,4-Trichlorobenzene	4.83	0.20	0.50	"	5.00		96.6	70-130	3.46	30	
1,1,1-Trichloroethane	4.70	0.20	0.50	"	5.00		94.0	70-130	3.96	30	
1,1,2-Trichloroethane	5.20	0.20	0.50	"	5.00		104	70-130	2.14	30	
Trichloroethene	4.67	0.20	0.50	"	5.00		93.4	70-130	5.42	30	
Trichlorofluoromethane	5.01	0.20	0.50	"	5.00		100	70-130	2.56	30	
Trichlorotrifluoroethane	5.29	0.20	0.50	"	5.00		106	70-130	4.98	30	
1,2,3-Trichloropropane	5.09	0.13	0.50	"	5.00		102	70-130	1.19	25	
1,2,4-Trimethylbenzene	5.28	0.10	0.50	"	5.00		106	70-130	1.50	30	
1,3,5-Trimethylbenzene	5.28	0.10	0.50	"	5.00		106	70-130	1.50	30	
Vinyl chloride	5.27	0.10	0.50	"	5.00		105	70-130	2.44	30	
m,p-Xylene	10.1	0.20	0.50	"	10.0		101	70-130	0.888	30	
o-Xylene	5.11	0.10	0.50	"	5.00		102	70-130	2.51	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Xylenes (total)	15.2	0.20	0.50	ug/l	15.0		101	70-130	1.44	30	
Methyl tert-butyl ether	4.81	0.50	0.50	"	5.00		96.2	70-130	1.65	30	
Ethyl tert-butyl ether	5.20	0.20	0.50	"	5.00		104	70-130	6.97	30	
Tert-amyl methyl ether	4.85	0.20	0.50	"	5.00		97.0	70-130	1.64	30	
Surrogate: Bromofluorobenzene	*25.4*			*"*	*25.0*		*102*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*96.1*	*70-130*			
Surrogate: Toluene-d8	*25.2*			*"*	*25.0*		*101*	*70-130*			
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Acetone	26.9	0.80	5.0	ug/l	20.0	1.79	126	70-130			
Acrylonitrile	5.81	0.20	5.0	"	5.00	ND	116	70-130			
Benzene	5.43	0.20	0.30	"	5.00	ND	109	70-130			
Bromobenzene	5.48	0.10	0.50	"	5.00	ND	110	70-130			
Bromochloromethane	5.55	0.20	0.50	"	5.00	ND	111	70-130			
Bromodichloromethane	10.0	0.50	0.50	"	5.00	4.42	112	70-130			
Bromoform	4.44	0.50	0.50	"	5.00	ND	88.8	70-130			
Bromomethane	6.20	0.20	0.50	"	5.00	ND	124	70-130			
n-Butylbenzene	5.03	0.10	0.50	"	5.00	ND	101	70-130			
sec-Butylbenzene	5.41	0.10	0.50	"	5.00	ND	108	70-130			
tert-Butylbenzene	5.60	0.10	0.50	"	5.00	ND	112	70-130			
Carbon disulfide	5.36	0.20	0.50	"	5.00	ND	107	70-130			
Carbon tetrachloride	4.97	0.30	0.50	"	5.00	ND	99.4	70-130			
Chlorobenzene	5.35	0.20	0.50	"	5.00	ND	107	70-130			
Chloroethane	6.00	0.10	0.50	"	5.00	ND	120	70-130			
Chloroform	35.3	0.50	0.50	"	5.00	31.5	76.2	70-130			
Chloromethane	6.60	0.20	0.50	"	5.00	ND	132	70-130			QM-05
2-Chlorotoluene	5.65	0.20	0.50	"	5.00	ND	113	70-130			
4-Chlorotoluene	5.61	0.10	0.50	"	5.00	ND	112	70-130			
Dibromochloromethane	4.80	0.50	0.50	"	5.00	ND	96.0	70-130			
1,2-Dibromo-3-chloropropane	4.62	0.36	0.50	"	5.00	ND	92.4	70-130			
1,2-Dibromoethane (EDB)	5.29	0.14	0.50	"	5.00	ND	106	70-130			
Dibromomethane	5.47	0.20	0.50	"	5.00	ND	109	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
1,2-Dichlorobenzene	4.95	0.20	0.50	ug/l	5.00	ND	99.0	70-130			
1,3-Dichlorobenzene	5.47	0.20	0.50	"	5.00	ND	109	70-130			
trans-1,4-Dichloro-2-butene	5.53	0.095	5.0	"	5.00	ND	111	70-130			
1,4-Dichlorobenzene	5.16	0.10	0.50	"	5.00	ND	103	70-130			
Dichlorodifluoromethane	6.69	0.20	0.50	"	5.00	ND	134	70-130			QM-05
1,1-Dichloroethane	5.61	0.10	0.50	"	5.00	ND	112	70-130			
1,2-Dichloroethane	5.51	0.20	0.50	"	5.00	ND	110	70-130			
1,1-Dichloroethene	5.37	0.10	0.30	"	5.00	ND	107	70-130			
cis-1,2-Dichloroethene	5.51	0.20	0.50	"	5.00	ND	110	70-130			
trans-1,2-Dichloroethene	5.31	0.20	0.50	"	5.00	ND	106	70-130			
1,2-Dichloropropane	5.29	0.20	0.50	"	5.00	ND	106	70-130			
1,3-Dichloropropane	5.45	0.20	0.50	"	5.00	ND	109	70-130			
2,2-Dichloropropane	4.58	0.10	0.50	"	5.00	ND	91.6	70-130			
1,1-Dichloropropene	5.13	0.10	0.50	"	5.00	ND	103	70-130			
cis-1,3-Dichloropropene	4.84	0.20	0.50	"	5.00	ND	96.8	70-130			
trans-1,3-Dichloropropene	4.50	0.20	0.50	"	5.00	ND	90.0	70-130			
2-Hexanone	5.62	0.097	5.0	"	5.00	ND	112	70-130			
Ethylbenzene	5.30	0.10	0.50	"	5.00	ND	106	70-130			
Hexachlorobutadiene	4.84	0.30	0.50	"	5.00	ND	96.8	70-130			
Isopropylbenzene	5.74	0.20	0.50	"	5.00	ND	115	70-130			
p-Isopropyltoluene	5.59	0.10	0.50	"	5.00	ND	112	70-130			
Methyl ethyl ketone	12.3	0.40	1.0	"	10.0	ND	123	70-130			
Methyl iodide	5.66	0.12	2.0	"	5.00	ND	113	70-130			
Methyl isobutyl ketone	10.7	0.30	1.0	"	10.0	ND	107	70-130			
Methylene chloride	4.34	0.40	0.50	"	5.00	ND	86.8	70-130			
Naphthalene	5.02	0.20	0.50	"	5.00	ND	100	70-130			
n-Propylbenzene	5.74	0.20	0.50	"	5.00	ND	115	70-130			
Styrene	5.53	0.10	0.50	"	5.00	ND	111	70-130			
1,1,1,2-Tetrachloroethane	4.62	0.20	0.50	"	5.00	ND	92.4	70-130			
1,1,2,2-Tetrachloroethane	5.37	0.20	0.50	"	5.00	ND	107	70-130			
Tetrachloroethene	5.41	0.20	0.50	"	5.00	ND	108	70-130			
Toluene	5.51	0.10	0.50	"	5.00	ND	110	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
1,2,3-Trichlorobenzene	5.07	0.10	0.50	ug/l	5.00	ND	101	70-130			
1,2,4-Trichlorobenzene	4.77	0.20	0.50	"	5.00	ND	95.4	70-130			
1,1,1-Trichloroethane	5.12	0.20	0.50	"	5.00	ND	102	70-130			
1,1,2-Trichloroethane	5.46	0.20	0.50	"	5.00	ND	109	70-130			
Trichloroethene	5.13	0.20	0.50	"	5.00	ND	103	70-130			
Trichlorofluoromethane	5.52	0.20	0.50	"	5.00	ND	110	70-130			
Trichlorotrifluoroethane	6.04	0.20	0.50	"	5.00	ND	121	70-130			
1,2,3-Trichloropropane	5.35	0.13	0.50	"	5.00	ND	107	70-130			
1,2,4-Trimethylbenzene	5.57	0.10	0.50	"	5.00	ND	111	70-130			
1,3,5-Trimethylbenzene	5.57	0.10	0.50	"	5.00	ND	111	70-130			
Vinyl chloride	6.10	0.10	0.50	"	5.00	ND	122	70-130			
m,p-Xylene	11.0	0.20	0.50	"	10.0	ND	110	70-130			
o-Xylene	5.54	0.10	0.50	"	5.00	ND	111	70-130			
Xylenes (total)	16.6	0.20	0.50	"	15.0	ND	110	70-130			
Methyl tert-butyl ether	4.80	0.50	0.50	"	5.00	ND	96.0	70-130			
Ethyl tert-butyl ether	5.52	0.20	0.50	"	5.00	ND	110	70-130			
Tert-amyl methyl ether	4.93	0.20	0.50	"	5.00	ND	98.6	70-130			
Surrogate: Bromofluorobenzene	*25.3*			*"*	*25.0*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*24.5*			*"*	*25.0*		*98.1*	*70-130*			
Surrogate: Toluene-d8	*25.0*			*"*	*25.0*		*99.9*	*70-130*			
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Acetone	26.1	0.80	5.0	ug/l	20.0	1.79	122	70-130	2.87	30	
Acrylonitrile	5.35	0.20	5.0	"	5.00	ND	107	70-130	8.24	30	
Benzene	4.92	0.20	0.30	"	5.00	ND	98.4	70-130	9.86	30	
Bromobenzene	5.04	0.10	0.50	"	5.00	ND	101	70-130	8.37	30	
Bromochloromethane	5.02	0.20	0.50	"	5.00	ND	100	70-130	10.0	30	
Bromodichloromethane	9.77	0.50	0.50	"	5.00	4.42	107	70-130	2.43	30	
Bromoform	4.34	0.50	0.50	"	5.00	ND	86.8	70-130	2.28	30	
Bromomethane	5.65	0.20	0.50	"	5.00	ND	113	70-130	9.28	30	
n-Butylbenzene	4.55	0.10	0.50	"	5.00	ND	91.0	70-130	10.0	30	
sec-Butylbenzene	5.00	0.10	0.50	"	5.00	ND	100	70-130	7.88	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**		Prepared: 02/04/14 Analyzed: 02/06/14							
tert-Butylbenzene	5.08	0.10	0.50	ug/l	5.00	ND	102	70-130	9.74	30	
Carbon disulfide	4.92	0.20	0.50	"	5.00	ND	98.4	70-130	8.56	30	
Carbon tetrachloride	4.66	0.30	0.50	"	5.00	ND	93.2	70-130	6.44	30	
Chlorobenzene	5.02	0.20	0.50	"	5.00	ND	100	70-130	6.36	30	
Chloroethane	5.44	0.10	0.50	"	5.00	ND	109	70-130	9.79	30	
Chloroform	35.4	0.50	0.50	"	5.00	31.5	77.4	70-130	0.170	30	
Chloromethane	6.07	0.20	0.50	"	5.00	ND	121	70-130	8.37	30	
2-Chlorotoluene	5.19	0.20	0.50	"	5.00	ND	104	70-130	8.49	30	
4-Chlorotoluene	4.85	0.10	0.50	"	5.00	ND	97.0	70-130	14.5	30	
Dibromochloromethane	4.76	0.50	0.50	"	5.00	ND	95.2	70-130	0.837	30	
1,2-Dibromo-3-chloropropane	4.49	0.36	0.50	"	5.00	ND	89.8	70-130	2.85	25	
1,2-Dibromoethane (EDB)	4.82	0.14	0.50	"	5.00	ND	96.4	70-130	9.30	25	
Dibromomethane	5.04	0.20	0.50	"	5.00	ND	101	70-130	8.18	30	
1,2-Dichlorobenzene	4.59	0.20	0.50	"	5.00	ND	91.8	70-130	7.55	30	
1,3-Dichlorobenzene	5.02	0.20	0.50	"	5.00	ND	100	70-130	8.58	30	
trans-1,4-Dichloro-2-butene	5.09	0.095	5.0	"	5.00	ND	102	70-130	8.29	25	
1,4-Dichlorobenzene	4.76	0.10	0.50	"	5.00	ND	95.2	70-130	8.06	30	
Dichlorodifluoromethane	6.09	0.20	0.50	"	5.00	ND	122	70-130	9.39	30	
1,1-Dichloroethane	5.17	0.10	0.50	"	5.00	ND	103	70-130	8.16	30	
1,2-Dichloroethane	5.08	0.20	0.50	"	5.00	ND	102	70-130	8.12	30	
1,1-Dichloroethene	4.99	0.10	0.30	"	5.00	ND	99.8	70-130	7.34	30	
cis-1,2-Dichloroethene	5.09	0.20	0.50	"	5.00	ND	102	70-130	7.92	30	
trans-1,2-Dichloroethene	4.93	0.20	0.50	"	5.00	ND	98.6	70-130	7.42	30	
1,2-Dichloropropane	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	8.47	30	
1,3-Dichloropropane	5.15	0.20	0.50	"	5.00	ND	103	70-130	5.66	30	
2,2-Dichloropropane	4.28	0.10	0.50	"	5.00	ND	85.6	70-130	6.77	30	
1,1-Dichloropropene	4.75	0.10	0.50	"	5.00	ND	95.0	70-130	7.69	30	
cis-1,3-Dichloropropene	4.62	0.20	0.50	"	5.00	ND	92.4	70-130	4.65	30	
trans-1,3-Dichloropropene	4.22	0.20	0.50	"	5.00	ND	84.4	70-130	6.42	30	
Ethylbenzene	4.83	0.10	0.50	"	5.00	ND	96.6	70-130	9.28	30	
2-Hexanone	5.28	0.097	5.0	"	5.00	ND	106	70-130	6.24	25	
Hexachlorobutadiene	4.48	0.30	0.50	"	5.00	ND	89.6	70-130	7.73	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**		Prepared: 02/04/14 Analyzed: 02/06/14							
Isopropylbenzene	5.21	0.20	0.50	ug/l	5.00	ND	104	70-130	9.68	30	
p-Isopropyltoluene	4.91	0.10	0.50	"	5.00	ND	98.2	70-130	13.0	30	
Methyl ethyl ketone	11.8	0.40	1.0	"	10.0	ND	118	70-130	3.89	30	
Methyl iodide	5.13	0.12	2.0	"	5.00	ND	103	70-130	9.82	25	
Methyl isobutyl ketone	9.80	0.30	1.0	"	10.0	ND	98.0	70-130	8.69	30	
Methylene chloride	3.66	0.40	0.50	"	5.00	ND	73.2	70-130	17.0	30	
Naphthalene	4.66	0.20	0.50	"	5.00	ND	93.2	70-130	7.44	30	
n-Propylbenzene	5.17	0.20	0.50	"	5.00	ND	103	70-130	10.4	30	
Styrene	5.04	0.10	0.50	"	5.00	ND	101	70-130	9.27	30	
1,1,1,2-Tetrachloroethane	4.34	0.20	0.50	"	5.00	ND	86.8	70-130	6.25	30	
1,1,2,2-Tetrachloroethane	4.95	0.20	0.50	"	5.00	ND	99.0	70-130	8.14	30	
Tetrachloroethene	4.90	0.20	0.50	"	5.00	ND	98.0	70-130	9.89	30	
Toluene	5.03	0.10	0.50	"	5.00	ND	101	70-130	9.11	30	
1,2,3-Trichlorobenzene	4.89	0.10	0.50	"	5.00	ND	97.8	70-130	3.61	30	
1,2,4-Trichlorobenzene	4.38	0.20	0.50	"	5.00	ND	87.6	70-130	8.52	30	
1,1,1-Trichloroethane	4.75	0.20	0.50	"	5.00	ND	95.0	70-130	7.50	30	
1,1,2-Trichloroethane	5.07	0.20	0.50	"	5.00	ND	101	70-130	7.41	30	
Trichloroethene	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	5.41	30	
Trichlorofluoromethane	4.90	0.20	0.50	"	5.00	ND	98.0	70-130	11.9	30	
Trichlorotrifluoroethane	5.57	0.20	0.50	"	5.00	ND	111	70-130	8.10	30	
1,2,3-Trichloropropane	4.93	0.13	0.50	"	5.00	ND	98.6	70-130	8.17	25	
1,2,4-Trimethylbenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130	8.61	30	
1,3,5-Trimethylbenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130	8.61	30	
Vinyl chloride	5.41	0.10	0.50	"	5.00	ND	108	70-130	12.0	30	
m,p-Xylene	9.99	0.20	0.50	"	10.0	ND	99.9	70-130	9.71	30	
o-Xylene	5.07	0.10	0.50	"	5.00	ND	101	70-130	8.86	30	
Xylenes (total)	15.1	0.20	0.50	"	15.0	ND	100	70-130	9.43	30	
Methyl tert-butyl ether	4.31	0.50	0.50	"	5.00	ND	86.2	70-130	10.8	30	
Ethyl tert-butyl ether	5.09	0.20	0.50	"	5.00	ND	102	70-130	8.11	30	
Tert-amyl methyl ether	4.48	0.20	0.50	"	5.00	ND	89.6	70-130	9.56	30	
Surrogate: Bromofluorobenzene	*25.4*			*"*	*25.0*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*24.2*			*"*	*25.0*		*97.0*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Surrogate: Toluene-d8	*24.8*			*ug/l*	*25.0*		*99.0*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Blank (AB40514-BLK1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	ND	0.010	0.050	ug/l							U
Chloroneb	ND	0.20	0.50	"							U
Chlorobenzilate	ND	2.0	5.0	"							U
Chlorothalonil	ND	0.030	0.10	"							U
DCPA	ND	0.020	0.040	"							U
4,4´-DDD	ND	0.020	0.050	"							U
4,4´-DDE	ND	0.020	0.050	"							U
4,4´-DDT	ND	0.020	0.020	"							U
Dieldrin	ND	0.010	0.010	"							U
Endosulfan I	ND	0.020	0.050	"							U
Endosulfan II	ND	0.020	0.050	"							U
Endosulfan sulfate	ND	0.020	0.020	"							U
Endrin	ND	0.030	0.10	"							U
Endrin aldehyde	ND	0.020	0.050	"							U
HCH-alpha	ND	0.010	0.050	"							U
HCH-beta	ND	0.020	0.050	"							U
HCH-delta	ND	0.030	0.050	"							U
HCH-gamma (Lindane)	ND	0.010	0.010	"							U
Heptachlor	ND	0.010	0.010	"							U
Heptachlor epoxide	ND	0.010	0.010	"							U
Hexachlorobenzene	ND	0.010	0.040	"							U
Hexachlorocyclopentadiene	ND	0.040	0.40	"							U
Methoxychlor	ND	0.020	0.020	"							U
cis-Permethrin	ND	0.070	0.20	"							U
trans-Permethrin	ND	0.090	0.20	"							U
Propachlor	ND	0.070	0.20	"							U
Trifluralin	ND	0.020	0.040	"							U
PCB-1016	ND	0.030	0.50	"							U
PCB-1221	ND	0.030	0.50	"							U
PCB-1232	ND	0.030	0.50	"							U
PCB-1242	ND	0.030	0.50	"							U
PCB-1248	ND	0.030	0.50	"							U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Blank (AB40514-BLK1)					Prepared: 02/05/14 Analyzed: 02/11/14						
PCB-1254	ND	0.030	0.50	ug/l							U
PCB-1260	ND	0.030	0.50	"							U
Total PCBs	ND	0.30	0.50	"							U
Toxaphene	ND	0.40	0.50	"							U
Chlordane (tech)	ND	0.030	0.050	"							U
Surrogate: Dibutylchlorendate	*1.05*			*"*	*0.952*		*110*	*70-130*			
LCS (AB40514-BS1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	0.263	0.010	0.050	ug/l	0.280		94.1	70-130			
Chloroneb	2.73	0.20	0.50	"	2.80		97.5	70-130			
Chlorobenzilate	3.29	2.0	5.0	"	2.80		117	70-130			J
Chlorothalonil	0.313	0.030	0.10	"	0.280		112	70-130			
DCPA	0.289	0.020	0.040	"	0.280		103	70-130			
4,4´-DDD	0.203	0.020	0.050	"	0.280		72.3	70-130			
4,4´-DDE	0.279	0.020	0.050	"	0.280		99.6	70-130			
4,4´-DDT	0.290	0.020	0.020	"	0.280		104	70-130			
Dieldrin	0.283	0.010	0.010	"	0.280		101	70-130			
Endosulfan I	0.285	0.020	0.050	"	0.280		102	70-130			
Endosulfan II	0.277	0.020	0.050	"	0.280		98.9	70-130			
Endosulfan sulfate	0.306	0.020	0.020	"	0.280		109	70-130			
Endrin	0.319	0.030	0.10	"	0.280		114	70-130			
Endrin aldehyde	0.267	0.020	0.050	"	0.280		95.3	70-130			
HCH-alpha	0.269	0.010	0.050	"	0.280		96.1	70-130			
HCH-beta	0.279	0.020	0.050	"	0.280		99.7	70-130			
HCH-delta	0.286	0.030	0.050	"	0.280		102	70-130			
HCH-gamma (Lindane)	0.273	0.010	0.010	"	0.280		97.7	70-130			
Heptachlor	0.273	0.010	0.010	"	0.280		97.6	70-130			
Heptachlor epoxide	0.279	0.010	0.010	"	0.280		99.5	70-130			
Hexachlorocyclopentadiene	0.409	0.040	0.40	"	0.560		73.1	15-90			
Hexachlorobenzene	0.237	0.010	0.040	"	0.280		84.7	70-130			
Methoxychlor	0.301	0.020	0.020	"	0.280		107	70-130			
cis-Permethrin	1.59	0.070	0.20	"	1.40		114	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
LCS (AB40514-BS1)					Prepared: 02/05/14 Analyzed: 02/11/14						
trans-Permethrin	1.60	0.090	0.20	ug/l	1.40		114	70-130			
Propachlor	0.306	0.070	0.20	"	0.280		109	70-130			
Trifluralin	0.416	0.020	0.040	"	0.420		99.0	70-130			
Surrogate: Dibutylchlorendate	*1.05*			*"*	*0.952*		*110*	*70-130*			
LCS Dup (AB40514-BSD1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	0.276	0.010	0.050	ug/l	0.280		98.7	70-130	4.77	25	
Chloroneb	2.84	0.20	0.50	"	2.80		101	70-130	3.76	25	
Chlorobenzilate	3.51	2.0	5.0	"	2.80		125	70-130	6.58	25	J
Chlorothalonil	0.334	0.030	0.10	"	0.280		119	70-130	6.41	25	
DCPA	0.304	0.020	0.040	"	0.280		109	70-130	5.05	25	
4,4´-DDD	0.208	0.020	0.050	"	0.280		74.3	70-130	2.71	25	
4,4´-DDE	0.299	0.020	0.050	"	0.280		107	70-130	7.17	25	
4,4´-DDT	0.307	0.020	0.020	"	0.280		109	70-130	5.49	25	
Dieldrin	0.301	0.010	0.010	"	0.280		108	70-130	6.30	25	
Endosulfan I	0.300	0.020	0.050	"	0.280		107	70-130	5.34	25	
Endosulfan II	0.287	0.020	0.050	"	0.280		103	70-130	3.69	25	
Endosulfan sulfate	0.324	0.020	0.020	"	0.280		116	70-130	5.53	25	
Endrin	0.336	0.030	0.10	"	0.280		120	70-130	5.28	25	
Endrin aldehyde	0.309	0.020	0.050	"	0.280		110	70-130	14.8	25	
HCH-alpha	0.280	0.010	0.050	"	0.280		99.9	70-130	3.84	25	
HCH-beta	0.294	0.020	0.050	"	0.280		105	70-130	5.16	25	
HCH-delta	0.303	0.030	0.050	"	0.280		108	70-130	5.61	25	
HCH-gamma (Lindane)	0.286	0.010	0.010	"	0.280		102	70-130	4.33	25	
Heptachlor	0.282	0.010	0.010	"	0.280		101	70-130	3.11	25	
Heptachlor epoxide	0.289	0.010	0.010	"	0.280		103	70-130	3.81	25	
Hexachlorocyclopentadiene	0.434	0.040	0.40	"	0.560		77.6	15-90	5.97	50	
Hexachlorobenzene	0.243	0.010	0.040	"	0.280		86.8	70-130	2.40	25	
Methoxychlor	0.326	0.020	0.020	"	0.280		116	70-130	8.17	25	
cis-Permethrin	1.62	0.070	0.20	"	1.40		116	70-130	1.95	25	
trans-Permethrin	1.67	0.090	0.20	"	1.40		119	70-130	4.72	25	
Propachlor	0.334	0.070	0.20	"	0.280		119	70-130	8.68	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
LCS Dup (AB40514-BSD1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Trifluralin	0.437	0.020	0.040	ug/l	0.420		104	70-130	5.02	25	
Surrogate: Dibutylchlorendate	*1.07*			*"*	*0.952*		*112*	*70-130*			
Matrix Spike (AB40514-MS1)		**Source: 14A1713-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
Aldrin	0.269	0.010	0.050	ug/l	0.280	ND	96.0	70-130			
Chloroneb	2.86	0.20	0.50	"	2.80	ND	102	70-130			
Chlorobenzilate	3.57	2.0	5.0	"	2.80	ND	127	70-130			J
Chlorothalonil	0.329	0.030	0.10	"	0.280	ND	117	70-130			
DCPA	0.303	0.020	0.040	"	0.280	ND	108	70-130			
4,4´-DDD	0.212	0.020	0.050	"	0.280	ND	75.7	70-130			
4,4´-DDE	0.288	0.020	0.050	"	0.280	ND	103	70-130			
4,4´-DDT	0.300	0.020	0.020	"	0.280	ND	107	70-130			
Dieldrin	0.295	0.010	0.010	"	0.280	ND	105	70-130			
Endosulfan I	0.298	0.020	0.050	"	0.280	ND	106	70-130			
Endosulfan II	0.298	0.020	0.050	"	0.280	ND	106	70-130			
Endosulfan sulfate	0.318	0.020	0.020	"	0.280	ND	113	70-130			
Endrin	0.354	0.030	0.10	"	0.280	ND	126	70-130			
Endrin aldehyde	0.299	0.020	0.050	"	0.280	ND	107	70-130			
HCH-alpha	0.285	0.010	0.050	"	0.280	ND	102	70-130			
HCH-beta	0.290	0.020	0.050	"	0.280	ND	104	70-130			
HCH-delta	0.300	0.030	0.050	"	0.280	ND	107	70-130			
HCH-gamma (Lindane)	0.291	0.010	0.010	"	0.280	ND	104	70-130			
Heptachlor	0.280	0.010	0.010	"	0.280	ND	100	70-130			
Heptachlor epoxide	0.286	0.010	0.010	"	0.280	ND	102	70-130			
Hexachlorobenzene	0.255	0.010	0.040	"	0.280	ND	91.0	70-130			
Hexachlorocyclopentadiene	0.486	0.040	0.40	"	0.560	ND	86.7	15-90			
Methoxychlor	0.323	0.020	0.020	"	0.280	ND	116	70-130			
cis-Permethrin	1.78	0.070	0.20	"	1.40	ND	127	70-130			
trans-Permethrin	1.78	0.090	0.20	"	1.40	ND	127	70-130			
Propachlor	0.336	0.070	0.20	"	0.280	ND	120	70-130			
Trifluralin	0.436	0.020	0.040	"	0.420	ND	104	70-130			
Surrogate: Dibutylchlorendate	*1.09*			*"*	*0.952*		*115*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Matrix Spike Dup (AB40514-MSD1)		**Source: 14A1713-01**		Prepared: 02/05/14 Analyzed: 02/12/14							
Aldrin	0.260	0.010	0.050	ug/l	0.280	ND	92.8	70-130	3.40	25	
Chloroneb	2.76	0.20	0.50	"	2.80	ND	98.6	70-130	3.61	25	
Chlorobenzilate	3.40	2.0	5.0	"	2.80	ND	121	70-130	4.87	25	J
Chlorothalonil	0.313	0.030	0.10	"	0.280	ND	112	70-130	4.86	25	
DCPA	0.290	0.020	0.040	"	0.280	ND	103	70-130	4.52	25	
4,4´-DDD	0.210	0.020	0.050	"	0.280	ND	74.9	70-130	1.06	25	
4,4´-DDE	0.275	0.020	0.050	"	0.280	ND	98.1	70-130	4.80	25	
4,4´-DDT	0.289	0.020	0.020	"	0.280	ND	103	70-130	3.94	25	
Dieldrin	0.283	0.010	0.010	"	0.280	ND	101	70-130	4.34	25	
Endosulfan I	0.285	0.020	0.050	"	0.280	ND	102	70-130	4.19	25	
Endosulfan II	0.288	0.020	0.050	"	0.280	ND	103	70-130	3.14	25	
Endosulfan sulfate	0.302	0.020	0.020	"	0.280	ND	108	70-130	5.03	25	
Endrin	0.320	0.030	0.10	"	0.280	ND	114	70-130	10.1	25	
Endrin aldehyde	0.275	0.020	0.050	"	0.280	ND	98.2	70-130	8.56	25	
HCH-alpha	0.271	0.010	0.050	"	0.280	ND	96.8	70-130	4.94	25	
HCH-beta	0.282	0.020	0.050	"	0.280	ND	101	70-130	2.62	25	
HCH-delta	0.290	0.030	0.050	"	0.280	ND	104	70-130	3.17	25	
HCH-gamma (Lindane)	0.279	0.010	0.010	"	0.280	ND	99.5	70-130	4.43	25	
Heptachlor	0.267	0.010	0.010	"	0.280	ND	95.4	70-130	4.78	25	
Heptachlor epoxide	0.277	0.010	0.010	"	0.280	ND	99.0	70-130	3.09	25	
Hexachlorobenzene	0.238	0.010	0.040	"	0.280	ND	85.1	70-130	6.62	25	
Hexachlorocyclopentadiene	0.433	0.040	0.40	"	0.560	ND	77.3	15-90	11.5	50	
Methoxychlor	0.309	0.020	0.020	"	0.280	ND	110	70-130	4.66	25	
cis-Permethrin	1.72	0.070	0.20	"	1.40	ND	123	70-130	3.19	25	
trans-Permethrin	1.68	0.090	0.20	"	1.40	ND	120	70-130	5.53	25	
Propachlor	0.320	0.070	0.20	"	0.280	ND	114	70-130	4.81	25	
Trifluralin	0.420	0.020	0.040	"	0.420	ND	100	70-130	3.78	25	
Surrogate: Dibutylchlorendate	*1.03*			*"*	*0.952*		*108*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Blank (AB40730-BLK1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	ND	0.50	0.50	ug/l							U
Atrazine	ND	0.30	0.50	"							U
Bromacil	ND	0.50	5.0	"							U
Butachlor	ND	0.40	0.50	"							U
Dimethoate	ND	0.20	1.0	"							U
Metolachlor	ND	0.30	0.50	"							U
Metribuzin	ND	0.40	0.50	"							U
Molinate	ND	0.20	0.50	"							U
Prometryn	ND	0.50	0.50	"							U
Propachlor	ND	0.30	0.50	"							U
Simazine	ND	0.30	0.50	"							U
Thiobencarb	ND	0.20	1.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.69*			*"*	*2.00*		*84.3*	*70-130*			
LCS (AB40730-BS1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.88	0.50	0.50	ug/l	2.00		94.2	62-128			
Atrazine	1.92	0.30	0.50	"	2.00		96.1	62-122			
Bromacil	1.94	0.50	5.0	"	2.00		96.9	61-121			J
Butachlor	1.99	0.40	0.50	"	2.00		99.3	66-126			
Dimethoate	1.97	0.20	1.0	"	2.00		98.3	67-127			
Metolachlor	1.93	0.30	0.50	"	2.00		96.6	63-123			
Metribuzin	1.91	0.40	0.50	"	2.00		95.4	71-131			
Molinate	1.95	0.20	0.50	"	2.00		97.4	44-137			
Prometryn	1.95	0.50	0.50	"	2.00		97.6	63-123			
Propachlor	1.95	0.30	0.50	"	2.00		97.3	66-126			
Simazine	1.94	0.30	0.50	"	2.00		96.9	70-130			
Thiobencarb	2.01	0.20	1.0	"	2.00		100	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.80*			*"*	*2.00*		*89.8*	*70-130*			

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
LCS Dup (AB40730-BSD1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	2.02	0.50	0.50	ug/l	2.00		101	62-128	6.95	30	
Atrazine	2.01	0.30	0.50	"	2.00		100	62-122	4.47	30	
Bromacil	2.14	0.50	5.0	"	2.00		107	61-121	10.0	30	J
Butachlor	2.09	0.40	0.50	"	2.00		105	66-126	5.23	30	
Dimethoate	2.17	0.20	1.0	"	2.00		108	67-127	9.82	30	
Metolachlor	2.02	0.30	0.50	"	2.00		101	63-123	4.37	30	
Metribuzin	2.04	0.40	0.50	"	2.00		102	71-131	6.92	30	
Molinate	1.94	0.20	0.50	"	2.00		96.8	44-137	0.569	30	
Prometryn	2.07	0.50	0.50	"	2.00		103	63-123	5.75	30	
Propachlor	2.00	0.30	0.50	"	2.00		100	66-126	2.80	30	
Simazine	2.09	0.30	0.50	"	2.00		105	70-130	7.61	30	
Thiobencarb	2.19	0.20	1.0	"	2.00		109	69-129	8.57	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.85*			*"*	*2.00*		*92.6*	*70-130*			
Matrix Spike (AB40730-MS1)		**Source: 14A1588-01**			Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.81	0.50	0.50	ug/l	2.00	ND	90.7	62-128			
Atrazine	1.79	0.30	0.50	"	2.00	ND	89.7	62-122			
Bromacil	1.75	0.50	5.0	"	2.00	ND	87.5	61-121			J
Butachlor	1.85	0.40	0.50	"	2.00	ND	92.6	66-126			
Dimethoate	1.70	0.20	1.0	"	2.00	ND	84.9	67-127			
Metolachlor	1.82	0.30	0.50	"	2.00	ND	91.2	63-123			
Metribuzin	1.78	0.40	0.50	"	2.00	ND	89.2	71-131			
Molinate	1.87	0.20	0.50	"	2.00	ND	93.4	44-137			
Prometryn	1.68	0.50	0.50	"	2.00	ND	83.9	63-123			
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.6	66-126			
Simazine	1.85	0.30	0.50	"	2.00	ND	92.5	70-130			
Thiobencarb	1.90	0.20	1.0	"	2.00	ND	95.2	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.51*			*"*	*2.00*		*75.3*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Matrix Spike Dup (AB40730-MSD1)		**Source: 14A1588-01**		Prepared: 02/08/14 Analyzed: 02/11/14							
Alachlor	1.91	0.50	0.50	ug/l	2.00	ND	95.3	62-128	4.97	30	
Atrazine	1.96	0.30	0.50	"	2.00	ND	98.2	62-122	9.04	30	
Bromacil	2.13	0.50	5.0	"	2.00	ND	107	61-121	19.7	30	J
Butachlor	2.02	0.40	0.50	"	2.00	ND	101	66-126	8.67	30	
Dimethoate	2.14	0.20	1.0	"	2.00	ND	107	67-127	23.0	30	
Metolachlor	1.96	0.30	0.50	"	2.00	ND	97.9	63-123	7.12	30	
Metribuzin	2.02	0.40	0.50	"	2.00	ND	101	71-131	12.3	30	
Molinate	1.79	0.20	0.50	"	2.00	ND	89.6	44-137	4.16	30	
Prometryn	2.02	0.50	0.50	"	2.00	ND	101	63-123	18.4	30	
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.4	66-126	0.171	30	
Simazine	2.07	0.30	0.50	"	2.00	ND	104	70-130	11.3	30	
Thiobencarb	1.96	0.20	1.0	"	2.00	ND	97.8	69-129	2.64	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.60*			*"*	*2.00*		*79.9*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Organic Analytes by EPA Method 504.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40359 - EPA 504.1											
Blank (AB40359-BLK1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l							U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"							U
LCS (AB40359-BS1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.262	0.0040	0.010	ug/l	0.250		105	70-130			
1,2-Dibromoethane (EDB)	0.255	0.0050	0.020	"	0.250		102	70-130			
LCS Dup (AB40359-BSD1)					Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.273	0.0040	0.010	ug/l	0.250		109	70-130	4.17	25	
1,2-Dibromoethane (EDB)	0.270	0.0050	0.020	"	0.250		108	70-130	5.47	25	
Matrix Spike (AB40359-MS1)		**Source: 14A1588-01**			Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.212	0.0040	0.010	ug/l	0.250	ND	84.8	70-130			
1,2-Dibromoethane (EDB)	0.214	0.0050	0.020	"	0.250	ND	85.5	70-130			
Matrix Spike Dup (AB40359-MSD1)		**Source: 14A1588-01**			Prepared & Analyzed: 02/04/14						
1,2-Dibromo-3-chloropropane	0.211	0.0040	0.010	ug/l	0.250	ND	84.2	70-130	0.698	25	
1,2-Dibromoethane (EDB)	0.212	0.0050	0.020	"	0.250	ND	84.8	70-130	0.771	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
Blank (AB40536-BLK1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	ND	0.50	1.0	ug/l							U
Bentazon	ND	0.40	0.40	"							U
2,4-D	ND	0.80	1.0	"							U
Dalapon	ND	6.0	6.0	"							U
2,4-DB	ND	4.0	5.0	"							U
Dicamba	ND	0.40	0.40	"							U
Dichlorprop	ND	1.0	1.0	"							U
Dinoseb	ND	0.80	1.0	"							U
4-Nitrophenol	ND	0.70	1.0	"							U
Pentachlorophenol	ND	0.20	0.20	"							U
Picloram	ND	0.50	1.0	"							U
2,4,5-T	ND	0.40	0.50	"							U
2,4,5-TP (Silvex)	ND	0.50	0.50	"							U
Surrogate: DCAA	*13.2*			*"*	*14.2*		*93.2*	*70-130*			
LCS (AB40536-BS1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	1.04	0.50	1.0	ug/l	0.960		109	70-130			
Bentazon	1.48	0.40	0.40	"	1.92		76.9	70-130			
2,4-D	1.68	0.80	1.0	"	1.92		87.8	48-124			
Dalapon	11.3	6.0	6.0	"	12.5		90.3	40-112			
2,4-DB	7.11	4.0	5.0	"	7.68		92.6	54-123			
Dicamba	0.876	0.40	0.40	"	0.960		91.3	70-130			
Dichlorprop	2.70	1.0	1.0	"	2.88		93.7	54-106			
Dinoseb	5.59	0.80	1.0	"	6.42		87.1	20-105			
4-Nitrophenol	1.13	0.70	1.0	"	0.960		117	60-202			
Pentachlorophenol	0.840	0.20	0.20	"	0.960		87.5	70-130			
Picloram	1.07	0.50	1.0	"	0.960		111	70-130			
2,4,5-T	0.892	0.40	0.50	"	0.960		93.0	68-166			
2,4,5-TP (Silvex)	0.900	0.50	0.50	"	0.960		93.7	70-130			
Surrogate: DCAA	*14.5*			*"*	*14.2*		*102*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
LCS Dup (AB40536-BSD1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Acifluorfen	1.03	0.50	1.0	ug/l	0.960		108	70-130	0.944	50	
Bentazon	1.63	0.40	0.40	"	1.92		84.8	70-130	9.86	50	
2,4-D	1.69	0.80	1.0	"	1.92		88.0	48-124	0.327	50	
Dalapon	11.4	6.0	6.0	"	12.5		91.2	40-112	0.968	50	
2,4-DB	7.24	4.0	5.0	"	7.68		94.3	54-123	1.84	50	
Dicamba	0.877	0.40	0.40	"	0.960		91.4	70-130	0.0891	50	
Dichlorprop	2.69	1.0	1.0	"	2.88		93.5	54-106	0.220	50	
Dinoseb	5.77	0.80	1.0	"	6.42		89.9	20-105	3.18	50	
4-Nitrophenol	0.901	0.70	1.0	"	0.960		93.8	60-202	22.3	50	J
Pentachlorophenol	0.841	0.20	0.20	"	0.960		87.6	70-130	0.0986	50	
Picloram	0.964	0.50	1.0	"	0.960		100	70-130	10.5	50	J
2,4,5-T	0.931	0.40	0.50	"	0.960		96.9	68-166	4.18	50	
2,4,5-TP (Silvex)	0.964	0.50	0.50	"	0.960		100	70-130	6.85	50	
Surrogate: DCAA	*14.2*			*"*	*14.2*		*99.8*	*70-130*			
Matrix Spike (AB40536-MS1)		**Source: 14A1588-01**			Prepared: 02/06/14 Analyzed: 02/08/14						
Acifluorfen	0.696	0.50	1.0	ug/l	0.960	ND	72.5	70-130			J
Bentazon	1.79	0.40	0.40	"	1.92	ND	93.0	70-130			
2,4-D	1.50	0.80	1.0	"	1.92	ND	78.3	48-124			
Dalapon	11.1	6.0	6.0	"	12.5	ND	88.8	40-112			
2,4-DB	7.08	4.0	5.0	"	7.68	ND	92.2	54-123			
Dicamba	0.867	0.40	0.40	"	0.960	ND	90.3	70-130			
Dichlorprop	2.75	1.0	1.0	"	2.88	ND	95.6	54-106			
Dinoseb	5.23	0.80	1.0	"	6.42	ND	81.4	20-105			
4-Nitrophenol	0.969	0.70	1.0	"	0.960	ND	101	60-202			J
Pentachlorophenol	0.642	0.20	0.20	"	0.960	ND	66.9	70-130			QM-07
Picloram	0.973	0.50	1.0	"	0.960	ND	101	70-130			J
2,4,5-T	0.862	0.40	0.50	"	0.960	ND	89.8	68-166			
2,4,5-TP (Silvex)	0.911	0.50	0.50	"	0.960	ND	94.9	70-130			
Surrogate: DCAA	*13.8*			*"*	*14.2*		*97.5*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40536 - EPA 515.1											
Matrix Spike Dup (AB40536-MSD1)		**Source: 14A1588-01**		Prepared: 02/06/14 Analyzed: 02/08/14							
Acifluorfen	0.926	0.50	1.0	ug/l	0.960	ND	96.5	70-130	28.3	50	J
Bentazon	1.79	0.40	0.40	"	1.92	ND	93.5	70-130	0.474	50	
2,4-D	1.64	0.80	1.0	"	1.92	ND	85.2	48-124	8.45	50	
Dalapon	11.5	6.0	6.0	"	12.5	ND	92.3	40-112	3.86	50	
2,4-DB	7.32	4.0	5.0	"	7.68	ND	95.4	54-123	3.40	50	
Dicamba	0.910	0.40	0.40	"	0.960	ND	94.8	70-130	4.86	50	
Dichlorprop	2.90	1.0	1.0	"	2.88	ND	101	54-106	5.12	50	
Dinoseb	5.49	0.80	1.0	"	6.42	ND	85.5	20-105	4.84	50	
4-Nitrophenol	1.04	0.70	1.0	"	0.960	ND	108	60-202	6.64	50	
Pentachlorophenol	0.721	0.20	0.20	"	0.960	ND	75.1	70-130	11.5	50	
Picloram	1.16	0.50	1.0	"	0.960	ND	121	70-130	17.4	50	
2,4,5-T	0.945	0.40	0.50	"	0.960	ND	98.4	68-166	9.12	50	
2,4,5-TP (Silvex)	0.967	0.50	0.50	"	0.960	ND	101	70-130	5.94	50	
Surrogate: DCAA	*14.5*			*"*	*14.2*		*102*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41142 - HPLC											
Blank (AB41142-BLK1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	ND	0.70	3.0	ug/l							U
Aldicarb sulfone	ND	0.70	4.0	"							U
Aldicarb sulfoxide	ND	0.80	3.0	"							U
Carbaryl	ND	0.70	5.0	"							U
Carbofuran	ND	2.0	5.0	"							U
3-Hydroxycarbofuran	ND	0.90	3.0	"							U
Methiocarb	ND	2.0	5.0	"							U
Methomyl	ND	2.0	2.0	"							U
Oxamyl	ND	0.80	20	"							U
Propoxur	ND	2.0	5.0	"							U
LCS (AB41142-BS1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	20.0	0.70	3.0	ug/l	20.0		99.9	80-120			
Aldicarb sulfone	20.1	0.70	4.0	"	19.0		106	80-120			
Aldicarb sulfoxide	19.2	0.80	3.0	"	19.8		97.0	80-120			
Carbaryl	20.4	0.70	5.0	"	20.0		102	80-120			
Carbofuran	19.5	2.0	5.0	"	20.0		97.7	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0		103	80-120			
Methiocarb	18.6	2.0	5.0	"	20.0		93.2	80-120			
Methomyl	21.1	2.0	2.0	"	20.0		105	80-120			
Oxamyl	20.5	0.80	20	"	20.0		102	80-120			
Propoxur	20.2	2.0	5.0	"	20.0		101	80-120			
LCS Dup (AB41142-BSD1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	19.3	0.70	3.0	ug/l	20.0		96.6	80-120	3.34	20	
Aldicarb sulfone	19.3	0.70	4.0	"	19.0		102	80-120	3.93	20	
Aldicarb sulfoxide	18.6	0.80	3.0	"	19.8		93.7	80-120	3.45	20	
Carbaryl	18.8	0.70	5.0	"	20.0		94.1	80-120	8.11	20	
Carbofuran	19.4	2.0	5.0	"	20.0		97.1	80-120	0.645	20	
3-Hydroxycarbofuran	19.0	0.90	3.0	"	20.0		95.1	80-120	8.35	20	
Methiocarb	19.1	2.0	5.0	"	20.0		95.7	80-120	2.65	20	
Methomyl	19.5	2.0	2.0	"	20.0		97.7	80-120	7.69	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41142 - HPLC											
LCS Dup (AB41142-BSD1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Oxamyl	19.2	0.80	20	ug/l	20.0		95.8	80-120	6.62	20	J
Propoxur	19.0	2.0	5.0	"	20.0		94.8	80-120	6.54	20	
Matrix Spike (AB41142-MS1)		**Source: 14B0426-01**			Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	18.7	0.70	3.0	ug/l	20.0	ND	93.3	80-120			
Aldicarb sulfone	20.1	0.70	4.0	"	19.0	ND	106	80-120			
Aldicarb sulfoxide	20.1	0.80	3.0	"	19.8	ND	102	80-120			
Carbaryl	20.0	0.70	5.0	"	20.0	ND	99.8	80-120			
Carbofuran	19.3	2.0	5.0	"	20.0	ND	96.6	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0	ND	103	80-120			
Methiocarb	18.2	2.0	5.0	"	20.0	ND	91.2	80-120			
Methomyl	21.0	2.0	2.0	"	20.0	ND	105	80-120			
Oxamyl	20.3	0.80	20	"	20.0	ND	102	80-120			
Propoxur	19.2	2.0	5.0	"	20.0	ND	95.9	80-120			
Matrix Spike Dup (AB41142-MSD1)		**Source: 14B0426-01**			Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	17.4	0.70	3.0	ug/l	20.0	ND	87.1	80-120	6.84	20	
Aldicarb sulfone	19.0	0.70	4.0	"	19.0	ND	100	80-120	5.57	20	
Aldicarb sulfoxide	18.8	0.80	3.0	"	19.8	ND	94.8	80-120	6.85	20	
Carbaryl	19.4	0.70	5.0	"	20.0	ND	97.1	80-120	2.76	20	
Carbofuran	19.4	2.0	5.0	"	20.0	ND	96.9	80-120	0.339	20	
3-Hydroxycarbofuran	19.8	0.90	3.0	"	20.0	ND	98.9	80-120	4.29	20	
Methiocarb	18.9	2.0	5.0	"	20.0	ND	94.6	80-120	3.68	20	
Methomyl	20.6	2.0	2.0	"	20.0	ND	103	80-120	1.83	20	
Oxamyl	19.2	0.80	20	"	20.0	ND	95.8	80-120	5.89	20	J
Propoxur	19.5	2.0	5.0	"	20.0	ND	97.3	80-120	1.47	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Endothall by EPA Method 548.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40357 - EPA 548.1											
Blank (AB40357-BLK1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	ND	2.0	45	ug/l							U
LCS (AB40357-BS1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	209	2.0	45	ug/l	200		104	80-120			
LCS Dup (AB40357-BSD1)					Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	217	2.0	45	ug/l	200		108	80-120	3.75	30	
Matrix Spike (AB40357-MS1)		**Source: 14A1588-01**			Prepared: 02/04/14 Analyzed: 02/06/14						
Endothall	187	2.0	45	ug/l	200	ND	93.7	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Glyphosate by EPA Method 547 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40427 - HPLC											
Blank (AB40427-BLK1)					Prepared & Analyzed: 02/04/14						
Glyphosate	ND	3.0	10	ug/l							U
LCS (AB40427-BS1)					Prepared & Analyzed: 02/04/14						
Glyphosate	111	3.0	10	ug/l	120		92.7	66-126			
LCS Dup (AB40427-BSD1)					Prepared & Analyzed: 02/04/14						
Glyphosate	112	3.0	10	ug/l	120		93.7	66-126	1.08	30	
Matrix Spike (AB40427-MS1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	111	3.0	10	ug/l	120	ND	92.7	66-126			
Matrix Spike Dup (AB40427-MSD1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	110	3.0	10	ug/l	120	ND	92.0	66-126	0.801	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Diquat by EPA Method 549.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AA43118 - HPLC											
Blank (AA43118-BLK1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	ND	2.0	2.0	ug/l							U
LCS (AA43118-BS1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	16.5	2.0	2.0	ug/l	19.8		83.3	70-130			
LCS Dup (AA43118-BSD1)					Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	16.2	2.0	2.0	ug/l	19.8		81.6	70-130	2.03	25	
Matrix Spike (AA43118-MS1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/10/14						
Diquat	8.63	2.0	2.0	ug/l	19.8	ND	43.5	70-130			QM-05

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41050 - EPA 552.2											
Blank (AB41050-BLK1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	ND	0.8	1.0	ug/l							U
Monochloroacetic Acid	ND	1.1	2.0	"							U
Dibromoacetic Acid	ND	0.8	1.0	"							U
Dichloroacetic Acid	ND	1.0	1.0	"							U
Trichloroacetic Acid	ND	1.0	1.0	"							U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"							U
Surrogate: 2,3-Dibromopropionic Acid	*9.59*			*"*	*10.0*		*95.9*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*11.7*			*"*	*10.0*		*117*	*70-130*			
LCS (AB41050-BS1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	25.5	0.8	1.0	ug/l	25.0		102	70-130			
Monochloroacetic Acid	26.9	1.1	2.0	"	25.0		107	70-130			
Dibromoacetic Acid	26.8	0.8	1.0	"	25.0		107	70-130			
Dichloroacetic Acid	26.0	1.0	1.0	"	25.0		104	70-130			
Trichloroacetic Acid	26.6	1.0	1.0	"	25.0		106	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*11.0*			*"*	*10.0*		*110*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*10.1*			*"*	*10.0*		*101*	*70-130*			
MRL Check (AB41050-MRL1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	1.07	0.8	1.0	ug/l	1.00		107	0-200			
Monochloroacetic Acid	ND	1.1	2.0	"	1.00			0-200			U
Dibromoacetic Acid	1.37	0.8	1.0	"	1.00		137	0-200			
Dichloroacetic Acid	ND	1.0	1.0	"	1.00			0-200			U
Trichloroacetic Acid	1.05	1.0	1.0	"	1.00		105	0-200			
Surrogate: 2,3-Dibromopropionic Acid	*1.40*			*"*	*1.00*		*140*	*0-200*			
Surrogate: 2-Bromopropionic Acid	*1.14*			*"*	*1.00*		*114*	*0-200*			
Matrix Spike (AB41050-MS1)		**Source: 14A1713-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Monobromoacetic Acid	24.9	0.8	1.0	ug/l	25.0	ND	99.7	70-130			
Monochloroacetic Acid	26.6	1.1	2.0	"	25.0	ND	106	70-130			

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Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 11:18

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41050 - EPA 552.2											
Matrix Spike (AB41050-MS1)		**Source: 14A1713-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Dibromoacetic Acid	32.2	0.8	1.0	ug/l	25.0	ND	129	70-130			
Dichloroacetic Acid	25.1	1.0	1.0	"	25.0	ND	100	70-130			
Trichloroacetic Acid	29.9	1.0	1.0	"	25.0	ND	120	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*12.1*			*"*	*10.0*		*121*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.42*			*"*	*10.0*		*94.2*	*70-130*			
Matrix Spike (AB41050-MS2)		**Source: 14B0089-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Monobromoacetic Acid	24.4	0.8	1.0	ug/l	25.0	ND	97.6	70-130			
Monochloroacetic Acid	25.3	1.1	2.0	"	25.0	ND	101	70-130			
Dibromoacetic Acid	31.9	0.8	1.0	"	25.0	ND	128	70-130			
Dichloroacetic Acid	24.0	1.0	1.0	"	25.0	ND	96.0	70-130			
Trichloroacetic Acid	31.1	1.0	1.0	"	25.0	ND	124	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*13.9*			*"*	*10.0*		*139*	*70-130*			*S-GC*
Surrogate: 2-Bromopropionic Acid	*10.9*			*"*	*10.0*		*109*	*70-130*			
Reference (AB41050-SRM1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	25.1	0.8	1.0	ug/l	25.0		100	0-200			
Monochloroacetic Acid	26.7	1.1	2.0	"	25.0		107	0-200			
Dibromoacetic Acid	25.6	0.8	1.0	"	25.0		103	0-200			
Dichloroacetic Acid	24.9	1.0	1.0	"	25.0		99.7	0-200			
Trichloroacetic Acid	25.8	1.0	1.0	"	25.0		103	0-200			
Surrogate: 2,3-Dibromopropionic Acid	*10.6*			*"*	*10.0*		*106*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.92*			*"*	*10.0*		*99.2*	*70-130*			

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Blank (AB40727-BLK1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	ND	0.080	0.10	ug/l							U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"							U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.23*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*3.73*			*"*	*5.00*		*74.6*	*70-130*			
Surrogate: Triphenyl phosphate	*4.72*			*"*	*5.00*		*94.4*	*70-130*			
LCS (AB40727-BS1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.13	0.080	0.10	ug/l	3.00		71.0	70-130			
Di(2-ethylhexyl)adipate	2.49	0.40	5.0	"	3.00		83.0	70-130			J
Di(2-ethylhexyl)phthalate	2.40	0.20	3.0	"	3.00		80.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.36*			*"*	*5.00*		*107*	*70-130*			
Surrogate: Perylene-d12	*4.65*			*"*	*5.00*		*93.0*	*70-130*			
Surrogate: Triphenyl phosphate	*5.36*			*"*	*5.00*		*107*	*70-130*			
LCS Dup (AB40727-BSD1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.40	0.080	0.10	ug/l	3.00		80.0	70-130	11.9	20	
Di(2-ethylhexyl)adipate	2.70	0.40	5.0	"	3.00		90.0	70-130	8.09	20	J
Di(2-ethylhexyl)phthalate	2.57	0.20	3.0	"	3.00		85.7	70-130	6.84	20	J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.39*			*"*	*5.00*		*108*	*70-130*			
Surrogate: Perylene-d12	*4.84*			*"*	*5.00*		*96.8*	*70-130*			
Surrogate: Triphenyl phosphate	*5.47*			*"*	*5.00*		*109*	*70-130*			
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.79	0.080	0.10	ug/l	3.00	ND	93.0	70-130			
Di(2-ethylhexyl)adipate	3.11	0.40	5.0	"	3.00	ND	104	70-130			J
Di(2-ethylhexyl)phthalate	2.79	0.20	3.0	"	3.00	ND	93.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.27*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*5.52*			*"*	*5.00*		*110*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 11:18

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Surrogate: Triphenyl phosphate	*5.65*			*ug/l*	*5.00*		*113*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 11:18

Notes and Definitions

J	Detected but below the Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ).
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
S-GC	Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogates.
U	Analyte included in analysis, but not detected at or above MDL.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

ASBESTOS TEM LABORATORIES, INC.

EPA 600/4-83 Drinking Water
Transmission Electron Microscopy
Analytical Report

Laboratory Job # 1288-00572

630 Bancroft Way
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

Certified by
CA DPH ELAP
Lab No. 1866

Feb/11/2014

David S. Pingatore
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482

RE: LABORATORY JOB # 1288-00572
Transmission electron microscopy analytical results for 1 water sample(s).
Job Site: Santa Margarita
Job No.: 14A1714

Enclosed please find results for the TEM analysis of one or more water samples. The analytical procedures were performed according to EPA Method 100.2 for the analysis of asbestos in drinking water.

Prior to analysis, samples are checked for damage, disruption of any chain-of-custody seals, and completeness of accompanying paperwork. If no problems are found, samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

Preparation of water samples is performed within a HEPA filtered, Class 100 air, laminar flow clean bench environment. Prior to filtration, water sample containers are ultrasonicated, and the exterior surfaces cleaned. An aliquot of water is drawn from the sample container and drawn through a special filtration apparatus and collected onto a mixed cellulose ester (MCE) or polycarbonate (PC) filter. The filters are removed from the apparatus and dried. A portion of each sample filter is sectioned, placed onto a glass microscope slide, and carbon coated. The filters are further sectioned and placed carbon side up onto 200-mesh copper TEM sample grids in a solvent bath until all filter material is dissolved. The TEM grids are removed and placed into labeled grid storage boxes.

TEM analysis is performed on a Philips EM-300 or CM-12 transmission electron microscope operating at 80 or 100 kV. Initially, the grid is scanned at low and medium magnification to insure proper sample loading, and coherence of the carbon support film. Then TEM grid openings are analyzed at a magnification of 10,000X. All fibers >10 um in length and exhibiting an aspect ratio >3:1 are analyzed. Scanning continues until either 100 asbestiform fibers >10um in length are counted, or an analytical sensitivity of 0.2 million fibers per liter (MFL) is achieved. Analyzed fibers are subjected to detailed morphological and selected area diffraction (SAED) analysis. Fibers indicated as asbestos, or potentially asbestos, are further analyzed by energy dispersive X-ray (EDX) analysis as needed. The number of asbestos fibers detected, and other analytical parameters, are then used to calculate the concentration of asbestos in MFL. The results are entered into a standard report format and reviewed by the analyst and the laboratory manager before release to the client.

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

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www.asbestostemlabs.com *With Offices in Reno, NV (775) 359-3377*

TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL REPORT

Contact:	David S. Pingatore		
Address:	Alpha Analytical Laboratories, Inc. 208 Mason Street Ukiah, CA 95482	Report No.:	**323875**
		Date:	Feb-11-14
		Total Samples Analyzed:	1
Job Site / No.	Santa Margarita 14A1714	Sample Collector:	

CLIENT SAMPLE #	**14A1714-01**	**SAMPLE LOCATION/DESCRIPTION**	Santa Margarita ASR MW-1
Laboratory Sample #	1288-00572-001		

WATER SAMPLE DATA

Date/Time Collected	Jan-30-14 / 2:50 pm	Volume Submitted (ml)	1000
Date/Time Lab Received	Feb-03-14 / 3:55 pm	Volume Filtered (ml)	15
Date/Time Filtered	Feb-05-14 / 9:00 pm	Filter & Pore Size	MCE 0.22
Date/Time Analyzed	Feb-11-14 / 8:25 am	UV/Ozone Treated:	YES

IDENTIFIED STRUCTURES (>10um)			
ASBESTOS		OTHER	
CHRYS	AMPH	AMBIG	NON-ASB
NSD	NSD	NSD	NSD

CALCULATED ASBESTOS STRUCTURE CONCENTRATION (>10um)		
CHRYS	AMPH	TOTAL
< 0.1 MFL	< 0.1 MFL	< 0.1 MFL

COMMENTS

No asbestos detected

Filter Loading: MODERATE

SAED Photo ID Nos.

TEM / ANALYTICAL PARAMETERS

Grid Openings Scanned at 10,000X	8	Analytical Sensitivity	0.1 MFL
Grid Opening Area (mm2)	0.0094	95% UCL	0.33 MFL
Scan Area (mm2)	0.0752	95% LCL	0 MFL

WATER SAMPLE LAB BLANK RESULTS

Lab ID#	Blank 9476	Analytical Sensitivity	0.01 MFL
Grid Openings Scanned at 10,000X	8	Asbestos Structure Concentration	<0.01 MFL
Volume Filtered (ml)	300		

NOTATION KEY

Chrys. - Chrysotile Asbestos
Amph. - Amphibole Asbestos
NSD - No Structures Detected
1 mm = 1 millimeter

1 um = 1 micron = 0.001 mm
MFL = Millions of Fibers per Liter
UCL = Upper Confidence Level
LCL = Lower Confidence Level

ANALYST SIGNATURE

Stephanie Dunn
LAB QC REVIEWER SIGNATURE

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1714

SENDING LABORATORY:	**RECEIVING LABORATORY:**
Alpha Analytical Laboratories, Inc.	Asbestos TEM Laboratories, Inc.
208 Mason St.	630 Bancroft Way
Ukiah, CA 95482	Berkeley, CA 94710
Phone: (707)468-0401	Phone :(510) 704-8930
Fax: (707)468-5267	Fax: (510) 704-8429
Project Manager: David S. Pingatore	**Terms: Net 30**

Analysis	Due	Expires	Comments
14A1714-01 Santa Margarita ASR MW-1 [Water] Sampled 01/30/14 14:50 Pacific			
Asbestos-DW SUB	02/14/14 12:00	02/01/14 14:50	
Containers Supplied:			
1L Amber- Unpres. (Y)	1L Amber- Unpres. (Z)		

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
	1-31-14	ATEM/RY	02-03-14 P03:55 IN
Released By	Date	Received By	Date

McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 1401904

Report Created for: Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Project Contact: David S. Pingatore
Project P.O.:
Project Name: #14A1714

Project Received: 01/31/2014

Analytical Report reviewed & approved for release on 02/05/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

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NELAP: 12283CA ♦ ELAP: 1644 ♦ ISO/IEC: 17025:2005 ♦ WSDE: C972-11 ♦ ADEC: UST-098 ♦ UCMR3

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http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: Alpha Analytical Laboratories
Project: #14A1714
WorkOrder: 1401904

Glossary Abbreviation	Description
95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

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http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1401904
Project:	#14A1714	**Extraction Method**	E218.6
Date Received:	1/31/14 12:16	**Analytical Method:**	E218.6
Date Prepared:	1/31/14	**Unit:**	µg/L

Hexachrome by IC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
Santa Margarita ASR MW-1	**1401904-001A**	**Water**	**01/30/2014 14:50**	**IC2**	**86616**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	ND	0.050	1	01/31/2014 18:09

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Quality Control Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1401904
Date Prepared:	1/31/14	**BatchID:**	86616
Date Analyzed:	1/31/14	**Extraction Method**	E218.6
Instrument:	IC2	**Analytical Method:**	E218.6
Matrix:	Water	**Unit:**	µg/L
Project:	#14A1714	**Sample ID:**	MB/LCS-86616 1401905-001AMS/MSD

QC Summary Report for E218.6

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	ND	25.38	0.050	25	-	102	90-110

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	24.94	25.03	25	1.560	93.5	93.9	90-110	0.360	10

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1401904 **ClientCode: ALPU**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
David S. Pingatore
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482
(707) 468-0401 FAX: (707) 468-5267

Email: sspeaks@alpha-labs.com;david@alpha-lab
cc:
PO:
ProjectNo: #14A1714

Bill to:
Accounts Payable
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Requested TAT: 5 days

Date Received: 01/31/2014
Date Printed: 01/31/2014

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1401904-001	Santa Margarita ASR MW-1	Water	1/30/2014 14:50	☐	A											

Test Legend:

1	218_6_DW	2		3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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http://www.mccampbell.com / E-mail: main@mccampbell.com

WORK ORDER SUMMARY

Client Name: ALPHA ANALYTICAL LABORATORIES
QC Level: LEVEL 2
Work Order: 1401904
Project: #14A1714
Client Contact: David S. Pingatore
Date Received: 1/31/2014
Comments:
Contact's Email: sspeaks@alpha-labs.com;david@alpha-labs.com

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Number of Containers	Bottle & Preservative	De-chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1401904-001A	Santa Margarita ASR MW-1	Water	E218.6 (Hexachrome)	1	250mL HDPE w/ (NH4)2SO4	☐	1/30/2014 14:50	5 days	Trace	☐	

*** NOTE: STLC and TCLP extractions require 48 hrs to complete; therefore, all TATs begin after the extraction is completed (i.e., 24hr TAT yields results in 72 hrs from sample submission).**

Bottle Legend:

250mL HDPE w/ (NH4)2SO4 = 250mL HDPE Bottle w/ Ammonium Sulfate

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

1401904

14A1714

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

McCampbell Analytical
1534 Willowpass Rd.
Pittsburg, CA 94565
Phone :(925) 252-9262
Fax: (925) 252-9269
Terms: Net 30

Analysis	Due	Expires	Comments
14A1714-01 Santa Margarita ASR MW-1 [Water] Sampled 01/30/14 14:50			
Pacific			
Cr6 218.6 DW	02/14/14 12:00	02/04/14 14:50	
Containers Supplied:			
250ml Poly - (NH4)2SO4 (A			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

NO

ICE/t° 3.2
GOOD CONDITION_____ APPROPRIATE
HEAD SPACE ABSENT_____ CONTAINERS_____
DECHLORINATED IN LAB_____ PRESERVED IN LAB_____

PRESERVATION	VOAS	O&G	METALS	OTHER

Released By	Date	Received By	Date
	01/31/14		1/31/14
Released By	Date	Received By	Date
	1/31/14		1/31/14 1150

Page 1 of 1

McCampbell Analytical, Inc.
"When Quality Counts"

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http://www.mccampbell.com / E-mail: main@mccampbell.com

Sample Receipt Checklist

Client Name:	**Alpha Analytical Laboratories**	Date and Time Received:	**1/31/2014 12:16:46 PM**
Project Name:	**#14A1714**	LogIn Reviewed by:	Maria Venegas
WorkOrder N°:	**1401904** Matrix: Water	Carrier:	Client Drop-In

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☐	No ☑

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp: 3.2°C		NA ☐
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	NA ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑
Samples Received on Ice?	Yes ☑	No ☐	

(Ice Type: BLUE ICE)

** NOTE: If the "No" box is checked, see comments below.*

Comments:

ALS Environmental
ALS Group USA, Corp.
1317 South 13th Avenue
Kelso, WA 98626
T: +1 360 577 7222
F: +1 360 636 1068
www.alsglobal.com

February 21, 2014 Analytical Report for Service Request No: K1401156

David Pingatore
Alpha Analytical Laboratories, Inc.
6398 Dougherty Road, Suite 35
Dublin, CA 94568

RE: 14A1714

Dear David:

Enclosed are the results of the sample submitted to our laboratory on February 05, 2014. For your reference, these analyses have been assigned our service request number K1401156.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3293. You may also contact me via Email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Shar Samy, Ph.D.
Project Manager

SS/mj

RIGHT SOLUTIONS | RIGHT PARTNER

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2286
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L12-28
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Georgia DNR	http://www.gaepd.org/Documents/techguide_pcb.html#cel	881
Hawaii DOH	Not available	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
Indiana DOH	http://www.in.gov/isdh/24859.htm	C-WA-01
ISO 17025	http://www.pjlabs.com/	L12-27
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	3016
Maine DHS	Not available	WA0035
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-368
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA35
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA200001
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	4704427-08-TX
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C1203
Wisconsin DNR	http://dnr.wi.gov/	998386840
Wyoming (EPA Region 8)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.caslab.com or at the accreditation bodies web site

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

ALS ENVIRONMENTAL

Client:	Alpha Analytical Laboratories, Inc.	**Service Request No.:**	K1401156
Project:	14A1714	**Date Received:**	02/05/14
Sample Matrix:	Water		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS), and Laboratory Control Sample (LCS).

Sample Receipt

One water sample was received for analysis at ALS Environmental on 02/05/14. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4ºC upon receipt at the laboratory.

Explosives by EPA Method 8330

Sample Notes and Discussion:
Insufficient sample volume was received to perform a Matrix Spike/Matrix Spike Duplicate (MS/MSD). A Laboratory Control Sample/Duplicate Laboratory Control Sample (LCS/DLCS) was analyzed and reported in lieu of the MS/MSD.

No other anomalies associated with the analysis of this sample were observed.

Approved by_____

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1714

K1401156

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

ALS Environmental - Kelso
1317 S. 13th Ave
Kelso, WA 98626
Phone :(360) 577-7222
Fax: -
Terms: Net 30

Analysis	Due	Expires	Comments
14A1714-01 Santa Margarita ASR MW-1 [Water] Sampled 01/30/14 14:50 Pacific			
8330B Explosives Water	02/14/14 12:00	02/06/14 14:50	
Containers Supplied:			
1L Amber- Unpres. (AD) 1L Amber- Unpres. (AE)			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
	1-31-14		2/3/14 1020
Released By	Date	Received By	Date

ALS

PC Shaw

Cooler Receipt and Preservation Form

Client / Project: Alpha Service Request K14 01156

Received: 2/5/14 Opened: 2/5/14 By: [illegible] Unloaded: 2/5/14 By: [illegible]

1. Samples were received via? *Mail* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? _____

   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID NA	Tracking Number NA	Filed
-0.9	-2.6	—	—	-0.1	308		1Z894250 01489477 38	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA Y N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

Page ____ *of* ____

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401156
Project:	14A1714	**Date Collected:**	01/30/2014
Sample Matrix:	Water	**Date Received:**	02/05/2014

Nitroaromatics and Nitramines (Explosives)

Sample Name:	14A1714-01 Santa Margarita ASR MW-1	**Units:**	ug/L
Lab Code:	K1401156-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.098	0.010	1	02/06/14	02/08/14	KWG1400979	
RDX	ND	U	0.098	0.017	1	02/06/14	02/08/14	KWG1400979	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/06/14	02/08/14	KWG1400979	
1,3-Dinitrobenzene	ND	U	0.098	0.0085	1	02/06/14	02/08/14	KWG1400979	
3,5-Dinitroaniline	ND	U	0.098	0.013	1	02/06/14	02/08/14	KWG1400979	
TETRYL	ND	U	0.10	0.042	1	02/06/14	02/08/14	KWG1400979	
Nitrobenzene	ND	U	0.098	0.013	1	02/06/14	02/08/14	KWG1400979	
4-Amino-2,6-dinitrotoluene	ND	U	0.098	0.016	1	02/06/14	02/08/14	KWG1400979	
2-Amino-4,6-dinitrotoluene	ND	U	0.098	0.0089	1	02/06/14	02/08/14	KWG1400979	
2,4,6-Trinitrotoluene	ND	U	0.098	0.026	1	02/06/14	02/08/14	KWG1400979	
2,6-Dinitrotoluene	ND	U	0.20	0.054	1	02/06/14	02/08/14	KWG1400979	
2,4-Dinitrotoluene	ND	U	0.098	0.0091	1	02/06/14	02/08/14	KWG1400979	
2-Nitrotoluene	**0.037**	JN	0.10	0.032	1	02/06/14	02/08/14	KWG1400979	
4-Nitrotoluene	ND	U	0.098	0.019	1	02/06/14	02/08/14	KWG1400979	
3-Nitrotoluene	ND	U	0.098	0.0064	1	02/06/14	02/08/14	KWG1400979	
Nitroglycerin	ND	U	0.98	0.39	1	02/06/14	02/08/14	KWG1400979	
Pentaerythritol Tetranitrate	ND	U	0.49	0.18	1	02/06/14	02/08/14	KWG1400979	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	87	23-98	02/08/14	Acceptable

Comments:

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401156
Project:	14A1714	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Nitroaromatics and Nitramines (Explosives)

Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1400979-3	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.098	0.010	1	02/06/14	02/07/14	KWG1400979	
RDX	ND	U	0.098	0.017	1	02/06/14	02/07/14	KWG1400979	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/06/14	02/07/14	KWG1400979	
1,3-Dinitrobenzene	ND	U	0.098	0.0085	1	02/06/14	02/07/14	KWG1400979	
3,5-Dinitroaniline	ND	U	0.098	0.013	1	02/06/14	02/07/14	KWG1400979	
TETRYL	ND	U	0.10	0.042	1	02/06/14	02/07/14	KWG1400979	
Nitrobenzene	ND	U	0.098	0.013	1	02/06/14	02/07/14	KWG1400979	
4-Amino-2,6-dinitrotoluene	ND	U	0.098	0.016	1	02/06/14	02/07/14	KWG1400979	
2-Amino-4,6-dinitrotoluene	ND	U	0.098	0.0089	1	02/06/14	02/07/14	KWG1400979	
2,4,6-Trinitrotoluene	ND	U	0.098	0.026	1	02/06/14	02/07/14	KWG1400979	
2,6-Dinitrotoluene	**0.068**	JN	0.20	0.054	1	02/06/14	02/07/14	KWG1400979	
2,4-Dinitrotoluene	ND	U	0.098	0.0091	1	02/06/14	02/07/14	KWG1400979	
2-Nitrotoluene	ND	U	0.10	0.032	1	02/06/14	02/07/14	KWG1400979	
4-Nitrotoluene	ND	U	0.098	0.019	1	02/06/14	02/07/14	KWG1400979	
3-Nitrotoluene	ND	U	0.098	0.0064	1	02/06/14	02/07/14	KWG1400979	
Nitroglycerin	ND	U	0.98	0.39	1	02/06/14	02/07/14	KWG1400979	
Pentaerythritol Tetranitrate	ND	U	0.49	0.18	1	02/06/14	02/07/14	KWG1400979	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	75	23-98	02/07/14	Acceptable

Comments:

Client: Alpha Analytical Laboratories, Inc. (Uki
Service Request: K1401156
Project: 14A1714
Sample Matrix: Water

Surrogate Recovery Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method: METHOD
Units: Percent
Analysis Method: 8330B
Level: Low

Sample Name	Lab Code	Sur1
14A1714-01 Santa Margarita ASR MV	K1401156-001	87
Method Blank	KWG1400979-3	75
Duplicate Lab Control Sample	KWG1400979-1	82
Lab Control Sample	KWG1400979-2	91

Surrogate Recovery Control Limits (%)

Sur1 = 1-Chloro-3-nitrobenzene 23-98

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401156
Project:	14A1714	**Date Extracted:**	02/06/2014
Sample Matrix:	Water	**Date Analyzed:**	02/07/2014

Lab Control Spike/Duplicate Lab Control Spike Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method:	METHOD	**Units:**	ug/L
Analysis Method:	8330B	**Basis:**	NA
		Level:	Low
		Extraction Lot:	KWG1400979

	Lab Control Sample KWG1400979-2 Lab Control Spike			Duplicate Lab Control Sample KWG1400979-1 Duplicate Lab Control Spike					
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**	**RPD**	**RPD Limit**
HMX	7.75	8.00	97	7.46	8.00	93	11-147	4	30
RDX	7.53	8.00	94	7.26	8.00	91	10-142	4	30
1,3,5-Trinitrobenzene	7.54	8.00	94	7.01	8.00	88	16-137	7	30
1,3-Dinitrobenzene	7.51	8.00	94	7.03	8.00	88	26-125	7	30
3,5-Dinitroaniline	7.48	8.00	93	7.09	8.00	89	30-133	5	30
TETRYL	7.71	8.00	96	7.26	8.00	91	29-123	6	30
Nitrobenzene	7.43	8.00	93	6.93	8.00	87	10-116	7	30
4-Amino-2,6-dinitrotoluene	7.57	8.00	95	7.11	8.00	89	55-117	6	30
2-Amino-4,6-dinitrotoluene	7.47	8.00	93	7.00	8.00	88	54-116	6	30
2,4,6-Trinitrotoluene	7.53	8.00	94	6.93	8.00	87	47-118	8	30
2,6-Dinitrotoluene	7.57	8.00	95	6.95	8.00	87	40-108	9	30
2,4-Dinitrotoluene	7.46	8.00	93	6.83	8.00	85	50-111	9	30
2-Nitrotoluene	7.18	8.00	90	6.55	8.00	82	12-110	9	30
4-Nitrotoluene	7.21	8.00	90	6.58	8.00	82	16-113	9	30
3-Nitrotoluene	7.51	8.00	94	6.83	8.00	85	13-109	10	30
Nitroglycerin	7.71	8.00	96	7.43	8.00	93	15-136	4	30
Pentaerythritol Tetranitrate	7.81	8.00	98	7.35	8.00	92	66-103	6	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

WECK LABORATORIES, INC.
Analytical Laboratory Service - Since 1964

Certificate of Analysis

Report Date: 02/24/14 10:55
Received Date: 02/05/14 08:30
Turnaround Time: Normal

Project: 14A1714

Phones: (925) 872-9637
Fax: (707) 468-5267

P.O. #:

Attn: David S. Pingatore

Client: Alpha Analytical Laboratories - Ukiah
208 Mason St
Ukiah, CA 95482

Dear David S. Pingatore :

Enclosed are the results of analyses for samples received 2/5/2014 with the Chain of Custody document. The samples were received in good condition, at 1.7 °C and on ice. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Lab Sample ID: 4B05034-01 **Sample ID: 14A1714-01 Santa Margarita ASR MW-1 Pacific** **Matrix:** Water
Sampled by: Client **Sampled: 01/30/14 14:50**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
N-Nitrosodiethylamine	ND		2.0	ng/l	1	EPA 1625M	2/6/14	2/7/14 12:34	W4B0247	
N-Nitrosodimethylamine	ND		2.0	ng/l	1	EPA 1625M	2/6/14	2/7/14 12:34	W4B0247	
N-Nitrosodi-n-butylamine	ND		2.0	ng/l	1	EPA 1625M	2/6/14	2/7/14 12:34	W4B0247	
N-Nitrosodi-n-propylamine	ND		2.0	ng/l	1	EPA 1625M	2/6/14	2/7/14 12:34	W4B0247	
N-Nitrosomethylethylamine	ND		2.0	ng/l	1	EPA 1625M	2/6/14	2/7/14 12:34	W4B0247	
N-Nitrosomorpholine	ND		2.0	ng/l	1	EPA 1625M	2/6/14	2/7/14 12:34	W4B0247	
N-Nitrosopiperidine	ND		2.0	ng/l	1	EPA 1625M	2/6/14	2/7/14 12:34	W4B0247	
N-Nitrosopyrrolidine	ND		2.0	ng/l	1	EPA 1625M	2/6/14	2/7/14 12:34	W4B0247	
17-a-Ethynylestradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 19:29	W4B0281	
17-b-Estradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 19:29	W4B0281	
Estrone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 19:29	W4B0281	
Progesterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 19:29	W4B0281	
Testosterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 19:29	W4B0281	
Bisphenol A	**1400**		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:04	W4B0283	
Gemfibrozil	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:04	W4B0283	
Ibuprofen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:04	W4B0283	
Iopromide	ND		5.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:04	W4B0283	
Naproxen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:04	W4B0283	
Salicylic Acid	ND		50	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:04	W4B0283	
Triclosan	ND		2.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 0:04	W4B0283	

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Lab Sample ID: 4B05034-01 **Sample ID: 14A1714-01 Santa Margarita ASR MW-1 Pacific** **Matrix:** Water
Sampled by: Client **Sampled: 01/30/14 14:50**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
Acetaminophen	ND		20	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Amoxicillin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Atenolol	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Atorvastatin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Azithromycin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Caffeine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Carbamazepine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Ciprofloxacin	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Cotinine	ND		2.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
DEET	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Diazepam	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Fluoxetine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Meprobamate	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Methadone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Oxybenzone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Phenytoin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Primidone	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	R-01
Sucralose	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Sulfamethoxazole	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
TCEP	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
TCPP	**1.6**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	B
TDCPP	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	
Trimethoprim	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 0:31	W4B0282	

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Quality Control Section

Nitrosamines by isotopic dilution GC/MS CI Mode - Quality Control

Batch W4B0247 - EPA 1625M

Blank (W4B0247-BLK1) — **Prepared: 02/06/14 Analyzed: 02/07/14 14:20**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		ND		ng/l					
N-Nitrosomethylethylamine		ND		ng/l					
N-Nitrosodiethylamine		ND		ng/l					
N-Nitrosodi-n-propylamine		ND		ng/l					
N-Nitrosomorpholine		ND		ng/l					
N-Nitrosopyrrolidine		ND		ng/l					
N-Nitrosopiperidine		ND		ng/l					
N-Nitrosodi-n-butylamine		7.00	B-06	ng/l					

LCS (W4B0247-BS1) — **Prepared: 02/06/14 Analyzed: 02/07/14 13:55**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		3.23		ng/l	3.00	108	50-150		
N-Nitrosomethylethylamine		2.82		ng/l	3.00	94	50-150		
N-Nitrosodiethylamine		3.38		ng/l	3.00	113	50-150		
N-Nitrosodi-n-propylamine		3.26		ng/l	3.00	109	50-150		
N-Nitrosomorpholine		2.75		ng/l	3.00	92	50-150		
N-Nitrosopyrrolidine		2.77		ng/l	3.00	92	50-150		
N-Nitrosopiperidine		2.99		ng/l	3.00	100	50-150		
N-Nitrosodi-n-butylamine		11.0	Q-08	ng/l	3.00	367	50-150		

LCS Dup (W4B0247-BSD1) — **Prepared: 02/06/14 Analyzed: 02/07/14 13:29**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		3.40		ng/l	3.00	113	50-150	5	30
N-Nitrosomethylethylamine		3.05		ng/l	3.00	102	50-150	8	30
N-Nitrosodiethylamine		3.18		ng/l	3.00	106	50-150	6	30
N-Nitrosodi-n-propylamine		2.99		ng/l	3.00	100	50-150	9	30
N-Nitrosomorpholine		4.10	Q-12	ng/l	3.00	137	50-150	39	30
N-Nitrosopyrrolidine		3.24		ng/l	3.00	108	50-150	16	30
N-Nitrosopiperidine		3.73		ng/l	3.00	124	50-150	22	30
N-Nitrosodi-n-butylamine		11.2	Q-08	ng/l	3.00	373	50-150	2	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		ND		ng/l					
Caffeine		ND		ng/l					
Sulfamethoxazole		ND		ng/l					
Trimethoprim		ND		ng/l					
Azithromycin		ND		ng/l					
Cotinine		ND		ng/l					

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Atenolol		ND		ng/l					
Ciprofloxacin		ND		ng/l					
Carbamazepine		ND		ng/l					
DEET		ND		ng/l					
Fluoxetine		ND		ng/l					
Atorvastatin		ND		ng/l					
Methadone		ND		ng/l					
Primidone		ND		ng/l					
Diazepam		ND		ng/l					
TCPP		2.23	B	ng/l					
TCEP		ND		ng/l					
TDCPP		ND		ng/l					
Phenytoin		ND		ng/l					
Amoxicillin		ND		ng/l					
Meprobamate		ND		ng/l					
Sucralose		ND		ng/l					
Oxybenzone		ND		ng/l					

LCS (W4B0282-BS1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:53**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		435		ng/l	400	109	66-156		
Caffeine		17.4		ng/l	20.0	87	55-152		
Sulfamethoxazole		17.6		ng/l	20.0	88	60-133		
Trimethoprim		18.6		ng/l	20.0	93	67-139		
Azithromycin		199		ng/l	200	100	52-166		
Cotinine		22.6		ng/l	20.0	113	68-155		
Atenolol		21.0		ng/l	20.0	105	56-164		
Ciprofloxacin		83.8		ng/l	100	84	51-168		
Carbamazepine		19.3		ng/l	20.0	96	60-135		
DEET		15.5		ng/l	20.0	78	45-135		
Fluoxetine		23.8		ng/l	20.0	119	55-150		
Atorvastatin		16.3		ng/l	20.0	82	0.1-173		
Methadone		19.0		ng/l	20.0	95	62-137		
Primidone		17.1		ng/l	20.0	86	54-147		
Diazepam		18.3		ng/l	20.0	92	58-127		
TCPP		18.1		ng/l	20.0	90	24-149		
TCEP		17.5		ng/l	20.0	88	25-149		
TDCPP		17.7		ng/l	20.0	88	20-158		
Phenytoin		18.2		ng/l	20.0	91	69-138		
Amoxicillin		164		ng/l	200	82	14-167		
Meprobamate		20.5		ng/l	20.0	102	11-166		
Sucralose		95.7		ng/l	100	96	50-150		
Oxybenzone		15.4		ng/l	20.0	77	50-150		

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

LCS Dup (W4B0282-BSD1) — **Prepared: 02/07/14 Analyzed: 02/18/14 23:07**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		499		ng/l	400	125	66-156	14	30
Caffeine		18.2		ng/l	20.0	91	55-152	4	30
Sulfamethoxazole		19.4		ng/l	20.0	97	60-133	10	30
Trimethoprim		18.4		ng/l	20.0	92	67-139	1	30
Azithromycin		206		ng/l	200	103	52-166	3	30
Cotinine		26.7		ng/l	20.0	134	68-155	17	30
Atenolol		23.0		ng/l	20.0	115	56-164	9	30
Ciprofloxacin		83.4		ng/l	100	83	51-168	0.5	30
Carbamazepine		19.7		ng/l	20.0	98	60-135	2	30
DEET		16.4		ng/l	20.0	82	45-135	6	30
Fluoxetine		22.8		ng/l	20.0	114	55-150	4	30
Atorvastatin		15.1		ng/l	20.0	76	0.1-173	8	30
Methadone		19.1		ng/l	20.0	96	62-137	0.5	30
Primidone		16.2		ng/l	20.0	81	54-147	5	30
Diazepam		18.9		ng/l	20.0	94	58-127	3	30
TCPP		21.0		ng/l	20.0	105	24-149	15	30
TCEP		20.6		ng/l	20.0	103	25-149	16	30
TDCPP		18.9		ng/l	20.0	94	20-158	7	30
Phenytoin		18.4		ng/l	20.0	92	69-138	1	30
Amoxicillin		164		ng/l	200	82	14-167	0	30
Meprobamate		20.6		ng/l	20.0	103	11-166	0.5	30
Sucralose		93.0		ng/l	100	93	50-150	3	30
Oxybenzone		18.3		ng/l	20.0	92	50-150	17	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

Blank (W4B0283-BLK1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:08**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		1.99	B	ng/l					
Gemfibrozil		ND		ng/l					
Ibuprofen		ND		ng/l					
Naproxen		ND		ng/l					
Salicylic Acid		ND		ng/l					
Triclosan		ND		ng/l					
Iopromide		ND		ng/l					

LCS (W4B0283-BS1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:22**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		19.5		ng/l	20.0	98	53-168		
Gemfibrozil		18.0		ng/l	20.0	90	76-122		
Ibuprofen		17.7		ng/l	20.0	88	67-139		
Naproxen		17.3		ng/l	20.0	86	64-138		
Salicylic Acid		171		ng/l	200	86	56-229		

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PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

LCS (W4B0283-BS1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:22**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Triclosan		38.9		ng/l	40.0	97	76-139		
Iopromide		114		ng/l	100	114	0.1-163		

LCS Dup (W4B0283-BSD1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		18.4		ng/l	20.0	92	53-168	6	30
Gemfibrozil		18.3		ng/l	20.0	92	76-122	2	30
Ibuprofen		19.8		ng/l	20.0	99	67-139	11	30
Naproxen		19.1		ng/l	20.0	96	64-138	10	30
Salicylic Acid		183		ng/l	200	92	56-229	7	30
Triclosan		40.5		ng/l	40.0	101	76-139	4	30
Iopromide		104		ng/l	100	104	0.1-163	9	30

PPCPs - Hormones by LC/MSMS-APCI - Quality Control

Batch W4B0281 - EPA 1694M-APCI

Blank (W4B0281-BLK1) — **Prepared: 02/07/14 Analyzed: 02/19/14 16:58**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		ND		ng/l					
17-b-Estradiol		ND		ng/l					
Estrone		ND		ng/l					
Progesterone		ND		ng/l					
Testosterone		ND		ng/l					

LCS (W4B0281-BS1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:15**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		19.1		ng/l	20.0	96	68-159		
17-b-Estradiol		18.0		ng/l	20.0	90	65-146		
Estrone		17.6		ng/l	20.0	88	59-141		
Progesterone		17.8		ng/l	20.0	89	58-154		
Testosterone		24.8		ng/l	20.0	124	60-172		

LCS Dup (W4B0281-BSD1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:31**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		18.9		ng/l	20.0	94	68-159	1	30
17-b-Estradiol		18.4		ng/l	20.0	92	65-146	2	30
Estrone		18.3		ng/l	20.0	92	59-141	4	30
Progesterone		18.1		ng/l	20.0	90	58-154	2	30
Testosterone		26.0		ng/l	20.0	130	60-172	5	30

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Notes:
The Chain of Custody document is part of the analytical report.
Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
All results are expressed on wet weight basis unless otherwise specified.

An Absence of Total Coliform meets the drinking water standards as established by the State of California Department of Health Services.
The Reporting Limit (RL) is referenced as laboratory's Practical Quantitation Limit (PQL).
For Potable water analysis, the Reporting Limit (RL) is referenced as Detection Limit for reporting purposes (DLRs) defined by EPA.

If sample collected by Weck Laboratories, sampled in accordance to lab SOP MIS002

Authorized Signature
Contact: Kim G Tu
(Project Manager)

ELAP # 1132
LACSD # 10143
NELAC # 04229CA

The results in this report apply to the samples analyzed in accordance with the chain of custody document. Weck Laboratories certifies that the test results meet all requirements of NELAC unless noted in the Case Narrative. This analytical report must be reproduced in its entirety.

Flags for Data Qualifiers:

B	Blank contamination. The analyte was found in the associated blank as well as in the sample.
B-06	This analyte was found in the method blank, which was possibly contaminated during sample preparation. The batch was accepted since this analyte was either not detected or more than 10 times of the blank value for all the samples in the batch.
Q-08	High bias in the QC sample does not affect sample result since analyte was not detected or below the reporting limit.
Q-12	The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on the percent recoveries and/or other acceptable QC data.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
ND	NOT DETECTED at or above the Reporting Limit. If J-value reported, then NOT DETECTED at or above the Method Detection Limit (MDL).
Sub	Subcontracted analysis, original report enclosed.
DL	Method Detection Limit
RL	Method Reporting Limit
MDA	Minimum Detectable Activity
NR	Not Reportable

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ISOTECH
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Water Analysis

Lab Number: 410667 Job Number: 24232 IS-69368

Sample Name: SANTA MARGARITA ASR MW-1

Company Lab #:

Company Job #:

Company: Alpha Analytical, Inc.

API/Well:

Field or Site: WO 14A1714

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Date Sampled: 1/30/2014 Date Received 2/05/2014 Date Reported: 2/26/2014

δD of water	----------	na
$\delta^{18}O$ of water	----------	na
Tritium content of water	----------	< 1.00 TU
$\delta^{13}C$ of DIC	----------	na
^{14}C content of DIC	----------	na
$\delta^{15}N$ of nitrate	----------	na
$\delta^{18}O$ of nitrate	----------	na
$\delta^{34}S$ of sulfate	----------	na
$\delta^{18}O$ of sulfate	----------	na

Remarks:

NELAC NARRATIVE PAGE

Client: Alpha Analytical Report #: 310984NP

Underwriters Laboratories is a NELAP accredited laboratory. All reported results meet the requirements of the NELAC standards, unless otherwise noted.

UL contact person: James Van Fleit

NELAP requires complete reporting of deviations from method requirements, regardless of the suspected impact on the data. Quality control failures not reported within the report summary are noted here.

There were no quality control failures.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature Title Date

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Laboratory Report

Client:	Alpha Analytical	Report:	310984
Attn:	David Pingatore 6398 Dougherty Road, Suite 35 Dublin, CA 94568	Priority:	Standard Written
		Status:	Final
		PWS ID:	Not Supplied
Copies to:	None		

Sample Information

UL ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
2967003	14A1714-01	905.0	01/30/14 14:50	Client	02/04/14 11:45
2967004	14A1714-01	7110 B	01/30/14 14:50	Client	02/04/14 11:45
2967005	14A1714-01	1613	01/30/14 14:50	Client	02/04/14 11:45
2967006	14A1714-01	7500-Ra B	01/30/14 14:50	Client	02/04/14 11:45
2967006	14A1714-01	7500-Ra D	01/30/14 14:50	Client	02/04/14 11:45
2967007	14A1714-01	300.1	01/30/14 14:50	Client	02/04/14 11:45
2967008	14A1714-01	300.0	01/30/14 14:50	Client	02/04/14 11:45

Report Summary

Note: See attached page for additional comments.

Note: Sample containers were provided by the client except for Methods 300.0 and 300.1.

Note: Strontium-90 analysis was performed by General Engineering Laboratories, Charleston, SC.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call James Van Fleit at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature | Title | Date

Client Name: Alpha Analytical
Report #: 310984

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Client Name: Alpha Analytical

Report #: 310984

Sampling Point: 14A1714-01

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
14998-27-7	Chlorite	300.0	1000 *	20	< 20	ug/L	---	02/06/14 21:42	2967008
15541-45-4	Bromate	300.1	10 *	5.0	< 5.0	ug/L	---	02/05/14 00:22	2967007

Radionuclides

Analyte ID #	Analyte	Method	Reg Limit	DL**	Result	Units	Preparation Date	Analyzed	UL ID #
---	Gross Alpha	7110 B	15 *	3.0	**8.7 ± 1.2**	pCi/L	02/21/14 07:49	02/27/14 10:40	2967004
---	Gross Beta	7110 B	50 *	4.0	**8.8 ± 0.9**	pCi/L	02/21/14 07:49	02/27/14 10:40	2967004
13982-63-3	Radium-226	7500-Ra B	3 *	1.0	**1.9 ± 0.9**	pCi/L	02/18/14 09:45	03/02/14 11:36	2967006
15262-20-1	Radium-228	7500-Ra D	2 *	1.0	**2.2 ± 0.7**	pCi/L	02/18/14 09:45	02/26/14 16:02	2967006
---	Combined Radium	calc.	5 *	1.0	**4.1 ± 1.2**	pCi/L	02/18/14 09:45	03/02/14 11:36	2967006

** Detection Limit (DL) shall be that concentration which can be counted with a precision of plus or minus 100% at the 95 % confidence level.

Semi-volatile Organic Chemicals

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	UL ID #
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	1613	30 *	5.0	< 5.0	pg/L	02/12/14 07:40	02/13/14 19:18	2967005

Reference Lab Tests

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	UL ID #
---	Strontium-90	905.0	8 *	2.00	**-1.27 ± 0.850**	pCi/L	---	02/20/14 08:04	2967003

† UL has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14A1714

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

Zymax
600 S. Andreasen Drive, Suite B
Escondido, CA 92029
Phone :(760) 781-3338
Fax: (760) 781-3339
Terms: Net 30

1 ice Chest

Analysis	Due	Expires	Comments
14A1714-01 Santa Margarita ASR MW-1 [Water] Sampled 01/30/14 14:50 Pacific			43452-1
N and O Isotopes of Nitrate	02/14/14 12:00	02/06/14 14:50	
Oxygen 18 - Isotope / Hydroger	02/14/14 12:00	07/29/14 14:50	

Containers Supplied:

250 mL Poly Unpres (AQ) 250 mL Poly Unpres (AR)

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
			2/5/14 9:05
Released By	Date	Received By	Date

David S. Pingatore
Project Manager
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482
Tel: 707.468.0401
Fax: 707.468.5267
Project: 14A1714
Email: david @ alpha.com

Dr. Yi Wang
Director of ZymaX Forensics Isotope
Senior Environmental Geochemist, PACE
600 S. Andreasen Dr., Suite B
Escondido, CA 92029
Tel: 760.781.3338 ext 202
Fax: 760.781.3339
Cell: 609.721.2843
Email: yi.wang@zymaxusa.com

REPORT OF ENVIRONMENTAL FORENSICS ISOTOPE ANALYSES

Date Received: February 5th, 2014
Date Reported: March 20th, 2014

Sample from Alpha Analytical Labs for $\delta^{15}N$ (‰ Air), $\delta^{18}O$ and δD (‰ VSMOW) stable isotope analysis

ZymaX ID	Client ID/Sample Description	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
43452-1	14A1714-01 Santa Margarita ASR MW-1	-6.24	-45.90	U -	U -
	Analytical precision (1σ)	0.06	0.32	0.2	0.4

U - Either there was no peak corresponding to the target analyte or that such a peak did not produce a reliable CSIA result

ZymaX ID	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
QC-01	-5.89	-41.12	4.5	25.3
QC-02	-5.98	-41.57	4.8	25.9
Mean	-5.94	-41.35	4.7	25.6
Analytical Precision (1σ)	0.06	0.32	0.2	0.4

ZymaX Forensics Isotope Services

Product or Dissolved Organics: Chlorinated Solvents, Oil, Extract, Fraction and Kerogen
3D-CSIA of ^{13}C, ^{37}Cl, and ^{2}H for PCE, TCE, DCE, MTBE, BTEX, PAHs, Pesticides, Alkanes, Gasoline and Oil; Bulk ^{13}C, ^{2}H, ^{18}O, ^{34}S, and ^{15}N
Gas Sample
Gas Composition and 2D-CSIA of ^{13}C and ^{2}H of C1 to C5; ^{13}C of CO_2; ^{14}C of C1 and CO_2; ^{34}S of H_2S; ^{15}N and ^{18}O of N_2O gas
Water and Dissolved Inorganics
^{2}H, ^{3}H and ^{18}O; ^{34}S and ^{18}O of dissolved sulfate; ^{34}S of dissolved H_2S
^{15}N and ^{18}O of dissolved Nitrate; ^{15}N of Ammonia; ^{13}C of dissolved CO_2 and Carbonate/Bicarbonate
Soil and Minerals
^{13}C, ^{18}O, ^{15}N, ^{34}S, D/H; ^{14}C of carbonate or organics
Post-Analysis Forensic Isotope Data Interpretation

Laboratory Order - Summary

analytical chemistry for a better environment

Report To:	David S. Pingatore Alpha Analytical Laboratories, Inc. 208 Mason St. Ukiah, CA. 95482	Date Received: Date Due: Project:	02/05/2014 04/24/2014 14A1714	9:05AM 12:00AM
Phone: Fax:	(707) 468-0401 (707) 468-5267	Project Number:		

Lab Number	Description	Analysis	Dept
43452-1	14A1714-01 Santa Margarita ASR MW-	d15N and d18O of NO3	M6
		d18O+dD of H2O	M6

Notes/Special Instructions	SC Login/Computer Login CY/CY	DPRA PM: YW

ZymaX FORENSICS

Condition Upon Reciept

Lab Number: 43452 Client: AAL

Sample Temprature (should be 2-6 degrees C): 1.9°C

Do the sample descriptions on the containers match the discriptions on the COC? ☒ Yes ☐ No

Do the sample dates on the containers match the sample dates on the COC? ☒ Yes ☐ No

Are the samples within holding time for each analysis at time of reciept? ☒ Yes ☐ No ☐ N/A

Do the number of containers received match the number listed on the COC, and are all of the necessary containers for the required analysis available? ☒ Yes ☐ No ☐ N/A

Does the preservation of the samples match the notation on the COC, and is the preservation correct for requested analysis? ☐ Yes ☐ No ☐ N/A ☒ Zymax

Are all of the samples intact with no headspace, if required for analysis? ☒ Yes ☐ No

Did samples arrive with custody seal intact? ☒ Yes ☐ No ☐ N/A

Sample Control Signature: [signature] Date: 2/5/14 Time: 9:05

Client Discrepancies

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14A1714

Report to:
Company: Todd Engineers
Attn: Dr. Bill Motzer
Address: 2490 Mariner Square Loop, Suite 215, Alameda, CA 94501
Phone/Fax: 510.747.6920 / 510.747.6921
Email Address: bmotzer@toddengineers.com

Invoice to (if different):
Company:
Attn:
Address:
Phone/Fax:
Email Address:

Project Info for Report:
Project ID: Groundwater Reuse Project
Project No: Project # 60408
PO/Reference :

Signature below authorizes work under terms stated on reverse side.

Samplers Signature:
Print:

Sample Identification	Sampled: Date	Sampled: Time	40ml VOA	Poly	Amber glass	Soil jar		NaOH	HNO3	H2SO4	Other	None	Water	Soil		Total Number of Containers	Inorganics Scan, DU-General Physical Scan	200.7 - Ca, K, Mg, Na	200.8 - Ag, B, Cu, Fe, Mn, U, V, Zn	Bicarbonate, Chloride, Conductivity	MBAS, Perchlorate, TDS, Sulfate	HAA5, TOC	507, 508, 515, 525 DHS, 531, 547, 548, 549	504.1, 524.2 Sample Traps scan	Asbestos DW (sub TEM Lab)	Cr6 218.6 DW (sub MAI) - DU Reader	Dioxin 2,3,7,8 TCDD DW (sub UL)	Sample Notes or CDPH Source Numbers:
~~Seaside Middle School (deep)~~	1-30-14	1450		x	x			x	x			x	x			4	x	x	x	x	x							
SANTA MARGARITA ASR MW-1			x		x						x		x			3						x						
				x	x						x	x	x			10							x					(507/508/515.1 = one 1L BRA ea)
			x								x		x			7								x				
					x							x	x			2									x			
				x							x		x			1										x		
					x							x	x			2											x	
Trip blank ($0.00 analysis)			x								x	x	x			2								x				

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___ days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only)
Temperature: 1.2° 4 deg. C
Shipment Method:
Custody Seals: Y / N

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	1-30-14	15:00
[signature]	[signature]	1/30/14	1725
[signature]	[signature]	1-30-14	1900
[signature]	LAB [signature]	1-30-14	9:25

CDPH Write On EDT Transmission? ○ Yes ○ No
State System Number:
If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No
Global ID:
Sampling Company Log Code:
EDF to (Email Address):
Travel and Site Time:
Mileage:
Misc. Supplies:

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

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707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14A1714

Report to:	Invoice to (if different):	Project Info for Report:
Company: Todd Engineers	Company:	Project ID: Groundwater Reuse Project
Attn: Dr. Bill Motzer	Attn:	
Address: 2490 Mariner Square Loop, Suite 215, Alameda, CA 94501	Address:	Project No: Project # 60408
Phone/Fax: 510.747.6920 / 510.747.6921	Phone/Fax:	PO/Reference :
Email Address: bmotzer@toddengineers.com	Email Address:	

Signature below authorizes work under terms stated on reverse side.

Samplers Signature:

Print:

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only): Temperature: 4 deg. C; Shipment Method:; Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	Container: 40ml VOA	Poly	Amber glass	Soil jar		Preservative: HCL	HNO3	H2SO4	Other	None	Matrix: Water	Soil		Total Number of Containers	8330B Explosives (sub ALS)	PPCP Hormones 1694M (sub Weck)	PPCP Negative Pharmas 1694M (sub Weck)	PPCP Positive Pharmas 1694M (sub Weck)	Nitrosamines LL 1625M (sub Weck)	Gross A & B, R226 &R228, Sr 90 (sub UL)	Bromate 300.1, Chlorite 300.0 (sub UL)	Tritium, Enriched (sub Isotech)	Oxygen 18 Isotope (sub Zymax)	N and O Isotopes of NO3 (sub Zymax)	j-flag MDL reporting + Standard excel EDD	Sample Notes or CDPH Source Numbers:
~~Seaside Middle School (deep)~~	1-30-14	1450			x							x	x			2	x										x	
Santa Margarita ASR MW-1					x						x		x			2		x	x	x								
					x							x	x			2					x							
				x					x				x			4						x						
				x							x		x			2							x					
				x								x	x			1								x				
				x								x	x			1									x			
				x								x	x			1										x		

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	1-30-14	15:00
[signature]	[signature]	1-30-14	1900
[signature]	[signature]	1-30-14	3125

CDPH Write On EDT Transmission? ○ Yes ○ No

State System Number: _____

If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No

Global ID: Sampling Company Log Code:

EDF to (Email Address):

Travel and Site Time: Mileage: Misc. Supplies:

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

ELAP Certificate Numbers 1551 and 2728

18 February 2014

Todd Groundwater
Attn: Dr. Bill Motzer
2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
RE: Groundwater Reuse Project
Work Order: 14B0093

Enclosed are the results of analyses for samples received by the laboratory on 02/03/14 21:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeanette Poplin

Jeanette L. Poplin For David S. Pingatore
Project Manager

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 14:08

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
City Of Seaside #4	14B0093-01	Water	02/03/14 15:00	02/03/14 21:30
Trip Blank	14B0093-02	Water	02/03/14 15:00	02/03/14 21:30

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Metals (Drinking Water) by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Mercury	ND	0.060	1.0	ug/l	1	AB40532	02/10/14 10:00	02/11/14 11:53	EPA 245.1	U

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Metals by EPA 200 Series Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Calcium	**14**	0.010	1.0	mg/l	1	AB40524	02/05/14 10:04	02/10/14 12:51	EPA 200.7	
Magnesium	**6.5**	0.0080	1.0	"	"	"	"	"	"	
Potassium	**2.0**	0.0080	1.0	"	"	"	"	"	"	
Sodium	**43**	0.020	1.0	"	"	"	"	"	"	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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e-mail: clientservices@alpha-labs.com
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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Metals by EPA Method 200.8 ICP/MS
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Aluminum	ND	8.0	50	ug/l	4	AB40328	02/05/14 09:28	02/10/14 16:20	EPA 200.8	U
Antimony	ND	0.080	6.0	"	"	"	"	"	"	U
Arsenic	**1.2**	0.28	2.0	"	"	"	"	"	"	J
Barium	**26**	0.12	100	"	"	"	"	"	"	J
Beryllium	ND	0.080	1.0	"	"	"	"	"	"	U
Boron	**42**	24	50	"	"	"	"	"	"	J
Cadmium	ND	0.080	1.0	"	"	"	"	"	"	U
Chromium	**3.6**	0.32	10	"	"	"	"	"	"	J
Copper	**1.1**	0.16	2.0	"	"	"	"	"	"	R-01, J
Iron	ND	7.2	200	"	"	"	"	"	"	R-01, U
Lead	ND	0.080	5.0	"	"	"	"	"	"	U
Manganese	**0.25**	0.12	5.0	"	"	"	"	"	"	R-01, J
Nickel	**0.54**	0.24	10	"	"	"	"	"	"	J
Selenium	**0.66**	0.28	5.0	"	"	"	"	"	"	J
Silver	ND	0.080	0.40	"	"	"	"	"	"	R-01, U
Thallium	ND	0.080	1.0	"	"	"	"	"	"	U
Uranium	ND	0.080	1.0	pCi/l	"	"	"	"	"	U
Vanadium	**2.5**	1.2	4.0	ug/l	"	"	"	"	"	R-01, J
Zinc	**2.9**	2.0	20	"	"	"	"	"	"	J

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Conventional Chemistry Parameters by APHA/EPA Methods
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Bicarbonate	**66**	0.060	5.0	mg/l	1	AB41221	02/12/14 07:35	02/12/14 17:00	SM2320B	
Color	ND	3.0	5.0	Color Units	"	AB40438	02/03/14 18:30	02/03/14 18:30	SM2120B	U
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l	"	AB40528	02/05/14 11:20	02/12/14 12:02	SM5540C	U
Odor	ND		1.0	T.O.N.	"	AB40438	02/03/14 18:30	02/03/14 18:30	EPA 140.1	U
Perchlorate	ND	0.90	4.0	ug/l	"	AB41141	02/11/14 09:49	02/11/14 14:52	EPA 314.0	U
Specific Conductance (EC)	**340**	1.0	20	umhos/cm	"	AB40448	02/04/14 13:00	02/04/14 17:00	SM2510B	
Total Dissolved Solids	**250**	5.0	10	mg/l	"	AB40515	02/05/14 09:15	02/10/14 13:00	SM2540C	
Turbidity	**0.32**	0.040	0.10	NTU	"	AB40440	02/03/14 18:30	02/03/14 18:30	SM2130B	
Nitrate + Nitrite as N	**3.0**	0.0086	0.40	mg/l	"	AB41339	02/13/14 10:39	02/13/14 11:18	EPA 300.0	
Total Organic Carbon	**0.274**	0.100	0.300	"	"	AB40803	02/08/14 12:46	02/08/14 23:03	SM5310C	J

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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Miscellaneous Physical/Conventional Chemistry Parameters
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water	**Sampled: 02/03/14 15:00**		**Received: 02/03/14 21:30**							
Cyanide (total)	**0.0028**	0.0020	0.10	mg/l	1	AB40428	02/04/14 09:46	02/05/14 15:29	10-204-00-1X	J

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Anions by EPA Method 300.0
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Nitrate as NO3	**13**	0.20	2.0	mg/l	1	AB40426	02/04/14 09:20	02/04/14 14:37	EPA 300.0	
Chloride	**59**	0.15	2.5	"	5	"	"	02/04/14 14:22	"	
Fluoride	ND	0.070	0.10	"	1	"	"	02/04/14 14:37	"	U
Nitrite as N	ND	0.020	0.40	"	"	"	"	"	"	U
Sulfate as SO4	**14**	0.090	0.50	"	"	"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Acetone	ND	0.80	5.0	ug/l	1	AB40725	02/04/14 11:57	02/06/14 17:52	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
1,3-Dichloropropane	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 17:52	EPA 524.2	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
o-Xylene	ND	0.10	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 17:52	EPA 524.2	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*99.0 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*98.0 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*101 %*	*70-130*			"	"	"	"	
Trip Blank (14B0093-02) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Acetone	ND	0.80	5.0	ug/l	1	AB40725	02/04/14 11:57	02/06/14 18:29	EPA 524.2	U
Acrylonitrile	ND	0.20	5.0	"	"	"	"	"	"	U
Benzene	ND	0.20	0.30	"	"	"	"	"	"	U
Bromobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Bromochloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Bromodichloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
Bromoform	ND	0.50	0.50	"	"	"	"	"	"	U
Bromomethane	ND	0.20	0.50	"	"	"	"	"	"	U
n-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
sec-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
tert-Butylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Carbon disulfide	ND	0.20	0.50	"	"	"	"	"	"	U
Carbon tetrachloride	ND	0.30	0.50	"	"	"	"	"	"	U
Chlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Chloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
Chloroform	ND	0.50	0.50	"	"	"	"	"	"	U
Chloromethane	ND	0.20	0.50	"	"	"	"	"	"	U
2-Chlorotoluene	ND	0.20	0.50	"	"	"	"	"	"	U
4-Chlorotoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Dibromochloromethane	ND	0.50	0.50	"	"	"	"	"	"	U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"	"	"	"	"	"	U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"	"	"	"	"	"	U
Dibromomethane	ND	0.20	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14B0093-02) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
1,2-Dichlorobenzene	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 18:29	EPA 524.2	U
1,3-Dichlorobenzene	ND	0.20	0.50	"	"	"	"	"	"	U
1,4-Dichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"	"	"	"	"	"	U
Dichlorodifluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethane	ND	0.10	0.50	"	"	"	"	"	"	U
1,2-Dichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1-Dichloroethene	ND	0.10	0.30	"	"	"	"	"	"	U
cis-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,2-Dichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
1,2-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropane	ND	0.20	0.50	"	"	"	"	"	"	U
2,2-Dichloropropane	ND	0.10	0.50	"	"	"	"	"	"	U
1,1-Dichloropropene	ND	0.10	0.50	"	"	"	"	"	"	U
cis-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
trans-1,3-Dichloropropene	ND	0.20	0.50	"	"	"	"	"	"	U
1,3-Dichloropropene (total)	ND	0.20	0.50	"	"	"	"	"	"	U
2-Hexanone	ND	0.097	5.0	"	"	"	"	"	"	U
Ethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Hexachlorobutadiene	ND	0.30	0.50	"	"	"	"	"	"	U
Isopropylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
p-Isopropyltoluene	ND	0.10	0.50	"	"	"	"	"	"	U
Methyl ethyl ketone	ND	0.40	1.0	"	"	"	"	"	"	U
Methyl iodide	ND	0.12	2.0	"	"	"	"	"	"	U
Methyl isobutyl ketone	ND	0.30	1.0	"	"	"	"	"	"	U
Methylene chloride	ND	0.40	0.50	"	"	"	"	"	"	U
Naphthalene	ND	0.20	0.50	"	"	"	"	"	"	U
n-Propylbenzene	ND	0.20	0.50	"	"	"	"	"	"	U
Styrene	ND	0.10	0.50	"	"	"	"	"	"	U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Tetrachloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Toluene	ND	0.10	0.50	"	"	"	"	"	"	U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Trip Blank (14B0093-02) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
1,2,4-Trichlorobenzene	ND	0.20	0.50	ug/l	1	AB40725	02/04/14 11:57	02/06/14 18:29	EPA 524.2	U
1,1,1-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,1,2-Trichloroethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichloroethene	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorofluoromethane	ND	0.20	0.50	"	"	"	"	"	"	U
Trichlorotrifluoroethane	ND	0.20	0.50	"	"	"	"	"	"	U
1,2,3-Trichloropropane	ND	0.13	0.50	"	"	"	"	"	"	U
1,2,4-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"	"	"	"	"	"	U
Vinyl chloride	ND	0.10	0.50	"	"	"	"	"	"	U
m,p-Xylene	ND	0.20	0.50	"	"	"	"	"	"	U
o-Xylene	ND	0.10	0.50	"	"	"	"	"	"	U
Xylenes (total)	ND	0.20	0.50	"	"	"	"	"	"	U
Trihalomethanes (total)	ND	0.50	0.50	"	"	"	"	"	"	U
Methyl tert-butyl ether	ND	0.50	0.50	"	"	"	"	"	"	U
Ethyl tert-butyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Tert-amyl methyl ether	ND	0.20	0.50	"	"	"	"	"	"	U
Surrogate: Bromofluorobenzene		*96.4 %*	*70-130*			"	"	"	"	
Surrogate: Dibromofluoromethane		*98.7 %*	*70-130*			"	"	"	"	
Surrogate: Toluene-d8		*98.5 %*	*70-130*			"	"	"	"	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Aldrin	ND	0.010	0.050	ug/l	1	AB40514	02/05/14 08:08	02/12/14 02:13	EPA 508	U
Chloroneb	ND	0.20	0.50	"	"	"	"	"	"	U
Chlorobenzilate	ND	2.0	5.0	"	"	"	"	"	"	U
Chlorothalonil	ND	0.030	0.10	"	"	"	"	"	"	U
DCPA	ND	0.020	0.040	"	"	"	"	"	"	U
4,4´-DDD	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDE	ND	0.020	0.050	"	"	"	"	"	"	U
4,4´-DDT	ND	0.020	0.020	"	"	"	"	"	"	U
Dieldrin	ND	0.010	0.010	"	"	"	"	"	"	U
Endosulfan I	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan II	ND	0.020	0.050	"	"	"	"	"	"	U
Endosulfan sulfate	ND	0.020	0.020	"	"	"	"	"	"	U
Endrin	ND	0.030	0.10	"	"	"	"	"	"	U
Endrin aldehyde	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-alpha	ND	0.010	0.050	"	"	"	"	"	"	U
HCH-beta	ND	0.020	0.050	"	"	"	"	"	"	U
HCH-delta	ND	0.030	0.050	"	"	"	"	"	"	U
HCH-gamma (Lindane)	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor	ND	0.010	0.010	"	"	"	"	"	"	U
Heptachlor epoxide	ND	0.010	0.010	"	"	"	"	"	"	U
Hexachlorobenzene	ND	0.010	0.040	"	"	"	"	"	"	U
Hexachlorocyclopentadiene	ND	0.040	0.40	"	"	"	"	"	"	U
Methoxychlor	ND	0.020	0.020	"	"	"	"	"	"	U
cis-Permethrin	ND	0.070	0.20	"	"	"	"	"	"	U
trans-Permethrin	ND	0.090	0.20	"	"	"	"	"	"	U
Propachlor	ND	0.070	0.20	"	"	"	"	"	"	U
Trifluralin	ND	0.020	0.040	"	"	"	"	"	"	U
PCB-1016	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1221	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1232	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1242	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1248	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1254	ND	0.030	0.50	"	"	"	"	"	"	U
PCB-1260	ND	0.030	0.50	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Chlorinated Pesticides and PCBs by EPA Method 508
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Total PCBs	ND	0.30	0.50	ug/l	1	AB40514	02/05/14 08:08	02/12/14 02:13	EPA 508	U
Toxaphene	ND	0.40	0.50	"	"	"	"	"	"	U
Chlordane (tech)	ND	0.030	0.050	"	"	"	"	"	"	U
Surrogate: Dibutylchlorendate		*106 %*	*70-130*			"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Nitrogen- and Phosphorus- Pesticides by EPA Method 507
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Alachlor	ND	0.50	0.50	ug/l	1	AB40730	02/08/14 15:03	02/11/14 14:05	EPA 507	U
Atrazine	ND	0.30	0.50	"	"	"	"	"	"	U
Bromacil	ND	0.50	5.0	"	"	"	"	"	"	U
Butachlor	ND	0.40	0.50	"	"	"	"	"	"	U
Dimethoate	ND	0.20	1.0	"	"	"	"	"	"	U
Metolachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Metribuzin	ND	0.40	0.50	"	"	"	"	"	"	U
Molinate	ND	0.20	0.50	"	"	"	"	"	"	U
Prometryn	ND	0.50	0.50	"	"	"	"	"	"	U
Propachlor	ND	0.30	0.50	"	"	"	"	"	"	U
Simazine	ND	0.30	0.50	"	"	"	"	"	"	U
Thiobencarb	ND	0.20	1.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*86.6 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Organic Analytes by EPA Method 504.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40703	02/07/14 08:14	02/08/14 00:33	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U
Trip Blank (14B0093-02) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l	1	AB40703	02/07/14 08:14	02/08/14 01:08	EPA 504.1	U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"	"	"	"	"	"	U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Chlorinated Acids by EPA Method 515.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Acifluorfen	ND	0.50	1.0	ug/l	1	AB41155	02/12/14 14:27	02/15/14 01:07	EPA 515.1	U
Bentazon	ND	0.40	0.40	"	"	"	"	"	"	U
2,4-D	ND	0.80	1.0	"	"	"	"	"	"	U
Dalapon	ND	6.0	6.0	"	"	"	"	"	"	U
2,4-DB	ND	4.0	5.0	"	"	"	"	"	"	U
Dicamba	ND	0.40	0.40	"	"	"	"	"	"	U
Dichlorprop	ND	1.0	1.0	"	"	"	"	"	"	U
Dinoseb	ND	0.80	1.0	"	"	"	"	"	"	U
4-Nitrophenol	ND	0.70	1.0	"	"	"	"	"	"	U
Pentachlorophenol	ND	0.20	0.20	"	"	"	"	"	"	U
Picloram	ND	0.50	1.0	"	"	"	"	"	"	U
2,4,5-T	ND	0.40	0.50	"	"	"	"	"	"	U
2,4,5-TP (Silvex)	ND	0.50	0.50	"	"	"	"	"	"	U
Surrogate: DCAA		*98.3 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Carbamates by EPA Method 531.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Aldicarb	ND	0.70	3.0	ug/l	1	AB41142	02/11/14 10:07	02/12/14 15:04	EPA 531.1	U
Aldicarb sulfone	ND	0.70	4.0	"	"	"	"	"	"	U
Aldicarb sulfoxide	ND	0.80	3.0	"	"	"	"	"	"	U
Carbaryl	ND	0.70	5.0	"	"	"	"	"	"	U
Carbofuran	ND	2.0	5.0	"	"	"	"	"	"	U
3-Hydroxycarbofuran	ND	0.90	3.0	"	"	"	"	"	"	U
Methiocarb	ND	2.0	5.0	"	"	"	"	"	"	U
Methomyl	ND	2.0	2.0	"	"	"	"	"	"	U
Oxamyl	ND	0.80	20	"	"	"	"	"	"	U
Propoxur	ND	2.0	5.0	"	"	"	"	"	"	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Endothall by EPA Method 548.1
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Endothall	ND	2.0	45	ug/l	1	AB40801	02/10/14 09:16	02/11/14 14:47	EPA 548.1	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Glyphosate by EPA Method 547
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Glyphosate	ND	3.0	10	ug/l	1	AB40427	02/04/14 09:22	02/05/14 06:03	EPA 547	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Diquat by EPA Method 549.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Diquat	ND	2.0	2.0	ug/l	1	AB40717	02/07/14 10:11	02/11/14 01:20	EPA 549.2	U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Haloacetic Acids by EPA Method 552.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Monobromoacetic Acid	ND	0.8	1.0	ug/l	1	AB41050	02/11/14 13:22	02/12/14 19:55	EPA 552.2	U
Monochloroacetic Acid	ND	1.1	2.0	"	"	"	"	"	"	U
Dibromoacetic Acid	ND	0.8	1.0	"	"	"	"	"	"	U
Dichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Trichloroacetic Acid	ND	1.0	1.0	"	"	"	"	"	"	U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"	"	"	"	"	"	U
Surrogate: 2,3-Dibromopropionic Acid		*83.7 %*	*70-130*			*"*	*"*	*"*	*"*	
Surrogate: 2-Bromopropionic Acid		*76.9 %*	*70-130*			*"*	*"*	*"*	*"*	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Semivolatile Organic Compounds by EPA Method 525.2
Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
City Of Seaside #4 (14B0093-01) Water Sampled: 02/03/14 15:00 Received: 02/03/14 21:30										
Benzo (a) pyrene	ND	0.080	0.10	ug/l	1	AB40727	02/08/14 13:35	02/13/14 20:01	EPA 525.2	U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"	"	"	"	"	"	U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"	"	"	"	"	"	U
Surrogate: 1,3-Dimethyl-2-nitrobenzene		*101 %*	*70-130*			"	"	"	"	
Surrogate: Perylene-d12		*97.2 %*	*70-130*			"	"	"	"	
Surrogate: Triphenyl phosphate		*109 %*	*70-130*			"	"	"	"	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Metals (Drinking Water) by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40532 - EPA 245.1 Hg Water											
Blank (AB40532-BLK1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Mercury	ND	0.060	1.0	ug/l							U
LCS (AB40532-BS1)					Prepared: 02/06/14 Analyzed: 02/07/14						
Mercury	2.32	0.060	1.0	ug/l	2.50		92.8	80-120			
Duplicate (AB40532-DUP1)		**Source: 14B0232-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Mercury	ND	0.060	1.0	ug/l		ND				20	U
Matrix Spike (AB40532-MS1)		**Source: 14B0232-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Mercury	2.54	0.060	1.0	ug/l	2.50	ND	102	60-140			
Matrix Spike (AB40532-MS2)		**Source: 14B0093-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Mercury	2.52	0.060	1.0	ug/l	2.50	ND	101	60-140			
Matrix Spike Dup (AB40532-MSD1)		**Source: 14B0232-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Mercury	2.55	0.060	1.0	ug/l	2.50	ND	102	60-140	0.393	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40524 - Metals Digest											
Blank (AB40524-BLK1)					Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	ND	0.010	1.0	mg/l							U
Magnesium	ND	0.0080	1.0	"							U
Potassium	0.0126	0.0080	1.0	"							J
Sodium	0.0265	0.020	1.0	"							J
LCS (AB40524-BS1)					Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	5.56	0.010	1.0	mg/l	5.88		94.5	85-115			
Magnesium	7.59	0.0080	1.0	"	8.00		94.9	85-115			
Potassium	7.84	0.0080	1.0	"	8.00		98.0	85-115			
Sodium	7.76	0.020	1.0	"	8.00		97.0	85-115			
Duplicate (AB40524-DUP1)		**Source: 14B0094-01**			Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	17.9	0.010	1.0	mg/l		19.2			7.01	20	
Magnesium	8.60	0.0080	1.0	"		7.91			8.38	20	
Potassium	10.5	0.0080	1.0	"		11.1			5.86	20	
Sodium	66.8	0.020	1.0	"		74.1			10.5	20	
Matrix Spike (AB40524-MS1)		**Source: 14B0094-01**			Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	22.6	0.010	1.0	mg/l	5.88	19.2	58.3	70-130			QM-01
Magnesium	14.5	0.0080	1.0	"	8.00	7.91	82.2	70-130			
Potassium	17.1	0.0080	1.0	"	8.00	11.1	74.7	70-130			
Sodium	73.2	0.020	1.0	"	8.00	74.1	NR	70-130			QM-4X
Matrix Spike (AB40524-MS2)		**Source: 14B0174-01**			Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	5.85	0.010	1.0	mg/l	5.88	0.483	91.3	70-130			
Magnesium	8.39	0.0080	1.0	"	8.00	1.19	89.9	70-130			
Potassium	8.03	0.0080	1.0	"	8.00	0.312	96.5	70-130			
Sodium	13.9	0.020	1.0	"	8.00	6.35	94.9	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Metals by EPA 200 Series Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40524 - Metals Digest											
Matrix Spike Dup (AB40524-MSD1)		**Source: 14B0094-01**			Prepared: 02/05/14 Analyzed: 02/07/14						
Calcium	22.0	0.010	1.0	mg/l	5.88	19.2	48.1	70-130	2.69	20	QM-01
Magnesium	13.5	0.0080	1.0	"	8.00	7.91	69.6	70-130	7.22	20	
Potassium	16.9	0.0080	1.0	"	8.00	11.1	71.9	70-130	1.29	20	
Sodium	68.2	0.020	1.0	"	8.00	74.1	NR	70-130	6.98	20	QM-4X

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Blank (AB40328-BLK1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	ND	2.0	50	ug/l							U
Antimony	ND	0.020	6.0	"							U
Arsenic	ND	0.070	2.0	"							U
Barium	ND	0.030	100	"							U
Beryllium	ND	0.020	1.0	"							U
Boron	17.8	6.0	50	"							J
Cadmium	ND	0.020	1.0	"							U
Chromium	ND	0.080	10	"							U
Copper	ND	0.040	0.50	"							U
Iron	ND	1.8	50	"							U
Lead	ND	0.020	5.0	"							U
Manganese	ND	0.030	5.0	"							U
Nickel	ND	0.060	10	"							U
Selenium	0.0754	0.070	5.0	"							J
Silver	ND	0.020	0.10	"							U
Thallium	ND	0.020	1.0	"							U
Uranium	ND	0.020	1.0	pCi/l							U
Vanadium	ND	0.30	1.0	ug/l							U
Zinc	1.13	0.50	5.0	"							J
LCS (AB40328-BS1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	483	2.0	50	ug/l	520		92.8	85-115			
Antimony	20.1	0.020	6.0	"	20.0		100	85-115			
Arsenic	19.7	0.070	2.0	"	20.0		98.7	85-115			
Barium	19.1	0.030	100	"	20.0		95.4	85-115			J
Beryllium	18.8	0.020	1.0	"	20.0		94.1	85-115			
Boron	110	6.0	50	"	100		110	85-115			
Cadmium	18.8	0.020	1.0	"	20.0		94.0	85-115			
Chromium	19.3	0.080	10	"	20.0		96.6	85-115			
Copper	19.0	0.040	0.50	"	20.0		95.1	85-115			
Iron	502	1.8	50	"	520		96.6	85-115			
Lead	17.5	0.020	5.0	"	20.0		87.5	85-115			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
LCS (AB40328-BS1)					Prepared: 02/03/14 Analyzed: 02/04/14						
Manganese	18.8	0.030	5.0	ug/l	20.0		94.2	85-115			
Nickel	19.3	0.060	10	"	20.0		96.6	85-115			
Selenium	20.1	0.070	5.0	"	20.0		100	85-115			
Silver	18.1	0.020	0.10	"	20.0		90.4	85-115			
Thallium	17.1	0.020	1.0	"	20.0		85.6	85-115			
Uranium	11.5	0.020	1.0	pCi/l	13.4		85.5	85-115			
Vanadium	19.8	0.30	1.0	ug/l	20.0		99.0	85-115			
Zinc	98.6	0.50	5.0	"	100		98.6	85-115			
Duplicate (AB40328-DUP1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1120	2.0	50	ug/l		1150			1.98	20	
Antimony	0.0754	0.020	6.0	"		0.0744			1.34	20	J
Arsenic	1.08	0.070	2.0	"		1.15			6.89	20	J
Barium	70.3	0.030	100	"		68.3			2.85	20	J
Beryllium	0.0788	0.020	1.0	"		0.0838			6.24	20	J
Boron	37.9	6.0	50	"		36.2			4.75	20	J
Cadmium	0.0848	0.020	1.0	"		0.0857			1.11	20	J
Chromium	0.470	0.080	10	"		0.382			20.5	20	J
Copper	12.8	0.040	0.50	"		12.3			3.69	20	
Iron	412	1.8	50	"		408			0.910	20	
Lead	1.06	0.020	5.0	"		1.12			4.92	20	J
Manganese	6.46	0.030	5.0	"		7.23			11.3	20	
Nickel	1.21	0.060	10	"		1.20			1.54	20	J
Selenium	0.159	0.070	5.0	"		0.171			7.50	20	J
Silver	0.0362	0.020	0.10	"		0.0220			48.8	20	J
Thallium	0.105	0.020	1.0	"		0.0948			9.86	20	J
Uranium	0.249	0.020	1.0	pCi/l		0.265			6.25	20	J
Vanadium	1.52	0.30	1.0	ug/l		1.64			7.56	20	
Zinc	6.79	0.50	5.0	"		6.73			0.780	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Matrix Spike (AB40328-MS1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1570	2.0	50	ug/l	520	1150	81.5	70-130			
Antimony	18.9	0.020	6.0	"	20.0	0.0744	94.1	70-130			
Arsenic	19.9	0.070	2.0	"	20.0	1.15	93.5	70-130			
Barium	85.5	0.030	100	"	20.0	68.3	85.8	70-130			J
Beryllium	17.8	0.020	1.0	"	20.0	0.0838	88.5	70-130			
Boron	114	6.0	50	"	100	36.2	78.1	70-130			
Cadmium	18.7	0.020	1.0	"	20.0	0.0857	93.0	70-130			
Chromium	17.4	0.080	10	"	20.0	0.382	85.1	70-130			
Copper	29.6	0.040	0.50	"	20.0	12.3	86.4	70-130			
Iron	858	1.8	50	"	520	408	86.4	70-130			
Lead	19.8	0.020	5.0	"	20.0	1.12	93.4	70-130			
Manganese	23.4	0.030	5.0	"	20.0	7.23	80.7	70-130			
Nickel	18.2	0.060	10	"	20.0	1.20	85.0	70-130			
Selenium	18.7	0.070	5.0	"	20.0	0.171	92.7	70-130			
Silver	17.9	0.020	0.10	"	20.0	0.0220	89.3	70-130			
Thallium	18.5	0.020	1.0	"	20.0	0.0948	92.1	70-130			
Uranium	13.5	0.020	1.0	pCi/l	13.4	0.265	98.5	70-130			
Vanadium	19.1	0.30	1.0	ug/l	20.0	1.64	87.4	70-130			
Zinc	98.9	0.50	5.0	"	100	6.73	92.1	70-130			
Matrix Spike (AB40328-MS2)		**Source: 14B0124-02**			Prepared: 02/05/14 Analyzed: 02/06/14						
Aluminum	529	2.0	50	ug/l	520	70.3	88.1	70-130			
Antimony	20.4	0.020	6.0	"	20.0	0.0711	102	70-130			
Arsenic	21.4	0.070	2.0	"	20.0	2.13	96.2	70-130			
Barium	35.8	0.030	100	"	20.0	16.9	94.7	70-130			J
Beryllium	19.3	0.020	1.0	"	20.0	ND	96.4	70-130			
Boron	150	6.0	50	"	100	63.0	87.0	70-130			
Cadmium	19.4	0.020	1.0	"	20.0	ND	97.0	70-130			
Chromium	20.0	0.080	10	"	20.0	0.590	97.0	70-130			
Copper	19.6	0.040	0.50	"	20.0	1.39	90.9	70-130			
Iron	602	1.8	50	"	520	91.5	98.1	70-130			
Lead	20.2	0.020	5.0	"	20.0	0.0825	101	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Metals by EPA Method 200.8 ICP/MS - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40328 - EPA 200.8											
Matrix Spike (AB40328-MS2)		**Source: 14B0124-02**			Prepared: 02/05/14 Analyzed: 02/06/14						
Manganese	26.7	0.030	5.0	ug/l	20.0	7.07	98.0	70-130			
Nickel	19.5	0.060	10	"	20.0	0.983	92.8	70-130			
Selenium	19.2	0.070	5.0	"	20.0	0.207	95.2	70-130			
Silver	19.4	0.020	0.10	"	20.0	ND	97.2	70-130			
Thallium	19.8	0.020	1.0	"	20.0	ND	99.0	70-130			
Uranium	14.2	0.020	1.0	pCi/l	13.4	0.107	105	70-130			
Vanadium	24.6	0.30	1.0	ug/l	20.0	5.40	95.9	70-130			
Zinc	99.9	0.50	5.0	"	100	3.69	96.2	70-130			
Matrix Spike Dup (AB40328-MSD1)		**Source: 14A1755-01**			Prepared: 02/03/14 Analyzed: 02/04/14						
Aluminum	1580	2.0	50	ug/l	520	1150	83.4	70-130	0.635	20	
Antimony	19.7	0.020	6.0	"	20.0	0.0744	98.1	70-130	4.13	20	
Arsenic	20.5	0.070	2.0	"	20.0	1.15	96.6	70-130	3.05	20	
Barium	88.4	0.030	100	"	20.0	68.3	100	70-130	3.29	20	J
Beryllium	19.1	0.020	1.0	"	20.0	0.0838	95.3	70-130	7.32	20	
Boron	125	6.0	50	"	100	36.2	88.8	70-130	8.99	20	
Cadmium	19.7	0.020	1.0	"	20.0	0.0857	98.0	70-130	5.25	20	
Chromium	18.0	0.080	10	"	20.0	0.382	88.1	70-130	3.40	20	
Copper	30.7	0.040	0.50	"	20.0	12.3	91.9	70-130	3.64	20	
Iron	860	1.8	50	"	520	408	86.8	70-130	0.291	20	
Lead	21.5	0.020	5.0	"	20.0	1.12	102	70-130	8.35	20	
Manganese	23.8	0.030	5.0	"	20.0	7.23	83.1	70-130	2.03	20	
Nickel	18.6	0.060	10	"	20.0	1.20	87.2	70-130	2.36	20	
Selenium	19.1	0.070	5.0	"	20.0	0.171	94.8	70-130	2.29	20	
Silver	19.1	0.020	0.10	"	20.0	0.0220	95.5	70-130	6.75	20	
Thallium	20.0	0.020	1.0	"	20.0	0.0948	99.5	70-130	7.72	20	
Uranium	14.5	0.020	1.0	pCi/l	13.4	0.265	107	70-130	7.74	20	
Vanadium	19.8	0.30	1.0	ug/l	20.0	1.64	91.0	70-130	3.68	20	
Zinc	105	0.50	5.0	"	100	6.73	97.9	70-130	5.71	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40440 - General Preparation											
Blank (AB40440-BLK1)					Prepared & Analyzed: 02/03/14						
Turbidity	ND	0.040	0.10	NTU							U
Duplicate (AB40440-DUP1)		**Source: 14B0115-02**			Prepared & Analyzed: 02/03/14						
Turbidity	2.42	0.040	0.10	NTU		2.42			0.00	30	
Batch AB40448 - General Preparation											
Duplicate (AB40448-DUP1)		**Source: 14B0118-01**			Prepared & Analyzed: 02/04/14						
Specific Conductance (EC)	197	1.0	20	umhos/cm		200			1.51	10	
Batch AB40515 - General Preparation											
Blank (AB40515-BLK1)					Prepared: 02/05/14 Analyzed: 02/10/14						
Total Dissolved Solids	ND	5.0	10	mg/l							U
Duplicate (AB40515-DUP1)		**Source: 14B0089-01**			Prepared: 02/05/14 Analyzed: 02/10/14						
Total Dissolved Solids	464	5.0	10	mg/l		464			0.00	30	
Duplicate (AB40515-DUP2)		**Source: 14B0098-03**			Prepared: 02/05/14 Analyzed: 02/10/14						
Total Dissolved Solids	496	5.0	10	mg/l		526			5.87	30	
Batch AB40528 - General Preparation											
Blank (AB40528-BLK1)					Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l							U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40528 - General Preparation											
LCS (AB40528-BS1)					Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	0.215	0.030	0.050	mg/l	0.200		108	80-120			
Duplicate (AB40528-DUP1)		**Source: 14B0089-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	ND	0.030	0.050	mg/l		ND				20	U
Matrix Spike (AB40528-MS1)		**Source: 14B0089-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	0.212	0.030	0.050	mg/l	0.200	ND	106	80-120			
Matrix Spike Dup (AB40528-MSD1)		**Source: 14B0089-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
MBAS, calculated as LAS, mw 340	0.208	0.030	0.050	mg/l	0.200	ND	104	80-120	1.63	20	
Batch AB40803 - General Prep											
Blank (AB40803-BLK1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	ND	0.100	0.300	mg/l							U
LCS (AB40803-BS1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.6	0.100	0.300	mg/l	10.0		106	85-115			
LCS Dup (AB40803-BSD1)					Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.5	0.100	0.300	mg/l	10.0		105	85-115	1.20	20	
Duplicate (AB40803-DUP1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	ND	0.100	0.300	mg/l		0.112				20	U
Matrix Spike (AB40803-MS1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.7	0.100	0.300	mg/l	10.0	0.112	106	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40803 - General Prep											
Matrix Spike Dup (AB40803-MSD1)		**Source: 14B0427-01**			Prepared & Analyzed: 02/08/14						
Total Organic Carbon	10.4	0.100	0.300	mg/l	10.0	0.112	102	70-130	3.54	20	
Batch AB41141 - General Preparation											
Blank (AB41141-BLK1)					Prepared & Analyzed: 02/11/14						
Perchlorate	0.967	0.90	4.0	ug/l							J
LCS (AB41141-BS1)					Prepared & Analyzed: 02/11/14						
Perchlorate	23.9	0.90	4.0	ug/l	25.0		95.5	85-115			
Duplicate (AB41141-DUP1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	ND	0.90	4.0	ug/l		ND				15	U
Matrix Spike (AB41141-MS1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130			
Matrix Spike Dup (AB41141-MSD1)		**Source: 14A1643-01**			Prepared & Analyzed: 02/11/14						
Perchlorate	25.9	0.90	4.0	ug/l	25.0	ND	104	70-130	0.00386	15	
Batch AB41221 - General Preparation											
Duplicate (AB41221-DUP1)		**Source: 14B0313-04**			Prepared & Analyzed: 02/12/14						
Bicarbonate	354	0.060	5.0	mg/l		360			1.71	20	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Miscellaneous Physical/Conventional Chemistry Parameters - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40428 - General Preparation											
Blank (AB40428-BLK1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l							U
LCS (AB40428-BS1)					Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.202	0.0020	0.10	mg/l	0.200		101	85-115			
Duplicate (AB40428-DUP1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	ND	0.0020	0.10	mg/l		ND				25	U
Matrix Spike (AB40428-MS1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.188	0.0020	0.10	mg/l	0.200	ND	93.9	85-115			
Matrix Spike (AB40428-MS2)		**Source: 14A1635-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.220	0.0020	0.10	mg/l	0.200	ND	110	85-115			
Matrix Spike Dup (AB40428-MSD1)		**Source: 14A1492-02**			Prepared: 02/04/14 Analyzed: 02/05/14						
Cyanide (total)	0.186	0.0020	0.10	mg/l	0.200	ND	92.8	85-115	1.23	25	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40426 - General Preparation											
Blank (AB40426-BLK1)					Prepared & Analyzed: 02/04/14						
Nitrate as NO3	ND	0.20	2.0	mg/l							U
Sulfate as SO4	ND	0.090	0.50	"							U
Nitrite as N	ND	0.020	0.40	"							U
Fluoride	ND	0.070	0.10	"							U
Chloride	ND	0.030	0.50	"							U
LCS (AB40426-BS1)					Prepared & Analyzed: 02/04/14						
Nitrate as NO3	23	0.20	2.0	mg/l	22.2		102	90-110			
Sulfate as SO4	20.2	0.090	0.50	"	20.0		101	90-110			
Chloride	10.2	0.030	0.50	"	10.0		102	90-110			
Fluoride	5.18	0.070	0.10	"	5.00		104	90-110			
Nitrite as N	5.22	0.020	0.40	"	5.00		104	90-110			
Duplicate (AB40426-DUP1)		**Source: 14B0093-01**			Prepared & Analyzed: 02/04/14						
Nitrate as NO3	13	0.20	2.0	mg/l		13			0.107	20	
Sulfate as SO4	13.8	0.090	0.50	"		13.8			0.0434	20	
Chloride	59.0	0.15	2.5	"		59.0			0.0678	20	
Fluoride	ND	0.070	0.10	"		ND				20	U
Nitrite as N	ND	0.020	0.40	"		ND				20	U
Matrix Spike (AB40426-MS1)		**Source: 14B0093-01**			Prepared & Analyzed: 02/04/14						
Nitrate as NO3	37	1.0	10	mg/l	24.7	13	95.4	80-120			
Nitrite as N	5.39	0.10	2.0	"	5.56	ND	97.0	80-120			
Chloride	70.5	0.15	2.5	"	11.1	59.0	104	80-120			
Fluoride	4.92	0.35	0.50	"	5.56	ND	88.6	80-120			
Sulfate as SO4	34.8	0.45	2.5	"	22.2	13.8	94.4	80-120			
Matrix Spike (AB40426-MS2)		**Source: 14B0115-02**			Prepared & Analyzed: 02/04/14						
Nitrate as NO3	24	1.0	10	mg/l	24.7	0.67	96.5	80-120			
Sulfate as SO4	53.5	0.45	2.5	"	22.2	32.9	92.7	80-120			
Nitrite as N	5.44	0.10	2.0	"	5.56	ND	98.0	80-120			
Fluoride	5.07	0.35	0.50	"	5.56	0.107	89.4	80-120			
Chloride	20.9	0.15	2.5	"	11.1	9.42	103	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Anions by EPA Method 300.0 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40426 - General Preparation											
Matrix Spike Dup (AB40426-MSD1)		**Source: 14B0093-01**		Prepared & Analyzed: 02/04/14							
Nitrate as NO3	37	1.0	10	mg/l	24.7	13	95.6	80-120	0.136	20	
Nitrite as N	5.42	0.10	2.0	"	5.56	ND	97.5	80-120	0.514	20	
Sulfate as SO4	34.9	0.45	2.5	"	22.2	13.8	94.7	80-120	0.223	20	
Chloride	70.5	0.15	2.5	"	11.1	59.0	104	80-120	0.0473	20	
Fluoride	4.94	0.35	0.50	"	5.56	ND	89.0	80-120	0.450	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
Acetone	ND	0.80	5.0	ug/l							U
Acrylonitrile	ND	0.20	5.0	"							U
Benzene	ND	0.20	0.30	"							U
Bromobenzene	ND	0.10	0.50	"							U
Bromochloromethane	ND	0.20	0.50	"							U
Bromodichloromethane	ND	0.50	0.50	"							U
Bromoform	ND	0.50	0.50	"							U
Bromomethane	ND	0.20	0.50	"							U
n-Butylbenzene	ND	0.10	0.50	"							U
sec-Butylbenzene	ND	0.10	0.50	"							U
tert-Butylbenzene	ND	0.10	0.50	"							U
Carbon disulfide	ND	0.20	0.50	"							U
Carbon tetrachloride	ND	0.30	0.50	"							U
Chlorobenzene	ND	0.20	0.50	"							U
Chloroethane	ND	0.10	0.50	"							U
Chloroform	ND	0.50	0.50	"							U
Chloromethane	ND	0.20	0.50	"							U
2-Chlorotoluene	ND	0.20	0.50	"							U
4-Chlorotoluene	ND	0.10	0.50	"							U
Dibromochloromethane	ND	0.50	0.50	"							U
1,2-Dibromo-3-chloropropane	ND	0.36	0.50	"							U
1,2-Dibromoethane (EDB)	ND	0.14	0.50	"							U
Dibromomethane	ND	0.20	0.50	"							U
1,2-Dichlorobenzene	ND	0.20	0.50	"							U
1,3-Dichlorobenzene	ND	0.20	0.50	"							U
trans-1,4-Dichloro-2-butene	ND	0.095	5.0	"							U
1,4-Dichlorobenzene	ND	0.10	0.50	"							U
Dichlorodifluoromethane	ND	0.20	0.50	"							U
1,1-Dichloroethane	ND	0.10	0.50	"							U
1,2-Dichloroethane	ND	0.20	0.50	"							U
1,1-Dichloroethene	ND	0.10	0.30	"							U
cis-1,2-Dichloroethene	ND	0.20	0.50	"							U

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
trans-1,2-Dichloroethene	ND	0.20	0.50	ug/l							U
1,2-Dichloropropane	ND	0.20	0.50	"							U
1,3-Dichloropropane	ND	0.20	0.50	"							U
2,2-Dichloropropane	ND	0.10	0.50	"							U
1,1-Dichloropropene	ND	0.10	0.50	"							U
cis-1,3-Dichloropropene	ND	0.20	0.50	"							U
trans-1,3-Dichloropropene	ND	0.20	0.50	"							U
Ethylbenzene	ND	0.10	0.50	"							U
1,3-Dichloropropene (total)	ND	0.20	0.50	"							U
2-Hexanone	ND	0.097	5.0	"							U
Hexachlorobutadiene	ND	0.30	0.50	"							U
Isopropylbenzene	ND	0.20	0.50	"							U
p-Isopropyltoluene	ND	0.10	0.50	"							U
Methyl ethyl ketone	ND	0.40	1.0	"							U
Methyl iodide	ND	0.12	2.0	"							U
Methyl isobutyl ketone	ND	0.30	1.0	"							U
Methylene chloride	ND	0.40	0.50	"							U
Naphthalene	ND	0.20	0.50	"							U
n-Propylbenzene	ND	0.20	0.50	"							U
Styrene	ND	0.10	0.50	"							U
1,1,1,2-Tetrachloroethane	ND	0.20	0.50	"							U
1,1,2,2-Tetrachloroethane	ND	0.20	0.50	"							U
Tetrachloroethene	ND	0.20	0.50	"							U
Toluene	ND	0.10	0.50	"							U
1,2,3-Trichlorobenzene	ND	0.10	0.50	"							U
1,2,4-Trichlorobenzene	ND	0.20	0.50	"							U
1,1,1-Trichloroethane	ND	0.20	0.50	"							U
1,1,2-Trichloroethane	ND	0.20	0.50	"							U
Trichloroethene	ND	0.20	0.50	"							U
Trichlorofluoromethane	ND	0.20	0.50	"							U
Trichlorotrifluoroethane	ND	0.20	0.50	"							U
1,2,3-Trichloropropane	ND	0.13	0.50	"							U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Blank (AB40725-BLK1)					Prepared & Analyzed: 02/04/14						
1,2,4-Trimethylbenzene	ND	0.10	0.50	ug/l							U
1,3,5-Trimethylbenzene	ND	0.10	0.50	"							U
Vinyl chloride	ND	0.10	0.50	"							U
m,p-Xylene	ND	0.20	0.50	"							U
o-Xylene	ND	0.10	0.50	"							U
Xylenes (total)	ND	0.20	0.50	"							U
Trihalomethanes (total)	ND	0.50	0.50	"							U
Methyl tert-butyl ether	ND	0.50	0.50	"							U
Ethyl tert-butyl ether	ND	0.20	0.50	"							U
Tert-amyl methyl ether	ND	0.20	0.50	"							U
Surrogate: Bromofluorobenzene	*25.0*			*"*	*25.0*		*99.8*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*95.9*	*70-130*			
Surrogate: Toluene-d8	*25.4*			*"*	*25.0*		*102*	*70-130*			
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
Acetone	24.1	0.80	5.0	ug/l	20.0		120	70-130			
Acrylonitrile	5.73	0.20	5.0	"	5.00		115	70-130			
Benzene	4.88	0.20	0.30	"	5.00		97.6	70-130			
Bromobenzene	5.19	0.10	0.50	"	5.00		104	70-130			
Bromochloromethane	5.11	0.20	0.50	"	5.00		102	70-130			
Bromodichloromethane	4.65	0.50	0.50	"	5.00		93.0	70-130			
Bromoform	4.58	0.50	0.50	"	5.00		91.6	70-130			
Bromomethane	5.43	0.20	0.50	"	5.00		109	70-130			
n-Butylbenzene	5.09	0.10	0.50	"	5.00		102	70-130			
sec-Butylbenzene	5.06	0.10	0.50	"	5.00		101	70-130			
tert-Butylbenzene	5.24	0.10	0.50	"	5.00		105	70-130			
Carbon disulfide	4.99	0.20	0.50	"	5.00		99.8	70-130			
Carbon tetrachloride	4.76	0.30	0.50	"	5.00		95.2	70-130			
Chlorobenzene	5.07	0.20	0.50	"	5.00		101	70-130			
Chloroethane	5.33	0.10	0.50	"	5.00		107	70-130			
Chloroform	4.92	0.50	0.50	"	5.00		98.4	70-130			
Chloromethane	6.12	0.20	0.50	"	5.00		122	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
2-Chlorotoluene	5.26	0.20	0.50	ug/l	5.00		105	70-130			
4-Chlorotoluene	4.99	0.10	0.50	"	5.00		99.8	70-130			
Dibromochloromethane	4.81	0.50	0.50	"	5.00		96.2	70-130			
1,2-Dibromo-3-chloropropane	4.94	0.36	0.50	"	5.00		98.8	70-130			
1,2-Dibromoethane (EDB)	5.23	0.14	0.50	"	5.00		105	70-130			
Dibromomethane	4.94	0.20	0.50	"	5.00		98.8	70-130			
1,2-Dichlorobenzene	4.86	0.20	0.50	"	5.00		97.2	70-130			
1,3-Dichlorobenzene	5.18	0.20	0.50	"	5.00		104	70-130			
1,4-Dichlorobenzene	4.96	0.10	0.50	"	5.00		99.2	70-130			
trans-1,4-Dichloro-2-butene	4.74	0.095	5.0	"	5.00		94.8	70-130			J
Dichlorodifluoromethane	6.14	0.20	0.50	"	5.00		123	70-130			
1,1-Dichloroethane	5.10	0.10	0.50	"	5.00		102	70-130			
1,2-Dichloroethane	4.93	0.20	0.50	"	5.00		98.6	70-130			
1,1-Dichloroethene	4.96	0.10	0.30	"	5.00		99.2	70-130			
cis-1,2-Dichloroethene	5.01	0.20	0.50	"	5.00		100	70-130			
trans-1,2-Dichloroethene	4.99	0.20	0.50	"	5.00		99.8	70-130			
1,2-Dichloropropane	4.83	0.20	0.50	"	5.00		96.6	70-130			
1,3-Dichloropropane	5.09	0.20	0.50	"	5.00		102	70-130			
2,2-Dichloropropane	4.57	0.10	0.50	"	5.00		91.4	70-130			
1,1-Dichloropropene	4.65	0.10	0.50	"	5.00		93.0	70-130			
cis-1,3-Dichloropropene	4.66	0.20	0.50	"	5.00		93.2	70-130			
trans-1,3-Dichloropropene	4.58	0.20	0.50	"	5.00		91.6	70-130			
Ethylbenzene	5.06	0.10	0.50	"	5.00		101	70-130			
2-Hexanone	5.38	0.097	5.0	"	5.00		108	70-130			
Hexachlorobutadiene	4.93	0.30	0.50	"	5.00		98.6	70-130			
Isopropylbenzene	5.33	0.20	0.50	"	5.00		107	70-130			
p-Isopropyltoluene	5.25	0.10	0.50	"	5.00		105	70-130			
Methyl ethyl ketone	10.5	0.40	1.0	"	10.0		105	70-130			
Methyl iodide	5.04	0.12	2.0	"	5.00		101	70-130			
Methyl isobutyl ketone	10.3	0.30	1.0	"	10.0		103	70-130			
Methylene chloride	4.10	0.40	0.50	"	5.00		82.0	70-130			
Naphthalene	5.01	0.20	0.50	"	5.00		100	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS (AB40725-BS1)					Prepared & Analyzed: 02/04/14						
n-Propylbenzene	5.43	0.20	0.50	ug/l	5.00		109	70-130			
Styrene	5.32	0.10	0.50	"	5.00		106	70-130			
1,1,1,2-Tetrachloroethane	4.86	0.20	0.50	"	5.00		97.2	70-130			
1,1,2,2-Tetrachloroethane	5.08	0.20	0.50	"	5.00		102	70-130			
Tetrachloroethene	5.11	0.20	0.50	"	5.00		102	70-130			
Toluene	5.21	0.10	0.50	"	5.00		104	70-130			
1,2,3-Trichlorobenzene	5.08	0.10	0.50	"	5.00		102	70-130			
1,2,4-Trichlorobenzene	5.00	0.20	0.50	"	5.00		100	70-130			
1,1,1-Trichloroethane	4.89	0.20	0.50	"	5.00		97.8	70-130			
1,1,2-Trichloroethane	5.09	0.20	0.50	"	5.00		102	70-130			
Trichloroethene	4.93	0.20	0.50	"	5.00		98.6	70-130			
Trichlorofluoromethane	5.14	0.20	0.50	"	5.00		103	70-130			
Trichlorotrifluoroethane	5.56	0.20	0.50	"	5.00		111	70-130			
1,2,3-Trichloropropane	5.03	0.13	0.50	"	5.00		101	70-130			
1,2,4-Trimethylbenzene	5.36	0.10	0.50	"	5.00		107	70-130			
1,3,5-Trimethylbenzene	5.36	0.10	0.50	"	5.00		107	70-130			
Vinyl chloride	5.40	0.10	0.50	"	5.00		108	70-130			
m,p-Xylene	10.2	0.20	0.50	"	10.0		102	70-130			
o-Xylene	5.24	0.10	0.50	"	5.00		105	70-130			
Xylenes (total)	15.4	0.20	0.50	"	15.0		103	70-130			
Methyl tert-butyl ether	4.89	0.50	0.50	"	5.00		97.8	70-130			
Ethyl tert-butyl ether	4.85	0.20	0.50	"	5.00		97.0	70-130			
Tert-amyl methyl ether	4.93	0.20	0.50	"	5.00		98.6	70-130			
Surrogate: Bromofluorobenzene	*25.6*			*"*	*25.0*		*102*	*70-130*			
Surrogate: Dibromofluoromethane	*24.7*			*"*	*25.0*		*98.7*	*70-130*			
Surrogate: Toluene-d8	*25.3*			*"*	*25.0*		*101*	*70-130*			
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Acetone	22.4	0.80	5.0	ug/l	20.0		112	70-130	7.28	30	
Acrylonitrile	5.77	0.20	5.0	"	5.00		115	70-130	0.696	30	
Benzene	4.70	0.20	0.30	"	5.00		94.0	70-130	3.76	30	
Bromobenzene	5.09	0.10	0.50	"	5.00		102	70-130	1.95	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Bromochloromethane	4.92	0.20	0.50	ug/l	5.00		98.4	70-130	3.79	30	
Bromodichloromethane	4.56	0.50	0.50	"	5.00		91.2	70-130	1.95	30	
Bromoform	4.71	0.50	0.50	"	5.00		94.2	70-130	2.80	30	
Bromomethane	5.46	0.20	0.50	"	5.00		109	70-130	0.551	30	
n-Butylbenzene	4.88	0.10	0.50	"	5.00		97.6	70-130	4.21	30	
sec-Butylbenzene	5.00	0.10	0.50	"	5.00		100	70-130	1.19	30	
tert-Butylbenzene	5.15	0.10	0.50	"	5.00		103	70-130	1.73	30	
Carbon disulfide	4.83	0.20	0.50	"	5.00		96.6	70-130	3.26	30	
Carbon tetrachloride	4.64	0.30	0.50	"	5.00		92.8	70-130	2.55	30	
Chlorobenzene	5.01	0.20	0.50	"	5.00		100	70-130	1.19	30	
Chloroethane	5.12	0.10	0.50	"	5.00		102	70-130	4.02	30	
Chloroform	4.84	0.50	0.50	"	5.00		96.8	70-130	1.64	30	
Chloromethane	5.86	0.20	0.50	"	5.00		117	70-130	4.34	30	
2-Chlorotoluene	5.27	0.20	0.50	"	5.00		105	70-130	0.190	30	
4-Chlorotoluene	5.07	0.10	0.50	"	5.00		101	70-130	1.59	30	
Dibromochloromethane	4.72	0.50	0.50	"	5.00		94.4	70-130	1.89	30	
1,2-Dibromo-3-chloropropane	4.95	0.36	0.50	"	5.00		99.0	70-130	0.202	25	
1,2-Dibromoethane (EDB)	5.17	0.14	0.50	"	5.00		103	70-130	1.15	25	
Dibromomethane	5.07	0.20	0.50	"	5.00		101	70-130	2.60	30	
1,2-Dichlorobenzene	4.70	0.20	0.50	"	5.00		94.0	70-130	3.35	30	
1,3-Dichlorobenzene	5.10	0.20	0.50	"	5.00		102	70-130	1.56	30	
1,4-Dichlorobenzene	4.87	0.10	0.50	"	5.00		97.4	70-130	1.83	30	
trans-1,4-Dichloro-2-butene	4.90	0.095	5.0	"	5.00		98.0	70-130	3.32	25	J
Dichlorodifluoromethane	5.94	0.20	0.50	"	5.00		119	70-130	3.31	30	
1,1-Dichloroethane	4.86	0.10	0.50	"	5.00		97.2	70-130	4.82	30	
1,2-Dichloroethane	4.84	0.20	0.50	"	5.00		96.8	70-130	1.84	30	
1,1-Dichloroethene	4.67	0.10	0.30	"	5.00		93.4	70-130	6.02	30	
cis-1,2-Dichloroethene	4.85	0.20	0.50	"	5.00		97.0	70-130	3.25	30	
trans-1,2-Dichloroethene	4.78	0.20	0.50	"	5.00		95.6	70-130	4.30	30	
1,2-Dichloropropane	4.88	0.20	0.50	"	5.00		97.6	70-130	1.03	30	
1,3-Dichloropropane	5.07	0.20	0.50	"	5.00		101	70-130	0.394	30	
2,2-Dichloropropane	4.36	0.10	0.50	"	5.00		87.2	70-130	4.70	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
1,1-Dichloropropene	4.56	0.10	0.50	ug/l	5.00		91.2	70-130	1.95	30	
cis-1,3-Dichloropropene	4.68	0.20	0.50	"	5.00		93.6	70-130	0.428	30	
trans-1,3-Dichloropropene	4.74	0.20	0.50	"	5.00		94.8	70-130	3.43	30	
Ethylbenzene	4.96	0.10	0.50	"	5.00		99.2	70-130	2.00	30	
2-Hexanone	5.44	0.097	5.0	"	5.00		109	70-130	1.11	25	
Hexachlorobutadiene	4.64	0.30	0.50	"	5.00		92.8	70-130	6.06	30	
Isopropylbenzene	5.24	0.20	0.50	"	5.00		105	70-130	1.70	30	
p-Isopropyltoluene	5.08	0.10	0.50	"	5.00		102	70-130	3.29	30	
Methyl ethyl ketone	11.0	0.40	1.0	"	10.0		110	70-130	4.74	30	
Methyl iodide	4.90	0.12	2.0	"	5.00		98.0	70-130	2.82	25	
Methyl isobutyl ketone	10.4	0.30	1.0	"	10.0		104	70-130	0.679	30	
Methylene chloride	4.06	0.40	0.50	"	5.00		81.2	70-130	0.980	30	
Naphthalene	4.96	0.20	0.50	"	5.00		99.2	70-130	1.00	30	
n-Propylbenzene	5.47	0.20	0.50	"	5.00		109	70-130	0.734	30	
Styrene	5.28	0.10	0.50	"	5.00		106	70-130	0.755	30	
1,1,1,2-Tetrachloroethane	4.77	0.20	0.50	"	5.00		95.4	70-130	1.87	30	
1,1,2,2-Tetrachloroethane	5.14	0.20	0.50	"	5.00		103	70-130	1.17	30	
Tetrachloroethene	4.82	0.20	0.50	"	5.00		96.4	70-130	5.84	30	
Toluene	5.15	0.10	0.50	"	5.00		103	70-130	1.16	30	
1,2,3-Trichlorobenzene	4.99	0.10	0.50	"	5.00		99.8	70-130	1.79	30	
1,2,4-Trichlorobenzene	4.83	0.20	0.50	"	5.00		96.6	70-130	3.46	30	
1,1,1-Trichloroethane	4.70	0.20	0.50	"	5.00		94.0	70-130	3.96	30	
1,1,2-Trichloroethane	5.20	0.20	0.50	"	5.00		104	70-130	2.14	30	
Trichloroethene	4.67	0.20	0.50	"	5.00		93.4	70-130	5.42	30	
Trichlorofluoromethane	5.01	0.20	0.50	"	5.00		100	70-130	2.56	30	
Trichlorotrifluoroethane	5.29	0.20	0.50	"	5.00		106	70-130	4.98	30	
1,2,3-Trichloropropane	5.09	0.13	0.50	"	5.00		102	70-130	1.19	25	
1,2,4-Trimethylbenzene	5.28	0.10	0.50	"	5.00		106	70-130	1.50	30	
1,3,5-Trimethylbenzene	5.28	0.10	0.50	"	5.00		106	70-130	1.50	30	
Vinyl chloride	5.27	0.10	0.50	"	5.00		105	70-130	2.44	30	
m,p-Xylene	10.1	0.20	0.50	"	10.0		101	70-130	0.888	30	
o-Xylene	5.11	0.10	0.50	"	5.00		102	70-130	2.51	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
LCS Dup (AB40725-BSD1)					Prepared & Analyzed: 02/04/14						
Xylenes (total)	15.2	0.20	0.50	ug/l	15.0		101	70-130	1.44	30	
Methyl tert-butyl ether	4.81	0.50	0.50	"	5.00		96.2	70-130	1.65	30	
Ethyl tert-butyl ether	5.20	0.20	0.50	"	5.00		104	70-130	6.97	30	
Tert-amyl methyl ether	4.85	0.20	0.50	"	5.00		97.0	70-130	1.64	30	
Surrogate: Bromofluorobenzene	*25.4*			*"*	*25.0*		*102*	*70-130*			
Surrogate: Dibromofluoromethane	*24.0*			*"*	*25.0*		*96.1*	*70-130*			
Surrogate: Toluene-d8	*25.2*			*"*	*25.0*		*101*	*70-130*			
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Acetone	26.9	0.80	5.0	ug/l	20.0	1.79	126	70-130			
Acrylonitrile	5.81	0.20	5.0	"	5.00	ND	116	70-130			
Benzene	5.43	0.20	0.30	"	5.00	ND	109	70-130			
Bromobenzene	5.48	0.10	0.50	"	5.00	ND	110	70-130			
Bromochloromethane	5.55	0.20	0.50	"	5.00	ND	111	70-130			
Bromodichloromethane	10.0	0.50	0.50	"	5.00	4.42	112	70-130			
Bromoform	4.44	0.50	0.50	"	5.00	ND	88.8	70-130			
Bromomethane	6.20	0.20	0.50	"	5.00	ND	124	70-130			
n-Butylbenzene	5.03	0.10	0.50	"	5.00	ND	101	70-130			
sec-Butylbenzene	5.41	0.10	0.50	"	5.00	ND	108	70-130			
tert-Butylbenzene	5.60	0.10	0.50	"	5.00	ND	112	70-130			
Carbon disulfide	5.36	0.20	0.50	"	5.00	ND	107	70-130			
Carbon tetrachloride	4.97	0.30	0.50	"	5.00	ND	99.4	70-130			
Chlorobenzene	5.35	0.20	0.50	"	5.00	ND	107	70-130			
Chloroethane	6.00	0.10	0.50	"	5.00	ND	120	70-130			
Chloroform	35.3	0.50	0.50	"	5.00	31.5	76.2	70-130			
Chloromethane	6.60	0.20	0.50	"	5.00	ND	132	70-130			QM-05
2-Chlorotoluene	5.65	0.20	0.50	"	5.00	ND	113	70-130			
4-Chlorotoluene	5.61	0.10	0.50	"	5.00	ND	112	70-130			
Dibromochloromethane	4.80	0.50	0.50	"	5.00	ND	96.0	70-130			
1,2-Dibromo-3-chloropropane	4.62	0.36	0.50	"	5.00	ND	92.4	70-130			
1,2-Dibromoethane (EDB)	5.29	0.14	0.50	"	5.00	ND	106	70-130			
Dibromomethane	5.47	0.20	0.50	"	5.00	ND	109	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
1,2-Dichlorobenzene	4.95	0.20	0.50	ug/l	5.00	ND	99.0	70-130			
1,3-Dichlorobenzene	5.47	0.20	0.50	"	5.00	ND	109	70-130			
1,4-Dichlorobenzene	5.16	0.10	0.50	"	5.00	ND	103	70-130			
trans-1,4-Dichloro-2-butene	5.53	0.095	5.0	"	5.00	ND	111	70-130			
Dichlorodifluoromethane	6.69	0.20	0.50	"	5.00	ND	134	70-130			QM-05
1,1-Dichloroethane	5.61	0.10	0.50	"	5.00	ND	112	70-130			
1,2-Dichloroethane	5.51	0.20	0.50	"	5.00	ND	110	70-130			
1,1-Dichloroethene	5.37	0.10	0.30	"	5.00	ND	107	70-130			
cis-1,2-Dichloroethene	5.51	0.20	0.50	"	5.00	ND	110	70-130			
trans-1,2-Dichloroethene	5.31	0.20	0.50	"	5.00	ND	106	70-130			
1,2-Dichloropropane	5.29	0.20	0.50	"	5.00	ND	106	70-130			
1,3-Dichloropropane	5.45	0.20	0.50	"	5.00	ND	109	70-130			
2,2-Dichloropropane	4.58	0.10	0.50	"	5.00	ND	91.6	70-130			
1,1-Dichloropropene	5.13	0.10	0.50	"	5.00	ND	103	70-130			
cis-1,3-Dichloropropene	4.84	0.20	0.50	"	5.00	ND	96.8	70-130			
trans-1,3-Dichloropropene	4.50	0.20	0.50	"	5.00	ND	90.0	70-130			
2-Hexanone	5.62	0.097	5.0	"	5.00	ND	112	70-130			
Ethylbenzene	5.30	0.10	0.50	"	5.00	ND	106	70-130			
Hexachlorobutadiene	4.84	0.30	0.50	"	5.00	ND	96.8	70-130			
Isopropylbenzene	5.74	0.20	0.50	"	5.00	ND	115	70-130			
p-Isopropyltoluene	5.59	0.10	0.50	"	5.00	ND	112	70-130			
Methyl ethyl ketone	12.3	0.40	1.0	"	10.0	ND	123	70-130			
Methyl iodide	5.66	0.12	2.0	"	5.00	ND	113	70-130			
Methyl isobutyl ketone	10.7	0.30	1.0	"	10.0	ND	107	70-130			
Methylene chloride	4.34	0.40	0.50	"	5.00	ND	86.8	70-130			
Naphthalene	5.02	0.20	0.50	"	5.00	ND	100	70-130			
n-Propylbenzene	5.74	0.20	0.50	"	5.00	ND	115	70-130			
Styrene	5.53	0.10	0.50	"	5.00	ND	111	70-130			
1,1,1,2-Tetrachloroethane	4.62	0.20	0.50	"	5.00	ND	92.4	70-130			
1,1,2,2-Tetrachloroethane	5.37	0.20	0.50	"	5.00	ND	107	70-130			
Tetrachloroethene	5.41	0.20	0.50	"	5.00	ND	108	70-130			
Toluene	5.51	0.10	0.50	"	5.00	ND	110	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike (AB40725-MS1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
1,2,3-Trichlorobenzene	5.07	0.10	0.50	ug/l	5.00	ND	101	70-130			
1,2,4-Trichlorobenzene	4.77	0.20	0.50	"	5.00	ND	95.4	70-130			
1,1,1-Trichloroethane	5.12	0.20	0.50	"	5.00	ND	102	70-130			
1,1,2-Trichloroethane	5.46	0.20	0.50	"	5.00	ND	109	70-130			
Trichloroethene	5.13	0.20	0.50	"	5.00	ND	103	70-130			
Trichlorofluoromethane	5.52	0.20	0.50	"	5.00	ND	110	70-130			
Trichlorotrifluoroethane	6.04	0.20	0.50	"	5.00	ND	121	70-130			
1,2,3-Trichloropropane	5.35	0.13	0.50	"	5.00	ND	107	70-130			
1,2,4-Trimethylbenzene	5.57	0.10	0.50	"	5.00	ND	111	70-130			
1,3,5-Trimethylbenzene	5.57	0.10	0.50	"	5.00	ND	111	70-130			
Vinyl chloride	6.10	0.10	0.50	"	5.00	ND	122	70-130			
m,p-Xylene	11.0	0.20	0.50	"	10.0	ND	110	70-130			
o-Xylene	5.54	0.10	0.50	"	5.00	ND	111	70-130			
Xylenes (total)	16.6	0.20	0.50	"	15.0	ND	110	70-130			
Methyl tert-butyl ether	4.80	0.50	0.50	"	5.00	ND	96.0	70-130			
Ethyl tert-butyl ether	5.52	0.20	0.50	"	5.00	ND	110	70-130			
Tert-amyl methyl ether	4.93	0.20	0.50	"	5.00	ND	98.6	70-130			
Surrogate: Bromofluorobenzene	*25.3*			*"*	*25.0*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*24.5*			*"*	*25.0*		*98.1*	*70-130*			
Surrogate: Toluene-d8	*25.0*			*"*	*25.0*		*99.9*	*70-130*			
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Acetone	26.1	0.80	5.0	ug/l	20.0	1.79	122	70-130	2.87	30	
Acrylonitrile	5.35	0.20	5.0	"	5.00	ND	107	70-130	8.24	30	
Benzene	4.92	0.20	0.30	"	5.00	ND	98.4	70-130	9.86	30	
Bromobenzene	5.04	0.10	0.50	"	5.00	ND	101	70-130	8.37	30	
Bromochloromethane	5.02	0.20	0.50	"	5.00	ND	100	70-130	10.0	30	
Bromodichloromethane	9.77	0.50	0.50	"	5.00	4.42	107	70-130	2.43	30	
Bromoform	4.34	0.50	0.50	"	5.00	ND	86.8	70-130	2.28	30	
Bromomethane	5.65	0.20	0.50	"	5.00	ND	113	70-130	9.28	30	
n-Butylbenzene	4.55	0.10	0.50	"	5.00	ND	91.0	70-130	10.0	30	
sec-Butylbenzene	5.00	0.10	0.50	"	5.00	ND	100	70-130	7.88	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**		Prepared: 02/04/14 Analyzed: 02/06/14							
tert-Butylbenzene	5.08	0.10	0.50	ug/l	5.00	ND	102	70-130	9.74	30	
Carbon disulfide	4.92	0.20	0.50	"	5.00	ND	98.4	70-130	8.56	30	
Carbon tetrachloride	4.66	0.30	0.50	"	5.00	ND	93.2	70-130	6.44	30	
Chlorobenzene	5.02	0.20	0.50	"	5.00	ND	100	70-130	6.36	30	
Chloroethane	5.44	0.10	0.50	"	5.00	ND	109	70-130	9.79	30	
Chloroform	35.4	0.50	0.50	"	5.00	31.5	77.4	70-130	0.170	30	
Chloromethane	6.07	0.20	0.50	"	5.00	ND	121	70-130	8.37	30	
2-Chlorotoluene	5.19	0.20	0.50	"	5.00	ND	104	70-130	8.49	30	
4-Chlorotoluene	4.85	0.10	0.50	"	5.00	ND	97.0	70-130	14.5	30	
Dibromochloromethane	4.76	0.50	0.50	"	5.00	ND	95.2	70-130	0.837	30	
1,2-Dibromo-3-chloropropane	4.49	0.36	0.50	"	5.00	ND	89.8	70-130	2.85	25	
1,2-Dibromoethane (EDB)	4.82	0.14	0.50	"	5.00	ND	96.4	70-130	9.30	25	
Dibromomethane	5.04	0.20	0.50	"	5.00	ND	101	70-130	8.18	30	
1,2-Dichlorobenzene	4.59	0.20	0.50	"	5.00	ND	91.8	70-130	7.55	30	
1,3-Dichlorobenzene	5.02	0.20	0.50	"	5.00	ND	100	70-130	8.58	30	
1,4-Dichlorobenzene	4.76	0.10	0.50	"	5.00	ND	95.2	70-130	8.06	30	
trans-1,4-Dichloro-2-butene	5.09	0.095	5.0	"	5.00	ND	102	70-130	8.29	25	
Dichlorodifluoromethane	6.09	0.20	0.50	"	5.00	ND	122	70-130	9.39	30	
1,1-Dichloroethane	5.17	0.10	0.50	"	5.00	ND	103	70-130	8.16	30	
1,2-Dichloroethane	5.08	0.20	0.50	"	5.00	ND	102	70-130	8.12	30	
1,1-Dichloroethene	4.99	0.10	0.30	"	5.00	ND	99.8	70-130	7.34	30	
cis-1,2-Dichloroethene	5.09	0.20	0.50	"	5.00	ND	102	70-130	7.92	30	
trans-1,2-Dichloroethene	4.93	0.20	0.50	"	5.00	ND	98.6	70-130	7.42	30	
1,2-Dichloropropane	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	8.47	30	
1,3-Dichloropropane	5.15	0.20	0.50	"	5.00	ND	103	70-130	5.66	30	
2,2-Dichloropropane	4.28	0.10	0.50	"	5.00	ND	85.6	70-130	6.77	30	
1,1-Dichloropropene	4.75	0.10	0.50	"	5.00	ND	95.0	70-130	7.69	30	
cis-1,3-Dichloropropene	4.62	0.20	0.50	"	5.00	ND	92.4	70-130	4.65	30	
trans-1,3-Dichloropropene	4.22	0.20	0.50	"	5.00	ND	84.4	70-130	6.42	30	
2-Hexanone	5.28	0.097	5.0	"	5.00	ND	106	70-130	6.24	25	
Ethylbenzene	4.83	0.10	0.50	"	5.00	ND	96.6	70-130	9.28	30	
Hexachlorobutadiene	4.48	0.30	0.50	"	5.00	ND	89.6	70-130	7.73	30	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**		Prepared: 02/04/14 Analyzed: 02/06/14							
Isopropylbenzene	5.21	0.20	0.50	ug/l	5.00	ND	104	70-130	9.68	30	
p-Isopropyltoluene	4.91	0.10	0.50	"	5.00	ND	98.2	70-130	13.0	30	
Methyl ethyl ketone	11.8	0.40	1.0	"	10.0	ND	118	70-130	3.89	30	
Methyl iodide	5.13	0.12	2.0	"	5.00	ND	103	70-130	9.82	25	
Methyl isobutyl ketone	9.80	0.30	1.0	"	10.0	ND	98.0	70-130	8.69	30	
Methylene chloride	3.66	0.40	0.50	"	5.00	ND	73.2	70-130	17.0	30	
Naphthalene	4.66	0.20	0.50	"	5.00	ND	93.2	70-130	7.44	30	
n-Propylbenzene	5.17	0.20	0.50	"	5.00	ND	103	70-130	10.4	30	
Styrene	5.04	0.10	0.50	"	5.00	ND	101	70-130	9.27	30	
1,1,1,2-Tetrachloroethane	4.34	0.20	0.50	"	5.00	ND	86.8	70-130	6.25	30	
1,1,2,2-Tetrachloroethane	4.95	0.20	0.50	"	5.00	ND	99.0	70-130	8.14	30	
Tetrachloroethene	4.90	0.20	0.50	"	5.00	ND	98.0	70-130	9.89	30	
Toluene	5.03	0.10	0.50	"	5.00	ND	101	70-130	9.11	30	
1,2,3-Trichlorobenzene	4.89	0.10	0.50	"	5.00	ND	97.8	70-130	3.61	30	
1,2,4-Trichlorobenzene	4.38	0.20	0.50	"	5.00	ND	87.6	70-130	8.52	30	
1,1,1-Trichloroethane	4.75	0.20	0.50	"	5.00	ND	95.0	70-130	7.50	30	
1,1,2-Trichloroethane	5.07	0.20	0.50	"	5.00	ND	101	70-130	7.41	30	
Trichloroethene	4.86	0.20	0.50	"	5.00	ND	97.2	70-130	5.41	30	
Trichlorofluoromethane	4.90	0.20	0.50	"	5.00	ND	98.0	70-130	11.9	30	
Trichlorotrifluoroethane	5.57	0.20	0.50	"	5.00	ND	111	70-130	8.10	30	
1,2,3-Trichloropropane	4.93	0.13	0.50	"	5.00	ND	98.6	70-130	8.17	25	
1,2,4-Trimethylbenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130	8.61	30	
1,3,5-Trimethylbenzene	5.11	0.10	0.50	"	5.00	ND	102	70-130	8.61	30	
Vinyl chloride	5.41	0.10	0.50	"	5.00	ND	108	70-130	12.0	30	
m,p-Xylene	9.99	0.20	0.50	"	10.0	ND	99.9	70-130	9.71	30	
o-Xylene	5.07	0.10	0.50	"	5.00	ND	101	70-130	8.86	30	
Xylenes (total)	15.1	0.20	0.50	"	15.0	ND	100	70-130	9.43	30	
Methyl tert-butyl ether	4.31	0.50	0.50	"	5.00	ND	86.2	70-130	10.8	30	
Ethyl tert-butyl ether	5.09	0.20	0.50	"	5.00	ND	102	70-130	8.11	30	
Tert-amyl methyl ether	4.48	0.20	0.50	"	5.00	ND	89.6	70-130	9.56	30	
Surrogate: Bromofluorobenzene	*25.4*			*"*	*25.0*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*24.2*			*"*	*25.0*		*97.0*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Volatile Organic Compounds by EPA Method 524.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40725 - VOAs in Water GCMS											
Matrix Spike Dup (AB40725-MSD1)		**Source: 14B0115-02**			Prepared: 02/04/14 Analyzed: 02/06/14						
Surrogate: Toluene-d8	*24.8*			*ug/l*	*25.0*		*99.0*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Blank (AB40514-BLK1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	ND	0.010	0.050	ug/l							U
Chloroneb	ND	0.20	0.50	"							U
Chlorobenzilate	ND	2.0	5.0	"							U
Chlorothalonil	ND	0.030	0.10	"							U
DCPA	ND	0.020	0.040	"							U
4,4´-DDD	ND	0.020	0.050	"							U
4,4´-DDE	ND	0.020	0.050	"							U
4,4´-DDT	ND	0.020	0.020	"							U
Dieldrin	ND	0.010	0.010	"							U
Endosulfan I	ND	0.020	0.050	"							U
Endosulfan II	ND	0.020	0.050	"							U
Endosulfan sulfate	ND	0.020	0.020	"							U
Endrin	ND	0.030	0.10	"							U
Endrin aldehyde	ND	0.020	0.050	"							U
HCH-alpha	ND	0.010	0.050	"							U
HCH-beta	ND	0.020	0.050	"							U
HCH-delta	ND	0.030	0.050	"							U
HCH-gamma (Lindane)	ND	0.010	0.010	"							U
Heptachlor	ND	0.010	0.010	"							U
Heptachlor epoxide	ND	0.010	0.010	"							U
Hexachlorocyclopentadiene	ND	0.040	0.40	"							U
Hexachlorobenzene	ND	0.010	0.040	"							U
Methoxychlor	ND	0.020	0.020	"							U
cis-Permethrin	ND	0.070	0.20	"							U
trans-Permethrin	ND	0.090	0.20	"							U
Propachlor	ND	0.070	0.20	"							U
Trifluralin	ND	0.020	0.040	"							U
PCB-1016	ND	0.030	0.50	"							U
PCB-1221	ND	0.030	0.50	"							U
PCB-1232	ND	0.030	0.50	"							U
PCB-1242	ND	0.030	0.50	"							U
PCB-1248	ND	0.030	0.50	"							U

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Blank (AB40514-BLK1)					Prepared: 02/05/14 Analyzed: 02/11/14						
PCB-1254	ND	0.030	0.50	ug/l							U
PCB-1260	ND	0.030	0.50	"							U
Total PCBs	ND	0.30	0.50	"							U
Toxaphene	ND	0.40	0.50	"							U
Chlordane (tech)	ND	0.030	0.050	"							U
Surrogate: Dibutylchlorendate	*1.05*			*"*	*0.952*		*110*	*70-130*			
LCS (AB40514-BS1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	0.263	0.010	0.050	ug/l	0.280		94.1	70-130			
Chloroneb	2.73	0.20	0.50	"	2.80		97.5	70-130			
Chlorobenzilate	3.29	2.0	5.0	"	2.80		117	70-130			J
Chlorothalonil	0.313	0.030	0.10	"	0.280		112	70-130			
DCPA	0.289	0.020	0.040	"	0.280		103	70-130			
4,4´-DDD	0.203	0.020	0.050	"	0.280		72.3	70-130			
4,4´-DDE	0.279	0.020	0.050	"	0.280		99.6	70-130			
4,4´-DDT	0.290	0.020	0.020	"	0.280		104	70-130			
Dieldrin	0.283	0.010	0.010	"	0.280		101	70-130			
Endosulfan I	0.285	0.020	0.050	"	0.280		102	70-130			
Endosulfan II	0.277	0.020	0.050	"	0.280		98.9	70-130			
Endosulfan sulfate	0.306	0.020	0.020	"	0.280		109	70-130			
Endrin	0.319	0.030	0.10	"	0.280		114	70-130			
Endrin aldehyde	0.267	0.020	0.050	"	0.280		95.3	70-130			
HCH-alpha	0.269	0.010	0.050	"	0.280		96.1	70-130			
HCH-beta	0.279	0.020	0.050	"	0.280		99.7	70-130			
HCH-delta	0.286	0.030	0.050	"	0.280		102	70-130			
HCH-gamma (Lindane)	0.273	0.010	0.010	"	0.280		97.7	70-130			
Heptachlor	0.273	0.010	0.010	"	0.280		97.6	70-130			
Heptachlor epoxide	0.279	0.010	0.010	"	0.280		99.5	70-130			
Hexachlorobenzene	0.237	0.010	0.040	"	0.280		84.7	70-130			
Hexachlorocyclopentadiene	0.409	0.040	0.40	"	0.560		73.1	15-90			
Methoxychlor	0.301	0.020	0.020	"	0.280		107	70-130			
cis-Permethrin	1.59	0.070	0.20	"	1.40		114	70-130			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
LCS (AB40514-BS1)					Prepared: 02/05/14 Analyzed: 02/11/14						
trans-Permethrin	1.60	0.090	0.20	ug/l	1.40		114	70-130			
Propachlor	0.306	0.070	0.20	"	0.280		109	70-130			
Trifluralin	0.416	0.020	0.040	"	0.420		99.0	70-130			
Surrogate: Dibutylchlorendate	*1.05*			*"*	*0.952*		*110*	*70-130*			
LCS Dup (AB40514-BSD1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Aldrin	0.276	0.010	0.050	ug/l	0.280		98.7	70-130	4.77	25	
Chloroneb	2.84	0.20	0.50	"	2.80		101	70-130	3.76	25	
Chlorobenzilate	3.51	2.0	5.0	"	2.80		125	70-130	6.58	25	J
Chlorothalonil	0.334	0.030	0.10	"	0.280		119	70-130	6.41	25	
DCPA	0.304	0.020	0.040	"	0.280		109	70-130	5.05	25	
4,4´-DDD	0.208	0.020	0.050	"	0.280		74.3	70-130	2.71	25	
4,4´-DDE	0.299	0.020	0.050	"	0.280		107	70-130	7.17	25	
4,4´-DDT	0.307	0.020	0.020	"	0.280		109	70-130	5.49	25	
Dieldrin	0.301	0.010	0.010	"	0.280		108	70-130	6.30	25	
Endosulfan I	0.300	0.020	0.050	"	0.280		107	70-130	5.34	25	
Endosulfan II	0.287	0.020	0.050	"	0.280		103	70-130	3.69	25	
Endosulfan sulfate	0.324	0.020	0.020	"	0.280		116	70-130	5.53	25	
Endrin	0.336	0.030	0.10	"	0.280		120	70-130	5.28	25	
Endrin aldehyde	0.309	0.020	0.050	"	0.280		110	70-130	14.8	25	
HCH-alpha	0.280	0.010	0.050	"	0.280		99.9	70-130	3.84	25	
HCH-beta	0.294	0.020	0.050	"	0.280		105	70-130	5.16	25	
HCH-delta	0.303	0.030	0.050	"	0.280		108	70-130	5.61	25	
HCH-gamma (Lindane)	0.286	0.010	0.010	"	0.280		102	70-130	4.33	25	
Heptachlor	0.282	0.010	0.010	"	0.280		101	70-130	3.11	25	
Heptachlor epoxide	0.289	0.010	0.010	"	0.280		103	70-130	3.81	25	
Hexachlorobenzene	0.243	0.010	0.040	"	0.280		86.8	70-130	2.40	25	
Hexachlorocyclopentadiene	0.434	0.040	0.40	"	0.560		77.6	15-90	5.97	50	
Methoxychlor	0.326	0.020	0.020	"	0.280		116	70-130	8.17	25	
cis-Permethrin	1.62	0.070	0.20	"	1.40		116	70-130	1.95	25	
trans-Permethrin	1.67	0.090	0.20	"	1.40		119	70-130	4.72	25	
Propachlor	0.334	0.070	0.20	"	0.280		119	70-130	8.68	25	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
LCS Dup (AB40514-BSD1)					Prepared: 02/05/14 Analyzed: 02/11/14						
Trifluralin	0.437	0.020	0.040	ug/l	0.420		104	70-130	5.02	25	
Surrogate: Dibutylchlorendate	*1.07*			*"*	*0.952*		*112*	*70-130*			
Matrix Spike (AB40514-MS1)		**Source: 14A1713-01**			Prepared: 02/05/14 Analyzed: 02/12/14						
Aldrin	0.269	0.010	0.050	ug/l	0.280	ND	96.0	70-130			
Chloroneb	2.86	0.20	0.50	"	2.80	ND	102	70-130			
Chlorobenzilate	3.57	2.0	5.0	"	2.80	ND	127	70-130			J
Chlorothalonil	0.329	0.030	0.10	"	0.280	ND	117	70-130			
DCPA	0.303	0.020	0.040	"	0.280	ND	108	70-130			
4,4´-DDD	0.212	0.020	0.050	"	0.280	ND	75.7	70-130			
4,4´-DDE	0.288	0.020	0.050	"	0.280	ND	103	70-130			
4,4´-DDT	0.300	0.020	0.020	"	0.280	ND	107	70-130			
Dieldrin	0.295	0.010	0.010	"	0.280	ND	105	70-130			
Endosulfan I	0.298	0.020	0.050	"	0.280	ND	106	70-130			
Endosulfan II	0.298	0.020	0.050	"	0.280	ND	106	70-130			
Endosulfan sulfate	0.318	0.020	0.020	"	0.280	ND	113	70-130			
Endrin	0.354	0.030	0.10	"	0.280	ND	126	70-130			
Endrin aldehyde	0.299	0.020	0.050	"	0.280	ND	107	70-130			
HCH-alpha	0.285	0.010	0.050	"	0.280	ND	102	70-130			
HCH-beta	0.290	0.020	0.050	"	0.280	ND	104	70-130			
HCH-delta	0.300	0.030	0.050	"	0.280	ND	107	70-130			
HCH-gamma (Lindane)	0.291	0.010	0.010	"	0.280	ND	104	70-130			
Heptachlor	0.280	0.010	0.010	"	0.280	ND	100	70-130			
Heptachlor epoxide	0.286	0.010	0.010	"	0.280	ND	102	70-130			
Hexachlorobenzene	0.255	0.010	0.040	"	0.280	ND	91.0	70-130			
Hexachlorocyclopentadiene	0.486	0.040	0.40	"	0.560	ND	86.7	15-90			
Methoxychlor	0.323	0.020	0.020	"	0.280	ND	116	70-130			
cis-Permethrin	1.78	0.070	0.20	"	1.40	ND	127	70-130			
trans-Permethrin	1.78	0.090	0.20	"	1.40	ND	127	70-130			
Propachlor	0.336	0.070	0.20	"	0.280	ND	120	70-130			
Trifluralin	0.436	0.020	0.040	"	0.420	ND	104	70-130			
Surrogate: Dibutylchlorendate	*1.09*			*"*	*0.952*		*115*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Chlorinated Pesticides and PCBs by EPA Method 508 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40514 - SVOAs in Water GC											
Matrix Spike Dup (AB40514-MSD1)		**Source: 14A1713-01**		Prepared: 02/05/14 Analyzed: 02/12/14							
Aldrin	0.260	0.010	0.050	ug/l	0.280	ND	92.8	70-130	3.40	25	
Chloroneb	2.76	0.20	0.50	"	2.80	ND	98.6	70-130	3.61	25	
Chlorobenzilate	3.40	2.0	5.0	"	2.80	ND	121	70-130	4.87	25	J
Chlorothalonil	0.313	0.030	0.10	"	0.280	ND	112	70-130	4.86	25	
DCPA	0.290	0.020	0.040	"	0.280	ND	103	70-130	4.52	25	
4,4´-DDD	0.210	0.020	0.050	"	0.280	ND	74.9	70-130	1.06	25	
4,4´-DDE	0.275	0.020	0.050	"	0.280	ND	98.1	70-130	4.80	25	
4,4´-DDT	0.289	0.020	0.020	"	0.280	ND	103	70-130	3.94	25	
Dieldrin	0.283	0.010	0.010	"	0.280	ND	101	70-130	4.34	25	
Endosulfan I	0.285	0.020	0.050	"	0.280	ND	102	70-130	4.19	25	
Endosulfan II	0.288	0.020	0.050	"	0.280	ND	103	70-130	3.14	25	
Endosulfan sulfate	0.302	0.020	0.020	"	0.280	ND	108	70-130	5.03	25	
Endrin	0.320	0.030	0.10	"	0.280	ND	114	70-130	10.1	25	
Endrin aldehyde	0.275	0.020	0.050	"	0.280	ND	98.2	70-130	8.56	25	
HCH-alpha	0.271	0.010	0.050	"	0.280	ND	96.8	70-130	4.94	25	
HCH-beta	0.282	0.020	0.050	"	0.280	ND	101	70-130	2.62	25	
HCH-delta	0.290	0.030	0.050	"	0.280	ND	104	70-130	3.17	25	
HCH-gamma (Lindane)	0.279	0.010	0.010	"	0.280	ND	99.5	70-130	4.43	25	
Heptachlor	0.267	0.010	0.010	"	0.280	ND	95.4	70-130	4.78	25	
Heptachlor epoxide	0.277	0.010	0.010	"	0.280	ND	99.0	70-130	3.09	25	
Hexachlorobenzene	0.238	0.010	0.040	"	0.280	ND	85.1	70-130	6.62	25	
Hexachlorocyclopentadiene	0.433	0.040	0.40	"	0.560	ND	77.3	15-90	11.5	50	
Methoxychlor	0.309	0.020	0.020	"	0.280	ND	110	70-130	4.66	25	
cis-Permethrin	1.72	0.070	0.20	"	1.40	ND	123	70-130	3.19	25	
trans-Permethrin	1.68	0.090	0.20	"	1.40	ND	120	70-130	5.53	25	
Propachlor	0.320	0.070	0.20	"	0.280	ND	114	70-130	4.81	25	
Trifluralin	0.420	0.020	0.040	"	0.420	ND	100	70-130	3.78	25	
Surrogate: Dibutylchlorendate	*1.03*			*"*	*0.952*		*108*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Blank (AB40730-BLK1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	ND	0.50	0.50	ug/l							U
Atrazine	ND	0.30	0.50	"							U
Bromacil	ND	0.50	5.0	"							U
Butachlor	ND	0.40	0.50	"							U
Dimethoate	ND	0.20	1.0	"							U
Metolachlor	ND	0.30	0.50	"							U
Metribuzin	ND	0.40	0.50	"							U
Molinate	ND	0.20	0.50	"							U
Prometryn	ND	0.50	0.50	"							U
Propachlor	ND	0.30	0.50	"							U
Simazine	ND	0.30	0.50	"							U
Thiobencarb	ND	0.20	1.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.69*			*"*	*2.00*		*84.3*	*70-130*			
LCS (AB40730-BS1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.88	0.50	0.50	ug/l	2.00		94.2	62-128			
Atrazine	1.92	0.30	0.50	"	2.00		96.1	62-122			
Bromacil	1.94	0.50	5.0	"	2.00		96.9	61-121			J
Butachlor	1.99	0.40	0.50	"	2.00		99.3	66-126			
Dimethoate	1.97	0.20	1.0	"	2.00		98.3	67-127			
Metolachlor	1.93	0.30	0.50	"	2.00		96.6	63-123			
Metribuzin	1.91	0.40	0.50	"	2.00		95.4	71-131			
Molinate	1.95	0.20	0.50	"	2.00		97.4	44-137			
Prometryn	1.95	0.50	0.50	"	2.00		97.6	63-123			
Propachlor	1.95	0.30	0.50	"	2.00		97.3	66-126			
Simazine	1.94	0.30	0.50	"	2.00		96.9	70-130			
Thiobencarb	2.01	0.20	1.0	"	2.00		100	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.80*			*"*	*2.00*		*89.8*	*70-130*			

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Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
LCS Dup (AB40730-BSD1)					Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	2.02	0.50	0.50	ug/l	2.00		101	62-128	6.95	30	
Atrazine	2.01	0.30	0.50	"	2.00		100	62-122	4.47	30	
Bromacil	2.14	0.50	5.0	"	2.00		107	61-121	10.0	30	J
Butachlor	2.09	0.40	0.50	"	2.00		105	66-126	5.23	30	
Dimethoate	2.17	0.20	1.0	"	2.00		108	67-127	9.82	30	
Metolachlor	2.02	0.30	0.50	"	2.00		101	63-123	4.37	30	
Metribuzin	2.04	0.40	0.50	"	2.00		102	71-131	6.92	30	
Molinate	1.94	0.20	0.50	"	2.00		96.8	44-137	0.569	30	
Prometryn	2.07	0.50	0.50	"	2.00		103	63-123	5.75	30	
Propachlor	2.00	0.30	0.50	"	2.00		100	66-126	2.80	30	
Simazine	2.09	0.30	0.50	"	2.00		105	70-130	7.61	30	
Thiobencarb	2.19	0.20	1.0	"	2.00		109	69-129	8.57	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.85*			*"*	*2.00*		*92.6*	*70-130*			
Matrix Spike (AB40730-MS1)		**Source: 14A1588-01**			Prepared: 02/08/14 Analyzed: 02/11/14						
Alachlor	1.81	0.50	0.50	ug/l	2.00	ND	90.7	62-128			
Atrazine	1.79	0.30	0.50	"	2.00	ND	89.7	62-122			
Bromacil	1.75	0.50	5.0	"	2.00	ND	87.5	61-121			J
Butachlor	1.85	0.40	0.50	"	2.00	ND	92.6	66-126			
Dimethoate	1.70	0.20	1.0	"	2.00	ND	84.9	67-127			
Metolachlor	1.82	0.30	0.50	"	2.00	ND	91.2	63-123			
Metribuzin	1.78	0.40	0.50	"	2.00	ND	89.2	71-131			
Molinate	1.87	0.20	0.50	"	2.00	ND	93.4	44-137			
Prometryn	1.68	0.50	0.50	"	2.00	ND	83.9	63-123			
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.6	66-126			
Simazine	1.85	0.30	0.50	"	2.00	ND	92.5	70-130			
Thiobencarb	1.90	0.20	1.0	"	2.00	ND	95.2	69-129			
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.51*			*"*	*2.00*		*75.3*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Nitrogen- and Phosphorus- Pesticides by EPA Method 507 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40730 - SVOAs in Water GC											
Matrix Spike Dup (AB40730-MSD1)		**Source: 14A1588-01**		Prepared: 02/08/14 Analyzed: 02/11/14							
Alachlor	1.91	0.50	0.50	ug/l	2.00	ND	95.3	62-128	4.97	30	
Atrazine	1.96	0.30	0.50	"	2.00	ND	98.2	62-122	9.04	30	
Bromacil	2.13	0.50	5.0	"	2.00	ND	107	61-121	19.7	30	J
Butachlor	2.02	0.40	0.50	"	2.00	ND	101	66-126	8.67	30	
Dimethoate	2.14	0.20	1.0	"	2.00	ND	107	67-127	23.0	30	
Metolachlor	1.96	0.30	0.50	"	2.00	ND	97.9	63-123	7.12	30	
Metribuzin	2.02	0.40	0.50	"	2.00	ND	101	71-131	12.3	30	
Molinate	1.79	0.20	0.50	"	2.00	ND	89.6	44-137	4.16	30	
Prometryn	2.02	0.50	0.50	"	2.00	ND	101	63-123	18.4	30	
Propachlor	1.93	0.30	0.50	"	2.00	ND	96.4	66-126	0.171	30	
Simazine	2.07	0.30	0.50	"	2.00	ND	104	70-130	11.3	30	
Thiobencarb	1.96	0.20	1.0	"	2.00	ND	97.8	69-129	2.64	30	
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*1.60*			*"*	*2.00*		*79.9*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Organic Analytes by EPA Method 504.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40703 - EPA 504.1											
Blank (AB40703-BLK1)					Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	ND	0.0040	0.010	ug/l							U
1,2-Dibromoethane (EDB)	ND	0.0050	0.020	"							U
LCS (AB40703-BS1)					Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	0.299	0.0040	0.010	ug/l	0.250		119	70-130			
1,2-Dibromoethane (EDB)	0.279	0.0050	0.020	"	0.250		112	70-130			
LCS Dup (AB40703-BSD1)					Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	0.314	0.0040	0.010	ug/l	0.250		126	70-130	5.15	25	
1,2-Dibromoethane (EDB)	0.292	0.0050	0.020	"	0.250		117	70-130	4.42	25	
Matrix Spike (AB40703-MS1)		**Source: 14B0336-01**			Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	0.381	0.0040	0.010	ug/l	0.250	0.111	108	70-130			
1,2-Dibromoethane (EDB)	0.265	0.0050	0.020	"	0.250	ND	106	70-130			
Matrix Spike Dup (AB40703-MSD1)		**Source: 14B0336-01**			Prepared & Analyzed: 02/07/14						
1,2-Dibromo-3-chloropropane	0.357	0.0040	0.010	ug/l	0.250	0.111	98.0	70-130	6.77	25	
1,2-Dibromoethane (EDB)	0.235	0.0050	0.020	"	0.250	ND	94.0	70-130	12.0	25	

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41155 - EPA 515.1											
Blank (AB41155-BLK1)					Prepared: 02/12/14 Analyzed: 02/14/14						
Acifluorfen	ND	0.50	1.0	ug/l							U
Bentazon	ND	0.40	0.40	"							U
2,4-D	ND	0.80	1.0	"							U
Dalapon	ND	6.0	6.0	"							U
2,4-DB	ND	4.0	5.0	"							U
Dicamba	ND	0.40	0.40	"							U
Dichlorprop	ND	1.0	1.0	"							U
Dinoseb	ND	0.80	1.0	"							U
4-Nitrophenol	ND	0.70	1.0	"							U
Pentachlorophenol	ND	0.20	0.20	"							U
Picloram	ND	0.50	1.0	"							U
2,4,5-T	ND	0.40	0.50	"							U
2,4,5-TP (Silvex)	ND	0.50	0.50	"							U
Surrogate: DCAA	*13.8*			*"*	*14.2*		*97.0*	*70-130*			
LCS (AB41155-BS1)					Prepared: 02/12/14 Analyzed: 02/14/14						
Acifluorfen	0.895	0.50	1.0	ug/l	0.960		93.2	70-130			J
Bentazon	1.68	0.40	0.40	"	1.92		87.7	70-130			
2,4-D	1.62	0.80	1.0	"	1.92		84.5	48-124			
Dalapon	10.9	6.0	6.0	"	12.5		87.5	40-112			
2,4-DB	7.43	4.0	5.0	"	7.68		96.8	54-123			
Dicamba	0.861	0.40	0.40	"	0.960		89.7	70-130			
Dichlorprop	2.88	1.0	1.0	"	2.88		100	54-106			
Dinoseb	5.06	0.80	1.0	"	6.42		78.7	20-105			
4-Nitrophenol	0.759	0.70	1.0	"	0.960		79.0	60-202			J
Pentachlorophenol	0.816	0.20	0.20	"	0.960		85.0	70-130			
Picloram	0.929	0.50	1.0	"	0.960		96.7	70-130			J
2,4,5-T	0.918	0.40	0.50	"	0.960		95.6	68-166			
2,4,5-TP (Silvex)	0.969	0.50	0.50	"	0.960		101	70-130			
Surrogate: DCAA	*14.7*			*"*	*14.2*		*103*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41155 - EPA 515.1											
LCS Dup (AB41155-BSD1)					Prepared: 02/12/14 Analyzed: 02/14/14						
Acifluorfen	0.947	0.50	1.0	ug/l	0.960		98.7	70-130	5.68	50	J
Bentazon	1.74	0.40	0.40	"	1.92		90.5	70-130	3.16	50	
2,4-D	1.34	0.80	1.0	"	1.92		69.7	48-124	19.2	50	
Dalapon	10.6	6.0	6.0	"	12.5		85.2	40-112	2.63	50	
2,4-DB	7.11	4.0	5.0	"	7.68		92.6	54-123	4.37	50	
Dicamba	0.872	0.40	0.40	"	0.960		90.8	70-130	1.23	50	
Dichlorprop	2.46	1.0	1.0	"	2.88		85.2	54-106	15.9	50	
Dinoseb	5.84	0.80	1.0	"	6.42		90.9	20-105	14.4	50	
4-Nitrophenol	0.982	0.70	1.0	"	0.960		102	60-202	25.6	50	J
Pentachlorophenol	0.871	0.20	0.20	"	0.960		90.7	70-130	6.49	50	
Picloram	0.976	0.50	1.0	"	0.960		102	70-130	4.94	50	J
2,4,5-T	0.681	0.40	0.50	"	0.960		70.9	68-166	29.7	50	
2,4,5-TP (Silvex)	0.783	0.50	0.50	"	0.960		81.5	70-130	21.3	50	
Surrogate: DCAA	*13.7*			*"*	*14.2*		*96.4*	*70-130*			
Matrix Spike (AB41155-MS1)		**Source: 14B0093-01**			Prepared: 02/12/14 Analyzed: 02/15/14						
Acifluorfen	0.842	0.50	1.0	ug/l	0.960	ND	87.7	70-130			J
Bentazon	1.55	0.40	0.40	"	1.92	ND	80.9	70-130			
2,4-D	1.44	0.80	1.0	"	1.92	ND	75.1	48-124			
Dalapon	11.9	6.0	6.0	"	12.5	ND	95.4	40-112			
2,4-DB	5.89	4.0	5.0	"	7.68	ND	76.7	54-123			
Dicamba	0.889	0.40	0.40	"	0.960	ND	92.6	70-130			
Dichlorprop	2.46	1.0	1.0	"	2.88	ND	85.2	54-106			
Dinoseb	4.86	0.80	1.0	"	6.42	ND	75.7	20-105			
4-Nitrophenol	1.02	0.70	1.0	"	0.960	ND	107	60-202			
Pentachlorophenol	0.822	0.20	0.20	"	0.960	ND	85.6	70-130			
Picloram	0.865	0.50	1.0	"	0.960	ND	90.1	70-130			J
2,4,5-T	0.730	0.40	0.50	"	0.960	ND	76.0	68-166			
2,4,5-TP (Silvex)	0.805	0.50	0.50	"	0.960	ND	83.9	70-130			
Surrogate: DCAA	*12.7*			*"*	*14.2*		*89.6*	*70-130*			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Chlorinated Acids by EPA Method 515.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41155 - EPA 515.1											
Matrix Spike Dup (AB41155-MSD1)		**Source: 14B0093-01**		Prepared: 02/12/14 Analyzed: 02/15/14							
Acifluorfen	0.798	0.50	1.0	ug/l	0.960	ND	83.2	70-130	5.34	50	J
Bentazon	1.71	0.40	0.40	"	1.92	ND	89.0	70-130	9.58	50	
2,4-D	1.27	0.80	1.0	"	1.92	ND	66.0	48-124	12.8	50	
Dalapon	11.2	6.0	6.0	"	12.5	ND	89.6	40-112	6.23	50	
2,4-DB	5.76	4.0	5.0	"	7.68	ND	75.0	54-123	2.16	50	
Dicamba	0.837	0.40	0.40	"	0.960	ND	87.2	70-130	6.01	50	
Dichlorprop	2.39	1.0	1.0	"	2.88	ND	83.0	54-106	2.62	50	
Dinoseb	4.47	0.80	1.0	"	6.42	ND	69.6	20-105	8.43	50	
4-Nitrophenol	1.42	0.70	1.0	"	0.960	ND	148	60-202	32.4	50	
Pentachlorophenol	0.808	0.20	0.20	"	0.960	ND	84.2	70-130	1.62	50	
Picloram	0.847	0.50	1.0	"	0.960	ND	88.2	70-130	2.10	50	J
2,4,5-T	0.628	0.40	0.50	"	0.960	ND	65.5	68-166	14.9	50	QM-07
2,4,5-TP (Silvex)	0.725	0.50	0.50	"	0.960	ND	75.5	70-130	10.5	50	
Surrogate: DCAA	*12.5*			*"*	*14.2*		*88.2*	*70-130*			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41142 - HPLC											
Blank (AB41142-BLK1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	ND	0.70	3.0	ug/l							U
Aldicarb sulfone	ND	0.70	4.0	"							U
Aldicarb sulfoxide	ND	0.80	3.0	"							U
Carbaryl	ND	0.70	5.0	"							U
Carbofuran	ND	2.0	5.0	"							U
3-Hydroxycarbofuran	ND	0.90	3.0	"							U
Methiocarb	ND	2.0	5.0	"							U
Methomyl	ND	2.0	2.0	"							U
Oxamyl	ND	0.80	20	"							U
Propoxur	ND	2.0	5.0	"							U
LCS (AB41142-BS1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	20.0	0.70	3.0	ug/l	20.0		99.9	80-120			
Aldicarb sulfone	20.1	0.70	4.0	"	19.0		106	80-120			
Aldicarb sulfoxide	19.2	0.80	3.0	"	19.8		97.0	80-120			
Carbaryl	20.4	0.70	5.0	"	20.0		102	80-120			
Carbofuran	19.5	2.0	5.0	"	20.0		97.7	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0		103	80-120			
Methiocarb	18.6	2.0	5.0	"	20.0		93.2	80-120			
Methomyl	21.1	2.0	2.0	"	20.0		105	80-120			
Oxamyl	20.5	0.80	20	"	20.0		102	80-120			
Propoxur	20.2	2.0	5.0	"	20.0		101	80-120			
LCS Dup (AB41142-BSD1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	19.3	0.70	3.0	ug/l	20.0		96.6	80-120	3.34	20	
Aldicarb sulfone	19.3	0.70	4.0	"	19.0		102	80-120	3.93	20	
Aldicarb sulfoxide	18.6	0.80	3.0	"	19.8		93.7	80-120	3.45	20	
Carbaryl	18.8	0.70	5.0	"	20.0		94.1	80-120	8.11	20	
Carbofuran	19.4	2.0	5.0	"	20.0		97.1	80-120	0.645	20	
3-Hydroxycarbofuran	19.0	0.90	3.0	"	20.0		95.1	80-120	8.35	20	
Methiocarb	19.1	2.0	5.0	"	20.0		95.7	80-120	2.65	20	
Methomyl	19.5	2.0	2.0	"	20.0		97.7	80-120	7.69	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Carbamates by EPA Method 531.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41142 - HPLC											
LCS Dup (AB41142-BSD1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Oxamyl	19.2	0.80	20	ug/l	20.0		95.8	80-120	6.62	20	J
Propoxur	19.0	2.0	5.0	"	20.0		94.8	80-120	6.54	20	
Matrix Spike (AB41142-MS1)		**Source: 14B0426-01**			Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	18.7	0.70	3.0	ug/l	20.0	ND	93.3	80-120			
Aldicarb sulfone	20.1	0.70	4.0	"	19.0	ND	106	80-120			
Aldicarb sulfoxide	20.1	0.80	3.0	"	19.8	ND	102	80-120			
Carbaryl	20.0	0.70	5.0	"	20.0	ND	99.8	80-120			
Carbofuran	19.3	2.0	5.0	"	20.0	ND	96.6	80-120			
3-Hydroxycarbofuran	20.7	0.90	3.0	"	20.0	ND	103	80-120			
Methiocarb	18.2	2.0	5.0	"	20.0	ND	91.2	80-120			
Methomyl	21.0	2.0	2.0	"	20.0	ND	105	80-120			
Oxamyl	20.3	0.80	20	"	20.0	ND	102	80-120			
Propoxur	19.2	2.0	5.0	"	20.0	ND	95.9	80-120			
Matrix Spike Dup (AB41142-MSD1)		**Source: 14B0426-01**			Prepared: 02/11/14 Analyzed: 02/12/14						
Aldicarb	17.4	0.70	3.0	ug/l	20.0	ND	87.1	80-120	6.84	20	
Aldicarb sulfone	19.0	0.70	4.0	"	19.0	ND	100	80-120	5.57	20	
Aldicarb sulfoxide	18.8	0.80	3.0	"	19.8	ND	94.8	80-120	6.85	20	
Carbaryl	19.4	0.70	5.0	"	20.0	ND	97.1	80-120	2.76	20	
Carbofuran	19.4	2.0	5.0	"	20.0	ND	96.9	80-120	0.339	20	
3-Hydroxycarbofuran	19.8	0.90	3.0	"	20.0	ND	98.9	80-120	4.29	20	
Methiocarb	18.9	2.0	5.0	"	20.0	ND	94.6	80-120	3.68	20	
Methomyl	20.6	2.0	2.0	"	20.0	ND	103	80-120	1.83	20	
Oxamyl	19.2	0.80	20	"	20.0	ND	95.8	80-120	5.89	20	J
Propoxur	19.5	2.0	5.0	"	20.0	ND	97.3	80-120	1.47	20	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Endothall by EPA Method 548.1 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40801 - EPA 548.1											
Blank (AB40801-BLK1)					Prepared: 02/10/14 Analyzed: 02/11/14						
Endothall	ND	2.0	45	ug/l							U
LCS (AB40801-BS1)					Prepared: 02/10/14 Analyzed: 02/11/14						
Endothall	201	2.0	45	ug/l	200		100	80-120			
LCS Dup (AB40801-BSD1)					Prepared: 02/10/14 Analyzed: 02/11/14						
Endothall	204	2.0	45	ug/l	200		102	80-120	1.53	30	
Matrix Spike (AB40801-MS1)		**Source: 14B0089-01**			Prepared: 02/10/14 Analyzed: 02/11/14						
Endothall	190	2.0	45	ug/l	200	ND	94.8	80-120			

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Glyphosate by EPA Method 547 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40427 - HPLC											
Blank (AB40427-BLK1)					Prepared & Analyzed: 02/04/14						
Glyphosate	ND	3.0	10	ug/l							U
LCS (AB40427-BS1)					Prepared & Analyzed: 02/04/14						
Glyphosate	111	3.0	10	ug/l	120		92.7	66-126			
LCS Dup (AB40427-BSD1)					Prepared & Analyzed: 02/04/14						
Glyphosate	112	3.0	10	ug/l	120		93.7	66-126	1.08	30	
Matrix Spike (AB40427-MS1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	111	3.0	10	ug/l	120	ND	92.7	66-126			
Matrix Spike Dup (AB40427-MSD1)		**Source: 14B0093-01**			Prepared: 02/04/14 Analyzed: 02/05/14						
Glyphosate	110	3.0	10	ug/l	120	ND	92.0	66-126	0.801	30	

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Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Diquat by EPA Method 549.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40717 - HPLC											
Blank (AB40717-BLK1)					Prepared: 02/07/14 Analyzed: 02/10/14						
Diquat	ND	2.0	2.0	ug/l							U
LCS (AB40717-BS1)					Prepared: 02/07/14 Analyzed: 02/11/14						
Diquat	17.4	2.0	2.0	ug/l	19.8		87.8	70-130			
LCS Dup (AB40717-BSD1)					Prepared: 02/07/14 Analyzed: 02/11/14						
Diquat	18.0	2.0	2.0	ug/l	19.8		90.5	70-130	3.10	25	
Matrix Spike (AB40717-MS1)		**Source: 14B0426-01**			Prepared: 02/07/14 Analyzed: 02/11/14						
Diquat	19.8	2.0	2.0	ug/l	19.8	ND	99.9	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41050 - EPA 552.2											
Blank (AB41050-BLK1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	ND	0.8	1.0	ug/l							U
Monochloroacetic Acid	ND	1.1	2.0	"							U
Dibromoacetic Acid	ND	0.8	1.0	"							U
Dichloroacetic Acid	ND	1.0	1.0	"							U
Trichloroacetic Acid	ND	1.0	1.0	"							U
Total Haloacetic Acids (HAA5)	ND	1.0	1.0	"							U
Surrogate: 2,3-Dibromopropionic Acid	*9.59*			*"*	*10.0*		*95.9*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*11.7*			*"*	*10.0*		*117*	*70-130*			
LCS (AB41050-BS1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	25.5	0.8	1.0	ug/l	25.0		102	70-130			
Monochloroacetic Acid	26.9	1.1	2.0	"	25.0		107	70-130			
Dibromoacetic Acid	26.8	0.8	1.0	"	25.0		107	70-130			
Dichloroacetic Acid	26.0	1.0	1.0	"	25.0		104	70-130			
Trichloroacetic Acid	26.6	1.0	1.0	"	25.0		106	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*11.0*			*"*	*10.0*		*110*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*10.1*			*"*	*10.0*		*101*	*70-130*			
MRL Check (AB41050-MRL1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	1.07	0.8	1.0	ug/l	1.00		107	0-200			
Monochloroacetic Acid	ND	1.1	2.0	"	1.00			0-200			U
Dibromoacetic Acid	1.37	0.8	1.0	"	1.00		137	0-200			
Dichloroacetic Acid	ND	1.0	1.0	"	1.00			0-200			U
Trichloroacetic Acid	1.05	1.0	1.0	"	1.00		105	0-200			
Surrogate: 2,3-Dibromopropionic Acid	*1.40*			*"*	*1.00*		*140*	*0-200*			
Surrogate: 2-Bromopropionic Acid	*1.14*			*"*	*1.00*		*114*	*0-200*			
Matrix Spike (AB41050-MS1)		**Source: 14A1713-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Monobromoacetic Acid	24.9	0.8	1.0	ug/l	25.0	ND	99.7	70-130			
Monochloroacetic Acid	26.6	1.1	2.0	"	25.0	ND	106	70-130			

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Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Dr. Bill Motzer Project: Groundwater Reuse Project Project Number: 60408	Reported: 02/18/14 14:08

Haloacetic Acids by EPA Method 552.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB41050 - EPA 552.2											
Matrix Spike (AB41050-MS1)		**Source: 14A1713-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Dibromoacetic Acid	32.2	0.8	1.0	ug/l	25.0	ND	129	70-130			
Dichloroacetic Acid	25.1	1.0	1.0	"	25.0	ND	100	70-130			
Trichloroacetic Acid	29.9	1.0	1.0	"	25.0	ND	120	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*12.1*			*"*	*10.0*		*121*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.42*			*"*	*10.0*		*94.2*	*70-130*			
Matrix Spike (AB41050-MS2)		**Source: 14B0089-01**			Prepared: 02/11/14 Analyzed: 02/13/14						
Monobromoacetic Acid	24.4	0.8	1.0	ug/l	25.0	ND	97.6	70-130			
Monochloroacetic Acid	25.3	1.1	2.0	"	25.0	ND	101	70-130			
Dibromoacetic Acid	31.9	0.8	1.0	"	25.0	ND	128	70-130			
Dichloroacetic Acid	24.0	1.0	1.0	"	25.0	ND	96.0	70-130			
Trichloroacetic Acid	31.1	1.0	1.0	"	25.0	ND	124	70-130			
Surrogate: 2,3-Dibromopropionic Acid	*13.9*			*"*	*10.0*		*139*	*70-130*			*S-GC*
Surrogate: 2-Bromopropionic Acid	*10.9*			*"*	*10.0*		*109*	*70-130*			
Reference (AB41050-SRM1)					Prepared: 02/11/14 Analyzed: 02/12/14						
Monobromoacetic Acid	25.1	0.8	1.0	ug/l	25.0		100	0-200			
Monochloroacetic Acid	26.7	1.1	2.0	"	25.0		107	0-200			
Dibromoacetic Acid	25.6	0.8	1.0	"	25.0		103	0-200			
Dichloroacetic Acid	24.9	1.0	1.0	"	25.0		99.7	0-200			
Trichloroacetic Acid	25.8	1.0	1.0	"	25.0		103	0-200			
Surrogate: 2,3-Dibromopropionic Acid	*10.6*			*"*	*10.0*		*106*	*70-130*			
Surrogate: 2-Bromopropionic Acid	*9.92*			*"*	*10.0*		*99.2*	*70-130*			

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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e-mail: clientservices@alpha-labs.com
Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Blank (AB40727-BLK1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	ND	0.080	0.10	ug/l							U
Di(2-ethylhexyl)adipate	ND	0.40	5.0	"							U
Di(2-ethylhexyl)phthalate	ND	0.20	3.0	"							U
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.23*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*3.73*			*"*	*5.00*		*74.6*	*70-130*			
Surrogate: Triphenyl phosphate	*4.72*			*"*	*5.00*		*94.4*	*70-130*			
LCS (AB40727-BS1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.13	0.080	0.10	ug/l	3.00		71.0	70-130			
Di(2-ethylhexyl)adipate	2.49	0.40	5.0	"	3.00		83.0	70-130			J
Di(2-ethylhexyl)phthalate	2.40	0.20	3.0	"	3.00		80.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.36*			*"*	*5.00*		*107*	*70-130*			
Surrogate: Perylene-d12	*4.65*			*"*	*5.00*		*93.0*	*70-130*			
Surrogate: Triphenyl phosphate	*5.36*			*"*	*5.00*		*107*	*70-130*			
LCS Dup (AB40727-BSD1)					Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.40	0.080	0.10	ug/l	3.00		80.0	70-130	11.9	20	
Di(2-ethylhexyl)adipate	2.70	0.40	5.0	"	3.00		90.0	70-130	8.09	20	J
Di(2-ethylhexyl)phthalate	2.57	0.20	3.0	"	3.00		85.7	70-130	6.84	20	J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.39*			*"*	*5.00*		*108*	*70-130*			
Surrogate: Perylene-d12	*4.84*			*"*	*5.00*		*96.8*	*70-130*			
Surrogate: Triphenyl phosphate	*5.47*			*"*	*5.00*		*109*	*70-130*			
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Benzo (a) pyrene	2.79	0.080	0.10	ug/l	3.00	ND	93.0	70-130			
Di(2-ethylhexyl)adipate	3.11	0.40	5.0	"	3.00	ND	104	70-130			J
Di(2-ethylhexyl)phthalate	2.79	0.20	3.0	"	3.00	ND	93.0	70-130			J
Surrogate: 1,3-Dimethyl-2-nitrobenzene	*5.27*			*"*	*5.00*		*105*	*70-130*			
Surrogate: Perylene-d12	*5.52*			*"*	*5.00*		*110*	*70-130*			

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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater	Project Manager:	Dr. Bill Motzer	
Alameda CA, 94501	Project:	Groundwater Reuse Project	Reported:
2490 Mariner Square Loop, Suite 215	Project Number:	60408	02/18/14 14:08

Semivolatile Organic Compounds by EPA Method 525.2 - Quality Control

Alpha Analytical Laboratories, Inc.

Analyte	Result	MDL	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AB40727 - EPA 525.2											
Matrix Spike (AB40727-MS1)		**Source: 14A1714-01**			Prepared: 02/08/14 Analyzed: 02/13/14						
Surrogate: Triphenyl phosphate	*5.65*			*ug/l*	*5.00*		*113*	*70-130*			

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com
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Satellite Laboratory: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309

Todd Groundwater Alameda CA, 94501 2490 Mariner Square Loop, Suite 215	Project Manager: Project: Project Number:	Dr. Bill Motzer Groundwater Reuse Project 60408	Reported: 02/18/14 14:08

Notes and Definitions

J	Detected but below the Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ).
QM-01	The spike recovery for this QC sample is outside of established control limits possibly due to a sample matrix interference.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
QM-4X	The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
S-GC	Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogates.
U	Analyte included in analysis, but not detected at or above MDL.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 1402036

Report Created for: Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Project Contact: David S. Pingatore
Project P.O.:
Project Name: #14B0093

Project Received: 02/04/2014

Analytical Report reviewed & approved for release on 02/10/2014 by:

Question about your data?

Click here to email McCampbell

Angela Rydelius,
Laboratory Manager

The report shall not be reproduced except in full, without the written approval of the laboratory. The analytical results relate only to the items tested. Results reported conform to the most current NELAP standards, where applicable, unless otherwise stated in the case narrative.

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http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: Alpha Analytical Laboratories
Project: #14B0093
WorkOrder: 1402036

Glossary Abbreviation	Description
95% Interval	95% Confident Interval
DF	Dilution Factor
DUP	Duplicate
EDL	Estimated Detection Limit
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Not detected at or above the indicated MDL or RL
NR	Matrix interferences, or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix; or sample diluted due to high matrix or analyte content.
RD	Relative Difference
RL	Reporting Limit (The RL is the lowest calibration standard in a multipoint calibration.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
TEQ	Toxicity Equivalence

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Analytical Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1402036
Project:	#14B0093	**Extraction Method**	E218.6
Date Received:	2/4/14 9:23	**Analytical Method:**	E218.6
Date Prepared:	2/4/14	**Unit:**	µg/L

Hexachrome by IC

Client ID	Lab ID	Matrix/ExtType	Date Collected	Instrument	Batch ID
City of Seaside #4	**1402036-001A**	**Water**	**02/03/2014 15:00**	**IC2**	**86689**

Analytes	Result	RL	DF	Date Analyzed
Hexachrome	**3.4**	0.050	1	02/04/2014 15:01

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Quality Control Report

Client:	Alpha Analytical Laboratories	**WorkOrder:**	1402036
Date Prepared:	2/4/14	**BatchID:**	86689
Date Analyzed:	2/4/14	**Extraction Method**	E218.6
Instrument:	IC2	**Analytical Method:**	E218.6
Matrix:	Water	**Unit:**	µg/L
Project:	#14B0093	**Sample ID:**	MB/LCS-86689 1402035-001AMS/MSD

QC Summary Report for E218.6

Analyte	MB Result	LCS Result	RL	SPK Val	MB SS %REC	LCS %REC	LCS Limits
Hexachrome	ND	24.04	0.050	25	-	96.2	90-110

Analyte	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Hexachrome	23.52	24.27	25	ND	94.1	97.1	90-110	3.14	10

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1402036 **ClientCode: ALPU**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
David S. Pingatore
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482
(707) 468-0401 FAX: (707) 468-5267

Email: sspeaks@alpha-labs.com;david@alpha-lab
cc:
PO:
ProjectNo: #14B0093

Bill to:
Accounts Payable
Alpha Analytical Laboratories
208 Mason Street
Ukiah, CA 95482

Requested TAT: 5 days

Date Received: 02/04/2014
Date Printed: 02/04/2014

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1402036-001	City of Seaside #4	Water	2/3/2014 15:00	☐	A											

Test Legend:

1	218_6_DW	2		3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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WORK ORDER SUMMARY

Client Name: ALPHA ANALYTICAL LABORATORIES
QC Level: LEVEL 2
Work Order: 1402036
Project: #14B0093
Client Contact: David S. Pingatore
Date Received: 2/4/2014
Comments:
Contact's Email: sspeaks@alpha-labs.com;david@alpha-labs.com

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Lab ID	Client ID	Matrix	Test Name	Number of Containers	Bottle & Preservative	De-chlorinated	Collection Date & Time	TAT	Sediment Content	Hold	SubOut
1402036-001A	City of Seaside #4	Water	E218.6 (Hexachrome)	1	250mL HDPE w/ (NH4)2SO4	☐	2/3/2014 15:00	5 days	None	☐	

*** NOTE: STLC and TCLP extractions require 48 hrs to complete; therefore, all TATs begin after the extraction is completed (i.e., 24hr TAT yields results in 72 hrs from sample submission).**

Bottle Legend:

250mL HDPE w/ (NH4)2SO4 = 250mL HDPE Bottle w/ Ammonium Sulfate

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

1402036

14B0093

SENDING LABORATORY:	**RECEIVING LABORATORY:**
Alpha Analytical Laboratories, Inc.	McCampbell Analytical
208 Mason St.	1534 Willowpass Rd.
Ukiah, CA 95482	Pittsburg, CA 94565
Phone: (707)468-0401	Phone :(925) 252-9262
Fax: (707)468-5267	Fax: (925) 252-9269
Project Manager: David S. Pingatore	**Terms: Net 30**

Analysis	Due	Expires	Comments
14B0093-01 City Of Seaside #4 [Water] Sampled 02/03/14 15:00 Pacific			
Cr6 218.6 DW	02/18/14 12:00	02/08/14 15:00	
Containers Supplied:			
250ml Poly - (NH4)2SO4 (A			

☐ *Report to State*

System Name: NO **Employed by:**

User ID: **Sampler:**

System Number:

1.3

CONDITION APPROPRIATE

HEADSPACE ABSENT CONTAINERS

DECHLORINATED IN LAB PRESERVED IN LAB

PRESERVATION	VOAS	O&G	METALS	OTHER

Released By	Date	Received By	Date
[signature]	02/04/14	[signature]	2/4/14 0916

Page 1 of 1

McCampbell Analytical, Inc.
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http://www.mccampbell.com / E-mail: main@mccampbell.com

Sample Receipt Checklist

Client Name:	**Alpha Analytical Laboratories**	Date and Time Received:	**2/4/2014 9:23:23 AM**
Project Name:	**#14B0093**	LogIn Reviewed by:	Maria Venegas
WorkOrder N°:	**1402036** Matrix: Water	Carrier:	Client Drop-In

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐
Chain of custody signed when relinquished and received?	Yes ☑	No ☐
Chain of custody agrees with sample labels?	Yes ☑	No ☐
Sample IDs noted by Client on COC?	Yes ☑	No ☐
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐
Sampler's name noted on COC?	Yes ☐	No ☑

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp: 1.3°C		NA ☐
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	NA ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑
Samples Received on Ice?	Yes ☑	No ☐	

(Ice Type: BLUE ICE)

** NOTE: If the "No" box is checked, see comments below.*

Comments:

ASBESTOS TEM LABORATORIES, INC.

EPA 600/4-83 Drinking Water
Transmission Electron Microscopy
Analytical Report

Laboratory Job # 1288-00573

630 Bancroft Way
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

Certified by
CA DPH ELAP
Lab No. 1866

Feb/13/2014

David S. Pingatore
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482

RE: LABORATORY JOB # 1288-00573
Transmission electron microscopy analytical results for 1 water sample(s).
Job Site: City of Seaside # 4
Job No.: 14B0093

Enclosed please find results for the TEM analysis of one or more water samples. The analytical procedures were performed according to EPA Method 100.2 for the analysis of asbestos in drinking water.

Prior to analysis, samples are checked for damage, disruption of any chain-of-custody seals, and completeness of accompanying paperwork. If no problems are found, samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

Preparation of water samples is performed within a HEPA filtered, Class 100 air, laminar flow clean bench environment. Prior to filtration, water sample containers are ultrasonicated, and the exterior surfaces cleaned. An aliquot of water is drawn from the sample container and drawn through a special filtration apparatus and collected onto a mixed cellulose ester (MCE) or polycarbonate (PC) filter. The filters are removed from the apparatus and dried. A portion of each sample filter is sectioned, placed onto a glass microscope slide, and carbon coated. The filters are further sectioned and placed carbon side up onto 200-mesh copper TEM sample grids in a solvent bath until all filter material is dissolved. The TEM grids are removed and placed into labeled grid storage boxes.

TEM analysis is performed on a Philips EM-300 or CM-12 transmission electron microscope operating at 80 or 100 kV. Initially, the grid is scanned at low and medium magnification to insure proper sample loading, and coherence of the carbon support film. Then TEM grid openings are analyzed at a magnification of 10,000X. All fibers >10 um in length and exhibiting an aspect ratio >3:1 are analyzed. Scanning continues until either 100 asbestiform fibers >10um in length are counted, or an analytical sensitivity of 0.2 million fibers per liter (MFL) is achieved. Analyzed fibers are subjected to detailed morphological and selected area diffraction (SAED) analysis. Fibers indicated as asbestos, or potentially asbestos, are further analyzed by energy dispersive X-ray (EDX) analysis as needed. The number of asbestos fibers detected, and other analytical parameters, are then used to calculate the concentration of asbestos in MFL. The results are entered into a standard report format and reviewed by the analyst and the laboratory manager before release to the client.

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

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www.asbestostemlabs.com *With Offices in Reno, NV (775) 359-3377*

TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL REPORT

Contact:	David S. Pingatore		
Address:	Alpha Analytical Laboratories, Inc. 208 Mason Street Ukiah, CA 95482	Report No.:	323883
		Date:	Feb-13-14
		Total Samples Analyzed:	1
Job Site / No.	City of Seaside # 4 14B0093	Sample Collector:	

CLIENT SAMPLE #	**14B0093-01**	**SAMPLE LOCATION/DESCRIPTION**	
Laboratory Sample #	1288-00573-001		

WATER SAMPLE DATA

Date/Time Collected	Feb-03-14 / 3:00 pm	Volume Submitted (ml)	1000
Date/Time Lab Received	Feb-04-14 / 4:48 pm	Volume Filtered (ml)	15
Date/Time Filtered	Feb-04-14 / 5:20 pm	Filter & Pore Size	MCE 0.22
Date/Time Analyzed	Feb-13-14 / 8:15 am	UV/Ozone Treated:	NO

IDENTIFIED STRUCTURES (>10um)			
ASBESTOS		OTHER	
CHRYS	AMPH	AMBIG	NON-ASB
NSD	NSD	NSD	NSD

CALCULATED ASBESTOS STRUCTURE CONCENTRATION (>10um)		
CHRYS	AMPH	TOTAL
< 0.1 MFL	< 0.1 MFL	< 0.1 MFL

COMMENTS

No asbestos detected

Filter Loading: LIGHT

SAED Photo ID Nos.

TEM / ANALYTICAL PARAMETERS

Grid Openings Scanned at 10,000X	8	Analytical Sensitivity	0.1 MFL
Grid Opening Area (mm2)	0.0094	95% UCL	0.33 MFL
Scan Area (mm2)	0.0752	95% LCL	0 MFL

WATER SAMPLE LAB BLANK RESULTS

Lab ID#	Blank 9478	Analytical Sensitivity	0.01 MFL
Grid Openings Scanned at 10,000X	8	Asbestos Structure Concentration	<0.01 MFL
Volume Filtered (ml)	300		

NOTATION KEY

Chrys. - Chrysotile Asbestos
Amph. - Amphibole Asbestos
NSD - No Structures Detected
1 mm = 1 millimeter

1 um = 1 micron = 0.001 mm
MFL = Millions of Fibers per Liter
UCL = Upper Confidence Level
LCL = Lower Confidence Level

ANALYST SIGNATURE

Stephanie Dunn
LAB QC REVIEWER SIGNATURE

ASBESTOS TEM LABORATORIES, INC.
www.asbestostemlabs.com
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With Offices in Reno, NV (775) 359-3377

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14B0093 323883

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

Asbestos TEM Laboratories, Inc.
630 Bancroft Way
Berkeley, CA 94710
Phone :(510) 704-8930
Fax: (510) 704-8429
Terms: Net 30

Analysis	Due	Expires	Comments
14B0093-01 City Of Seaside #4 [Water] Sampled 02/03/14 15:00 Pacific			
Asbestos-DW SUB	02/18/14 12:00	02/05/14 15:00	
Containers Supplied:			
1L Amber- Unpres. (Y)	1L Amber- Unpres. (Z)		

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
[signature]	2-4-14	PTEM/RY	02-04-14 P04:48 IN
Released By	Date	Received By	Date

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February 21, 2014 Analytical Report for Service Request No: K1401158

David Pingatore
Alpha Analytical Laboratories, Inc.
6398 Dougherty Road, Suite 35
Dublin, CA 94568

RE: 14B0093

Dear David:

Enclosed are the results of the sample submitted to our laboratory on February 05, 2014. For your reference, these analyses have been assigned our service request number K1401158.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3293. You may also contact me via Email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Shar Samy, Ph.D.
Project Manager

SS/mj

RIGHT SOLUTIONS | RIGHT PARTNER

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2286
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L12-28
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Georgia DNR	http://www.gaepd.org/Documents/techguide_pcb.html#cel	881
Hawaii DOH	Not available	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
Indiana DOH	http://www.in.gov/isdh/24859.htm	C-WA-01
ISO 17025	http://www.pjlabs.com/	L12-27
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	3016
Maine DHS	Not available	WA0035
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-368
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA35
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA200001
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	4704427-08-TX
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C1203
Wisconsin DNR	http://dnr.wi.gov/	998386840
Wyoming (EPA Region 8)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.caslab.com or at the accreditation bodies web site

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

ALS ENVIRONMENTAL

Client:	Alpha Analytical Laboratories, Inc.	**Service Request No.:**	K1401158
Project:	14B0093	**Date Received:**	02/05/14
Sample Matrix:	Water		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS), and Laboratory Control Sample (LCS).

Sample Receipt

One water sample was received for analysis at ALS Environmental on 02/05/14. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4ºC upon receipt at the laboratory.

Explosives by EPA Method 8330

Sample Notes and Discussion:
Insufficient sample volume was received to perform a Matrix Spike/Matrix Spike Duplicate (MS/MSD). A Laboratory Control Sample/Duplicate Laboratory Control Sample (LCS/DLCS) was analyzed and reported in lieu of the MS/MSD.

No other anomalies associated with the analysis of this sample were observed.

Approved by_____

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14B0093

K1401158

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

ALS Environmental - Kelso
1317 S. 13th Ave
Kelso, WA 98626
Phone :(360) 577-7222
Fax: -
Terms: Net 30

Analysis	Due	Expires	Comments
14B0093-01 City Of Seaside #4 [Water] Sampled 02/03/14 15:00 Pacific			
8330B Explosives Water	02/18/14 12:00	02/10/14 15:00	
Containers Supplied:			
1L Amber- Unpres. (AD) 1L Amber- Unpres. (AE)			

☐ *Report to State*

System Name: _____ **Employed by:** _____

User ID: _____ **Sampler:** _____

System Number: _____

+QC

Released By	Date	Received By	Date
[illegible]	2-4-14	[illegible]	2/5/14 10:20
Released By	Date	Received By	Date

ALS

PC Shan

Cooler Receipt and Preservation Form

Client / Project: Alpha Service Request K14 01158

Received: 2/5/14 Opened: 2/5/14 By: Jan Unloaded: 2/5/14 By: Jan

1. Samples were received via? *Mail* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? _____

   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID → NA	Tracking Number NA	Filed
-0.9	-0.6	—	—	-0.1	308		1Z894250 01489473	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA Y N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

Page ____ *of* ____

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401158
Project:	14B0093	**Date Collected:**	02/03/2014
Sample Matrix:	Water	**Date Received:**	02/05/2014

Nitroaromatics and Nitramines (Explosives)

Sample Name:	14B0093-01 City of Seaside #4	**Units:**	ug/L
Lab Code:	K1401158-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.099	0.010	1	02/06/14	02/08/14	KWG1400979	
RDX	ND	U	0.099	0.017	1	02/06/14	02/08/14	KWG1400979	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/06/14	02/08/14	KWG1400979	
1,3-Dinitrobenzene	ND	U	0.099	0.0085	1	02/06/14	02/08/14	KWG1400979	
3,5-Dinitroaniline	ND	U	0.099	0.013	1	02/06/14	02/08/14	KWG1400979	
TETRYL	ND	U	0.10	0.042	1	02/06/14	02/08/14	KWG1400979	
Nitrobenzene	ND	U	0.099	0.013	1	02/06/14	02/08/14	KWG1400979	
4-Amino-2,6-dinitrotoluene	ND	U	0.099	0.016	1	02/06/14	02/08/14	KWG1400979	
2-Amino-4,6-dinitrotoluene	ND	U	0.099	0.0089	1	02/06/14	02/08/14	KWG1400979	
2,4,6-Trinitrotoluene	ND	U	0.099	0.026	1	02/06/14	02/08/14	KWG1400979	
2,6-Dinitrotoluene	ND	U	0.20	0.054	1	02/06/14	02/08/14	KWG1400979	
2,4-Dinitrotoluene	ND	U	0.099	0.0091	1	02/06/14	02/08/14	KWG1400979	
2-Nitrotoluene	ND	U	0.10	0.032	1	02/06/14	02/08/14	KWG1400979	
4-Nitrotoluene	ND	U	0.099	0.019	1	02/06/14	02/08/14	KWG1400979	
3-Nitrotoluene	ND	U	0.099	0.0064	1	02/06/14	02/08/14	KWG1400979	
Nitroglycerin	ND	U	0.99	0.39	1	02/06/14	02/08/14	KWG1400979	
Pentaerythritol Tetranitrate	ND	U	0.50	0.18	1	02/06/14	02/08/14	KWG1400979	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	90	23-98	02/08/14	Acceptable

Comments:

ALS Group USA, Corp. dba ALS Environmental

Analytical Results

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401158
Project:	14B0093	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Nitroaromatics and Nitramines (Explosives)

Sample Name:	Method Blank	**Units:**	ug/L
Lab Code:	KWG1400979-3	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	8330B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
HMX	ND	U	0.098	0.010	1	02/06/14	02/07/14	KWG1400979	
RDX	ND	U	0.098	0.017	1	02/06/14	02/07/14	KWG1400979	
1,3,5-Trinitrobenzene	ND	U	0.20	0.050	1	02/06/14	02/07/14	KWG1400979	
1,3-Dinitrobenzene	ND	U	0.098	0.0085	1	02/06/14	02/07/14	KWG1400979	
3,5-Dinitroaniline	ND	U	0.098	0.013	1	02/06/14	02/07/14	KWG1400979	
TETRYL	ND	U	0.10	0.042	1	02/06/14	02/07/14	KWG1400979	
Nitrobenzene	ND	U	0.098	0.013	1	02/06/14	02/07/14	KWG1400979	
4-Amino-2,6-dinitrotoluene	ND	U	0.098	0.016	1	02/06/14	02/07/14	KWG1400979	
2-Amino-4,6-dinitrotoluene	ND	U	0.098	0.0089	1	02/06/14	02/07/14	KWG1400979	
2,4,6-Trinitrotoluene	ND	U	0.098	0.026	1	02/06/14	02/07/14	KWG1400979	
2,6-Dinitrotoluene	**0.068**	JN	0.20	0.054	1	02/06/14	02/07/14	KWG1400979	
2,4-Dinitrotoluene	ND	U	0.098	0.0091	1	02/06/14	02/07/14	KWG1400979	
2-Nitrotoluene	ND	U	0.10	0.032	1	02/06/14	02/07/14	KWG1400979	
4-Nitrotoluene	ND	U	0.098	0.019	1	02/06/14	02/07/14	KWG1400979	
3-Nitrotoluene	ND	U	0.098	0.0064	1	02/06/14	02/07/14	KWG1400979	
Nitroglycerin	ND	U	0.98	0.39	1	02/06/14	02/07/14	KWG1400979	
Pentaerythritol Tetranitrate	ND	U	0.49	0.18	1	02/06/14	02/07/14	KWG1400979	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
1-Chloro-3-nitrobenzene	75	23-98	02/07/14	Acceptable

Comments:

Client: Alpha Analytical Laboratories, Inc. (Uki
Service Request: K1401158
Project: 14B0093
Sample Matrix: Water

Surrogate Recovery Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method: METHOD
Units: Percent
Analysis Method: 8330B
Level: Low

Sample Name	Lab Code	Sur1
14B0093-01 City of Seaside #4	K1401158-001	90
Method Blank	KWG1400979-3	75
Duplicate Lab Control Sample	KWG1400979-1	82
Lab Control Sample	KWG1400979-2	91

Surrogate Recovery Control Limits (%)

Sur1 = 1-Chloro-3-nitrobenzene 23-98

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client:	Alpha Analytical Laboratories, Inc. (Uki	**Service Request:**	K1401158
Project:	14B0093	**Date Extracted:**	02/06/2014
Sample Matrix:	Water	**Date Analyzed:**	02/07/2014

Lab Control Spike/Duplicate Lab Control Spike Summary
Nitroaromatics and Nitramines (Explosives)

Extraction Method:	METHOD	**Units:**	ug/L
Analysis Method:	8330B	**Basis:**	NA
		Level:	Low
		Extraction Lot:	KWG1400979

	Lab Control Sample KWG1400979-2 Lab Control Spike			Duplicate Lab Control Sample KWG1400979-1 Duplicate Lab Control Spike					
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**	**RPD**	**RPD Limit**
HMX	7.75	8.00	97	7.46	8.00	93	11-147	4	30
RDX	7.53	8.00	94	7.26	8.00	91	10-142	4	30
1,3,5-Trinitrobenzene	7.54	8.00	94	7.01	8.00	88	16-137	7	30
1,3-Dinitrobenzene	7.51	8.00	94	7.03	8.00	88	26-125	7	30
3,5-Dinitroaniline	7.48	8.00	93	7.09	8.00	89	30-133	5	30
TETRYL	7.71	8.00	96	7.26	8.00	91	29-123	6	30
Nitrobenzene	7.43	8.00	93	6.93	8.00	87	10-116	7	30
4-Amino-2,6-dinitrotoluene	7.57	8.00	95	7.11	8.00	89	55-117	6	30
2-Amino-4,6-dinitrotoluene	7.47	8.00	93	7.00	8.00	88	54-116	6	30
2,4,6-Trinitrotoluene	7.53	8.00	94	6.93	8.00	87	47-118	8	30
2,6-Dinitrotoluene	7.57	8.00	95	6.95	8.00	87	40-108	9	30
2,4-Dinitrotoluene	7.46	8.00	93	6.83	8.00	85	50-111	9	30
2-Nitrotoluene	7.18	8.00	90	6.55	8.00	82	12-110	9	30
4-Nitrotoluene	7.21	8.00	90	6.58	8.00	82	16-113	9	30
3-Nitrotoluene	7.51	8.00	94	6.83	8.00	85	13-109	10	30
Nitroglycerin	7.71	8.00	96	7.43	8.00	93	15-136	4	30
Pentaerythritol Tetranitrate	7.81	8.00	98	7.35	8.00	92	66-103	6	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ASBESTOS TEM LABORATORIES, INC.

EPA 600/4-83 Drinking Water
Transmission Electron Microscopy
Analytical Report

Laboratory Job # 1288-00573

630 Bancroft Way
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

Certified by
CA DPH ELAP
Lab No. 1866

Feb/13/2014

David S. Pingatore
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482

RE: LABORATORY JOB # 1288-00573
Transmission electron microscopy analytical results for 1 water sample(s).
Job Site: City of Seaside # 4
Job No.: 14B0093

Enclosed please find results for the TEM analysis of one or more water samples. The analytical procedures were performed according to EPA Method 100.2 for the analysis of asbestos in drinking water.

Prior to analysis, samples are checked for damage, disruption of any chain-of-custody seals, and completeness of accompanying paperwork. If no problems are found, samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

Preparation of water samples is performed within a HEPA filtered, Class 100 air, laminar flow clean bench environment. Prior to filtration, water sample containers are ultrasonicated, and the exterior surfaces cleaned. An aliquot of water is drawn from the sample container and drawn through a special filtration apparatus and collected onto a mixed cellulose ester (MCE) or polycarbonate (PC) filter. The filters are removed from the apparatus and dried. A portion of each sample filter is sectioned, placed onto a glass microscope slide, and carbon coated. The filters are further sectioned and placed carbon side up onto 200-mesh copper TEM sample grids in a solvent bath until all filter material is dissolved. The TEM grids are removed and placed into labeled grid storage boxes.

TEM analysis is performed on a Philips EM-300 or CM-12 transmission electron microscope operating at 80 or 100 kV. Initially, the grid is scanned at low and medium magnification to insure proper sample loading, and coherence of the carbon support film. Then TEM grid openings are analyzed at a magnification of 10,000X. All fibers >10 um in length and exhibiting an aspect ratio >3:1 are analyzed. Scanning continues until either 100 asbestiform fibers >10um in length are counted, or an analytical sensitivity of 0.2 million fibers per liter (MFL) is achieved. Analyzed fibers are subjected to detailed morphological and selected area diffraction (SAED) analysis. Fibers indicated as asbestos, or potentially asbestos, are further analyzed by energy dispersive X-ray (EDX) analysis as needed. The number of asbestos fibers detected, and other analytical parameters, are then used to calculate the concentration of asbestos in MFL. The results are entered into a standard report format and reviewed by the analyst and the laboratory manager before release to the client.

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

630 Bancroft Way ▪ BERKELEY, CA 94710 ▪ (510) 704-8930 ▪ FAX (510) 704-8429
www.asbestostemlabs.com *With Offices in Reno, NV (775) 359-3377*

TRANSMISSION ELECTRON MICROSCOPY ANALYTICAL REPORT

Contact:	David S. Pingatore		
Address:	Alpha Analytical Laboratories, Inc. 208 Mason Street Ukiah, CA 95482	Report No.:	**323883**
		Date:	Feb-13-14
		Total Samples Analyzed:	1
Job Site / No.	City of Seaside # 4 14B0093	Sample Collector:	

CLIENT SAMPLE # **14B0093-01**

Laboratory Sample # 1288-00573-001

SAMPLE LOCATION/DESCRIPTION

WATER SAMPLE DATA

Date/Time Collected	Feb-03-14 / 3:00 pm	Volume Submitted (ml)	1000
Date/Time Lab Received	Feb-04-14 / 4:48 pm	Volume Filtered (ml)	15
Date/Time Filtered	Feb-04-14 / 5:20 pm	Filter & Pore Size	MCE 0.22
Date/Time Analyzed	Feb-13-14 / 8:15 am	UV/Ozone Treated:	NO

IDENTIFIED STRUCTURES (>10um)			
ASBESTOS		OTHER	
CHRYS	AMPH	AMBIG	NON-ASB
NSD	NSD	NSD	NSD

CALCULATED ASBESTOS STRUCTURE CONCENTRATION (>10um)		
CHRYS	AMPH	TOTAL
< 0.1 MFL	< 0.1 MFL	< 0.1 MFL

COMMENTS

No asbestos detected

Filter Loading: LIGHT

SAED Photo ID Nos.

TEM / ANALYTICAL PARAMETERS

Grid Openings Scanned at 10,000X	8	Analytical Sensitivity	0.1 MFL
Grid Opening Area (mm2)	0.0094	95% UCL	0.33 MFL
Scan Area (mm2)	0.0752	95% LCL	0 MFL

WATER SAMPLE LAB BLANK RESULTS

Lab ID#	Blank 9478	Analytical Sensitivity	0.01 MFL
Grid Openings Scanned at 10,000X	8	Asbestos Structure Concentration	<0.01 MFL
Volume Filtered (ml)	300		

NOTATION KEY

Chrys. - Chrysotile Asbestos
Amph. - Amphibole Asbestos
NSD - No Structures Detected
1 mm = 1 millimeter

1 um = 1 micron = 0.001 mm
MFL = Millions of Fibers per Liter
UCL = Upper Confidence Level
LCL = Lower Confidence Level

ANALYST SIGNATURE

Stephanie Dunn

LAB QC REVIEWER SIGNATURE

ASBESTOS TEM LABORATORIES, INC. 630 BANCROFT WAY, BERKELEY, CA 94710 (510) 704-8930
www.asbestostemlabs.com
With Offices in Reno, NV (775) 359-3377

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Report Date: 02/24/14 10:55
Received Date: 02/05/14 08:30
Turnaround Time: Normal

Project: 14B0093

Phones: (925) 872-9637
Fax: (707) 468-5267

P.O. #:

Attn: David S. Pingatore

Client: Alpha Analytical Laboratories - Ukiah
208 Mason St
Ukiah, CA 95482

Dear David S. Pingatore :

Enclosed are the results of analyses for samples received 2/5/2014 with the Chain of Custody document. The samples were received in good condition, at 1.7 °C and on ice. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Lab Sample ID: 4B05036-01 **Sample ID: 14B0093-01 City of Seaside #4** **Matrix:** Water
Sampled by: Client **Sampled: 02/03/14 15:00**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
N-Nitrosodiethylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 23:25	W4B0362	
N-Nitrosodimethylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 23:25	W4B0362	
N-Nitrosodi-n-butylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 23:25	W4B0362	
N-Nitrosodi-n-propylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 23:25	W4B0362	
N-Nitrosomethylethylamine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 23:25	W4B0362	
N-Nitrosomorpholine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 23:25	W4B0362	
N-Nitrosopiperidine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 23:25	W4B0362	
N-Nitrosopyrrolidine	ND		2.0	ng/l	1	EPA 1625M	2/10/14	2/11/14 23:25	W4B0362	
17-a-Ethynylestradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:36	W4B0281	
17-b-Estradiol	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:36	W4B0281	
Estrone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:36	W4B0281	
Progesterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:36	W4B0281	
Testosterone	ND		1.0	ng/l	1	EPA 1694M-APCI	2/7/14	2/19/14 20:36	W4B0281	
Bisphenol A	**9.0**		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 1:02	W4B0283	
Gemfibrozil	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 1:02	W4B0283	
Ibuprofen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 1:02	W4B0283	
Iopromide	ND		5.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 1:02	W4B0283	
Naproxen	ND		1.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 1:02	W4B0283	
Salicylic Acid	**52**		50	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 1:02	W4B0283	
Triclosan	ND		2.0	ng/l	1	EPA 1694M-ESI-	2/7/14	2/15/14 1:02	W4B0283	

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Lab Sample ID: 4B05036-01 **Sample ID: 14B0093-01 City of Seaside #4** **Matrix:** Water
Sampled by: Client **Sampled: 02/03/14 15:00**

Analyte	Result	MDL	MRL	Units	Dil	Method	Prepared	Analyzed	Batch	Qualifier
Acetaminophen	ND		20	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Amoxicillin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Atenolol	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Atorvastatin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Azithromycin	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Caffeine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Carbamazepine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Ciprofloxacin	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Cotinine	ND		2.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
DEET	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Diazepam	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Fluoxetine	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Meprobamate	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Methadone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Oxybenzone	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Phenytoin	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Primidone	ND		10	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	R-01
Sucralose	ND		5.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Sulfamethoxazole	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
TCEP	**6.7**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
TCPP	**5.2**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	B
TDCPP	**1.1**		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	
Trimethoprim	ND		1.0	ng/l	1	EPA 1694M-ESI+	2/7/14	2/19/14 1:27	W4B0282	

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Quality Control Section

Nitrosamines by isotopic dilution GC/MS CI Mode - Quality Control

Batch W4B0362 - EPA 1625M

Blank (W4B0362-BLK1) — **Prepared: 02/10/14 Analyzed: 02/11/14 19:08**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		4.01	B-06	ng/l					
N-Nitrosomethylethylamine		ND		ng/l					
N-Nitrosodiethylamine		ND		ng/l					
N-Nitrosodi-n-propylamine		ND		ng/l					
N-Nitrosomorpholine		ND		ng/l					
N-Nitrosopyrrolidine		ND		ng/l					
N-Nitrosopiperidine		ND		ng/l					
N-Nitrosodi-n-butylamine		ND		ng/l					

LCS (W4B0362-BS1) — **Prepared: 02/10/14 Analyzed: 02/11/14 19:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		2.87		ng/l	3.00	96	50-150		
N-Nitrosomethylethylamine		2.86		ng/l	3.00	95	50-150		
N-Nitrosodiethylamine		2.97		ng/l	3.00	99	50-150		
N-Nitrosodi-n-propylamine		3.77		ng/l	3.00	126	50-150		
N-Nitrosomorpholine		2.95		ng/l	3.00	98	50-150		
N-Nitrosopyrrolidine		3.15		ng/l	3.00	105	50-150		
N-Nitrosopiperidine		3.42		ng/l	3.00	114	50-150		
N-Nitrosodi-n-butylamine		5.24	Q-08	ng/l	3.00	175	50-150		

LCS Dup (W4B0362-BSD1) — **Prepared: 02/10/14 Analyzed: 02/11/14 20:05**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
N-Nitrosodimethylamine		2.81		ng/l	3.00	94	50-150	2	30
N-Nitrosomethylethylamine		3.25		ng/l	3.00	108	50-150	13	30
N-Nitrosodiethylamine		4.22	Q-12	ng/l	3.00	141	50-150	35	30
N-Nitrosodi-n-propylamine		3.89		ng/l	3.00	130	50-150	3	30
N-Nitrosomorpholine		3.41		ng/l	3.00	114	50-150	15	30
N-Nitrosopyrrolidine		4.24		ng/l	3.00	141	50-150	29	30
N-Nitrosopiperidine		3.84		ng/l	3.00	128	50-150	12	30
N-Nitrosodi-n-butylamine		6.63	Q-08	ng/l	3.00	221	50-150	23	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		ND		ng/l					
Caffeine		ND		ng/l					
Sulfamethoxazole		ND		ng/l					
Trimethoprim		ND		ng/l					
Azithromycin		ND		ng/l					
Cotinine		ND		ng/l					

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

Blank (W4B0282-BLK1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:39**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Atenolol		ND		ng/l					
Ciprofloxacin		ND		ng/l					
Carbamazepine		ND		ng/l					
DEET		ND		ng/l					
Fluoxetine		ND		ng/l					
Atorvastatin		ND		ng/l					
Methadone		ND		ng/l					
Primidone		ND		ng/l					
Diazepam		ND		ng/l					
TCPP		2.23	B	ng/l					
TCEP		ND		ng/l					
TDCPP		ND		ng/l					
Phenytoin		ND		ng/l					
Amoxicillin		ND		ng/l					
Meprobamate		ND		ng/l					
Sucralose		ND		ng/l					
Oxybenzone		ND		ng/l					

LCS (W4B0282-BS1) — **Prepared: 02/07/14 Analyzed: 02/18/14 22:53**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		435		ng/l	400	109	66-156		
Caffeine		17.4		ng/l	20.0	87	55-152		
Sulfamethoxazole		17.6		ng/l	20.0	88	60-133		
Trimethoprim		18.6		ng/l	20.0	93	67-139		
Azithromycin		199		ng/l	200	100	52-166		
Cotinine		22.6		ng/l	20.0	113	68-155		
Atenolol		21.0		ng/l	20.0	105	56-164		
Ciprofloxacin		83.8		ng/l	100	84	51-168		
Carbamazepine		19.3		ng/l	20.0	96	60-135		
DEET		15.5		ng/l	20.0	78	45-135		
Fluoxetine		23.8		ng/l	20.0	119	55-150		
Atorvastatin		16.3		ng/l	20.0	82	0.1-173		
Methadone		19.0		ng/l	20.0	95	62-137		
Primidone		17.1		ng/l	20.0	86	54-147		
Diazepam		18.3		ng/l	20.0	92	58-127		
TCPP		18.1		ng/l	20.0	90	24-149		
TCEP		17.5		ng/l	20.0	88	25-149		
TDCPP		17.7		ng/l	20.0	88	20-158		
Phenytoin		18.2		ng/l	20.0	91	69-138		
Amoxicillin		164		ng/l	200	82	14-167		
Meprobamate		20.5		ng/l	20.0	102	11-166		
Sucralose		95.7		ng/l	100	96	50-150		
Oxybenzone		15.4		ng/l	20.0	77	50-150		

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PPCPs - Pharmaceuticals by LC/MSMS-ESI+ - Quality Control

Batch W4B0282 - EPA 1694M-ESI+

LCS Dup (W4B0282-BSD1) — **Prepared: 02/07/14 Analyzed: 02/18/14 23:07**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Acetaminophen		499		ng/l	400	125	66-156	14	30
Caffeine		18.2		ng/l	20.0	91	55-152	4	30
Sulfamethoxazole		19.4		ng/l	20.0	97	60-133	10	30
Trimethoprim		18.4		ng/l	20.0	92	67-139	1	30
Azithromycin		206		ng/l	200	103	52-166	3	30
Cotinine		26.7		ng/l	20.0	134	68-155	17	30
Atenolol		23.0		ng/l	20.0	115	56-164	9	30
Ciprofloxacin		83.4		ng/l	100	83	51-168	0.5	30
Carbamazepine		19.7		ng/l	20.0	98	60-135	2	30
DEET		16.4		ng/l	20.0	82	45-135	6	30
Fluoxetine		22.8		ng/l	20.0	114	55-150	4	30
Atorvastatin		15.1		ng/l	20.0	76	0.1-173	8	30
Methadone		19.1		ng/l	20.0	96	62-137	0.5	30
Primidone		16.2		ng/l	20.0	81	54-147	5	30
Diazepam		18.9		ng/l	20.0	94	58-127	3	30
TCPP		21.0		ng/l	20.0	105	24-149	15	30
TCEP		20.6		ng/l	20.0	103	25-149	16	30
TDCPP		18.9		ng/l	20.0	94	20-158	7	30
Phenytoin		18.4		ng/l	20.0	92	69-138	1	30
Amoxicillin		164		ng/l	200	82	14-167	0	30
Meprobamate		20.6		ng/l	20.0	103	11-166	0.5	30
Sucralose		93.0		ng/l	100	93	50-150	3	30
Oxybenzone		18.3		ng/l	20.0	92	50-150	17	30

PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

Blank (W4B0283-BLK1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:08**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		1.99	B	ng/l					
Gemfibrozil		ND		ng/l					
Ibuprofen		ND		ng/l					
Naproxen		ND		ng/l					
Salicylic Acid		ND		ng/l					
Triclosan		ND		ng/l					
Iopromide		ND		ng/l					

LCS (W4B0283-BS1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:22**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		19.5		ng/l	20.0	98	53-168		
Gemfibrozil		18.0		ng/l	20.0	90	76-122		
Ibuprofen		17.7		ng/l	20.0	88	67-139		
Naproxen		17.3		ng/l	20.0	86	64-138		
Salicylic Acid		171		ng/l	200	86	56-229		

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PPCPs - Pharmaceuticals by LC/MSMS-ESI- - Quality Control

Batch W4B0283 - EPA 1694M-ESI-

LCS (W4B0283-BS1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:22**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Triclosan		38.9		ng/l	40.0	97	76-139		
Iopromide		114		ng/l	100	114	0.1-163		

LCS Dup (W4B0283-BSD1) — **Prepared: 02/07/14 Analyzed: 02/14/14 22:37**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
Bisphenol A		18.4		ng/l	20.0	92	53-168	6	30
Gemfibrozil		18.3		ng/l	20.0	92	76-122	2	30
Ibuprofen		19.8		ng/l	20.0	99	67-139	11	30
Naproxen		19.1		ng/l	20.0	96	64-138	10	30
Salicylic Acid		183		ng/l	200	92	56-229	7	30
Triclosan		40.5		ng/l	40.0	101	76-139	4	30
Iopromide		104		ng/l	100	104	0.1-163	9	30

PPCPs - Hormones by LC/MSMS-APCI - Quality Control

Batch W4B0281 - EPA 1694M-APCI

Blank (W4B0281-BLK1) — **Prepared: 02/07/14 Analyzed: 02/19/14 16:58**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		ND		ng/l					
17-b-Estradiol		ND		ng/l					
Estrone		ND		ng/l					
Progesterone		ND		ng/l					
Testosterone		ND		ng/l					

LCS (W4B0281-BS1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:15**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		19.1		ng/l	20.0	96	68-159		
17-b-Estradiol		18.0		ng/l	20.0	90	65-146		
Estrone		17.6		ng/l	20.0	88	59-141		
Progesterone		17.8		ng/l	20.0	89	58-154		
Testosterone		24.8		ng/l	20.0	124	60-172		

LCS Dup (W4B0281-BSD1) — **Prepared: 02/07/14 Analyzed: 02/19/14 17:31**

Analyte	Sample Result	QC Result	Qualifier	Units	Spike Level	%REC	%REC Limits	RPD	RPD Limit
17-a-Ethynylestradiol		18.9		ng/l	20.0	94	68-159	1	30
17-b-Estradiol		18.4		ng/l	20.0	92	65-146	2	30
Estrone		18.3		ng/l	20.0	92	59-141	4	30
Progesterone		18.1		ng/l	20.0	90	58-154	2	30
Testosterone		26.0		ng/l	20.0	130	60-172	5	30

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Notes:
The Chain of Custody document is part of the analytical report.
Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
All results are expressed on wet weight basis unless otherwise specified.

An Absence of Total Coliform meets the drinking water standards as established by the State of California Department of Health Services.
The Reporting Limit (RL) is referenced as laboratory's Practical Quantitation Limit (PQL).
For Potable water analysis, the Reporting Limit (RL) is referenced as Detection Limit for reporting purposes (DLRs) defined by EPA.

If sample collected by Weck Laboratories, sampled in accordance to lab SOP MIS002

Authorized Signature
Contact: Kim G Tu
(Project Manager)

ELAP # 1132
LACSD # 10143
NELAC # 04229CA

The results in this report apply to the samples analyzed in accordance with the chain of custody document. Weck Laboratories certifies that the test results meet all requirements of NELAC unless noted in the Case Narrative. This analytical report must be reproduced in its entirety.

Flags for Data Qualifiers:

B	Blank contamination. The analyte was found in the associated blank as well as in the sample.
B-06	This analyte was found in the method blank, which was possibly contaminated during sample preparation. The batch was accepted since this analyte was either not detected or more than 10 times of the blank value for all the samples in the batch.
Q-08	High bias in the QC sample does not affect sample result since analyte was not detected or below the reporting limit.
Q-12	The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on the percent recoveries and/or other acceptable QC data.
R-01	The Reporting Limit for this analyte has been raised to account for matrix interference.
ND	NOT DETECTED at or above the Reporting Limit. If J-value reported, then NOT DETECTED at or above the Method Detection Limit (MDL).
Sub	Subcontracted analysis, original report enclosed.
DL	Method Detection Limit
RL	Method Reporting Limit
MDA	Minimum Detectable Activity
NR	Not Reportable

Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634
www.wecklabs.com

ISOTECH
ISOTECH LABORATORIES INC

ANALYSIS REPORT

Water Analysis

Lab Number: 410669 Job Number: 24232 IS-69368

Sample Name: CITY OF SEASIDE #4

Company Lab #:

Company Job #:

Company: Alpha Analytical, Inc.

API/Well:

Field or Site: WO 14B0093

Location:

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Date Sampled: 2/03/2014 Date Received 2/05/2014 Date Reported: 2/26/2014

δD of water	----------	na
$\delta^{18}O$ of water	----------	na
Tritium content of water	----------	0.70 ± 0.15 TU
$\delta^{13}C$ of DIC	----------	na
^{14}C content of DIC	----------	na
$\delta^{15}N$ of nitrate	----------	na
$\delta^{18}O$ of nitrate	----------	na
$\delta^{34}S$ of sulfate	----------	na
$\delta^{18}O$ of sulfate	----------	na

Remarks:

LABORATORY REPORT

This report contains ___7___ pages.
(including the cover page)

If you have any questions concerning this report, please do not hesitate to call us at (800) 332-4345 or (574) 233-4777.

This report may not be reproduced, except in full, without written approval from UL.

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

NELAC NARRATIVE PAGE

Client: Alpha Analytical Report #: 311111NP

Underwriters Laboratories is a NELAP accredited laboratory. All reported results meet the requirements of the NELAC standards, unless otherwise noted.

UL contact person: James Van Fleit

NELAP requires complete reporting of deviations from method requirements, regardless of the suspected impact on the data. Quality control failures not reported within the report summary are noted here.

There were no quality control failures.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature Title Date

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Laboratory Report

Client:	Alpha Analytical	Report:	311111
Attn:	David Pingatore 6398 Dougherty Road, Suite 35 Dublin, CA 94568	Priority:	Standard Written
		Status:	Final
		PWS ID:	Not Supplied

Copies to: None

Sample Information

UL ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
2968100	14B0093-01	905.0	02/03/14 15:00	Client	02/06/14 09:45
2968101	14B0093-01	7500-Ra B	02/03/14 15:00	Client	02/06/14 09:45
2968101	14B0093-01	7500-Ra D	02/03/14 15:00	Client	02/06/14 09:45
2968102	14B0093-01	7110 B	02/03/14 15:00	Client	02/06/14 09:45
2968103	14B0093-01	1613	02/03/14 15:00	Client	02/06/14 09:45
2968104	14B0093-01	300.0	02/03/14 15:00	Client	02/06/14 09:45
2968105	14B0093-01	300.1	02/03/14 15:00	Client	02/06/14 09:45

Report Summary

Note: See attached page for additional comments.

Note: Sample containers were provided by the client except for Methods 300.0 and 300.1.

Note: Strontium-90 analysis was performed by General Engineering Laboratories, Charleston, SC.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call James Van Fleit at (574) 233-4777.

Note: This report may not be reproduced, except in full, without written approval from UL. UL is accredited by the National Environmental Laboratory Accreditation Program (NELAP).

Authorized Signature | Title | Date

Client Name: Alpha Analytical
Report #: 311111

UL LLC
110 S. Hill St., South Bend, IN 46617-2702 USA
T: 800.332.4345 / F: 574.233.8207 / W: UL.com

Client Name: Alpha Analytical

Report #: 311111

Sampling Point: 14B0093-01

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	UL ID #
14998-27-7	Chlorite	300.0	1000 *	20	< 20	ug/L	---	02/07/14 03:49	2968104
15541-45-4	Bromate	300.1	10 *	5.0	< 5.0	ug/L	---	02/07/14 17:44	2968105

Radionuclides

Analyte ID #	Analyte	Method	Reg Limit	DL**	Result	Units	Preparation Date	Analyzed	UL ID #
---	Gross Alpha	7110 B	15 *	3.00	0.29 ± 0.39	pCi/L	02/24/14 09:07	02/27/14 13:25	2968102
---	Gross Beta	7110 B	50 *	4.0	1.4 ± 0.5	pCi/L	02/24/14 09:07	02/27/14 13:25	2968102
13982-63-3	Radium-226	7500-Ra B	3 *	1.00	0.48 ± 0.46	pCi/L	02/21/14 09:22	02/27/14 15:45	2968101
15262-20-1	Radium-228	7500-Ra D	2 *	1.00	0.11 ± 0.38	pCi/L	02/21/14 09:22	03/03/14 14:08	2968101
---	Combined Radium	calc.	5 *	1.00	0.59 ± 0.60	pCi/L	02/21/14 09:22	03/03/14 14:08	2968101

** Detection Limit (DL) shall be that concentration which can be counted with a precision of plus or minus 100% at the 95 % confidence level.

Semi-volatile Organic Chemicals

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	UL ID #
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-Dioxin	1613	30 *	5.0	< 5.0	pg/L	02/12/14 07:40	02/13/14 20:38	2968103

Reference Lab Tests

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed	UL ID #
---	Strontium-90	905.0	8 *	2.00	**0.339 ± 0.692**	pCi/L	---	02/21/14 14:23	2968100

† UL has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

SUBCONTRACT ORDER

Alpha Analytical Laboratories, Inc.

14B0093

250324

311111

SENDING LABORATORY:

Alpha Analytical Laboratories, Inc.
208 Mason St.
Ukiah, CA 95482
Phone: (707)468-0401
Fax: (707)468-5267
Project Manager: David S. Pingatore

RECEIVING LABORATORY:

UL Drinking Water Laboratory
110 South Hill Street
South Bend, IN 46617
Phone :(574) 472-5535
Fax: (574) 233-8207
Terms: Net 30

Analysis	Due	Expires	Comments
14B0093-01 City Of Seaside #4 [Water] Sampled 02/03/14 15:00 Pacific			
Strontium 90	02/18/14 12:00	08/02/14 15:00 (4)	pH<2 2968100
Radium 226 & 228	02/18/14 12:00	08/02/14 15:00	101
Gross Alpha & Beta	02/18/14 12:00	08/02/14 15:00	102
Dioxin 2378 TCDD Aq 1613	02/18/14 12:00	02/03/15 15:00 (2)	103
Chlorite 300.0	02/18/14 12:00	02/17/14 15:00 (1)	104
Bromate 300.1	02/18/14 12:00	03/03/14 15:00 (1)	105

Containers Supplied:

1L Amber- Unpres. (AB) 1L Amber- Unpres. (AC) 1L Poly - HNO3 (AJ) 1L Poly - HNO3 (AK) 1L Poly - HNO3 (AL)
500 mL Poly HNO3 (AM) 250 mL Poly EDA (AN) 250 mL Poly EDA (AO)

☐ *Report to State*

System Name: _____ Employed by: _____

User ID: _____ Sampler: _____

System Number: _____

+2C

Client Provided Sample Container Radn + Dioxin only

Wd in 0.2 ft

Released By	Date	Received By	Date
[signature]	2-4-14	Kellen Dupont	2.6.2014 0945
Released By	Date	Received By	Date

Underwriters Laboratories
110 South Hill Street
South Bend, IN 46617
800-332-4345
574-233-8207 fax

REC - Subcontractor Laboratory Request Form

Reference Lab Name: GEL Laboratories
Address: 2040 Savage Rd
City, State, Zip: Charleston, SC 29407
Telephone Number: 843-556-8171

Total Sent: 1
Shipping Method: SAVER
UL Contact Name: VANFleit

Reference Lab: This form must be returned by fax to 574-233-8207 (Attn: OTD Coordinator) upon receipt of samples. Note any discrepencies in the number of samples received, analyses requested, sample condition upon receipt, ID discrepencies, or price in the Reference Lab Notes section at the bottom of this form.

Result sheets must be faxed to 574-233-8207 (Attn: OTD Coordinator) upon completion of analysis. All sample charges may be billed to the VISA card on file.

UL Order #	UL Batch #	UL Sample ID#	Matrix	Collection Date	Collection Time	State of Origin	QC Criteria (circle one)	Analysis Requested	Price	UL-PM
250324	311111	2968100	DW	2-3-2014	1500	CA	NELAC / State compliance / non-compliance	STRONTium 90		
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			
							NELAC / State compliance / non-compliance			

Reference Lab Notes:

Relinquished from UL By: _____ Date/Time: _____

Matrix: DW, RW, GW, SW, BW, EW, PW, WW

Received by Reference Lab By: _____ Date/Time: _____

David S. Pingatore
Project Manager
Alpha Analytical Laboratories, Inc.
208 Mason Street
Ukiah, CA 95482
Tel: 707.468.0401
Fax: 707.468.5267
Project: 14B0093
Email: david @ alpha.com

Dr. Yi Wang
Director of ZymaX Forensics Isotope
Senior Environmental Geochemist, PACE
600 S. Andreasen Dr., Suite B
Escondido, CA 92029
Tel: 760.781.3338 ext 202
Fax: 760.781.3339
Cell: 609.721.2843
Email: yi.wang@zymaxusa.com

REPORT OF ENVIRONMENTAL FORENSICS ISOTOPE ANALYSES

Date Received: February 5th, 2014
Date Reported: March 20th, 2014

Sample from Alpha Analytical Labs for $\delta^{15}N$ (‰ Air), $\delta^{18}O$ and δD (‰ VSMOW) stable isotope analysis

ZymaX ID	Client ID/Sample Description	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
43454-1	14B0093-01 City of Seaside #4	-6.62	-44.27	1.4	0.7
	Analytical precision (1σ)	0.06	0.32	0.2	0.4

ZymaX ID	$\delta^{18}O_{H2O}$	δD_{H2O}	$\delta^{15}N_{NO3}$	$\delta^{18}O_{NO3}$
QC-01	-5.89	-41.12	4.5	25.3
QC-02	-5.98	-41.57	4.8	25.9
Mean	-5.94	-41.35	4.7	25.6
Analytical Precision (1σ)	0.06	0.32	0.2	0.4

ZymaX Forensics Isotope Services

Product or Dissolved Organics: Chlorinated Solvents, Oil, Extract, Fraction and Kerogen
3D-CSIA of ^{13}C, ^{37}Cl, and ^{2}H for PCE, TCE, DCE, MTBE, BTEX, PAHs, Pesticides, Alkanes, Gasoline and Oil; Bulk ^{13}C, ^{2}H, ^{18}O, ^{34}S, and ^{15}N
Gas Sample
Gas Composition and 2D-CSIA of ^{13}C and ^{2}H of C1 to C5; ^{13}C of CO_2; ^{14}C of C1 and CO_2; ^{34}S of H_2S; ^{15}N and ^{18}O of N_2O gas
Water and Dissolved Inorganics
^{2}H, ^{3}H and ^{18}O; ^{34}S and ^{18}O of dissolved sulfate; ^{34}S of dissolved H_2S
^{15}N and ^{18}O of dissolved Nitrate; ^{15}N of Ammonia; ^{13}C of dissolved CO_2 and Carbonate/Bicarbonate
Soil and Minerals
^{13}C, ^{18}O, ^{15}N, ^{34}S, D/H; ^{14}C of carbonate or organics
Post-Analysis Forensic Isotope Data Interpretation

Laboratory Order - Summary

analytical chemistry for a better environment

Report To:	David S. Pingatore Alpha Analytical Laboratories, Inc. 208 Mason St. Ukiah, CA. 95482	Date Received: Date Due: Project:	02/05/2014 04/28/2014 14B0093	9:05AM 12:00AM
Phone: Fax:	(707) 468-0401 (707) 468-5267	Project Number:		

Lab Number	Description	Analysis	Dept
43454-1	14B0093-01 City of Seaside #4	d15N and d18O of NO3	M6
		d18O+dD of H2O	M6

Notes/Special Instructions	SC Login/Computer Login CY/CY	DPRA PM: YW

ZymaX FORENSICS

Condition Upon Reciept

Lab Number: 43454 Client: AAL

Sample Temprature (should be 2-6 degrees C): 1.9°C

Do the sample descriptions on the containers match the discriptions on the COC? ☒ Yes ☐ No

Do the sample dates on the containers match the sample dates on the COC? ☒ Yes ☐ No

Are the samples within holding time for each analysis at time of reciept? ☒ Yes ☐ No ☐ N/A

Do the number of containers received match the number listed on the COC, and are all of the necessary containers for the required analysis available? ☒ Yes ☐ No ☐ N/A

Does the preservation of the samples match the notation on the COC, and is the preservation correct for requested analysis? ☐ Yes ☐ No ☐ N/A ☒ Zymax

Are all of the samples intact with no headspace, if required for analysis? ☒ Yes ☐ No

Did samples arrive with custody seal intact? ☒ Yes ☐ No ☐ N/A

Sample Control Signature: [signature] Date: 2/5/14 Time: 9:05

Client Discrepancies

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Contacted: _____ Date: _____ Sample Control Initials: _____

Discrepancy: _____

Solution: _____

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14B0093

Report to:	Invoice to (if different):	Project Info for Report:
Company: Todd Engineers	Company:	Project ID: Groundwater Reuse Project
Attn: Dr. Bill Motzer	Attn:	
Address: 2490 Mariner Square Loop, Suite 215 Alameda, CA 94501	Address:	Project No: Project # 60408
Phone/Fax: 510.747.6920 / 510.747.6921	Phone/Fax:	PO/Reference :
Email Address: bmotzer@toddengineers.com	Email Address:	

Samplers Signature: [signature]
Print: Jon Cutiz

Signature below authorizes work under terms stated on reverse side.

TAT: 10 days ● RUSH: 5 days ○ 48 hours ○ Other: ___days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only): Temperature: 4.2 1.9 deg. C; Shipment Method:; Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	Container: 40ml VOA	Poly	Amber glass	Soil jar		Preservative: NaOH	HNO3	H2SO4	Other	None	Matrix: Water	Soil		Total Number of Containers	Analyses Requested: Inorganics Scan, DU-General Physical Scan	200.7 - Ca, K, Mg, Na	200.8 - Ag, B, Cu, Fe, Mn, U, V, Zn	Bicarbonate, Chloride, Conductivity	MBAS, Perchlorate, TDS, Sulfate	HAA5, TOC	507, 508, 515, 525 DHS, 531, 547, 548, 549	504.1, 524.2 Sample Traps scan	Asbestos DW (sub TEM Lab)	Cr6 218.6 DW (sub MAI) - DU Refer	Dioxin 2,3,7,8 TCDD DW (sub UL)	Sample Notes or CDPH Source Numbers:
City of Seaside #4	2-3-14	1500		x	x			x	x			x	x			4	x	x	x	x	x							
			x		x						x		x			3						x						
				x	x						x	x	x			10							x					(507/508/515.1 = one 1L BRA ea)
			x								x		x			7								x				
					x							x	x			2									x			
				x							x		x			1										x		
					x							x	x			2											x	
Trip blank ($0.00 analysis)	2-3-14		x								x	x	x			2								x				

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	2-3-14	15:10
[signature]	[signature]	2-3-14	1700
[signature]	[signature]	2-3-14	1850
[signature]	LAB [signature]	2-3-14	2130

CDPH Write On EDT Transmission? ○ Yes ○ No

State System Number:

If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No

Global ID: Sampling Company Log Code:

EDF to (Email Address):

Travel and Site Time: Mileage: Misc. Supplies:

Alpha Analytical Laboratories Inc.
e-mail: clientservices@alpha-labs.com

Laboratory & Corporate: 208 Mason Street, Ukiah, CA 95482
707-468-0401 Fax: 707-468-5267

Service Center & Micro Lab: 6398 Dougherty Rd, Ste 35, Dublin, CA 94568
925-828-6226 Fax: 925-828-6309

Chain of Custody Record

Reports and Invoices will be delivered by email in .pdf format.

Lab No. 14B0093

Report to:
Company: Todd Engineers
Attn: Dr. Bill Motzer
Address: 2490 Mariner Square Loop, Suite 215, Alameda, CA 94501
Phone/Fax: 510.747.6920 / 510.747.6921
Email Address: bmotzer@toddengineers.com

Invoice to (if different):
Company:
Attn:
Address:
Phone/Fax:
Email Address:

Project Info for Report:
Project ID: Groundwater Reuse Project
Project No: Project # 60408
PO/Reference :

Samplers Signature:
Print: Jose Ortiz

Signature below authorizes work under terms stated on reverse side.

TAT: 10 days ● / RUSH: 5 days ○ / 48 hours ○ / Other: ___days ○

Lab Approval Required For Rush TATs

Sample Notes (lab use only): Temperature: 4 deg. C; Shipment Method:; Custody Seals: Y / N

Sample Identification	Sampled: Date	Sampled: Time	Container: 40ml VOA	Poly	Amber glass	Soil jar	Preservative: HCL	HNO3	H2SO4	Other	None	Matrix: Water	Soil	Total Number of Containers	8330B Explosives (sub ALS)	PPCP Hormones 1694M (sub Weck)	PPCP Negative Pharmas 1694M (sub Weck)	PPCP Positive Pharmas 1694M (sub Weck)	Nitrosamines LL 1625M (sub Weck)	Gross A & B, R226 &R228, Sr 90 (sub UL)	Bromate 300.1, Chlorite 300.0 (sub UL)	Tritium, Enriched (sub Isotech)	Oxygen 18 Isotope (sub Zymax)	N and O Isotopes of NO3 (sub Zymax)	j-flag MDL reporting + Standard excel EDD	Sample Notes or CDPH Source Numbers:
City of Seaside #4	2-3-14	1506			x						x	x		2	x											
					x					x		x		2		x	x	x							x	
					x						x	x		2					x							
				x				x				x		4						x						
				x						x		x		2							x					
				x							x	x		1								x				
				x							x	x		1									x			
				x							x	x		1										x		

Relinquished by:	Received by:	Date:	Time:
[signature]	[signature]	2-3-14	15:10
[signature]	[signature]	2-3-14	1850
[signature]	[signature]	2-3-14	5130

CDPH Write On EDT Transmission? ○ Yes ○ No
State System Number:
If "Y" please enter the Source Number(s) in the column above

CA Geotracker EDF Report? ○ Yes ○ No
Global ID: Sampling Company Log Code:
EDF to (Email Address):

Travel and Site Time: Mileage: Misc. Supplies:

APPENDIX G

Geochemical Model Simulation Results

Technical Memorandum: Geochemical Evaluation of Injection of Water into the Aromas Formation

Mahoney Geochemical Consulting
July 31, 2014

Technical Memorandum

TO: Edwin Lin, Gus Yates, William Motzer, Ph.D. - Todd Groundwater

FROM: John Mahoney, Ph.D.

DATE: July 31st, 2014

SUBJECT: Geochemical Evaluation of Injection of Water into the Aromas Formation

---

INTRODUCTION

A series of PHREEQC (Parkhurst and Appelo, 2013) geochemical models and PHAST for Windows (p4w) reactive transport models (Parkhurst et al. 2010) were constructed to better understand the potential impacts of aquifer storage in the Aromas Formation and subsequent infiltration into the Paso Robles Formation. Both programs were developed by the US Geological Survey and are in the public domain. Particular attention was focused on arsenic [assumed to be an arsenate form - As(5)] and hexavalent chromium [Cr(IV)]. The models primarily examined the interaction between the proposed injectate composition and the Aromas Sands. Examples of the general model setups are included at the end of this memo.

The composition of the pilot water (proposed injection solution) is listed below, this compositions was derived from the composition listed in Table 14 of the Todd Groundwater main report, prepared by Todd Groundwater, Inc. The parameters used to represent the modeled composition are listed in Table 1 of this technical memorandum. These modeled compositions were mainly major ions and trace metals that had values above the reporting limit.

Concentrations in the proposed pilot water for arsenic and lead were less than the reporting limit, so they were not included in the modeled composition. Ammonia, although reported, was not included in the model calculations either. In reaction models with excess oxygen, PHREEQC tends to completely oxidize ammonia to nitric acid, this changes the pH to unrealistically low values. Normally, nitrification occurs in steps and nitrogen gas is produced in the first step rather than nitrate. In most models the alternative approach is to remove the ammonia and nitrate reaction in the database, and this approach was used in these models. Ammonia is a reducing agent so its presence would have favored the production of Cr(III) rather than Cr(VI). So with respect to public health risk, the model is conservative.

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These models do not evaluate the oxidation of Cr(III) to hexavalent chromium. In most cases involving groundwater, oxidation is believed to be a slower process than the release of surface complexed As and Cr. Those rate limited models enter the realm of chemical kinetics and although PHREEQC can prepare such models they usually require a more detailed characterization including a series of concentration measurements reported as a function of time. Please see the work of Gonzales et al. (2005) for a discussion of oxidation of chromium to chromate in the Aromas Formation.

Table 1. Summary of Concentrations used in the Geochemical Models, units in mg/L.

Parameter	Pilot Water	FO-7 Shallow Paso Robles	Paso Robles Low As Pb
pH	7.7	8.11	8.11
pe	10.7	10.5	10.5
Bicarbonate	43	68	68
Ammonia (not included in model)	1.3	--	--
Arsenic as As(5)	--	0.2	0.01
Barium	0.14	--	--
Calcium	11	29	29
Chloride	2	44	44
Chromium as Cr(6)	0.00021	0.0017	0.0017
Lead	--	0.042	0.0042
Magnesium	--	3.8	3.8
Nitrate as N	0.64	0.266	0.266
Potassium	0.05	3.1	3.1
Sodium	19	38	38
Sulfate as S(6)	0.11	24	24
Iron as Fe(2)		80 Not used too high for this water turbidity issues	

The redox condition, listed as the pe in the input file, was defined by ORP measurements reported in volts, corrected for the reference electrode potential which converts the value from an $E_{measured}$ value to a true E_h value, where the subscript h refers to the standard hydrogen electrode (SHE) reference state. Tables in the primary Todd report use the alternative term Normal Hydrogen Electrode (NHE), this is equivalent to the SHE reference. The value is then converted to pe using the following equation:

$$pe = [F]\, E_h / 2.303RT$$

Where F is the Faraday constant (23.061 Kcal/V g eq, or 9.648×10^4 Coulombs/mole),
E_h is in volts,
R is the gas constant, and
T is the temperature in K.

The measured Eh and pH for the pilot water, the leach tests and the receiving water in the Paso Robles Formation are shown on Figures 1 and 2. The two diagrams demonstrate that the dominant (stable form) of chromium is hexavalent chromium (CrO_4^{-2}) and arsenate (as $HAsO_4^{-2}$) strictly speaking biarsenate.

Figure 1. Eh-pH diagram for the system Cr, O, H, at 25°C prepared using HYDRA/MEDUSA (Puigdomenech, 2009). The blue triangle represents the pilot water. The six green diamonds represent measurement taken from the Core Leachate Sample analyses as listed in Table 15 of the Todd Groundwater main report. The purple square represents the composition of the Paso Robles F0-7 shallow sample.

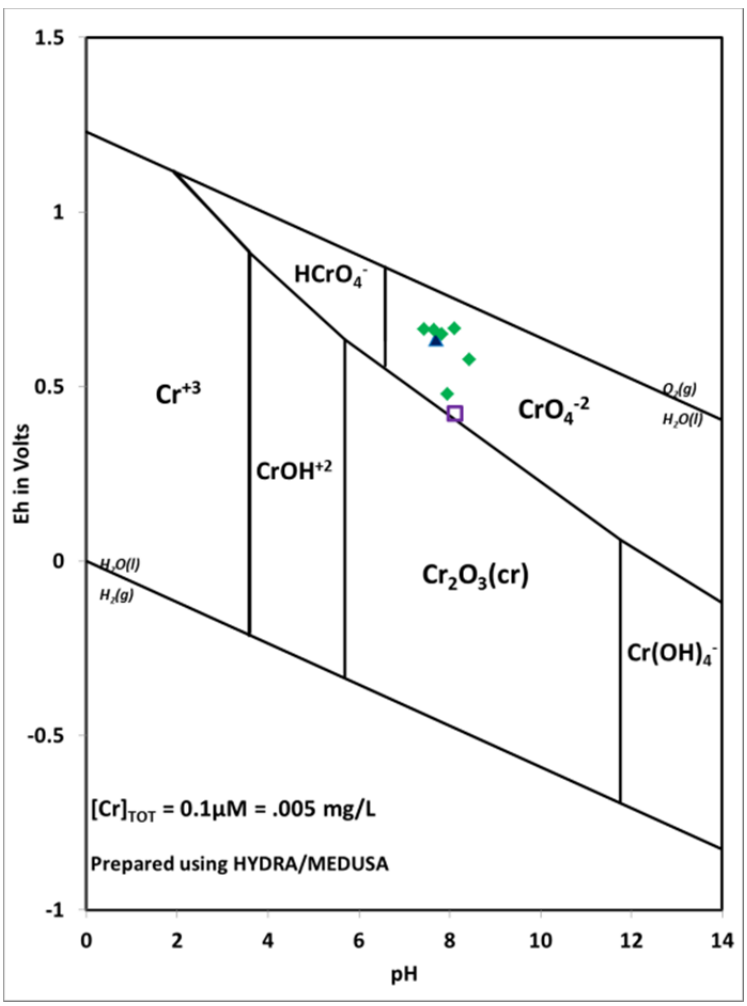
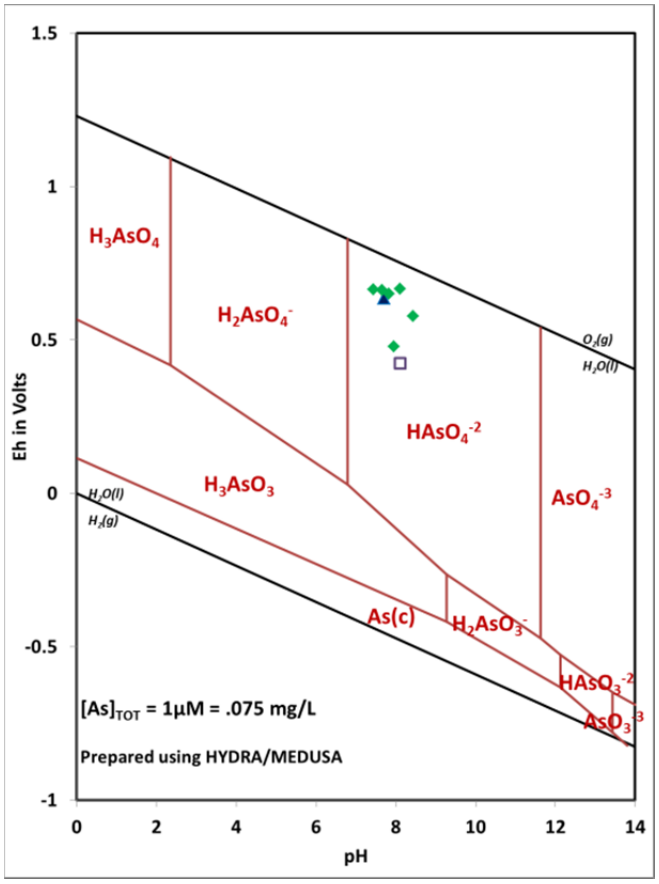


Figure 2. Eh-pH diagram for the system As, O, H, at 25°C. The blue triangle represents the pilot water (injection solution). The six green diamonds represent measurement taken from the Core Leachate Sample analyses as listed in Table 15 of the Todd Groundwater main report. The purple square represents the composition of the Paso Robles F0-7 shallow sample.



SURFACE COMPLEXATION MODELS

In selecting the geochemical modeling approach the chemical characteristics of arsenic and chromium were considered in light of the geochemical conditions related to the proposed (pilot water) injection solution, the nature of the unsaturated Aromas Formation and the composition of the ambient groundwater in the Paso Robles Formation. The low concentration of these components and oxidizing conditions preclude the formation of solid precipitates. Consequently, a sorption based model is believed to be the primary process to control these elements. The model relies primarily upon surface complexation reactions as defined by Dzombak and Morel, (1990). Model assumptions were confirmed and constrained by the laboratory results. Surface complexation parameters were updated for arsenic as arsenate, and the reactions of Gustafsson and Bhattacharya (2007) were used instead of those reported by Dzombak and Morel (1990). Surface complexation constants for hexavalent complexation onto HFO as reported by Dzombak

and Morel were reviewed and considered to be acceptable. Additional details about surface complexation models can be found in Langmuir (1997).

Surface ionization and complexation models allow for the calculation of adsorption reactions onto mineral surfaces. In these models the primary mineral is usually ferrihdyrite [$Fe(OH)_3$] and it is commonly called hydrous ferric oxide (HFO). The atoms that make up the surface form complexes with components in solution. The basic premise of all the models is that certain mineral surfaces can form complexes with dissolved species and these complexes lower the concentration of dissolved components in solution. There are various surface ionization and complexation models that mainly differ in how the surface charge and surface potential are estimated.

The particular version used in these models was based upon work presented in Dzombak and Morel (1990). For the HFO surface the dominant complexes are defined as the weak surface site, identified as Hfo_wOH.

Hfo_wOH = Hfo_wOH
log_k 0.0

The above reaction represents the formation or presence in the model of an uncharged surface species. The log K value of zero equals 1 and the above equation represents an identity. This is the surface component upon which all other weak surface complexes are based.

The surface sites can react with protons and under low pH conditions the surface will become positively charged.

Hfo_wOH + H^+ = Hfo_wOH_2^+
log_k 7.29 # = pKa1,int

The surface can also release protons in response to high pH conditions.

Hfo_wOH = Hfo_wO^- + H^+
log_k -8.93 # = -pKa2,int

In the diffuse layer model, all the surface charge related reactions occur in the same surface plane. For arsenate adsorption these additional reactions include:

Hfo_wOH + AsO_4^{-3} + $3H^+$ = Hfo_wH2AsO_4 + H_2O
log_k 30.98 # From Gustaffson D&M 29.31

Hfo_wOH + AsO_4^{-3} + $2H^+$ = Hfo_w$HAsO_4^-$ + H_2O
log_k 25.84 # From Gustaffson D&M 23.51

Hfo_wOH + AsO_4^{-3} + H^+ = Hfo_wAsO_4^{-2} + H_2O
log_k 19.5 # Added From Gustaffson D&M did not include

$Hfo\_wOH + AsO_4^{-3} = Hfo\_wOHAsO_4^{-3}$
log_k 11.92 # From Gustaffson D&M 10.58

There is only one reaction for surface complexation with hexavalent chromium:

$Hfo\_wOH + CrO_4^{-2} + H^+ = Hfo\_wCrO_4^- + H_2O$
log_k 10.85

For similar activities and pH values chromium forms fewer surface complexes, one may also say that the complexes with chromate are less strongly bound to the surface than are the arsenic surface complexes. Comparing the following equation $Hfo\_wOH + AsO_4^{-3} + H^+ = Hfo\_wAsO_4^{-2} + H_2O$ with a log k value of 19.5 to the single chromium reaction indicates that the difference is nearly nine orders of magnitude greater for the arsenate surface complex

Cations can also form surface complexes with the HFO weak sites, as well as a cation specific site called a strong site (Hfo_sOH). Using lead as an example we have:

Hfo_sOH + Pb+2 = Hfo_sOPb+ + H+
log_k 4.65

Hfo_wOH + Pb+2 = Hfo_wOPb+ + H+
log_k 0.3

Strong sites (HFo_sOH) were added by Dzombak and Morel to better fit cation surface complexation particularly under low pH conditions. Dzombak and Morel (1990) set the weak site density based upon 0.2 moles of sites per mole of HFO precipitated. The strong site density was much lower and was based upon a value of 0.005 moles of strong sites per mole of HFO precipitated. Because of the small amount of strong sites it is difficult to identify their role in simple potentiometric titrations. Consequently, the strong sites have the same amphoteric properties as the weak sites with the same log K values.

Hfo_sOH = Hfo_sOH
log_k 0.0

$Hfo\_sOH + H^+ = Hfo\_sOH_2^+$
log_k 7.29 # = pKa1,int

$Hfo\_sOH = Hfo\_sO^- + H^+$
log_k -8.93 # = -pKa2,int

The strong site complexation reactions form stronger complexes with the cations. In some cases strong site metal complexes can nearly equal the weak site concentrations for that metal.

There is another factor that influences the amount of surface complexation and that is the surface charge represented by sigma (σ) and resulting surface potential (ψ). In a surface complexation model calculation, PHREEQC sums up the net surface charge on the surface in terms of equivalents. Using the surface area in contact with the solution, the program then converts sigma values to units of Coulombs/m^2. For example, fresh laboratory produced HFO is assumed to have a surface area of 600m^2/gram. So a model that had 10 grams of fresh HFO would have a surface area of 6000m^2. A potential (ψ) in volts is then calculated and this is converted to a term represented by $\exp(-F\psi/RT)$. This term is used to calculate the thermodynamic "work" required to bring charged ions through the diffuse layer charge on the surface. If the surface is negatively charged, then positive ions (cations) will more readily form surface complexes. If anions are involved then there is a force working against their complex formation and less of the anions will be sorbed onto the surface. This helps explain the pH dependence of surface complexation and provides a starting place for the fact that anions, such as arsenate and chromate form more surface complexes at low pH, where the surface is typically positively charged. Those anions will desorb with increasing pH. Cations show the opposite pattern of increased surface complex formation with increasing pH.

DESCRIPTION OF SITE SPECIFIC MODEL

In most cases predictive geochemical models are not unique. There are numerous adjustable parameters that can influence the model setup and the final conclusion. Consequently, several different models were initially developed and parameters such as total arsenic, hexavalent chromium and the amount of sorbent surface (and the corresponding surface site concentration values) were adjusted primarily by a simple trial and error method. However, the selected values were generally constrained by appropriate laboratory results. Two models are described below and they demonstrate the range in the selection of the primary parameters. Ultimately the selected model was based upon an arsenic concentration consistent with measured values from the HA-HCl extraction test, a lower surface site concentration, than the initial model as well as approximate agreement with the leach test results.

All models assumed 30% porosity in the Aromas formation and that the main mineral in the formation was quartz with an iron oxide coating. Samples of the Aromas were analyzed using hydroxylamine hydrochloride (HA-HCl) to extract the readily reduced amorphous iron and selected trace metals in the sample. It should be noted that Gonzalez et al. (2005) also included a slightly different HA-HCl extraction in their extraction sequence, and for the most part their extractions produced comparable results. Figure 3 summarizes the calculations needed to estimate surface site concentrations for the model. Trace metal concentrations for arsenic, lead and Cr(VI) from the extraction were converted to concentrations based upon the amount of rock in contact with 1 liter of solution. To avoid confusion this memo will refer to the HA-HCl procedure as an extraction, and the column leach tests that used the proposed pilot water as the leachate will be described as the leach test. The two procedures are distinctly different.

PHREEQC is a solution centric model, and all of the reactions are based upon a specific amount of water. That amount is usually, but not always, 1.0 kilogram of water, which is usually equivalent to 1.0 liter of solution. For 30 percent porosity that means 2.33 liters of rock are in contact with one liter of water. If the rock is mainly quartz with a specific gravity of 2.65 then that liter of water is in contact with 6.18 kilograms of rock. The results of these extractions are listed in Table 15 of the Todd Groundwater main report. A spreadsheet was prepared to calculate site concentrations based upon the HA-HCl extraction results. The Aromas 200 to 202.5 foot sample was selected for the model because it has a significantly higher proportion of arsenic relative to the total amount of extractable iron.

Model one assumed that all of the extractable iron is in the form of HFO, 100% of which is exposed to the pore solution. It was decided to model the arsenic and chromium concentrations from the leach test results described on Table 15 of the Todd Groundwater main report. The leach test used 200 grams of solids and 1 liter of pilot water. This is a very high water to rock ratio, and the "porosity" in these leach test was effectively 1300 percent, [(1000 ml of solution)/(~75 ml of Aromas solids)]. Subsequent models used in the transport and PHAST models were based upon 30% porosity. In order to preserve the surface characteristics for subsequent applications the model of the leach test was scaled to represent 6.18 kilograms of solid and 30.9 liters of water. In this model arsenic and chromium reaction amounts were then adjusted to reach the average leachate concentrations. The leach test had a large amount of dilution, and the model must consider the dilution process and the surface complexation reactions simultaneously.

The target concentrations represent the model calculated concentration in the model step that simulates the leach tests. A value of 1.3 µg/L was selected for hexavalent chromium, which is the average from the six leach tests run on the Aromas. For arsenic, the target concentration was around 4-5 µg/L. However, only two of the six leach tests reported values greater than the detection limit of 5µg/L (5.5 and 7.6 µg/L). Accordingly, some latitude was allowed for the average arsenic concentration.

Figure 3. Calculation summary used to estimate surface site concentrations for the surface complexation model.

AROMAS 200 - 202.5						
SOLUTION CENTRIC SITE CONCENTRATION CALCULATION FOR HYDROXYLAMINE HCl EXTRACTABLE IRON						
Hydroxyl Amine HCl extractable iron =		3300	as mg Fe/Kg (Rock)			
			0.059	moles HFO / Kg (Rock) using =value/(55.847*1000)		
Specific Gravity of Minerals in Rock =		2.65	Calculation assumes iron with formula weight of 55.847 gm/mole			
Porosity %	Liters Rock in Contact with 1.0 L	Kilograms Rock in Contact with 1.0 L	Moles Ferrihydrite (HFO)	Hfo_wOH @ 0.2/mol HFO	Hfo_sOH @ 0.005/mol HFO	89 Mass of HFO default 89 g/mole
30	2.33	6.18	0.368	0.0735	0.001839	32.7292
CALCULATED VALUE						
			1%	0.00074	0.000018	0.3273
				For shallow sample 3300 mg/L Fe		
				As	Pb	Cr
			CONCENTRATION mg/kg	1.8	1.1	0.4
			Proportion rock mass/Liter at 30 % porosity	6.18	6.18	6.18
			Formula weights (mg/mole)	74922	207000	52000
			Concentrations to add moles	1.48E-04	3.28E-05	4.754E-05
			for As2O5	7.42E-05		

For an open system [CO2(g)] loaded surface, the model consisted of the first six steps.

1. Define the pilot water composition. This is defined as SOLUTION 1.

2. Use SOLUTION 1 and add K_2CrO_4 at a concentration of 1.0e-6 moles. This value was determined by trial and error. Maintain pH at 7.7. SAVE this as SOLUTION 2.

3. Use SOLUTION 2 and Add As_2O_5 at a concentration of 8.0-3 moles. Maintain pH at 7.7. SAVE this as SOLUTION 3.

4. Use SOLUTION 3, load SURFACE 1 with the arsenic and chromium. Maintain pH at 7.7. SAVE SURFACE as SURFACE 3. The SURFACE 1 starting parameters for 100% HFO are:

```
SURFACE
Hfo_wOH  0.0735  600.0  32.73
Hfo_sOH 0.00184
```

For 1% the values are:

```
SURFACE  1
Hfo_wOH  0.000735  6.0  .3273
Hfo_sOH 0.0000184

SAVE SURFACE 3
EQUILIBRIUM_PHASES 102
Fix_H+  -7.7 NaOH
CO2(g)  -3.4  10
END
```

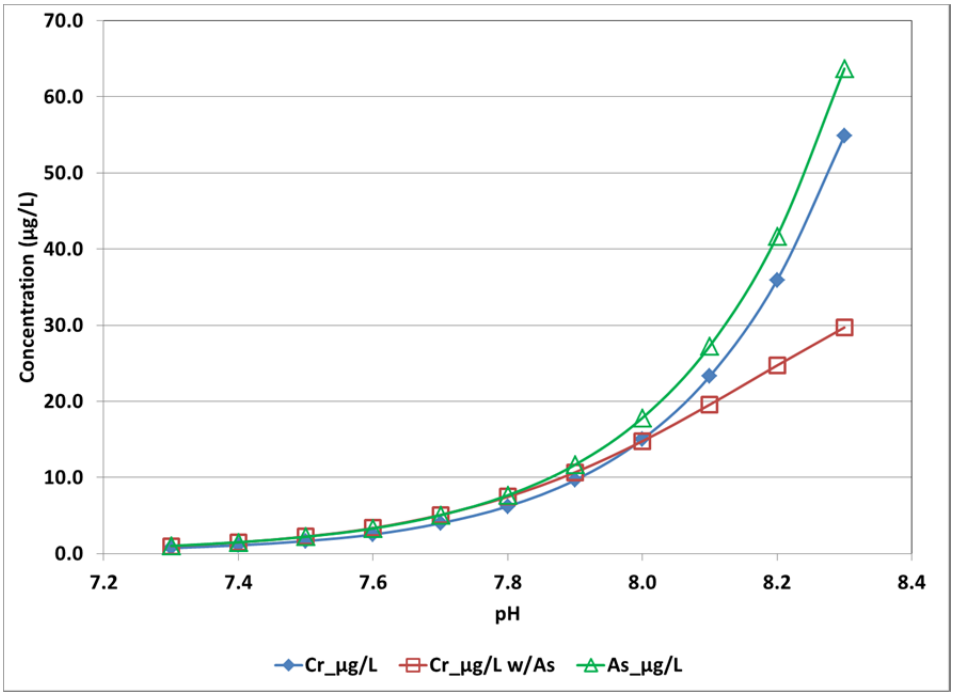
5. To compare to the leach test, prepare 30.9 liters of leaching SOLUTION 1. Do this by mixing SOLUTION 1 at 30.9. SAVE this as SOLUTION 31.

6. USE SOLUTION 31, USE SURFACE 3, and maintain pH at 7.7. This step represents the leach test and uses 6.18 kg of solid, and 30.9 liters of solution 1. Compare these concentrations to the target leachate parameters. Adjust concentrations in steps two and three to match target leachate average values.

Steps 7 to 17 used SOLUTION 1 and SURFACE 3 to sweep a range of pH's from 7.3 to 8.3.

After several iterations, the first model provided a good match to the leachate test results, with arsenic at 4.2 µg/L and chromium at 1.3µg/L. Figure 4 shows the results of the pH sweep calculations. Chromium was estimated to be at approximately 10 µg/L or less at pH values of 7.9 or less. The maximum concentration of hexavalent chromium was less than 30 µg/L at a pH of 8.3. Another simulation was also prepared that effectively removed arsenic from the surface. The figure shows that simulation as the blue line with the diamonds. For that model the chromium concentration was increased from the selected 1.0e-6 moles to 1.3e-5 moles. The increased load of Cr(VI) causes a steep increase in chromium above a pH of about 8.0.

Figure 4. Result of pH sweep simulations assuming 100 percent HA-HCl extractable iron available as HFO sorbent, initial models.



The arsenic concentration used to prepare the model shown in Figure 4 used a value of 8.e-3 moles of As_2O_5. This value is about 100 times greater than the concentration of arsenic measured in the HA-HCl extraction at 7.42e-5 moles of As_2O_5. These high concentrations of arsenic also decrease the surface charge and produce a negative surface even at a pH of 7.3. For the chromium only model the surface developed a negative charge at a pH between 8.1 and 8.2. An alternative model was prepared that was more consistent with the measurements from the HA-HCl extraction. This model constrained the total arsenic concentration to 7.42e-5 moles of As_2O_5. To achieve this, the percent of HFO exposed to pore water was decreased, eventually to 1.0 percent of HA-HCl extractable iron. This assumption is probably more reasonable as over time the effectiveness of HFO as a sorbent decreases as it increases in crystallinity, which decreases the exposed surface area.

The initial models were prepared under closed system conditions. That means that the solutions do not equilibrate with the atmospheric gases carbon dioxide [CO_2(g)] and oxygen [O_2(g)]. The models define oxidized species for arsenic and chromium so exchange with oxygen is not required. The open system model added a source of carbon dioxide and there are two additional surface complexation reactions that are included in the calculations. These reactions are taken from Appelo et al. (2002).

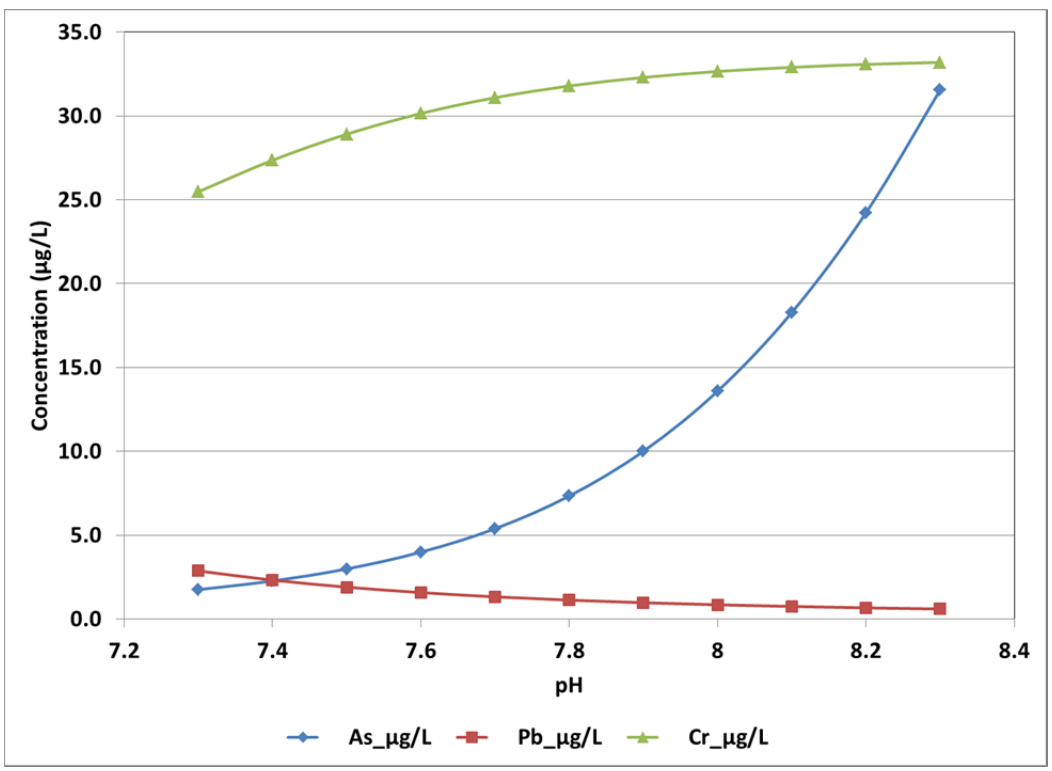
$$Hfo\_wOH + CO_3^{-2} + H+ = Hfo\_wOCO_2^{-} + H_2O$$
log_K 12.78

$Hfo\_wOH + CO_3^{-2} + 2H+ = Hfo\_wOCO_2H + H_2O$
log_K 20.37

Differences are slight between open and closed system models but it was decided to select an open system model (at least for the surface definition steps included loading of As, Cr, and Pb because the leach tests are probably closer to an open system than a closed system. The initial open system models increased the arsenic concentration in the leachate to about 3.5 µg/L and decreased chromium (VI) to 1.1 µg/L so some additional Cr(VI) was added in the reaction step.

Lead was reported in the HA-HCl leachate samples and so it was added to the HFO surface for the final model. As a cation it is strongly adsorbed under these relatively high pH conditions. It also increases the positive surface charge slightly, which helps retain chromate on the HFO surface. The two surface complexation reactions for lead described above were used. Lead was only reported in one of the core leachate samples, and so it was not used to calibrate the surface. Rather it acts more as a site occupying species and it has some influence on the surface charge. The low pH of the HA-HCl extraction may also dissolve other forms of lead in the samples, so it is not as certain that lead is dominantly surface complexed. Figure 5 shows the modeled pilot water concentration for the selected surface conditions as a function of pH.

Figure 5. Concentrations of arsenic, chromate and lead for the open system model for the arsenic constrained model, 1%HFO.



These calculations define a surface that can be used in subsequent models such as the transport models described below. The final surface assumes that only one percent of the HA-HCl extractable iron provides surface sites. The composition of the surface is consistent with the results for the HA-HCl extraction for arsenic. For chromium, the concentration in the extracted water was less than the (relatively high) detection limit of 0.4 mg/L, so a precise concentration could not be selected based upon those tests. However, the core leachate tests did detect chromate and the model is consistent with those results.

SUMMARY OF SURFACE MODEL SELECTION PROCEDURE

The final surface and the surfaces used as the basis for the one-dimensional transport models and the PHAST reactive transport models are summarized in Table 2. These concentrations when equilibrated with the pilot water produced concentrations of arsenic and hexavalent chromium consistent with the leach tests. The loaded surface was estimated at a fixed pH of 7.7 the pH of the pilot water.

Table 2 lists distribution coefficients (Kd) in two ways. The first way is the nondimensional Kd. In PHREEQC this type of Kd is readily calculated and it merely represents the proportion of surface complexed chromium in moles/kgw (kilograms of water) divided by the concentration of chromium in solution (moles/kgw). These are concentrations used in PHREEQC as part of its mass balance constraints. For chromium, the table also includes the more familiar representation reported in units of L/kg. The distribution coefficient is calculated according to:

$$K_d = \frac{\left(Conc_{init} - Conc_{final}\right)}{Conc_{final}} \times \frac{Volume}{Mass}$$

Where:

$Conc_{init}$ is the initial concentration of Cr(VI),
$Conc_{final}$ is the final concentration of Cr(VI),
Volume is volume of solution 1 Liter, and
Mass is mass of solid 6.18 kgs.

Table 2. Summary of HFO surface concentrations.

pH	Fixed 7.7
TOTAL Hfo_wOH moles/L	7.35E-04
TOTAL Hfo_sOH moles/L	1.84E-05
Cr Surface complexed moles/L	6.39E-07
Cr Surface complexed as µg/L	33
Kd Cr dimensionless	0.091
Kd Cr L/kg	0.015
As Surface complexed moles/L	0.00015
As Surface complexed as µg/L	11054
Kd As dimensionless	2677
Pb surface complexed moles/L	3.28E-05
Pb surface complexed as µg/L	6789
Kd Pb dimensionless	9897

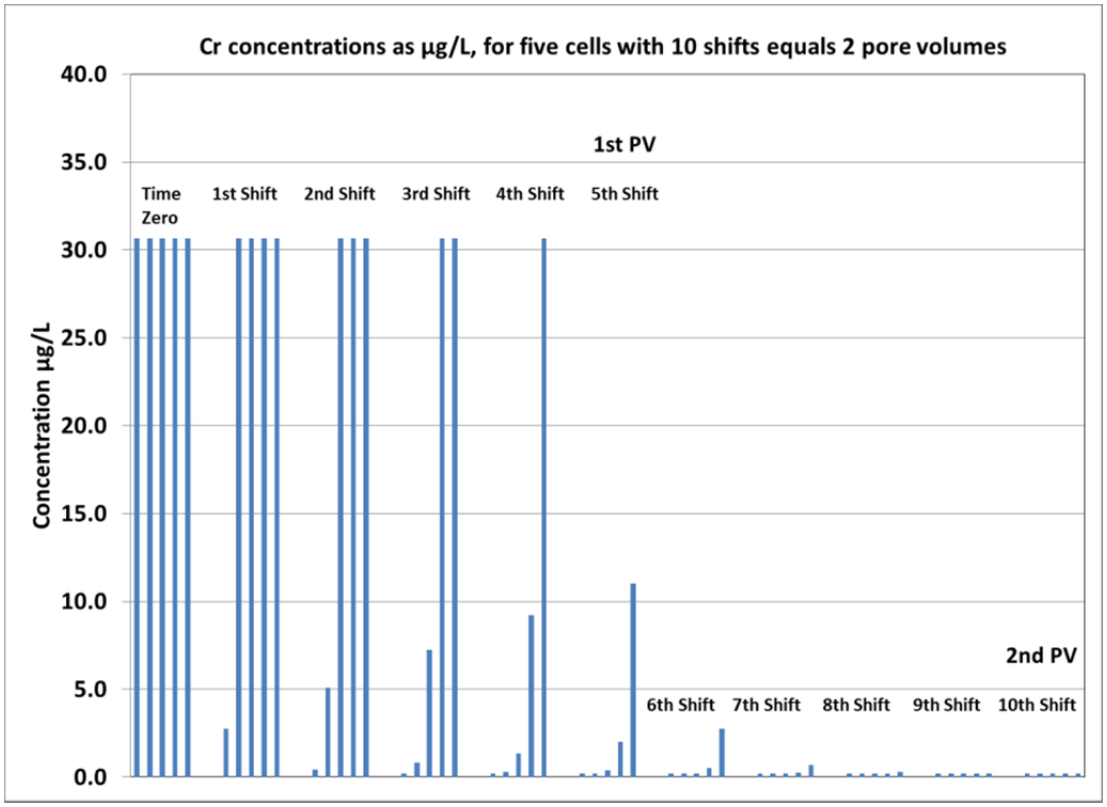
ONE-DIMENSIONAL TRANSPORT MODELS

To further understanding of the release of chromate from the HFO surface a series of transport models were prepared using PHREEQC. The purpose of the transport models was to work around a limitation of the leach test, in which the mineral surface equilibrated with five times more water than would be contained in the pores for that amount of aquifer solids. The concentration of the leachate is the average concentration for five pore volumes of desorption. If the same amount of metal desorbs with each new pore volume, the result is the same as if the

pore volumes had flowed through the rock sequentially, which is what would happen when injected water flows into the aquifer. If desorption decreases substantially with each new pore volume, a very different picture emerges. The transport models investigate this issue by simulating the five pore volumes in sequence rather than simultaneously.

The transport models assumed a simple five cell system and used the same surface as described above. Each of the five cells contained the equivalent of 6.18 kgs of Aromas material as the Loaded HFO surface and the volume of water in each cell was 1 liter. PHREEQC transport models are basically a set of beakers (the cells) and each shift adds new water to the first beaker and transports the water in each cell down to the next cell. For five cells it would take five shifts to replace a pore volume for the five cell system. Figure 6 shows the results of the transport model.

Figure 6. Results of PHREEQC transport model showing the concentrations of Cr(VI) along a five cell "flowpath". Ten shifts are equivalent to two pore volumes.



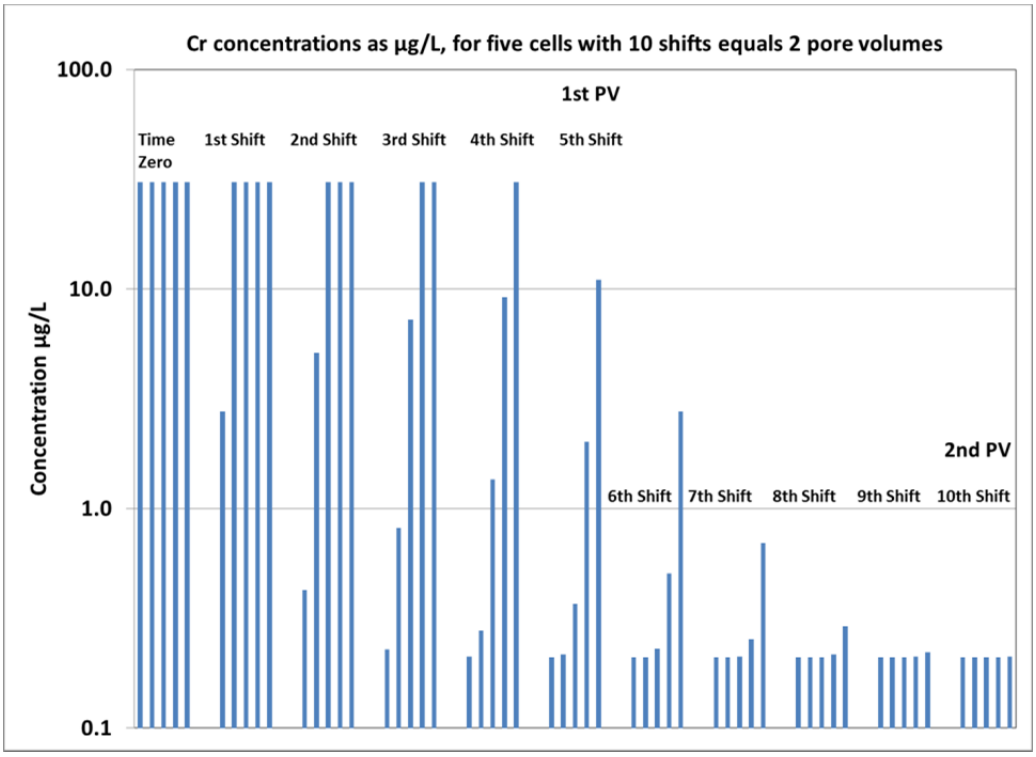
Because the Aromas is unsaturated the initial water in the cells (at Time Zero) is the same pilot water that was used in the previous models. The previously loaded surface equilibrates with the initial water and produced a chromium concentration of 30.65 µg/L. As a first approximation this can be considered to be 0.21 µg/L Cr(VI) from the pilot water and 30.45 µg/L from the surface. This amount is about 93 percent of the chromium on the surface at the start of the simulation. In the first shift, fresh pilot water displaces the waters in the cells and those waters

migrate into their next respective cell. The fresh pilot water introduced into cell 1 creates a new equilibrium, the resultant chromium concentration in cell 1 is now 2.76 µg/L, this removes another 7 to 8 percent of the originally surface complexed Cr(VI). The increase in chromium is a result of the desorption of the surface complexed chromium that remained. The non-dimensional distribution coefficient for Cr(VI) under these conditions is typically around 0.1 or less. Basically with such low Kd's each shift into cell 1 removes approximately 90% of the surface complexed chromium and places it into solution.

In the second shift, solutions are again moved into the next cell. The water previously in cell 1 now moves into cell 2 and a new equilibrium is established. The chromium concentration is now 5.10 µg/L, remember this solution when it was in cell 1 had 2.76 µg/L previously. The new composition in cell 1 is now 0.42 µg/L. The pilot water has a chromium (VI) concentration of 0.21µg/L. so the amount of chromium released in the second shift in cell 1 is only 0.21 µg/L.

In the third shift, cell 3 has a cumulative concentration of 7.25 µg/L. In cell 1, more pilot water is introduced, but the amount of surface complexed chromium is so small that the equilibrated concentration is now 0.228µg/L, nearly the same as the pilot water. The process continues with the next seven shifts. By the eighth shift concentrations in cells 1, 2 and 3 are 0.21 µg/L, and in cell 5 the concentration is 0.290 µg/L. After ten shifts the concentration in cell five is 0.212 ug/L. Figure 7 shows the concentration based upon a log concentration scale.

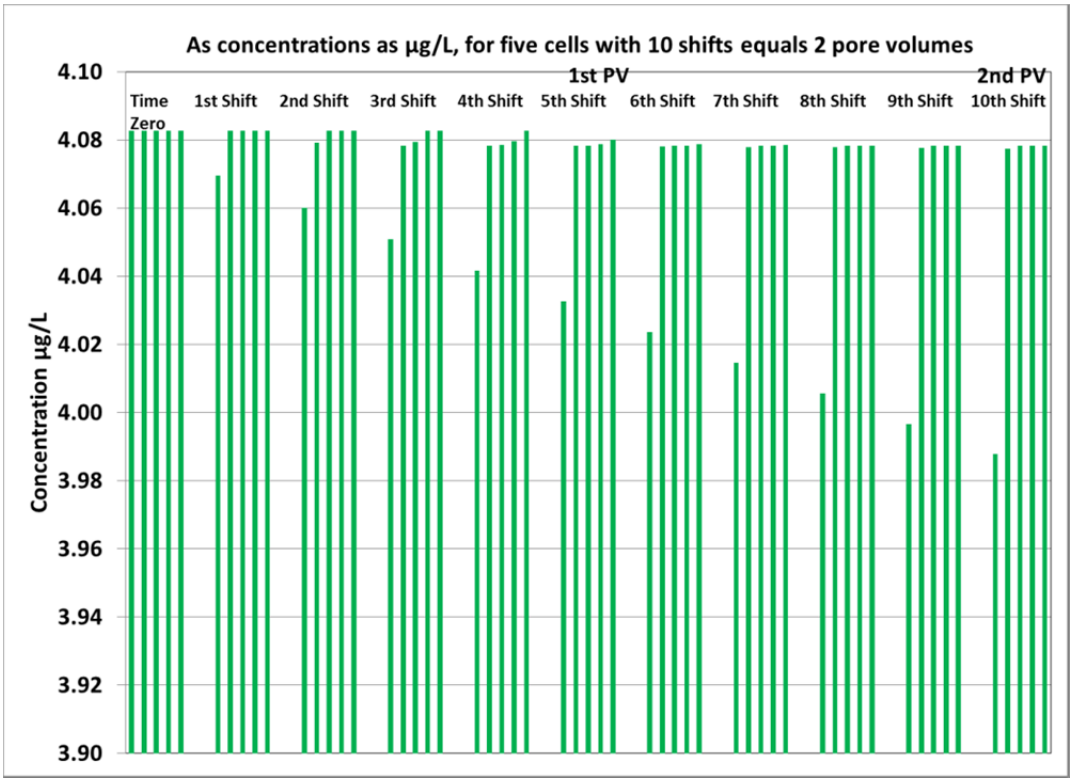
Figure 7. Results of PHREEQC transport model showing the concentrations of Cr(VI) along a five cell "flowpath". Concentrations are shown on a log base 10 scale.



Two pore volumes have essentially removed all of the chromate from this surface. The model that generated the results shown above was actually run out for 20 shifts or four pore volumes. But the result for the third and fourth PV's only showed near pilot concentration and so to simplify the figures and improve readability only the first ten shifts are shown.

The distribution coefficient for arsenic is much larger (Figure 8), so arsenic will be retained on the surface and it will be much harder to remove. In this case, the surface complexation reactions tend to retain the arsenic and release much less of it into the solution during each shift. After ten pore volumes, the concentration in the first cell is still half of its initial concentration, and the remaining four cells are still at or near the initial concentration.

Figure 8. Results of PHREEQC transport model showing the concentrations of arsenic along a five cell "flowpath". Ten shifts, equivalent to two pore volumes, are shown.



The pH sweep and one-dimensional transport models are consistent in their conclusions. The surface will react with the pilot water and release chromate and arsenate. Chromate concentrations 31 µg/L, but this only represents the first pore volume. The small value for the distribution coefficient for chromate means that based upon the core leachate samples there is little chromium "in reserve" on the surface. It is rapidly leached away and effectively diluted. Arsenic on the other hand is strongly retained so it maintains a concentration of around 4 µg/L for some time.

PHAST MODELS

The program PHAST (PHreeqc And Solute Transport) for Windows (version 1.0.8.8538) by Parkhurst et al. (2010) prepares three dimensional reactive solute transport models using PHREEQC to perform all the chemical related calculations. This is a finite difference model that permits scaling to real word dimensions and time frames and provides further insights into the water injection process. This is a preliminary model that is not perfect in its implementation of all proposed features of the project. It is designed to show the nature and extent of the expected geochemical processes at scales (volumes, fluxes and time frames) that approximate the scale of the expected project.

Figure 9 shows the basic features of the model. The model dimensions are 5000 feet by 5000 feet and 300 feet deep. Hydrologic parameters throughout the model are listed in Table 3. The unsaturated Aromas Formation is above the larger Paso Robles formation. Two wells are also included in the image. Later models included an area to allow zone flow estimates from the recharge zone to the Paso Robles.

Figure 9. Basic features of the PHAST model. The Z scale has been increased by a factor of 10. The two wells are represented by the yellow cylinders, the Aromas Formation is the upper purple box, with the spheres to show its dimensions. The area used for the zone flow measurements is the flat magenta square. It is centered in the model in the X and Y dimensions and it is 2500 feet by 2500 feet. Its Z range is 251 to 251.1 feet.

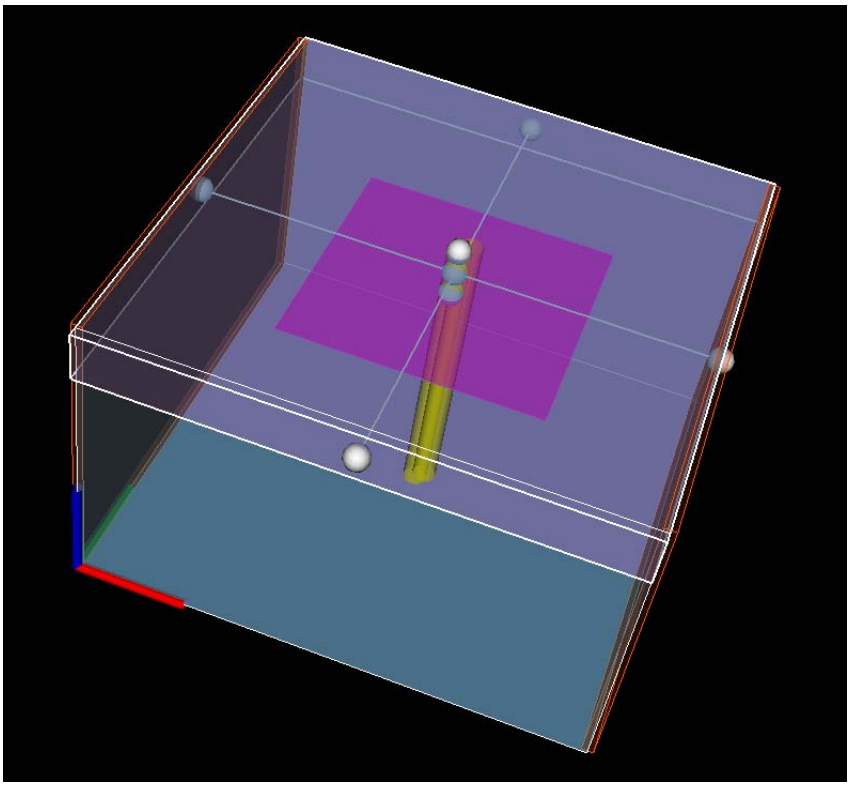


Table 3. Summary of hydrologic conditions for PHAST Model.

Parameter	Value	Units
Hydraulic Conductivity Kx	5	ft/day
Hydraulic Conductivity Ky	5	ft/day
Hydraulic Conductivity Kz	0.5	ft/day
Porosity	0.3	fraction
Specific Storage	0.0001	1/foot
Longitudinal Dispersivity	50	ft
Horizontal Dispersivity	50	ft
Vertical Dispersivity	5	ft

The finite element grid for the X and Y directions is shown on Figure 10. The vertical grid spacing is shown on Figure 11.

Figure 10. X and Y axes grid spacings for PHAST models.

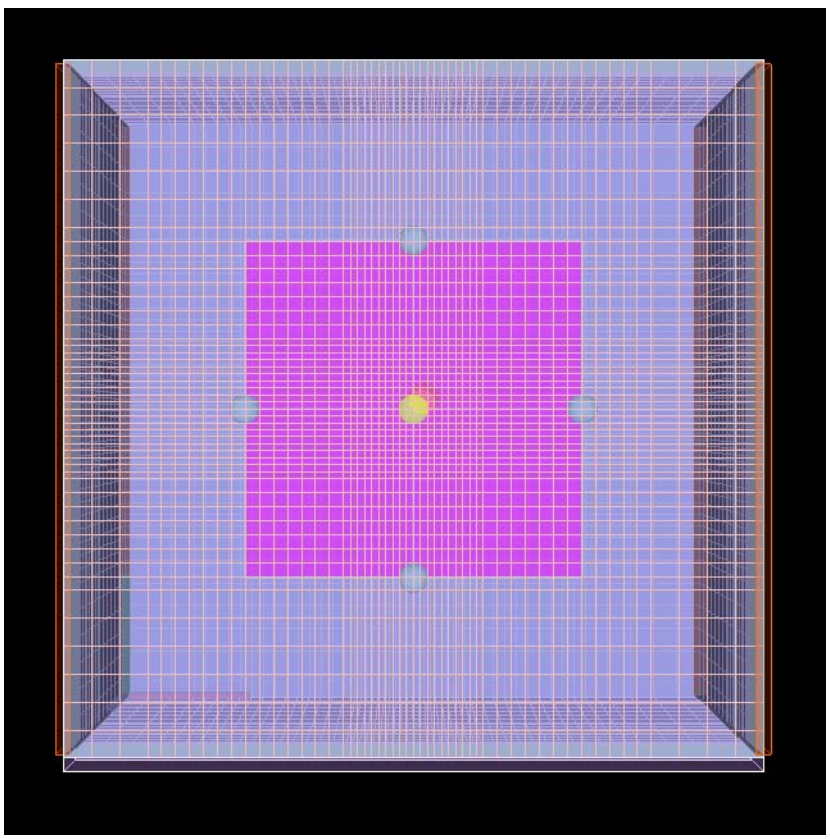
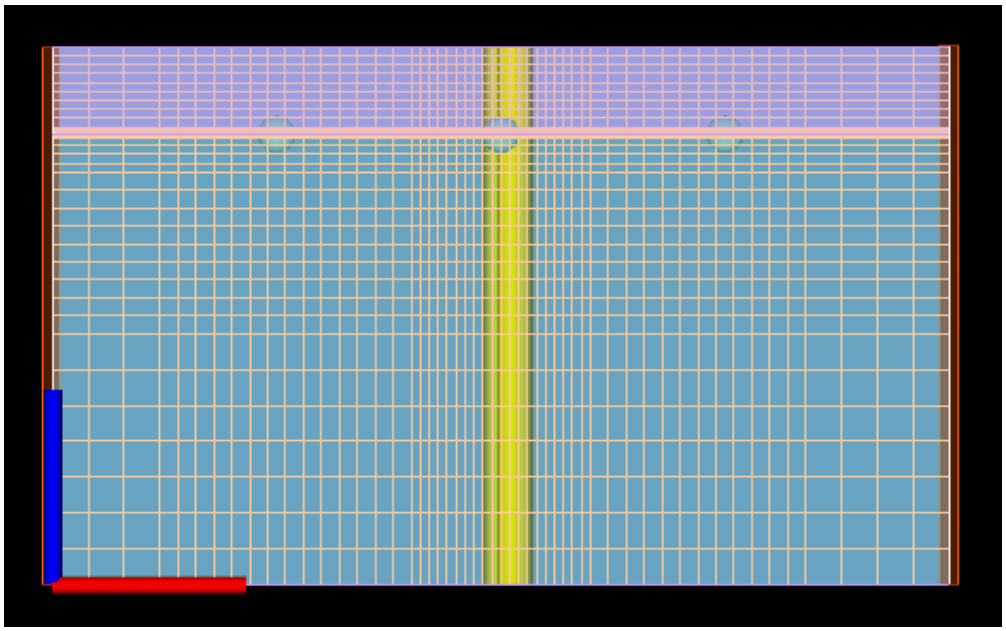


Figure 11. Z axis grid spacings for PHAST models.



The upper 50 feet represent the Aromas formation (purple box). The Aromas is unsaturated so there is no corresponding solution. However, it does have the same surface containing chromate and arsenate used in the previous models. The lower 250 feet represent the Paso Robles formation. It is saturated, and the composition of this solution is the FO-7 shallow water sample shown in Table 1. The PHAST model used the major ion concentrations, plus nitrate, and for trace metals it included, Cr(VI), As, and Pb. Arsenic concentrations at 200 µg/L are uncertain because of the high turbidity in the sample. The value was retained, however, because this is primarily a model to examine impact from injection of a low TDS solution. An alternative model with low lead and arsenic was developed for the PHAST simulations.

The groundwater level for the Paso Robles formation water was set at 252.5 feet on the left hand side and 248.5 feet on the right hand side. This is a gradient of 0.001. Constant head boundary conditions at these values were also defined on the left and right sides of the model at these elevations.

Two wells were also included in the model. The first well was the injection well. It is located in the center of the model at 2500 X and 2500 Y. It is screened in the Aromas (within the unsaturated zone) from 250 to 290 feet. It is 6 inches in diameter and injects pilot water at 110 gallons per minute. The model simulation generally ran for 6 years although some simulations were run out to 12 years. The second well was located at 2575 by 2575. It is slightly small at 5 inch diameter and pumps at 25 gpm and the screen interval is 100 to 120 feet. This well was originally included to provide additional water composition data. However, the review of the initial figures prepared by PHAST indicated that even close to the injection point acceptable

water quality was present and so additional review of simulated concentrations was not required for this review.

The initial models were set up so that there are no reactive phases (EQUILIBRIUM_PHASES) or surfaces (SURFACE) in the Paso Robles formation. In this respect the Paso Robles can be considered inert and only mixing/dilution reactions can take place in this formation. An HFO surface was not included as it was possible that the surface would remove target elements from the inflowing pilot water. This setup provides the most direct answer related to concentrations and their impact from the injected water. The injected water loads are essentially conserved in the Paso Robles Formation. As discussed below, the Paso Robles Formation appears to be at saturation with respect to calcite, but including this phase would increase the pH and so it was decide to not add it to the model.

An alternative low flow model was also prepared. That model injected water at 10 gpm and the pumping well was set at 2 gpm. The lower flow rates showed little difference to the higher flow rate model and so the results are not discussed further in this report.

Initial models run with a time step of 0.25 years per step provided an indication that a lot of the geochemistry was occurring near the injection well and in a very short period of time. This is consistent with the transport model results. Consequently, the model was modified to start with very small time steps (0.001 years per step). However, at a flow rate of 110 gpm even this short a time step (less than nine hours) was too big to identify the processes around the injection point so the low flow model was developed. But the grid spacing was too big to readily see the effects related to the low flow model under a short time frame. Final models used a 0.05 year time step to 0.25 years and then 0.25 years to 12 years. Near steady-state conditions were present by six years.

REVIEW OF PHAST FOR WINDOWS RESULTS

Model results are viewed using Model Viewer (Hsieh and Winston, 2002).

A “tracer” was also added to the injected solution. The tracer is called “Mx”, and it was added at a concentration of 1 mg/L. It represents a conservative neutral-charged non-reactive species. It is included as an additional component to the model thermodynamic data base and there is only one solution species - Mx. The tracer shows the extent of migration and mixing of the injected the pilot water. Figure 12a shows the distribution of the Mx tracer after one year of injection as a percentage of the total tracer. The figure has been cropped along the Y axis (50 % removed) to show the interior distribution. The injection well is represented by the small vertical magenta blocks. An alternative view is shown in Figure 12b, where the Mx plume has been cropped at 1 percent.

Figure 12a. Results of PHAST Calculations for the Mx (mixing) component after one year. Scale (color bar) shows percentage of Mx component.

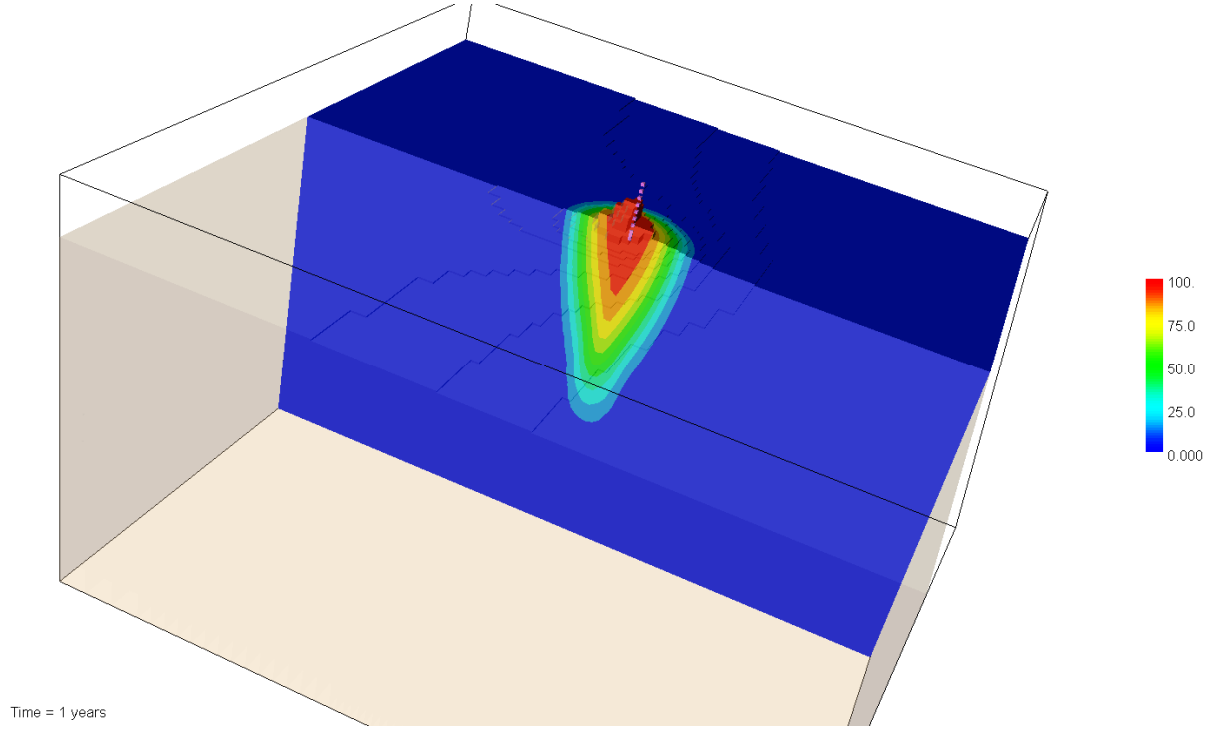


Figure 12b. Results of PHAST Calculations for the Mx (mixing) component after one year. The figure shows the threshold set at 1 percent Mx.

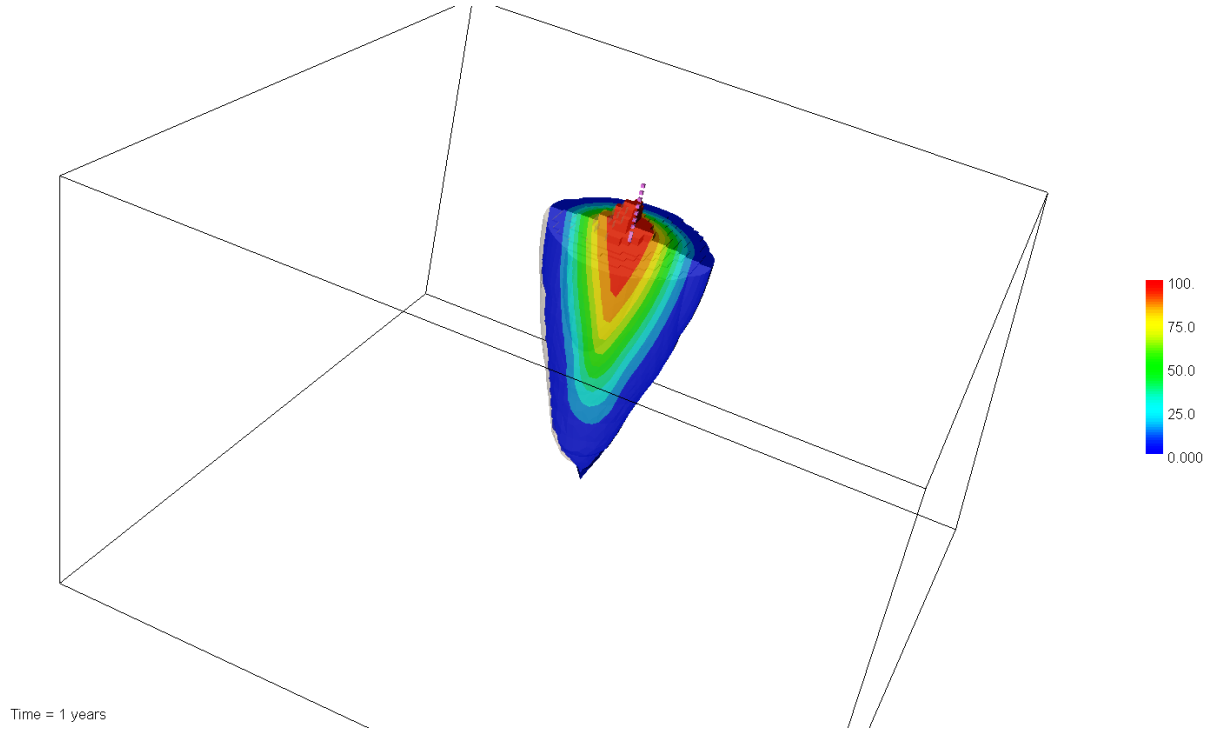
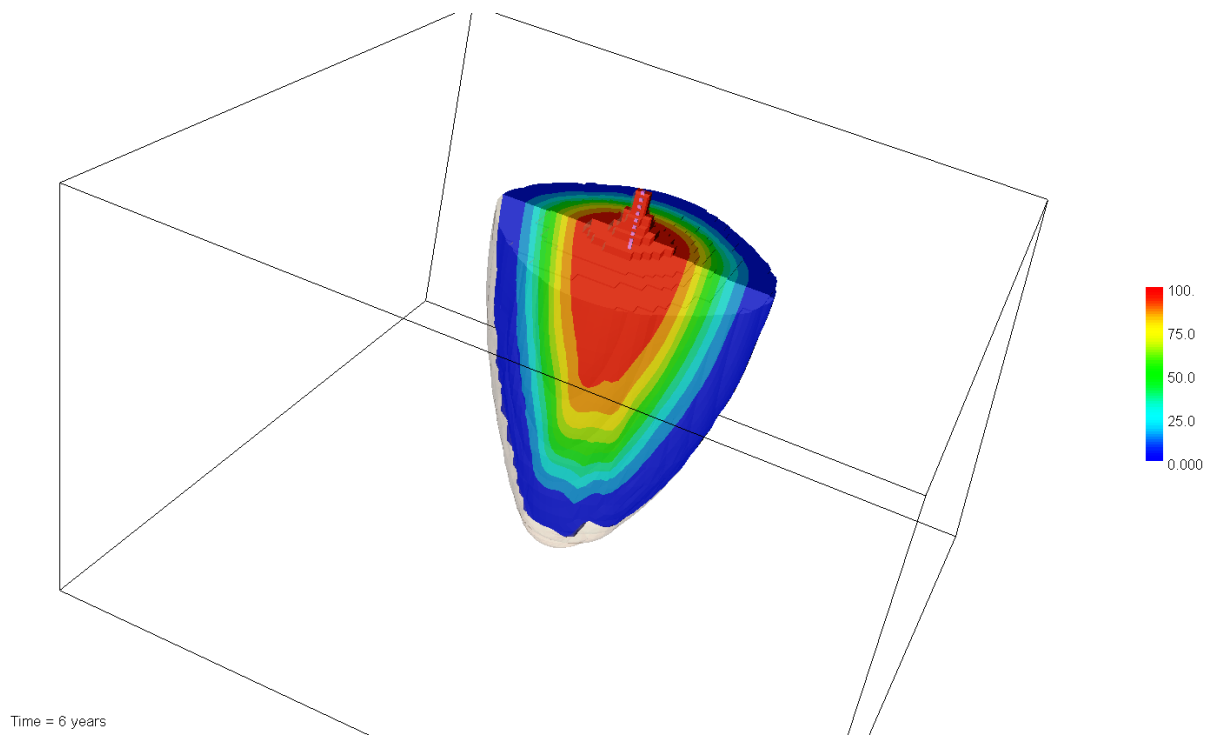


Figure 13 shows the distribution of the Mx tracer at six years. Note the mounding of water around the injection well. This is the volume of water that is wetted in the Aromas Formation, even after six years the volume is a small percentage of the entire injectate "plume". The simple tracer results show an important point in the overall process, namely that the volume of originally unsaturated Aromas Formation that has "leached" is small, and that resulting number of pore volumes is large.

Figure 13. Results of PHAST Calculations for the Mx (mixing) component after six years. The figure shows the threshold set at 1 percent Mx.



Figures 14 and 15 show the water table surface (fluid head) in meters. These are default figures prepared by PHAST and apparently the figures cannot be converted to elevation in units of feet. The chief features of these figures are the gradient across the model domain, and the mounding associated with the injection well. The area of low head shown in the central portion of the figures (at depth) is caused by the pumping well.

Figure 14. Water table surface (Fluid Head) in meters after one year. Color bar scaled to show overall regional gradient. The small green area in the middle of the figure is caused by the pumping well located at 100 to 120 feet elevation.

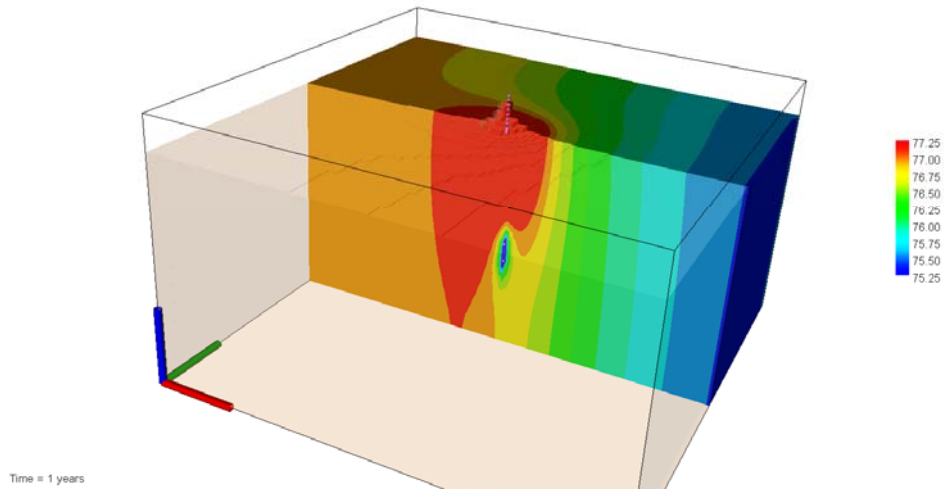


Figure 15. Water table surface (Fluid Head) in meters after six years. Color bar scaled to show overall regional gradient. The small green area in the middle of the figure is caused by the pumping well.

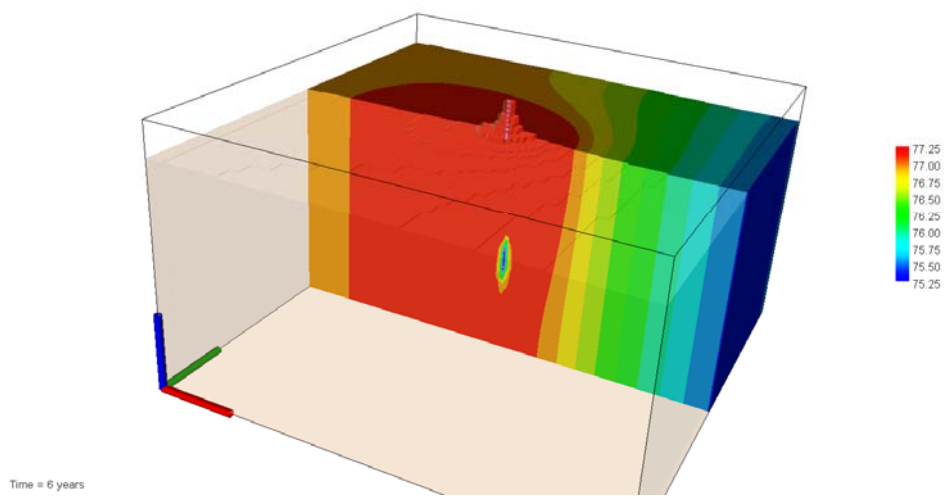


Figure 16 shows the distribution of pH after six years of injection. The slight initial decrease in pH for the pilot water is believed to be related to release of some of the protons from the HFO surface.

The pilot water had bicarbonate concentration of 43 mg/L as HCO3 and so there is some potential pH buffering. The pH drop is slight, only 0.05 units. Within the Paso Robles Formation mixing/dilution is the main process responsible for the decreases in concentrations. As mentioned above, the Paso Robles is probably at saturation with respect to calcite, but calcite was not included as an equilibrium phase in these initial PHAST models.

Figure 16. Distribution of pH at six years.

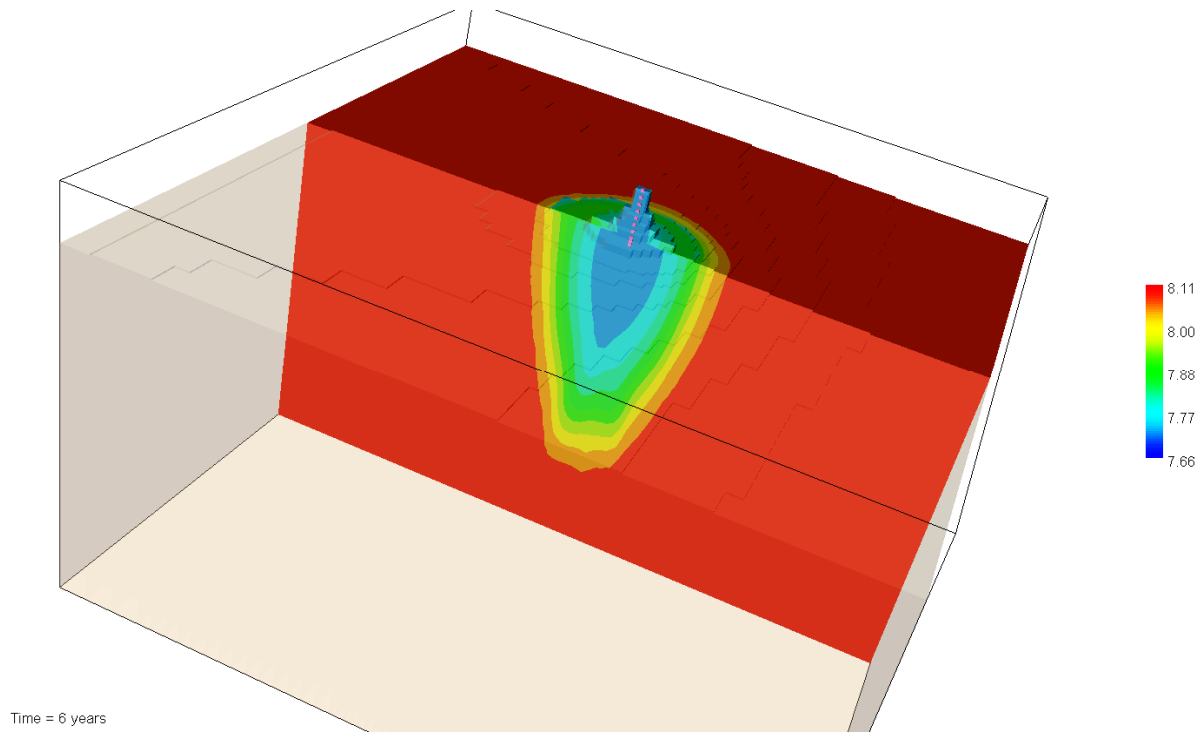


Figure 17 shows the distribution of hexavalent chromium [Cr(VI)] at 0.1 years, concentrations are all less than 1.7 µg/L. The ambient water in the Paso Robles formation was set at 1.7 µg/L, and most of the injected water has a lower chromium concentration at this time. Continued injection shows an expansion of the infiltration zone and some mounding of the injected solution (Figures 18, 19 and 20). At time 0.25 years, the maximum concentration is less than 4.1 µg/L. The maximum modeled concentration then decreases to around 4.00 µ/L with a slow decrease over time. After 6 years the maximum concentration is 3.75 µg/L, but the volume is small for this concentration.

Figure 17. Chromate concentrations after 0.1 years of injection, the greatest concentration was reported to be 1.7 µg/L.

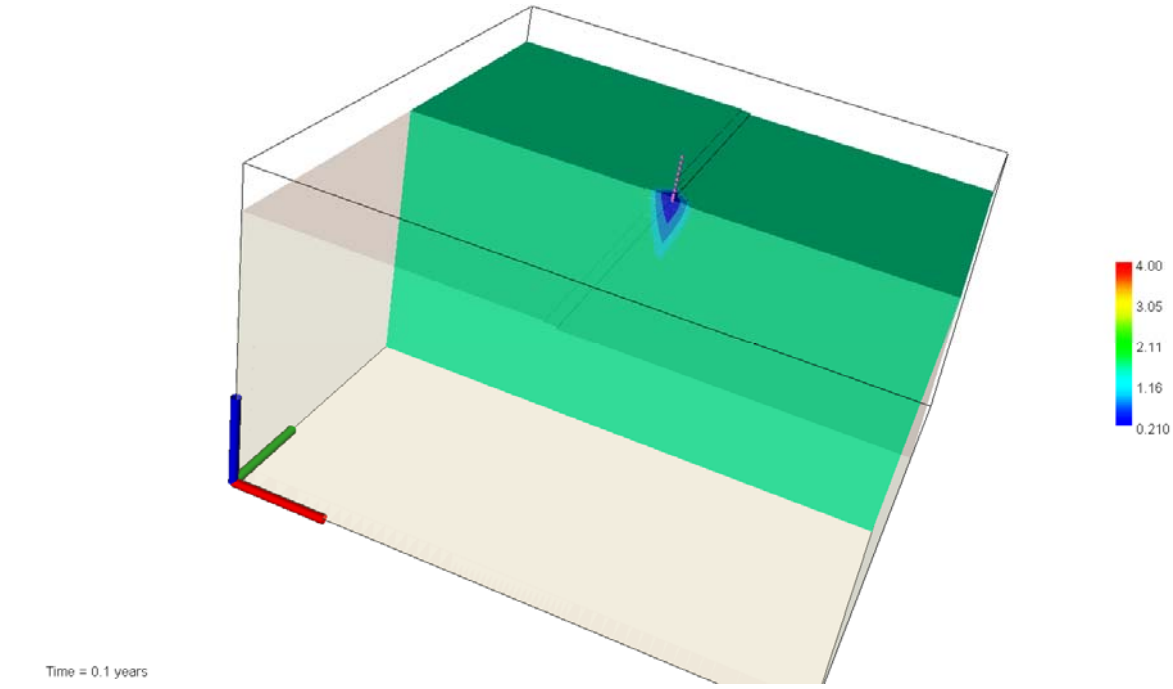


Figure 18. Chromate concentrations after 0.25 years of injection, the largest concentration was reported to be 4.1 µg/L.

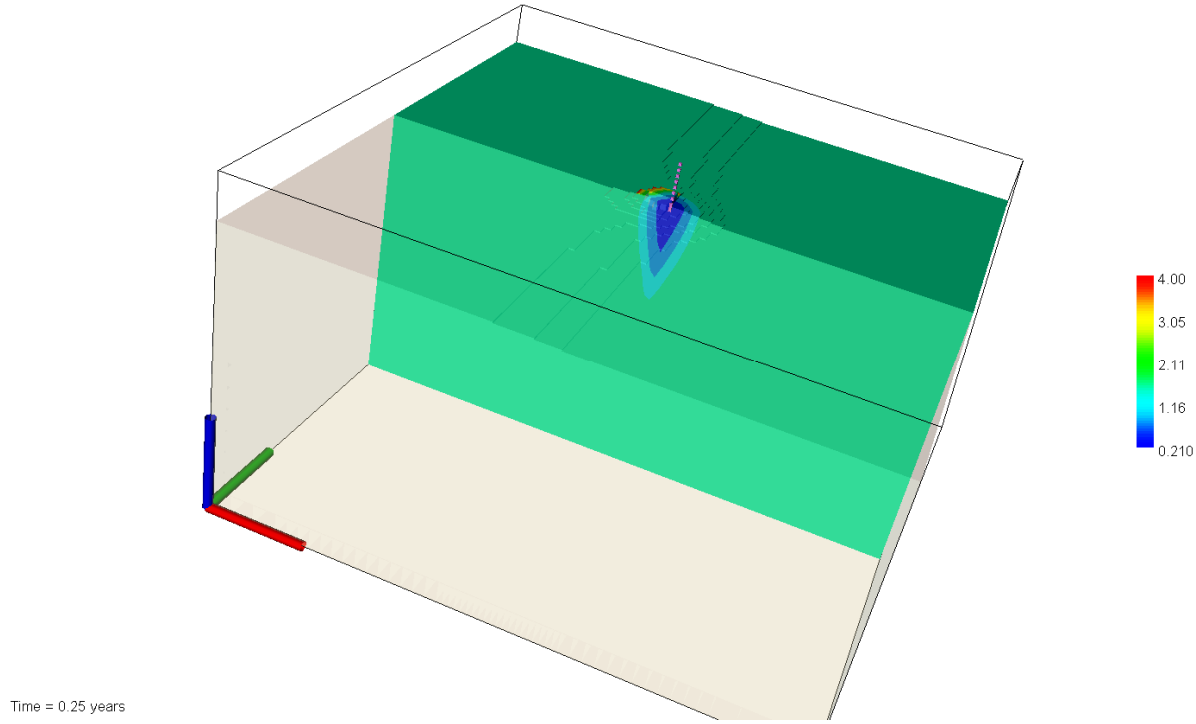


Figure 19. Chromate concentrations at 1 year of injection. The largest concentration was reported to be 3.99 µg/L.

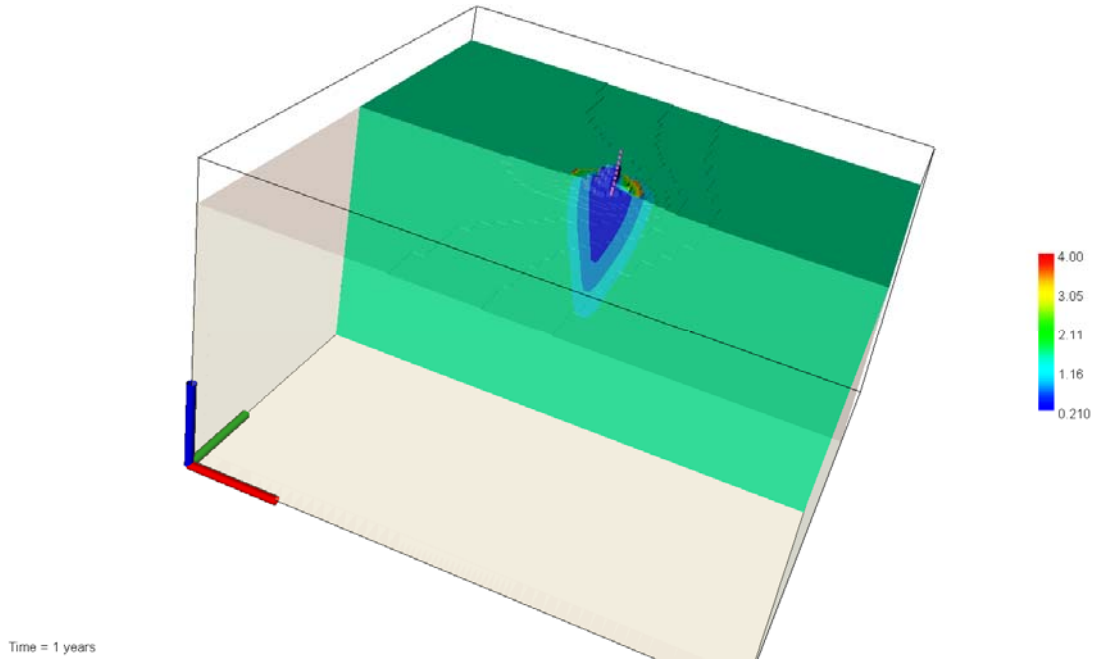


Figure 20. Chromate concentrations at 1 year of injection - threshold view. The largest concentration was reported to be 4.0 µg/L. Lower threshold value set at 1.75 µg/L. The greatest concentrations are noted at the outer perimeter of the mounded water.

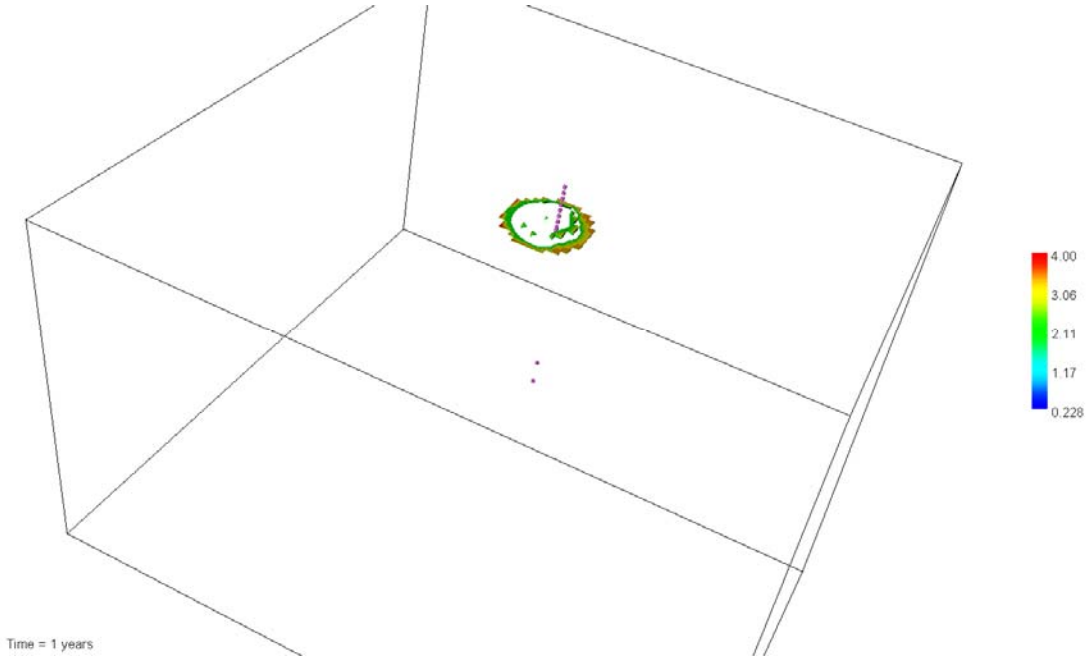


Figure 21 is an expanded view of the area around the injection well shown on Figure 22 and the figure demonstrates several processes related to chromium. First the volume closest to the injection well is characterized by low concentrations (less than the threshold of 1.75 µg/L). This volume has been essentially leached of the surface complexed hexavalent chromium. The greatest concentrations are in the areas that have just been wetted by the injection solution. In modeling unsaturated transport PHAST for Windows does not calculate reactions at the dry nodes. Only when water has contacted the appropriate node are the surface complexation reactions considered. This is reasonable when considering reactive solute transport near the water table. So these new points [HFO sites loaded with Cr(VI), As, and Pb] release some of the sorbed metals into solution. As this is the first contact, the initial concentrations will be high. However, it should be noted that this is a thin layer (about 1 foot in the model) and the underlying layers show even lower concentrations. The same type of effect is seen at higher elevations along the injection well. As the ground water mound builds upward and outward the same type of process is observed. The three images that make up Figure 22 show the distribution coefficient for Cr(VI) at this time. The greatest values are on the leading edges where chromate is actively being leached upon initial contact with solution. In those fresh (previously uncontacted) regions the distribution coefficients are comparable to the values noted in the initial PHREEQC modeling and in the transport modeling. The distribution of Kd values are consistent with the modeled concentrations.

Figure 21. Expanded image of chromate concentrations at 1 year of injection. The largest concentration was reported to be 5.83 µg/L. Lower threshold value set at 1.75 µg/L, just above the concentration of Cr(VI) in the Paso Robles. The image shows an expanded view of the recharge area. Vertical exaggeration set to 10. Note mounding around injection well and that the greatest concentrations are only present in one layer.

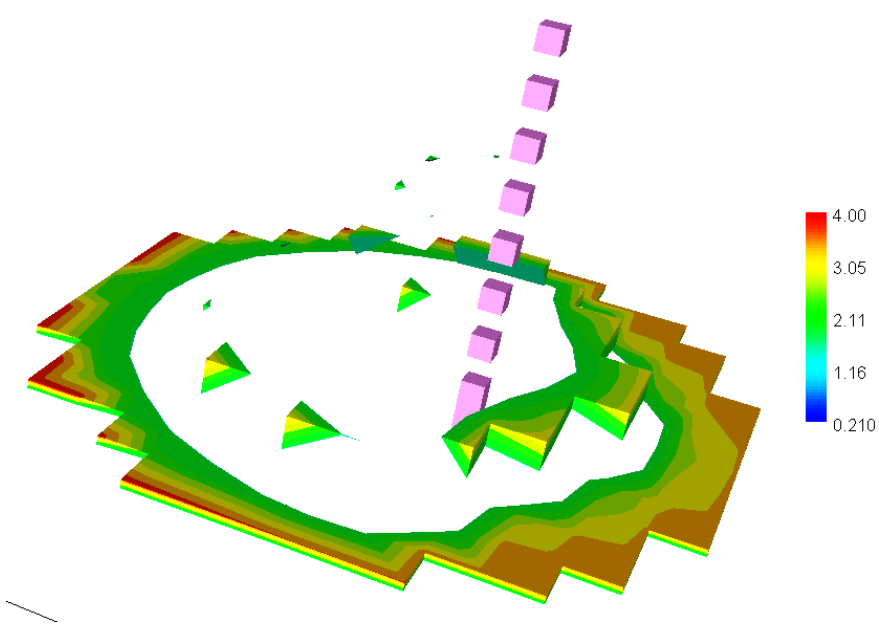


Figure 22 a, b, c. Distribution coefficients (non-dimensional) for chromate after one year of pilot water injection. The b-image has a threshold of 0.001, the c-image has been expanded and the vertical exaggeration is 10.

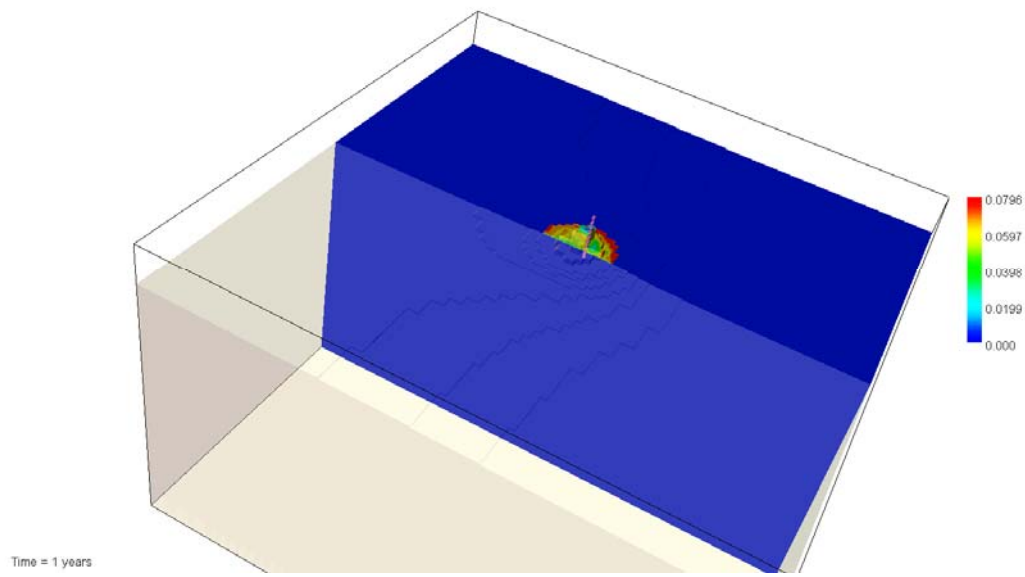


Figure 22 b.

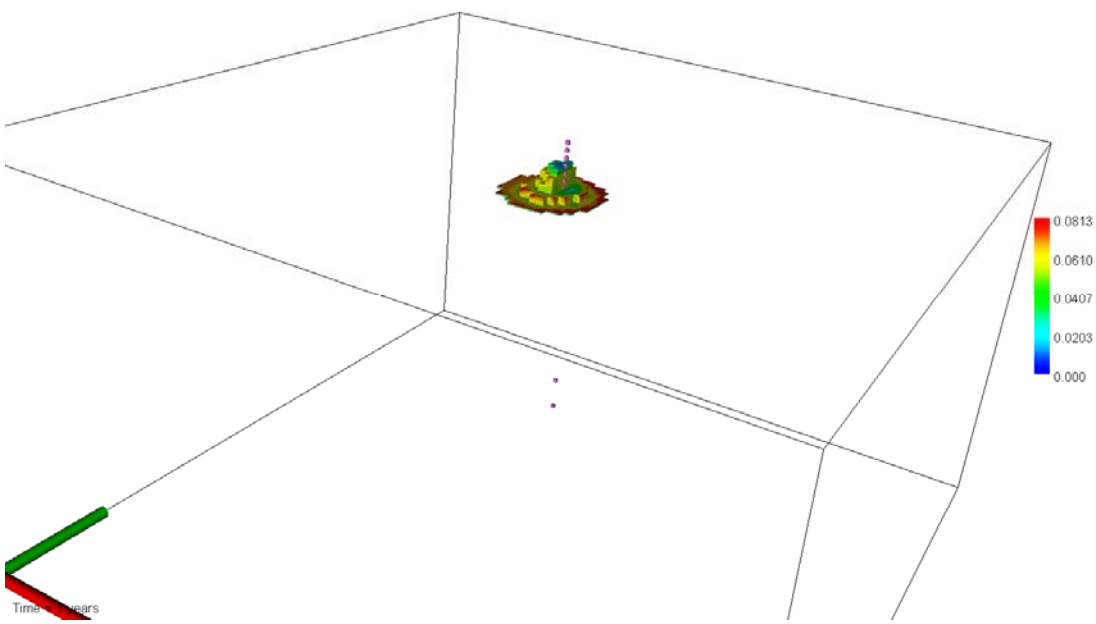
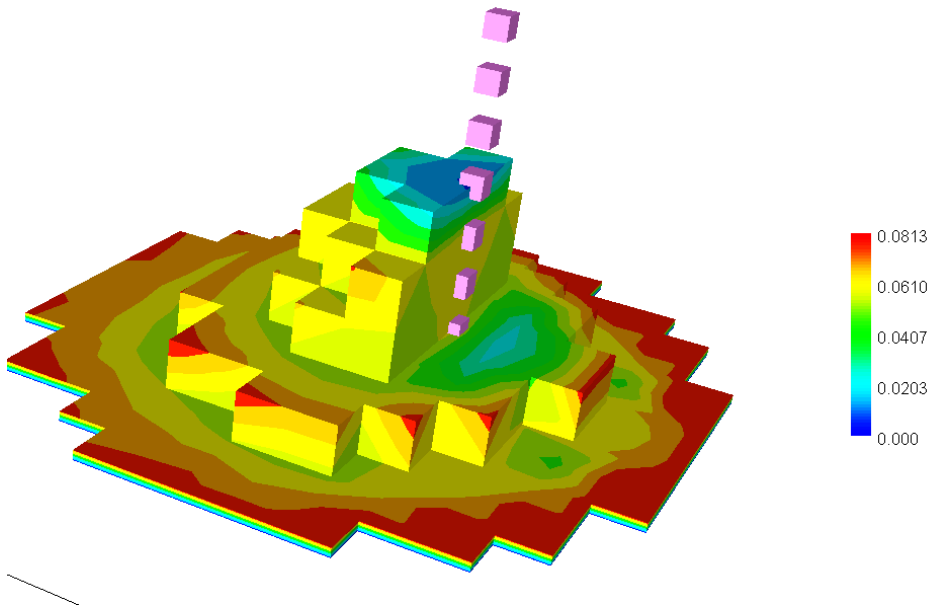


Figure 22 c.



With continued injection, a steady state condition is reached by about six years. Figure 23 shows the chromate distribution at six years. Figure 24 shows the distribution coefficients at six years the infiltration foot print has essentially stabilized and the values are lowered at the base of the Aromas formation. Higher Kd values are noted at higher elevations probably due to increases in water levels that are contacting cells that were previously dry.

Figure 23. Chromate concentrations at 6 year of injection. The largest concentration was reported to be 3.75 µg/L.

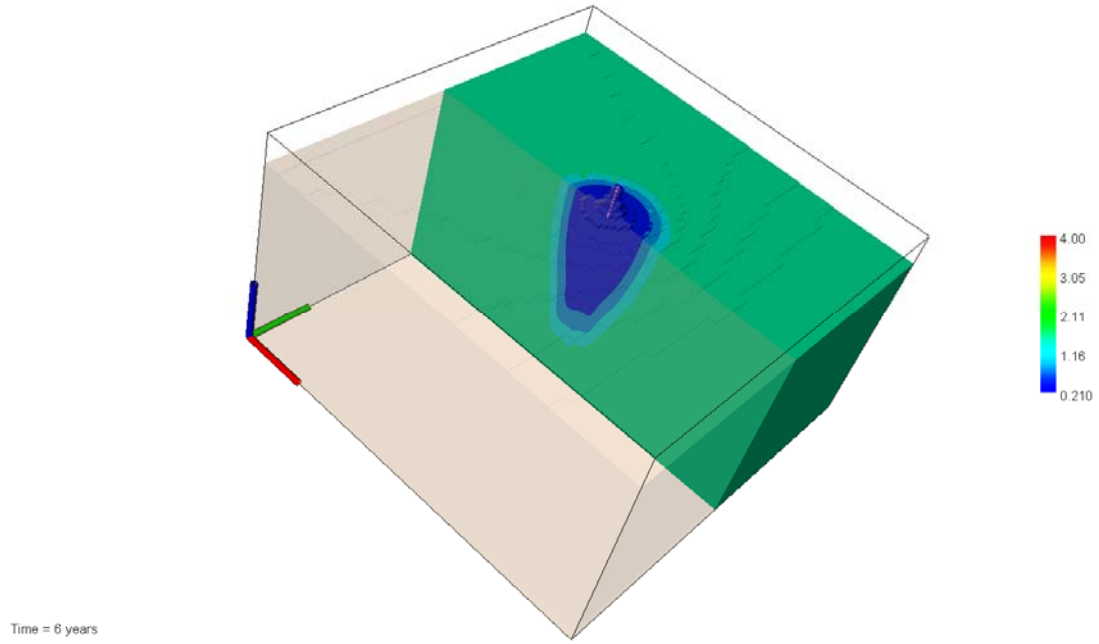


Figure 24 a,b. Chromate distribution coefficients (non-dimensional) after six years of pilot water injections.

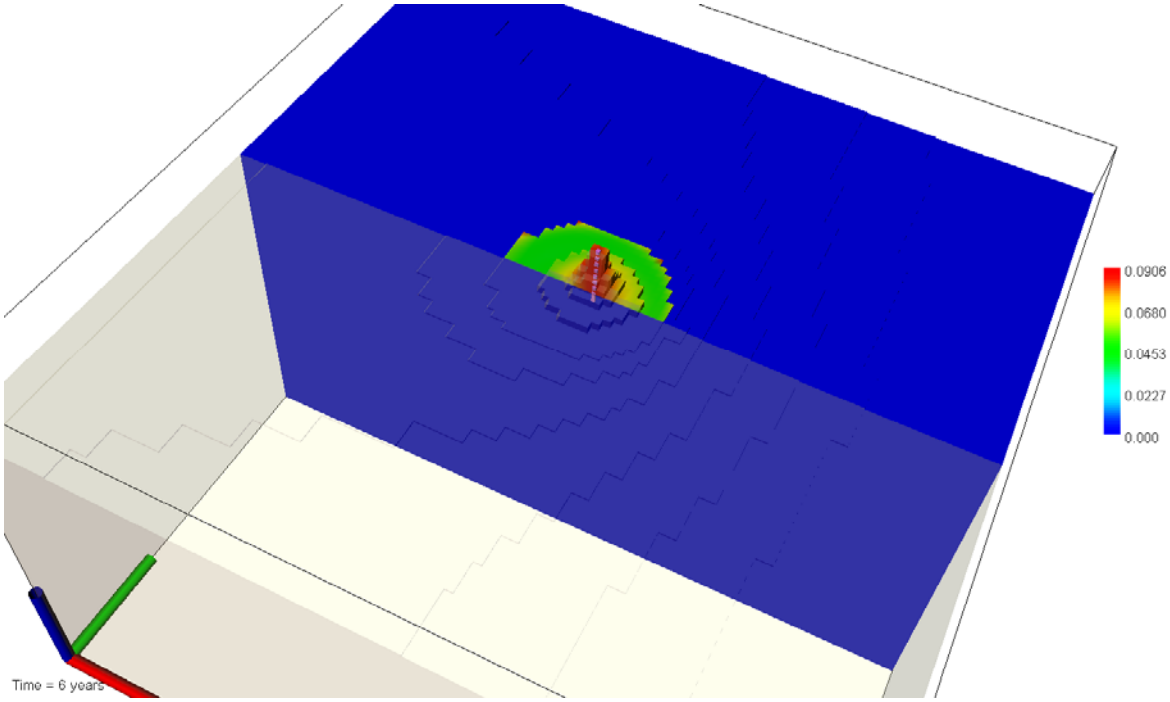
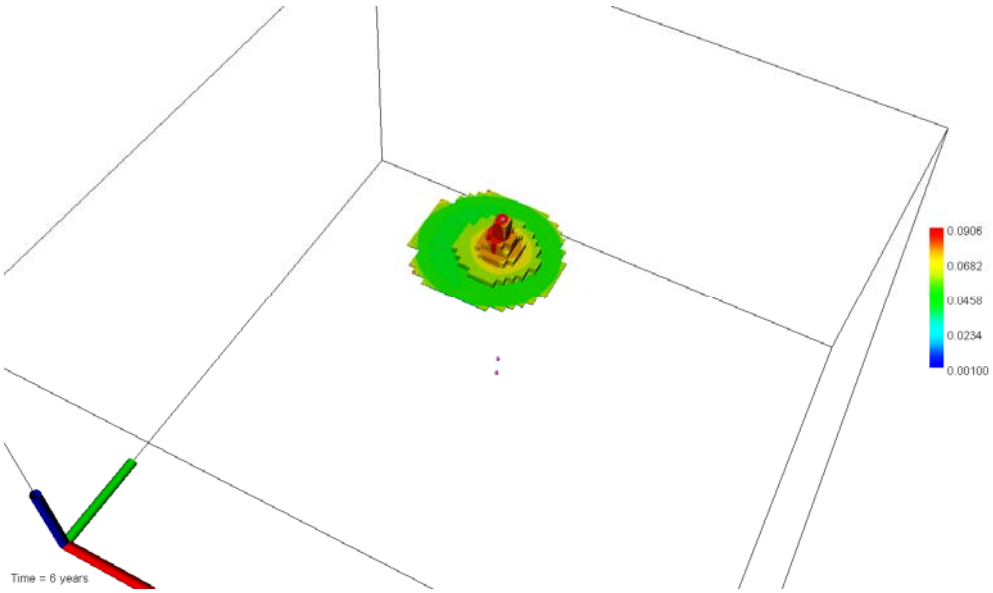


Figure 24 b.



Arsenic concentrations appear to be lower than the ambient concentration reported in the sample from the Paso Robles (Figure 25). Concentrations are consistent with the approximately 4 mg/L noted in the transport models. Lead concentrations from the inject water are also low as values of 0.5 to 0.6 µg/L are present after six years near the injection well (Figure 26). Because of the way Model Viewer sets its ranges for the color bar both figures show similar patterns.

Figure 25. Distribution of arsenic after six years of injection for the initial high arsenic/lead model.

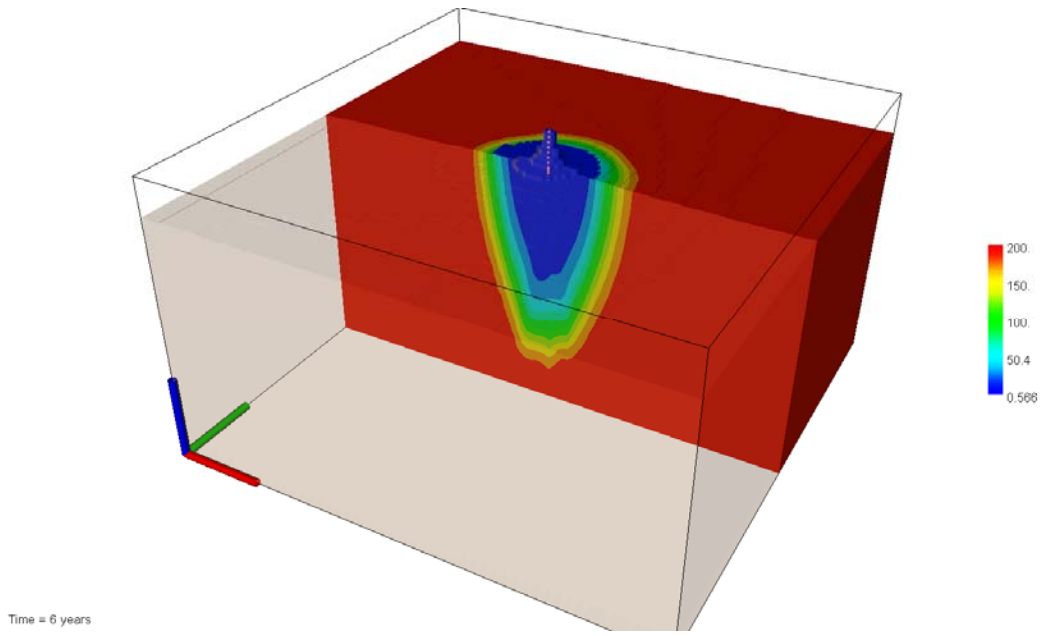
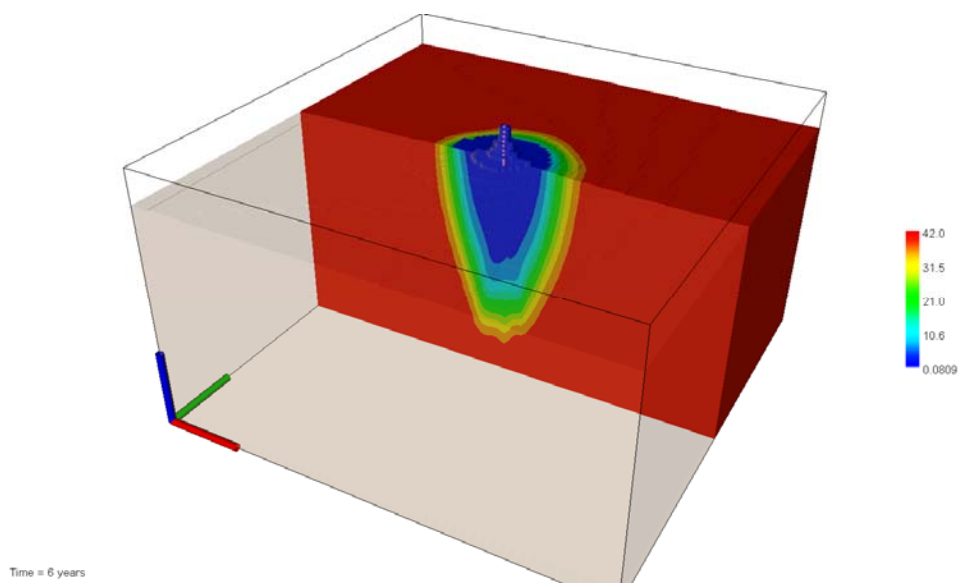


Figure 26. Distribution of lead after six years of injection for the initial high arsenic/lead model.



As mentioned previously the arsenic and lead concentrations in the Paso Robles Formation ground water sample appear to have been impacted by excess turbidity. Such a result is also consistent with the high iron noted in the sample and the high distribution coefficients for these two components. To show a more realistic set of model results, an additional PHAST model was prepared that used lower As and Pb concentrations (Table 1) (Figures 27 and 28). For lead the lower initial estimated concentration at six years is 0.06µg/L rather than 0.571 (Figure 28). This is about a ten-fold decrease. A tenfold decrease was also used to change the lead concentration from 42 to 4.2 µg/L in the Paso Robles Formation, suggesting that mixing of the injected solution with the Paso Robles was responsible for these concentrations. During early time steps (0.1 years) the minimum lead concentration was 0.4 µg/L, this minimum value decreased with time.

In the case of arsenic, a twenty fold dilution was used that lowered the arsenic from 200 µg/L to 10 µg/L. The revised low As/Pb model also shows a decrease in the lowest concentrations within the injection plume. The new value is 0.398 µg/L, at six years rather than the 2.88 reported in the original model.

The concentrations estimated for the low concentration model are probably more realistic than the models that used the measured concentrations.

Figure 27. Results of arsenic distribution from the low arsenic/lead model at six years.

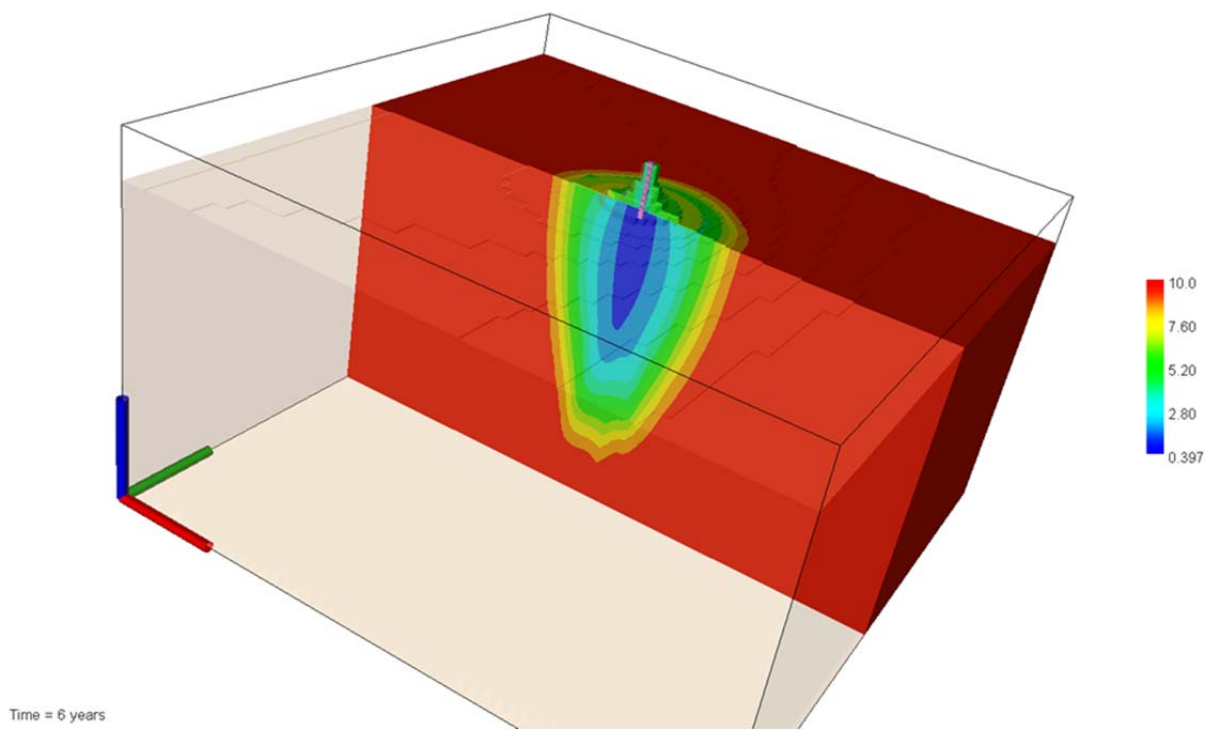
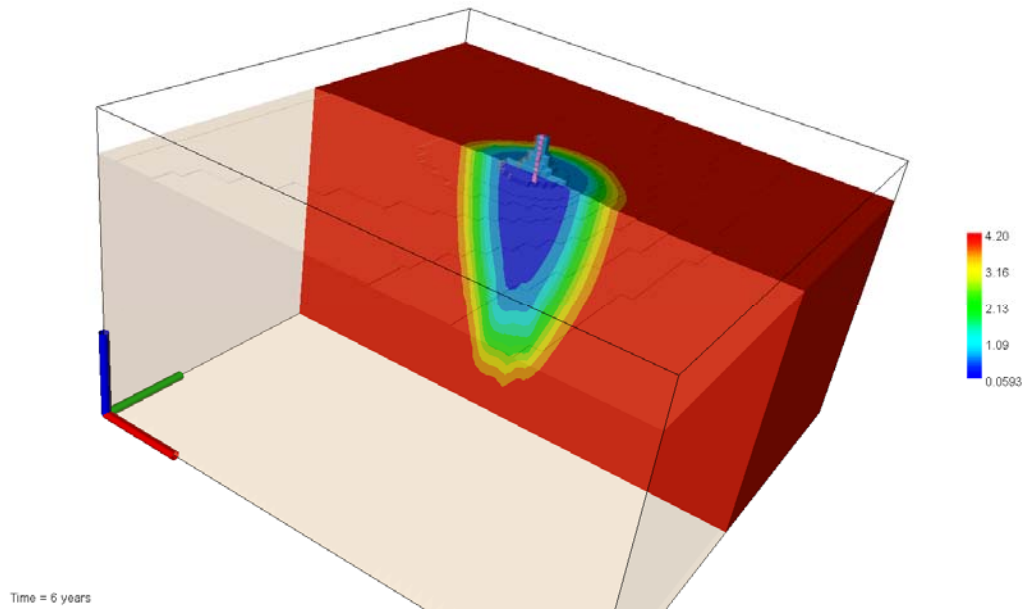


Figure 28. Results of lead distribution from the low arsenic/lead model at six years.



DISCUSSION

The volume of Aromas Formation that actually contacts the pilot water appears to be small and so it will rapidly release chromate in that volume of rock. Arsenic will be released slowly over time but even those concentrations will decrease over time. Figure 29 is the zone flow (flux rates) for Cr(VI) that migrates down from the Aromas recharge area to the Paso Robles Formation. These amounts represent masses that pass through the zone centered around the injection well. In the case of Cr(VI) the steady state flux of about 0.5 kilograms per 0.25 years is close to a concentration of 0.21 µg/L, the starting concentration for Cr(VI) in the pilot water.

Because Cr(VI) has such a low Kd, a set of simple calculations will put this in perspective. The zone flow values indicate that for the first 0.25 years 0.0975 kilograms of chromium passed through the zone boundary Figure 3X). Assuming a concentration of 7.5µg Cr(VI)/kilogram of rock indicates that the chromium came from the complete leaching of 1.3e7 kilograms of rock. At specific gravity of 2.65 for the quartz grains this corresponds to a volume of 4.9e6 liters of rock converting that to 30 porosity we estimate a pore space of 1.41e7 liters. An injection rate of 110 gpm corresponds to 416.39 liters per minute. In 0.25 years (assumed to be 90 days, to match the calculation) the volume of injected water would be 5.46e7 liters, which is 36.7 pore volumes. This number of pore volumes is consistent with the transport calculations and the results based upon the PHAST modeling. This effect increases with increased injection. Fluxes for 0.5 to 2.25 years range from 0.158 kg to 0.11 kilograms/year for chromium. After 2.25 years fluxes decrease to less than 0.1 kilogram per year or a concentration of about 0.4 µg/L. After about six years fluxes become nearly steady at 0.055 kilograms and slowly decrease to 0.05 kilograms per 0.25 years. These correspond to concentration of approximately 0.25 µg/L.

Similar patterns for fluxes are seen for arsenic and lead (Figure 31), where initial concentrations rapidly drop. However, the arsenic fluxes are greater and maintain higher fluxes during steady state. Furthermore, the higher Kd values preclude the application of the simple calculations shown above.

Figure 29. Zone flow calculations showing Cr(VI) flux in kilograms per 0.25 year moving from the Aromas recharge zone to the Paso Robles Formation, calculated using PHAST for Windows.

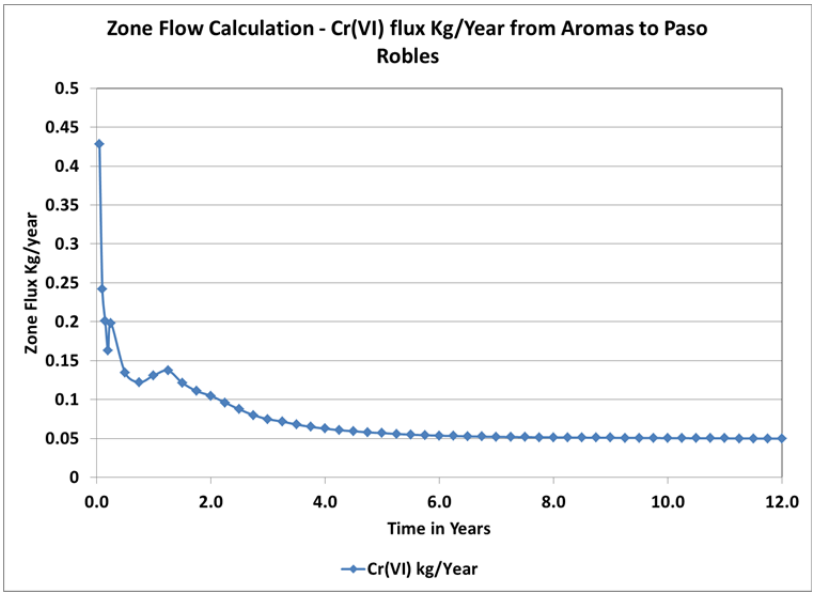


Figure 30. Zone flow calculations showing arsenic and lead for the low As/Pb model. Flux in in kilograms per 0.25 year moving from the Aromas recharge zone to the Paso Robles Formation, calculated using PHAST for Windows.

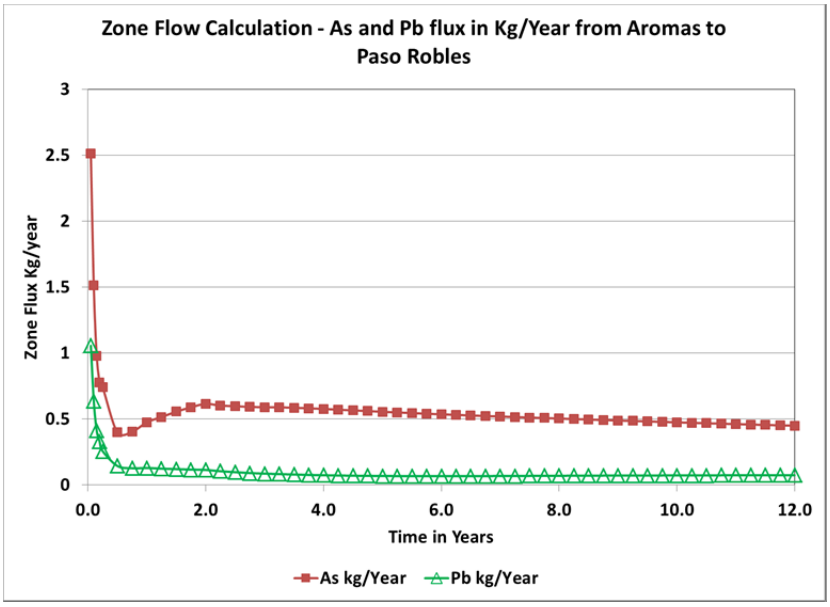
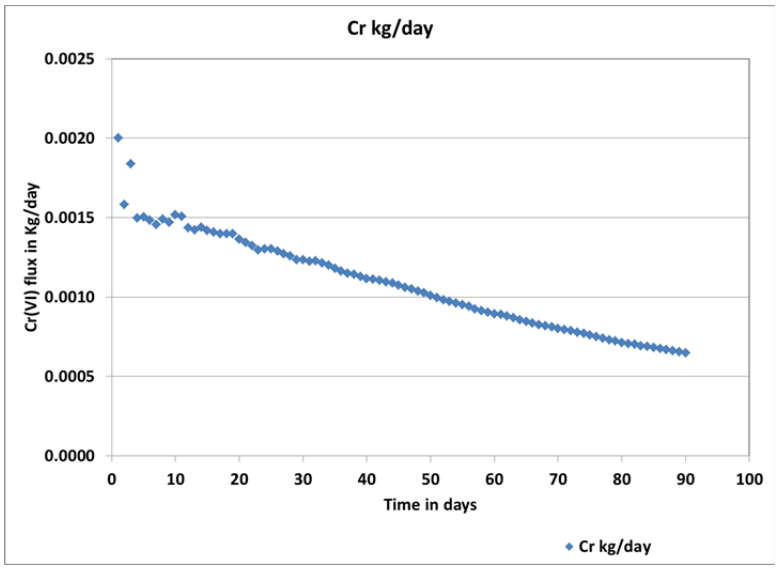


Figure 31. Cr(VI) daily flux rates from Aromas to Paso Robles Formation.



SATURATION INDEX CALCULATIONS

Another potential issue is associated with the potential for well plugging. One of the most likely precipitates is calcite ($CaCO_3$). In some cases gypsum ($CaSO_4 \cdot 2H_2O$) may form but this normally occurs with industrial wastes with much higher calcium and sulfate concentrations. These waters are far too dilute to cause gypsum precipitation. Silica was not reported for these samples so silica phases cannot be evaluated at this time.

Figure 29 shows the spatial distribution of saturation indices for calcite. Saturation indices provide a means to determine whether a solution is in equilibrium with a particular mineral phase. The Saturation Index (SI) is defined as:

$$SI = \log \frac{(IAP)}{K_{sp}}$$

Where:

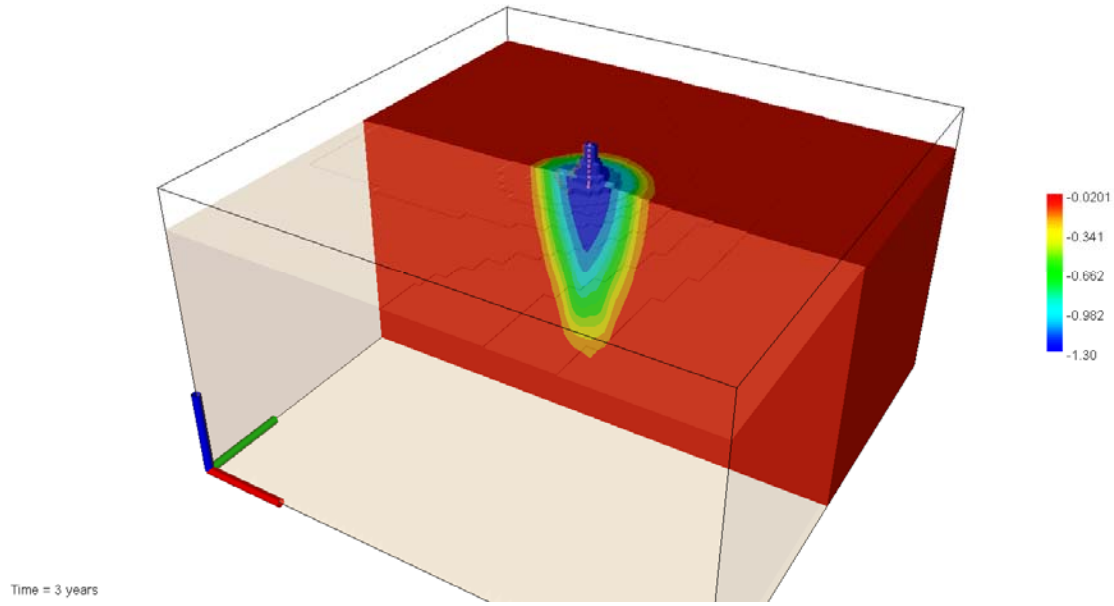
IAP represents the ion activity product, and

K_{sp} is the solubility product constant for the specific mineral.

Positive SI values mean that the solution is oversaturated with respect to that phase (mineral) and it should form. Negative values mean the solution is undersaturated and the mineral if present will dissolve to attain equilibrium. Zero values mean that equilibrium is present. The -0.02 value present throughout the Paso Robles Formation (Figure 32) is close enough to zero to indicate that the solution is in equilibrium with calcite; in this water if the pH was reported to be at 8.13 rather than 8.11, the SI would be 0.001. The pilot water has a lower pH at 7.7 and the calcite saturation

index is estimated to be -0.98, so it is strongly undersaturated. Calcite will dissolve to achieve equilibrium and the pH will increase from its initial value in the mid 7's. It is unlikely that the pH will increase beyond the 8.13 value estimated for equilibrium with calcite in the Paso Robles formation.

Figure 32. Saturation indices for calcite at 3 years.



CALCITE EQUILIBRIUM AND METAL MOBILITY

Several additional simulations were run to evaluate the role of calcite in the mobility of Cr(VI) As, and Pb. One model included calcite in both the Aromas and in the Paso Robles, the partial pressure for CO_2(g) was fixed at -3.3 log atmospheres, which is the model calculated partial pressure for the F0-7 shallow water sample. The pH values in the Paso Robles increased to 8.13 from 8.11 and the pH plume from the Aromas infiltration zone essentially vanished as the pH in nearly all of the model domain went to 8.13 also. Slight but insignificant changes were noted for Cr(VI). Basically the Kd at 7.7 is so low, and the total amount of Cr(VI) is similarly low that any further increase in the source terms is slight.

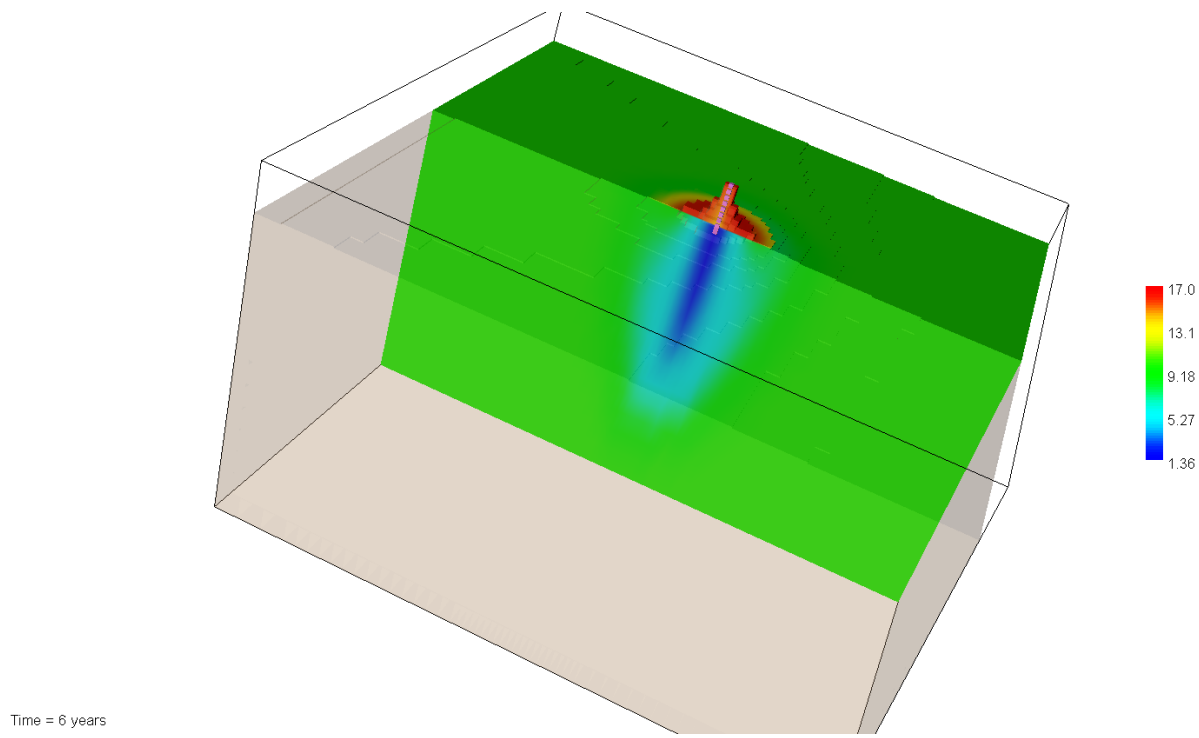
With the increased pH lead concentrations decreased slightly. This is consistent with the assumption of the surface complexation model.

Arsenic concentrations around the well increased by about a factor of 3, and this is reflected in the minimum concentrations noted at year 6 Figure 33. In the model without calcite the minimum As concentration was 0.355 µg/L with the maximum essentially at the formation

defined concentration of 10 µg/L. For the model that included calcite in the Aromas and Paso Robles the increased pH caused more As release and the maximum concentration was about 16.9 µg/L. But this area is limited to the saturated zone in the Aromas. A transport model was also run to confirm these observations. Because the model did not include initial mixing with the Paso Robles the pH increased to 8.23. Chromium concentrations increased to about 33 µg/L, for the initial cell values. But that means that the chromium can leach out even faster. Arsenic concentrations increased to about 23.8 µg/L. As the pH is slightly greater than estimated in the PHAST model the estimated maximum concentration of 16.9 µg/L from the PHAST model is consistent with the transport concentrations.

It should also be understood that the model did not include any type of sorbent (HFO) surface in the Paso Robles, and it is likely that all of these metals could be attenuated by additional surface complexation. So the model is very conservative in that respect. Some decreases in pH may help slow arsenic release and depending upon the extent of the pH reduction it could reduce hexavalent chromium mobility but as noted above lead would become more mobile. But the simplest control method is probably through pH adjustments.

Figure 33. Distribution of arsenic for model with calcite in the Aromas and Paso Robles, at six years.



CONCLUSIONS

All of the model results, whether from the pH sweeps, the transport models or the reactive transport PHAST simulations support the premise that any hexavalent chromium in the Aromas Formation is at average concentration around 7 to 8 mg/kg of rock or that about 45 µg per liter of chromate is in contact with water for every 6.18 kg of Aromas material (at 30% porosity). These estimated concentrations are derived from the average leach concentrations. Chromate is readily released upon addition of solution with a pH of the proposed pilot water. Contact with lower pH solutions would reduce the concentrations of chromate released to solution. This would lower the concentrations and increase the amount of time required to leach the chromium from the HFO surface.

Arsenic is present at a greater concentration in the Aromas Formation, but it is more strongly adsorbed onto the HFO surface. So it will continue to provide a small contribution of arsenic over the long term.

The model does not include any adsorption capacity in the Paso Robles. It is reasonable to expect that the relatively small loads of metals and metalloids (arsenic) from the Aromas would be "picked up" by the Aromas with a probably an unnoticeable change in the dissolved metal concentrations in the formation waters.

Lead concentrations and fluxes appear to be similarly slight.

The proposed injection solution is dilute and the pH is low enough that it will not cause mineral precipitation reactions that could plug well screens either in the Aromas or in the Paso Robles.

REFERENCES

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SAVED SURFACE FOR pH SWEEPS, TRANSPORT AND PHAST OPEN SYSTEM

```
SELECTED_OUTPUT 1
    -file                 BICARB Cr 7.7e-6 run Fix As first 1 percent HFO 6SA then
chrom.xls
    -reset                false
    -simulation           true
    -state                true
    -solution             true
    -distance             true
    -step                 true
    -pH                   true
    -water                true
USER_PUNCH
-headings pH Moles_As_Surface Kd_As LOG_Kd_As As_µg/L  MOLES_PB_SURFACE KD_Pb
LOG_KD_Pb Pb_µg/L Moles_Cr_Surface Kd_Cr LOG_Kd_Cr Cr_µg/L
-start
5  PUNCH -LA("H+")
10 TOTAsSURF = MOL("Hfo_wAsO4-2") + MOL("Hfo_wH2AsO4")  + MOL("Hfo_wHAsO4-") +
MOL("Hfo_wOHAsO4-3")
12 PUNCH  TOTAsSURF
20 PUNCH  TOTAsSURF/TOT("As")
21 PUNCH LOG10(TOTAsSURF/TOT("As"))
22 PUNCH TOT("As")*74922*1000
30 TOTPbSURF = MOL("Hfo_wOPb+") + MOL("Hfo_sOPb+")
32 PUNCH  TOTPbSURF
36 PUNCH TOTPbSURF/TOT("Pb")
37 PUNCH LOG10(TOTPbSURF/TOT("Pb"))
39 PUNCH TOT("Pb")*207*1000*1000
40 TOTCrSURF = MOL("Hfo_wCrO4-")
42 PUNCH TOTCrSURF
46 PUNCH TOTCrSURF/TOT("Cr")
48 PUNCH LOG10(TOTCrSURF/TOT("Cr"))
50 PUNCH TOT("Cr")*51.99*1000*1000
-end
USER_PRINT
-start
1 PRINT "Chromium(VI)  ug/L        :", TOT("Cr(6)")*51.996*1000*1000
3 PRINT "pH                        :", -LA("H+")
40 TOTCrSURF = MOL("Hfo_wCrO4-")
42 PRINT "MOLES Cr Surface complexed    :", TOTCrSURF
45 PRINT "MOLES Cr ",  TOT("Cr") "in Soln    :", TOT("Cr") *51990 " as mg/L  Cr  :"
46 PRINT "Kd Cr dimensionless      :", TOTCrSURF/TOT("Cr")
52 PRINT "     "

128 PRINT "Lead      ug/L        :", TOT("Pb")*207*1000*1000
130 TOTPbSURF = MOL("Hfo_wOPb+") + MOL("Hfo_sOPb+")
132 PRINT "MOLES Pb surface complexed    :", TOTPbSURF
135 PRINT "MOLES Pb  in Soln :", TOT("Pb") "Pb mg/L  :", TOT("Pb") *20700
136 PRINT "Kd Pb dimensionless      :", TOTPbSURF/TOT("Pb")
138 PRINT "     "
160 PRINT "Arsenic µg/L           :", TOT("As")*74922*1000
161 PRINT "pH                        :", -LA("H+")
162 TOTAsSURF = MOL("Hfo_wAsO4-2") + MOL("Hfo_wH2AsO4")  + MOL("Hfo_wHAsO4-") +
MOL("Hfo_wOHAsO4-3")
163 PRINT "MOLES As Surface complexed    :", TOTAsSURF
165 PRINT "MOLES As   in Soln :", TOT("As") "As mg/L  :", TOT("As")*74922
170 PRINT "Kd As dimensionless      :", TOTAsSURF/TOT("As")
-end
SOLUTION 200 Pilot water
```

```
    temp      25
    pH        7.70
    pe    10.7
    units     mg/l
    density   1
    S(6)      0.11
    N(5)      0.64
   # N(-3)     1.3
    Ca        11
    Ba    0.140
    Cr(6) 0.00021
    K         0.050
    Na        19
    Cl        2 charge
C(4)   43 as HCO3
    -water    1 # kg
PHASES
Fix_H+
H+ = H+
logk 0.0
END
USE SOLUTION 200
REACTION  100
K2CrO4  1
7.7e-6    #
EQUILIBRIUM_PHASES 100
Fix_H+  -7.7  NaOH
SAVE SOLUTION 202
END
USE SOLUTION 202
REACTION  200
PbCl 1
3.28e-5
SAVE SOLUTION 202
END
USE SOLUTION 202
REACTION  300
As2O5  1
0.74e-4
EQUILIBRIUM_PHASES  101
Fix_H+  -7.7  NaOH
SAVE SOLUTION 300
END
USE SOLUTION 300 #back to 1.0% HFO
SURFACE  1
Hfo_wOH  0.000735  6.0  .3273   #30.9 actual factor
Hfo_sOH 0.0000184
SAVE SURFACE 1
EQUILIBRIUM_PHASES 102
Fix_H+  -7.7 NaOH
CO2(g)  -3.4  10
END
MIX
200 30.9
SAVE SOLUTION 31
END
USE SOLUTION 31
USE SURFACE 1
EQUILIBRIUM_PHASES
Fix_H+  -7.7 NaOH
CO2(g)  -3.4  10
END
```

PHREEQC INPUT FILE

(Transport version)

```
#OPEN WITH TRANSPORT Pb 1%

PRINT

    -alkalinity            false
    -echo_input            true
    -eh                    false
    -equilibrium_phases    false
    -exchange              false
    -gas_phase             false
    -headings              true
    -inverse               false
    -kinetics              false
    -other                 true
    -saturation_indices    false
    -solid_solutions       false
    -species               false
    -surface               true
    -totals                true
    -user_print            true
    -selected_output       true
    -status                true
    -warnings              0

SELECTED_OUTPUT 1
    -file           FINAL SURFACE BICARB TRANSPORT Cr 7.7e-6 run Fix As first 1
percent HFO 6SA then chrom.xls
    -reset                false
    -simulation           true
    -state                true
    -solution             true
    -distance             true
    -step                 true
    -pH                   true
    -water                true
USER_PUNCH
-headings pH Moles_As_Surface Kd_As LOG_Kd_As As_µg/L  MOLES_PB_SURFACE KD_Pb
LOG_KD_Pb Pb_µg/L Moles_Cr_Surface Kd_Cr LOG_Kd_Cr Cr_µg/L
-start
5  PUNCH -LA("H+")
10 TOTAsSURF = MOL("Hfo_wAsO4-2") + MOL("Hfo_wH2AsO4")  + MOL("Hfo_wHAsO4-") +
MOL("Hfo_wOHAsO4-3")
12 PUNCH  TOTAsSURF
20 PUNCH  TOTAsSURF/TOT("As")
21 PUNCH LOG10(TOTAsSURF/TOT("As"))
22 PUNCH TOT("As")*74922*1000

30 TOTPbSURF = MOL("Hfo_wOPb+") + MOL("Hfo_sOPb+")
32 PUNCH  TOTPbSURF
36 PUNCH TOTPbSURF/TOT("Pb")
37 PUNCH LOG10(TOTPbSURF/TOT("Pb"))
39 PUNCH TOT("Pb")*207*1000*1000
40 TOTCrSURF = MOL("Hfo_wCrO4-")
42 PUNCH TOTCrSURF
46 PUNCH TOTCrSURF/TOT("Cr")
48 PUNCH LOG10(TOTCrSURF/TOT("Cr"))
```

```
50 PUNCH TOT("Cr")*51.99*1000*1000
-end

USER_PRINT
-start
1 PRINT "Chromium(VI)  ug/L        :", TOT("Cr(6)")*51.996*1000*1000
3 PRINT "pH                        :", -LA("H+")
40 TOTCrSURF = MOL("Hfo_wCrO4-")
42 PRINT "MOLES Cr Surface complexed    :", TOTCrSURF
45 PRINT "MOLES Cr ",  TOT("Cr") "in Soln    :", TOT("Cr") *51990 " as mg/L  Cr  :"
46 PRINT "Kd Cr dimensionless      :", TOTCrSURF/TOT("Cr")
52 PRINT "     "

128 PRINT "Lead      ug/L        :", TOT("Pb")*207*1000*1000
130 TOTPbSURF = MOL("Hfo_wOPb+") + MOL("Hfo_sOPb+")
132 PRINT "MOLES Pb surface complexed    :", TOTPbSURF
135 PRINT "MOLES Pb  in Soln :", TOT("Pb") "Pb mg/L  :", TOT("Pb") *20700
136 PRINT "Kd Pb dimensionless      :", TOTPbSURF/TOT("Pb")
138 PRINT "     "

160 PRINT "Arsenic µg/L           :", TOT("As")*74922*1000
161 PRINT "pH                        :", -LA("H+")
162 TOTAsSURF = MOL("Hfo_wAsO4-2") + MOL("Hfo_wH2AsO4")  + MOL("Hfo_wHAsO4-") +
MOL("Hfo_wOHAsO4-3")
163 PRINT "MOLES As Surface complexed    :", TOTAsSURF
165 PRINT "MOLES As   in Soln :", TOT("As") "As mg/L  :", TOT("As")*74922
170 PRINT "Kd As dimensionless      :", TOTAsSURF/TOT("As")
-end

SOLUTION 200 Pilot water
    temp      25
    pH        7.70
    pe    10.7
    units     mg/l
    density   1
    S(6)      0.11
    N(5)      0.64
   # N(-3)     1.3
    Ca        11
    Ba    0.140
    Cr(6) 0.00021
    K         0.050
    Na        19
    Cl        2 charge
C(4)   43 as HCO3
    -water    1 # kg

PHASES
Fix_H+
H+ = H+
logk 0.0
END
USE SOLUTION 200
REACTION  100
K2CrO4  1
7.7e-6    #
EQUILIBRIUM_PHASES 100
Fix_H+  -7.7  NaOH
SAVE SOLUTION 202

END
USE SOLUTION 202
REACTION  200
```

```
PbCl 1
3.28e-5
SAVE SOLUTION 202
END
USE SOLUTION 202
REACTION  300
As2O5  1
0.74e-4
EQUILIBRIUM_PHASES  101
Fix_H+  -7.7  NaOH
SAVE SOLUTION 300
END
USE SOLUTION 300 #back to 1.0% HFO
SURFACE  1
Hfo_wOH  0.000735  6.0  .3273   #30.9 actual factor
Hfo_sOH 0.0000184
SAVE SURFACE 1-5
EQUILIBRIUM_PHASES 102
Fix_H+  -7.7 NaOH
CO2(g)  -3.4  10
END
#MIX
#200 30.9
#SAVE SOLUTION 31
END
#USE SOLUTION 31
#USE SURFACE 101
#EQUILIBRIUM_PHASES
#Fix_H+  -7.7 NaOH
#CO2(g)  -3.4  10
END
SOLUTION 1-5 Pilot water
    temp      25
    pH        7.70
    pe    10.7
    units     mg/l
    density   1
    S(6)      0.11
    N(5)      0.64
   # N(-3)     1.3
    Ca        11
    Ba    0.140
    Cr(6) 0.00021
    K         0.050
    Na        19
    C(4)   43 as HCO3
    Cl        2 charge
    -water    1 # kg

EQUILIBRIUM_PHASES 1-5
CO2(g) -3.4  10
Fix_H+  -7.7 NaOH

SAVE SOLUTION 0

END
TRANSPORT
-cells 5
-shifts 20
END
```

PHAST INPUT FILES

*.trans.dat

```
# <?xml version="1.0" encoding="UTF-8" standalone="no" ?>
# <WPhast>
#   <!--Exported from C:\data\Projects\TODD engineers\Final
Models\PHAST\pasorobles4_0_7_midtimes_noFe_12_LowZonebicarb77.p4w-->
#   <!--Exported to   C:\Users\John J.
Mahoney\Desktop\pasorobles4_0_7_midtimes_noFe_12_LowZonebicarb77.trans.dat-->
# </WPhast>
#
SOLUTE_TRANSPORT true
      -diffusivity  1e-009
STEADY_FLOW false
FREE_SURFACE_BC true
SOLUTION_METHOD
      -iterative_solver   true
      -tolerance          1e-010
      -save_directions    20
      -maximum_iterations 500
      -space_differencing 0
      -time_differencing  1
      -cross_dispersion   false
      -rebalance_fraction 0.5
      -rebalance_by_cell  false
UNITS
      -time                              years
      -horizontal_grid                   ft
      -vertical_grid                     ft
      -map_horizontal                    ft
      -map_vertical                      ft
      -head                              ft
      -hydraulic_conductivity            ft/day
      -specific_storage                  1/foot
      -dispersivity                      ft
      -flux                              ft/second
      -leaky_hydraulic_conductivity      ft/day
      -leaky_thickness                   ft
      -well_diameter                     inches
      -well_flow_rate                    gallon/minute
      -well_depth                        ft
      -river_bed_hydraulic_conductivity m/s
      -river_bed_thickness               m
      -river_width                       m
      -river_depth                       m
      -drain_hydraulic_conductivity      m/s
      -drain_thickness                   m
      -drain_width                       m
      -equilibrium_phases                WATER
      -exchange                          WATER
      -surface                           WATER
      -solid_solutions                   WATER
      -kinetics                          WATER
      -gas_phase                         WATER
```

```
GRID
      -nonuniform X
            0    200    400    600    700
            800    900    1000    1100    1200
            1300    1400    1500    1600    1700
            1800    1900    2000    2050    2100
            2150    2200    2250    2300    2350
            2400    2450    2500    2550    2600
            2650    2700    2750    2800    2850
            2900    2950    3000    3100    3200
            3300    3400    3500    3600    3700
            3800    3900    4000    4100    4200
            4400    4600    4800    5000
      -nonuniform Y
            0    200    400    600    800
            1000    1200    1300    1400    1500
            1600    1700    1800    1900    2000
            2050    2100    2150    2200    2250
            2300    2350    2400    2450    2500
            2550    2600    2650    2700    2750
            2800    2850    2900    2950    3000
            3100    3200    3300    3400    3500
            3600    3700    3800    4000    4200
            4400    4600    4800    5000
      -nonuniform Z
            0    20    40    60    80
            100    120    140    150    160
            170    180    190    200    210
            220    230    235    240    245
            249    250    251    252    253
            254    255    260    265    270
            275    280    285    290    295
            300
      -snap X 0.001
      -snap Y 0.001
      -snap Z 0.001
      -chemistry_dimensions XYZ
      -print_orientation XY
      -grid_origin   0  0  0
      -grid_angle    0
MEDIA
      -domain
            -active                    1
            -Kx                        5
            -Ky                        5
            -Kz                        0.5
            -porosity                  0.3
            -specific_storage          0.0001
            -long_dispersivity         50
            -horizontal_dispersivity   50
            -vertical_dispersivity     5
            -tortuosity                1
SPECIFIED_HEAD_BC
      -box -56.38811531968 26.7758550919261 0 44.8549795025603
4965.99252455504 300.000008009863 GRID
            -head
                  0 years     252.5
```

```
            -associated_solution
                  0 years     7
SPECIFIED_HEAD_BC
      -box 4942.52900037648 26.7758550919261 0 5053.9301633344
4965.99252455504 300.611610625052 GRID
            -head
                  0 years     247.5
            -associated_solution
                  0 years     7
HEAD_IC
      -domain
            -head                     POINTS GRID
                        0 0 252.5    252.5
                        0 5000 252.5    252.5
                        5000 0 247.5    247.5
                        5000 5000 247.5    247.5
                        end_points
CHEMISTRY_IC
      -domain
            -solution            7
CHEMISTRY_IC
      -box 0 -98.0693175104449 251.100006103516 5000 5000 300.161987304688
GRID
            -surface             POINTS GRID
                        0 0 250    0
                        0 0 254    0
                        0 0 255    1
                        0 0 260    1
                        0 0 300    1
                        5000 0 250    0
                        5000 0 254    0
                        5000 0 255    1
                        5000 0 260    1
                        5000 0 300    1
                        0 5000 250    0
                        0 5000 254    0
                        0 5000 255    1
                        0 5000 260    1
                        0 5000 300    1
                        5000 5000 250    0
                        5000 5000 254    0
                        5000 5000 255    1
                        5000 5000 260    1
                        5000 5000 300    1
                        end_points
WELL 1
      -xy_coordinate_system GRID
      -z_coordinate_system GRID
      -location 2500 2500
      -diameter 6
      -elevation 250 290
      -allocate_by_head_and_mobility False
      -injection_rate
            0 years     110
      -solution
            0 years     0
WELL 2
```

```
      -xy_coordinate_system GRID
      -z_coordinate_system GRID
      -location 2575 2575
      -diameter 5
      -elevation 100 120
      -allocate_by_head_and_mobility False
      -pumping_rate
            0 years     25
ZONE_FLOW 1
      -write_xyzt    zoneFLow boundary
      -box 1250.4599609375 1250 251 3750.47998046875 3750 251.100006103516
GRID
PRINT_INITIAL
      -boundary_conditions        false
      -components                 false
      -conductances               false
      -echo_input                 true
      -fluid_properties           true
      -force_chemistry_print      false
      -HDF_chemistry              true
      -HDF_heads                  true
      -HDF_media                  true
      -HDF_steady_flow_velocities true
      -heads                      true
      -media_properties           false
      -solution_method            true
      -steady_flow_velocities     false
      -wells                      true
      -xyz_chemistry              false
      -xyz_components             false
      -xyz_heads                  false
      -xyz_steady_flow_velocities false
      -xyz_wells                  false
PRINT_FREQUENCY
      -save_final_heads false
      0
            -bc_flow_rates          0
            -boundary_conditions    false
            -components             0
            -conductances           0
            -end_of_period_default  true
            -flow_balance           end
            -force_chemistry_print  0
            -HDF_chemistry          0.05    years
            -HDF_heads              0.05    years
            -HDF_velocities         end
            -heads                  0.05    years
            -progress_statistics    end
            -restart_file           0
            -velocities             0
            -wells                  1    years
            -xyz_chemistry          0
            -xyz_components         0
            -xyz_heads              0
            -xyz_velocities         0
            -xyz_wells              1    years
            -zone_flow              0.05    years
```

```
            -zone_flow_xyzt         0.05    years
            -zone_flow_tsv          0.05    years
            -hdf_intermediate       0.05    years
      0.25 years
            -bc_flow_rates          0
            -boundary_conditions    false
            -components              0
            -conductances            0
            -end_of_period_default  true
            -flow_balance            end
            -force_chemistry_print  0
            -HDF_chemistry          0.25    years
            -HDF_heads              0.25    years
            -HDF_velocities         end
            -heads                  0.25    years
            -progress_statistics    end
            -restart_file            0
            -velocities              0
            -wells                   1    years
            -xyz_chemistry           0
            -xyz_components          0
            -xyz_heads               0
            -xyz_velocities          0
            -xyz_wells               1    years
            -zone_flow              0.25    years
            -zone_flow_xyzt         0.25    years
            -zone_flow_tsv          0.25    years
            -hdf_intermediate       0.25    years
TIME_CONTROL
      -time_step
            0 0.05 years
            0.25 years 0.25 years
      -time_change
            0.25 years
            12 years
      -start_time 0 years
```

Corresponding *.chem.dat file

```
#OPEN WITH TRANSPORT Pb 1% HFO

SOLUTION_MASTER_SPECIES
Mx   Mx   0.0  100 100

SOLUTION_SPECIES
#Mx
Mx = Mx
log_k 0.0

SELECTED_OUTPUT 1
    -file                 PR1.xls
    -reset                false
    -simulation           true
    -state                true
    -solution             true
    -distance             true
    -step                 true
    -pH                   true
```

```
    -water                true
    -totals As Cr Cr(6) Pb
    -molalities Hfo_wCrO4- Hfo_wAsO4-2  Hfo_wH2AsO4  Hfo_wHAsO4- Hfo_wOHAsO4-3
Hfo_sOPb+
-eq Calcite  CO2(g)
-si Cerrusite Hydrocerrusite

USER_PUNCH
-headings mix_% pH Moles_As_Surface As_µg/L  MOLES_PB_SURFACE  Pb_µg/L
Moles_Cr_Surface Kd_Cr Cr_µg/L  Cl_mg/L  SI_Calcite
-start
1 Punch TOT("Mx")*100*1000
5  PUNCH -LA("H+")
10 TOTAsSURF = MOL("Hfo_wAsO4-2") + MOL("Hfo_wH2AsO4")  + MOL("Hfo_wHAsO4-") +
MOL("Hfo_wOHAsO4-3")
12 PUNCH  TOTAsSURF
22 PUNCH TOT("As")*74922*1000
30 TOTPbSURF = MOL("Hfo_wOPb+") + MOL("Hfo_sOPb+")
32 PUNCH  TOTPbSURF
39 PUNCH TOT("Pb")*207*1000*1000
40 TOTCrSURF = MOL("Hfo_wCrO4-")
42 PUNCH TOTCrSURF
46 PUNCH TOTCrSURF/TOT("Cr")
50 PUNCH TOT("Cr")*51.99*1000*1000
66 PUNCH TOT("Cl")*35.5*1000
69 PUNCH SI("Calcite")
-end

SOLUTION 7 FO-7 Shallow Paso Robles
pe 7.16
pH 8.11
units mg/L
C(4) 68 as HCO3
Cl 44 charge
S(6)  24
N(5)  .266
 As  0.01
Cr(6)  0.0017
Ca 29
Mg  3.8
Pb  0.0042
Na  38
K 3.1
#Fe(2)  80
END

SOLUTION 1 Paso Robles water PRTIW MIssion Memorial
pe 7
pH 6.39
units mg/L
C(4) 130 as HCO3
Cl 86 charge
S(6)  89
N(5)  2.5
Al 0.0043
As 0.0016
Cr(6)  0.0016
Ca 37
Mg  10
Pb  0.0006
Na  64
K 3.1
Fe(2)  0.067
```

```
Ba 0.059

SOLUTION 200 Pilot water Ambient water also
    temp      25
    pH        7.10
    pe    10.7
    units     mg/l
    density   1
    S(6)      0.11
    N(5)      0.64
   # N(-3)     1.3
    Ca        11
    Ba    0.140
    Cr(6) 0.00021
    K         0.050
    Na        19
    Cl        2 charge
C(4)  43  as HCO3
    -water    1 # kg

PHASES
Fix_H+
H+ = H+
logk 0.0
END

USE SOLUTION 200
REACTION  100
K2CrO4  1
7.7e-6    #
EQUILIBRIUM_PHASES 100
Fix_H+  -7.7  NaOH

SAVE SOLUTION 202

END
USE SOLUTION 202
REACTION  200
PbCl 1
3.28e-5
SAVE SOLUTION 202

END

USE SOLUTION 202
REACTION  300
As2O5  1
0.74e-4

EQUILIBRIUM_PHASES  101
Fix_H+  -7.7  NaOH

SAVE SOLUTION 300

END

USE SOLUTION 300
SURFACE  1
Hfo_wOH  0.000735  6.0  .3273   # 1% HFO at 6.18 kg rock
Hfo_sOH 0.0000184

EQUILIBRIUM_PHASES 102
 Fix_H+  -7.7 NaOH
```

```
 CO2(g)  -3.4  10
 O2(g) -0.7 10

SAVE SURFACE 1
END

SURFACE  2  #clean
Hfo_wOH  0.000735  6.0  .3273   # 1% HFO at 6.18 kg rock
Hfo_sOH 0.0000184
END

SOLUTION 200 Pilot water injection version
    temp      25
    pH        7.70
    pe    10.7
    units     mg/l
    density   1
    Mx      100
    S(6)      0.11
    N(5)      0.64
   # N(-3)     1.3
    Ca        11
    Ba    0.140
    Cr(6) 0.00021
    K         0.050
    Na        19
C(4)  43  as HCO3
    Cl        2 charge
    -water    1 # kg

EQUILIBRIUM_PHASES 1
CO2(g) -3.4  10
Fix_H+  -7.7 NaOH

SAVE SOLUTION 0  # Pilot water injection

SURFACE  0
Hfo_wOH  0.00000000001  6  0.00000001
END

EQUILIBRIUM_PHASES 111
Calcite 0  0.1
CO2(g)  -3.3 0.1
END
```

APPENDIX H

Photographs

Appendix H. List of Photographs

Figure Number	Description
MEC Training, Site Control, Rig Setup	
H-1	Munitions and Explosives of Concern (MEC) Training on Dec. 16, 2013
H-1	Munitions and Explosives of Concern (MEC) Training on Jan. 27, 2014
H-2	Public Notice of Monitoring Well Installation
H-2	Traffic Control Measures
H-3	Sonice drilling rig and support vehicle setup
H-3	Field personnel work area
Well Drilling, Construction, Demobilization, and Sampling	
H-4	Core sample layout area
H-4	Nighttime operations
H-5	3-inch PVC well screen/casing installation
H-5	Well casing stabilizer
H-5	Well following tremie of cement seal
H-5	12-inch diameter well box
H-6	36-inch diameter circular asphalt cutter
H-6	Bolted well box with lamp black-tinted concrete
H-6	Core boxes/plastic removed and cores spread evenly across soil layout area
H-7	Sonic sediment core bag (Aromas Sand from 27.5 to 30.0 feet-bgs)
H-7	3-inch brass tube sediment samples for laboratory hydraulic analysis
Well Development, Geophysical Logging, and Groundwater Quality Sampling	
H-8	Well development - Smeal rig
H-8	Downhole geophysical logging
H-8	Low-flow water quality sampling setup at MRWPCA MW-1 (similar setup at FO-07)
H-9	Water quality sampling at ASR MW-1
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Core samples	
H-11	75.0 - 77.5 feet-bgs: AROMAS SAND (SP-SM)
H-11	174.5 - 177.0 feet-bgs: AROMAS SAND (SP-SM)
H-12	274.5 - 277.0 feet-bgs: AROMAS SAND (SP)
H-12	296.0 - 298.5 feet-bgs: AROMAS SAND (ML)
H-13	317.0 - 319.5 feet-bgs: AROMAS SAND (ML)
H-13	337.0 - 339.5 feet-bgs: AROMAS SAND (SP)
H-14	364.5 - 367.0 feet-bgs: AROMAS SAND (SP)
H-14	389.5 - 392.0 feet-bgs: AROMAS SAND (SM)
H-15	392.5 - 393.5 feet-bgs: PASO ROBLES FORMATION (ML)
H-15	396.0 - 398.5 feet-bgs: PASO ROBLES FORMATION (CL)
H-16	412.5 - 415.0 feet-bgs: PASO ROBLES FORMATION (ML)
H-16	430.5 - 433.0 feet-bgs: PASO ROBLES FORMATION (SP)
H-17	447.5 - 450.0 feet-bgs: PASO ROBLES FORMATION (ML)
H-17	469.5 - 472.0 feet-bgs: PASO ROBLES FORMATION (SM)
H-18	487.0 - 489.5 feet-bgs: PASO ROBLES FORMATION (SM-SP)
H-18	496.0 - 498.5 feet-bgs: PASO ROBLES FORMATION (ML)
H-19	514.5 - 517.0 feet-bgs: PASO ROBLES FORMATION (SP)
H-19	527.5 - 530.0 feet-bgs: PASO ROBLES FORMATION (ML)

Path: T:\Projects\MRWPCA-GW\FILMW 60408\GIS\MAPS\Appendix H Photos\Figure H-1.mxd

Munitions and Explosives of Concern (MEC) Training on December 16, 2013

Munitions and Explosives of Concern (MEC) Training on January 27, 2014

TODD GROUNDWATER

Figure H-1

Path: T:\Projects\MRWPCA-GW\EIR\MW 60408\GIS\MAPS\Appendix H Photos\Figure H-2.mxd

RESOURCE MANAGEMENT SERVICES | PLANNING DIVISION

440 Harcourt Avenue Phone (831) 899-6737 Seaside, CA 93955 Fax (831) 899-6211
http://www.ci.seaside.ca.us/

NOTICE OF MONITORING WELL INSTALLATION

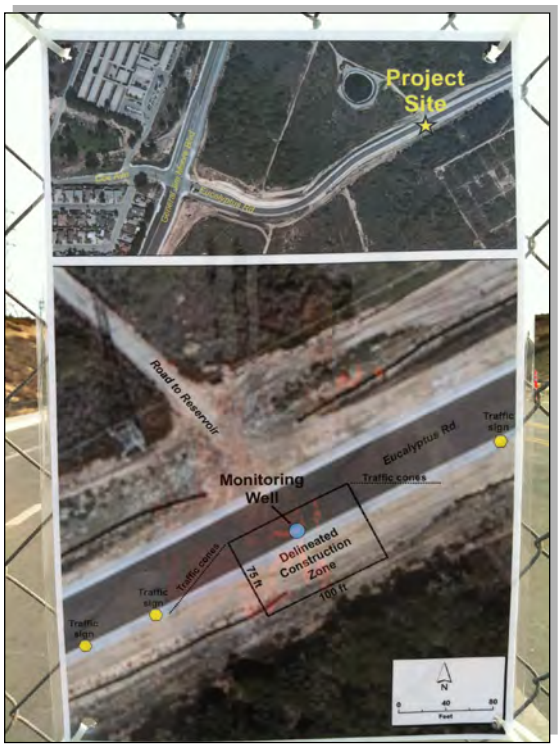
December 16, 2013

NOTICE IS HEREBY GIVEN that the City of Seaside, State of California, has issued an encroachment permit to the Monterey Regional Water Pollution Control Agency (MRWPCA) for the construction of the following application:

1. **Use Permit Application No UP-12-07**: The City of Seaside has approved Use Permit Application No. UP-12-07 allowing MRWPCA, Applicant, and Fort Ord Reuse Authority (FORA), Property Owner, to proceed with the installation and use of a monitoring well to collect site-specific hydrogeologic data for a potential future Monterey Peninsula Groundwater Replenishment project. The Monterey Peninsula Groundwater Replenishment project will be addressed in the future under a separate project-level environmental review process. In general, the proposed field program for the monitoring well includes the drilling of an approximate 550foot deep boring using the sonic drilling method, coring of the subsurface sediments, sampling and testing of core samples for hydraulic properties and leaching potential, and the installation and sampling of a monitoring well to obtain water levels and groundwater quality data. The monitoring well is proposed to be located within the southern bike lane of Eucalyptus Road, approximately 1,800 feet east of General Jim Moore Boulevard within the RS-8 (Single Family Residential) Zoning District. In accordance with the California Environmental Quality (CEQA) Guidelines, a Negative Declaration has been completed for the proposed project.

See accompanying map showing subject property.

NOTICE IS FURTHER GIVEN that the public may contact Scott Ottmar, Junior Engineer, at (831) 899-6886 (sottmar@ci.seaside.ca.us) for additional information concerning the proposed monitoring well and encroachment permit or to report any noise related / construction impacts resulting from the drilling process or any issues related to the placement of traffic signs and/or cones advising the public of the project construction area. The construction period for the monitoring well is from Monday, December 16, 2013 to Saturday, December 21, 2013.



Public Notice of Monitoring Well Installation (Eucalyptus Rd. and General Jim Moore Blvd.)

Traffic Control Measures

TODD GROUNDWATER

Figure H-2

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-3.mxd

Sonic drilling rig and support vehicle setup

Field personnel work area

TODD GROUNDWATER

Figure H-3

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-4.mxd

Core sample layout area

Nighttime operations

TODD GROUNDWATER

Figure H-4

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-5.mxd

3-inch PVC well screen/casing installation

Well casing centralizer

Well following tremie of cement seal

12-inch diameter well box

TODD GROUNDWATER

Figure H-5

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-6.mxd

36-inch diameter circular asphalt cutter

Bolted well box with lamp black-tinted concrete

Core boxes/plastic removed and cores spread evenly across soil layout area

TODD GROUNDWATER

Figure H-6

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-7.mxd

Sonic sediment core bag (Aromas Sand from 27.5 to 30.0 feet-bgs)

3-inch brass tube sediment samples for laboratory hydraulic analysis

TODD GROUNDWATER

Figure H-7

Path: T:\Projects\MRWPCA-GW\EIR\MW 60409\GIS\MAPS\Appendix H Photos\Figure H-8.mxd

Well development - Smeal rig

Downhole geophysical logging

Low-flow water quality sampling setup at MRWPCA MW-1 (similar setup at FO-07)

TODD GROUNDWATER

Figure H-8

Path: T:\Projects\MRWPCA GW\EIR MW 60409\GIS\MAPS\Appendix H Photos\Figure H-9.mxd

Water quality sampling at ASR MW-1

Water quality sampling at City of Seaside Well 4

TODD GROUNDWATER

Figure H-9

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-10.mxd

Water quality sampling at PRTIW Well at Mission Memorial Cemetery

TODD GROUNDWATER

Figure H-10

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-11.mxd

75.0 - 77.5 feet-bgs: AROMAS SAND (SP-SM) Dark yellowish brown fine sand with large silt nodules, dry

174.5 - 177.0 feet-bgs: AROMAS SAND (SP-SM) Yellowish brown silty fine sand, dry

TODD GROUNDWATER

Figure H-11

Path: T:\Projects\MR\WPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-12.mxd

274.5 - 277.0 feet-bgs: AROMAS SAND (SP) Dark yellowish brown fine sand, dry

296.0 - 298.5 feet-bgs: AROMAS SAND (ML) Light yellowish brown dense clayey silt with fine sand, moist

TODD GROUNDWATER

Figure H-12

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-13.mxd

317.0 - 319.5 feet-bgs: AROMAS SAND (ML) Yellowish brown fine sandy silt (40% sand / 60% silt), dry

337.0 - 339.5 feet-bgs: AROMAS SAND (SP) Yellowish brown fine sandy, clayey, silt (40% sand / 10% clay / 50% silt), dry

TODD GROUNDWATER

Figure H-13

364.5 - 367.0 feet-bgs: AROMAS SAND (SP) Yellowish brown very fine sand, dry

389.5 - 392.0 feet-bgs: AROMAS SAND (SM) Yellowish brown very fine silty sand (30% silt /70% sand), dry

TODD GROUNDWATER

Figure H-14

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-14.mxd

392.5 - 393.5 feet-bgs: PASO ROBLES FORMATION (ML) Very dark gray clayey silt, very dense, dry

396.0 - 398.5 feet-bgs: PASO ROBLES FORMATION (CL) Very dark gray silty clay (50% silt / 50% clay), very dense, dry

TODD GROUNDWATER

Figure H-15

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-15.mxd

412.5 - 415.0 feet-bgs: PASO ROBLES FORMATION (ML) Brown fine to medium coarse sandy silt (30% sand / 70% silt), dry

430.5 - 433.0 feet-bgs: PASO ROBLES FORMATION (SP) Dark yellowish brown silty fine sand, moist

TODD GROUNDWATER

Figure H-16

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-16.mxd

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-17.mxd

447.5 - 450.0 feet-bgs: PASO ROBLES FORMATION (ML) Olive gray clayey silt, wet

469.5 - 472.0 feet-bgs: PASO ROBLES FORMATION (SM) Olive silty fine sand (40% silt / 60% sand), wet

TODD GROUNDWATER

Figure H-17

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-18.mxd

487.0 - 489.5 feet-bgs: PASO ROBLES FORMATION (SM-SP) Yellowish brown silty fine to medium coarse sand (20% silt / 80% sand) with well-rounded chert cobbles up to 2", wet

496.0 - 498.5 feet-bgs: PASO ROBLES FORMATION (ML) Yellowish brown fine sandy, clayey silt (30% sand / 20% clay / 50% silt), dense

TODD GROUNDWATER

Figure H-18

Path: T:\Projects\MRWPCA GWRII MW 60408\GIS\MAPS\Appendix H Photos\Figure H-19.mxd

514.5 - 517.0 feet-bgs: PASO ROBLES FORMATION (SP) Yellowish brown fine to medium coarse sand (30/10/60), wet

527.5 - 530.0 feet-bgs: PASO ROBLES FORMATION (ML) Olive gray sandy, silty clay (30/30/40) with grayish white deposits of volcanic ash (reactive to acid, indicating calcium carbonate); lithology similar from 522 - 535 feet-bgs with fragments up to 6" diameter

TODD GROUNDWATER

Figure H-19

APPENDIX J

White Paper: Potable Reuse Operator Training and Certification Framework

A WHITE PAPER

Potable Reuse Operator Training and Certification Framework

January 2016

table of contents //

1 Executive Summary
2 Introduction
3 Operator Certification Survey
4 Current Operator Certification Practices
5 Existing Operator Training Opportunities
6 Advanced Water Treatment Processes Used in Potable Reuse
7 Gaps in AWT System Operator Skill Needs
8 Exploring Possible Paths Forward
9 CUWA Potable Reuse Operator Certification Workshop Outcomes
10 Conclusions & Recommendations
11 References
12 Acronyms

CALIFORNIA URBAN WATER AGENCIES

SECTION 1

Executive Summary

A regulatory framework for potable reuse is key to increasing statewide reuse and meeting the State Water Resources Control Board's (SWRCB's) goal of 1.5 million acre-feet/year (AFY) of recycled water by 2020 and at least 2.5 million AFY by 2030. Successful training and certification of potable reuse operators is a critical element of a comprehensive program to maintain high-quality reuse supplies that are protective of public health.

This paper summarizes existing standard practices for certification and training of operators at water, wastewater, and potable reuse facilities, explores additional skills and experience needed for operating potable reuse advanced treatment plants, outlines remaining challenges to implementation, and recommends a standardized potable reuse certification framework to the DDW.[1] This white paper can serve as a foundation for further development of actual training and certification requirements by DDW, along with pending DDW regulations for permitting and operation of reuse facilities, Individual agencies may also augment with additional, site-specific requirements as needed to protect public health and the environment.

Background

In California, indirect potable reuse (IPR) projects involve either the application of unrestricted non-potable recycled water through surface spreading, or the application of full advanced treated purified water for groundwater recharge or for surface water augmentation upstream of a water treatment plant. IPR uses the aquifer or reservoir as an environmental buffer to provide added treatment and response time. In the future, direct potable reuse would further expand potable reuse (PR) to include systems where the purified water is added directly upstream or downstream of a water treatment plant (WTP)—where there is no environmental buffer. The challenge for state regulators and municipalities implementing PR is to determine the best way to verify that operators assigned to operate a PR plant have an adequate level of experience and training to operate these complex and critically important systems.[2]

This white paper is a collaborative effort with CUWA and its partners:

- WateReuse California (WRCA)
- California-Nevada Section of the American Water Works Association (CA-NV Section AWWA)
- California Water Environment Association (CWEA)
- California Association of Sanitation Agencies (CASA)
- State Water Resources Control Board, Division of Drinking Water (DDW)

[1] A graphic illustrating the certification program development process is included in Attachment 1.

[2] This white paper is concerned with application of PR with the exception of groundwater recharge relying on percolation from spreading basins, which does not require AWT as defined in the Groundwater Recharge Regulations.

Current California Operator Certification Programs

"Certification" is a formal process to identify and acknowledge individuals who have met an established standard of competency for a defined job. Attachment 1 provides an illustration of a certification program development process.

Wastewater and drinking water operators are certified by the State Water Resources Control Board Office of Operator Certification (OOC). The wastewater and water operator programs were developed separately and are operated separately through the Wastewater Operator Certification Program (WW-OCP) and the Drinking Water Operator Certification Program (DW-OCP), respectively.

There are five grades for both wastewater and drinking water treatment certification. To receive a certificate, a candidate must:

1 Meet minimum experience and education requirements.

2 Pass a written test.

3 Apply for certification.

The grade level required for the chief plant operator and designated operator-in-charge depends upon the "grade" level of the wastewater treatment plant (WWTP) or WTP, which is a function of both its capacity and its complexity.

The specific educational and experience requirements for wastewater operator and for water treatment operator certifications vary. Additionally, a person certified by the DDW as a WTP operator may also operate a water recycling treatment plant[3] at a grade level appropriate for the class of WWTP being operated.

Gaps in Advanced Water Treatment (AWT) Operator Skill Needs from Conventional WTP and WWTP Operations

Except some applications where percolation basins are used for groundwater recharge, California potable reuse systems that supplement drinking water sources are expected to be advanced water purification facilities (AWPFs). Such systems use complex treatment trains centered on reverse osmosis (RO) and advanced oxidation processes (AOPs) not present in conventional WWTPs and WTPs. The reason for this sophisticated, multi-barrier AWT train is the need to achieve both a high level of log removal of pathogens and to remove organic and inorganic microcontaminants. The difficulty with applying only the existing California wastewater or drinking water treatment operator certification requirements to operators of PR plants is that the existing exams do not cover advanced water treatment or potable reuse-specific regulations and concerns (e.g., operation and monitoring of advanced technologies).

Water Boards

State Water Resources Control Board

EXAMINATION APPLICATION
FOR WASTEWATER TREATMENT PLANT OPERATOR

USE THIS FORM ONLY FOR EXAMINATION APPLICATIONS

FOR EXAMINATION ONLY

Existing exams do not cover advanced water treatment or potable reuse regulations and concerns.

[3] "Water recycling treatment plant" means a treatment plant that receives and further treats secondary and/or tertiary effluent from a wastewater treatment plant. –CCR Title 23, Division 3, Chapter 26, Article 1§ 3671.

Potable reuse system operation for groundwater recharge and surface water augmentation is different from conventional wastewater and water treatment operations in a number of important ways:

1. Potable reuse requires multiple barriers using a variety of technologies and a more complex treatment train than conventional water and wastewater treatment processes.
2. Given that source water is treated secondary or tertiary wastewater effluent, it is critical that all components are operated and maintained as intended.
3. Feedwater quality (both raw wastewater into the WWTP and secondary or tertiary effluent feedwater to the AWT process) can vary significantly, which can impact the daily operation of the advanced treatment plant and potentially the purified water quality.
4. Potable reuse is not regulated under any one existing Federal program.

Existing Operator Training Opportunities

Many training opportunities are available for existing wastewater and water treatment operator certification exams through community colleges, universities, and professional association-based organizations, but not for AWT. If a WTP or WWTP wants to train operators on AWT(s), it must be conducted largely in-house. Existing AWPFs have developed internal programs site-by-site that combine hands-on training under supervision with some combination of in-house training manuals and exams, standard operational plans, and consultant- and/or treatment process vendor-supplied supplemental instruction. Similar efforts have also been made by WTP and WWTPs with AWT systems. In order to create a substantial pool of potential AWPF operators, training available for PR would need to be expanded beyond the existing opportunities.

Exploring Possible Paths Forward

Operators that currently run AWT processes for potable water reclamation must be either water treatment- or wastewater-certified. Training program content and tests have historically been site-specific and developed in-house.

Potable Reuse Operator Certification Survey: Utility Preferences

As one of the collaborative partners on this joint certification effort, WateReuse California distributed a survey to their membership, including a wide range of California municipal water and wastewater agencies. It was used to identify gaps in the existing DW-OCP and WW-OCP with respect to AWT practices for potable reuse facilities. Sixty-four agencies answered the survey.

70%

of survey respondents agree that one certification process for all potable reuse water system types should be developed.

California representatives of the water and wastewater sector responding to our survey prefer new certification options to fill the “holes” in existing programs and allow water treatment and wastewater operators to obtain advanced treatment certification for potable reuse. A minority of survey respondents preferred one type of existing operator certification program, typically based on the method used within their facilities—i.e., water purveyors were more likely to state that potable reuse systems should be operated by water treatment operators, and wastewater agencies were more likely to state that potable reuse systems should be operated by wastewater operators. However, over 70% of respondents agreed that one certification process for all potable reuse water system types (both indirect and direct) should be developed. Workshop participants

were largely in agreement that it is important to draw on the knowledge and experience of both water and wastewater operators to operate reuse facilities successfully.

Potential approaches to developing an advanced potable reuse treatment certification program

A number of different paths could be taken to develop a potable reuse operator certification program. It could be developed as an independent, stand-alone program (option 1 below), or incorporated under an existing certification program or programs (i.e., under wastewater *or* water, or as a supplement to both)—such as options 2-4 below. The ideas presented here reflect thinking and discussion from different individuals and groups looking at the potable reuse operator certification question, particularly the CA-NV Section AWWA's Advanced Water Treatment Certification Workgroup, which is comprised of utility members (including some CUWA member agencies), California and federal regulators, and consultant potable water experts. This list is not intended to be a reflection of the ideas of any one group or person, but rather is an effort to capture and reflect some of the current avenues of thought and discussion on the topic.

While the growth of AWPFs may be the most pressing factor driving the need for AWT certification, there is also a desire for operator training and certification in other AWT facilities. For this reason, both a general AWT program and a PR-specific program are being considered.

Four potential potable reuse operator certification program options include:

1

SEPARATE POTABLE REUSE OPERATOR CERTIFICATION PROGRAM

Exclusively for potable reuse system operators, certifying that an individual has a defined level of potable reuse system-specific knowledge, skill, and experience.

2

PR or AWT OPERATOR CERTIFICATION PROGRAM SUPPLEMENT TO EXISTING DW CERTIFICATION

Verifies that a certified WTP operator has a defined level of specific knowledge, skill, and experience in AWT and related drinking water, wastewater and potable reuse rules and practices.

3

PR OR AWT OPERATOR CERTIFICATION PROGRAM SUPPLEMENT TO EXISTING WW CERTIFICATION

Verifies that a certified wastewater operator has a defined level of specific knowledge, skill, and experience in AWT and related drinking water, wastewater, and potable reuse rules and practices.

4

PR OR AWT SUPPLEMENT TO EITHER LICENSE

Certifies that a certified water treatment or wastewater operator has a defined level of specific knowledge, skill and experience in AWT and related drinking water, wastewater, and potable reuse rules and practices.

Selecting the program location and focus of a new stand-alone or supplemental certification program must balance two key necessities: covering knowledge elements necessary for operating indirect

and direct potable reuse systems, which by their nature straddle the wastewater and drinking water fields, while also developing a program that will be economically viable and draw a large enough pool of certified operators to meet utility hiring needs.

Recommendations and Conclusions

New training and certification programs are needed to provide AWT and potable reuse skill-specific operator endorsements. In a workshop facilitated by CUWA, a wide range of utility and State regulatory agency representatives came together and achieved consensus on the basic structure of the future certification program and a strategy for moving it forward. The CUWA workshop participants and the survey respondents both agreed that a special AWT or PR module to enhance existing certification (Option 4 on the previous page) is the best choice. The workshop participants developed a number of strategic recommendations:

1 The certification program should be centered on AWT technologies used in purification of wastewater effluent for potable reuse with a clear focus on protection of public health and should include risk management concepts.

2 It should be a certification "add on" available to both wastewater and water treatment operators with an acceptable level of training and experience.

3 One test for each level of certification should be given regardless of the qualifying background of the candidate. Training must be developed to address any gaps in background knowledge or experience associated with advanced treatment or potable reuse concepts for either water or wastewater candidates.

4 The program should provide an adequate population of certified operators from which utilities can hire new PR treatment plant operators and be broad enough to draw a large enough testing population to be financially viable.

Creating a certification program that is open to both water and wastewater operators offers the benefit of combining critical background knowledge from existing certification programs while enabling a broader pool of candidate operators for this additional training and certification. With increasing levels of certification, candidates must demonstrate their competence in increasingly complex potable reuse concepts beginning with an understanding of AWT basics and progressing into more critical aspects of potable reuse such as advanced monitoring, emergency response, and regulatory concepts.

The water/wastewater community has yet to reach consensus on one primary point: whether the ultimate target audience for the certification program should be centered on potable reuse with AWT specifically, or serve as a more general AWT program with water and wastewater elements. This decision is dependent upon: 1) what State regulators need to feel comfortable with the certification program, and 2) how broad the program needs to be to serve water sector needs and be economically viable for the certifying agency or agencies.

Regardless of the selected strategy, legislation and/or an update to the operator certification regulations will likely be needed to address the proposed new certification requirements. Additional work will also be needed to determine the details on the range of knowledge and criteria for qualifications.

This framework establishes a foundation for further development of a potable reuse training and certification program. A critical question to be resolved is what organization or organizations will create and maintain the program. At the workshop, there was general recognition that both water and wastewater perspectives are needed to develop the proper training and certification program to prepare and verify a minimum skillset for AWT/potable reuse operators. An effort is underway through the CA-NV Section AWWA AWT Operator Certification Committee to explore the possibility of developing an AWT- or PR-focused certification program. At the CUWA Workshop, representatives from CA-NV Section AWWA and CWEA agreed that collaboration would make good sense. It was also recognized that each organization would need to further explore with their leadership how such a partnership could work. As of publication, conversations between these groups are on-going, but no formal agreements have been made. An entity or entities will need to step forward and commit to developing training and certification programs for an AWT or PR supplement to create such a program.

It is important to note that while potable reuse training and certification is critically important, it is just one part of a comprehensive program required to ensure the protection of public health and safety amidst more widespread adoption of potable reuse. To have the greatest benefit, potable reuse operator training and certification must be accompanied by a regulatory framework as well as customized, agency-specific training and Operations, Monitoring, and Maintenance Plans (OMMPs).

SECTION 2

Introduction

California utilities are working hard to maximize beneficial use of all available water sources to enhance the resilience and reliability of their water supply portfolios. As noted in CUWA's Water Supply Reliability Report, demand management and water supply diversification are critical elements of establishing resilience to meet future challenges and uncertainties. Water reuse is a critical element of California's water supply portfolio, and the drought has elevated awareness of potable reuse as a locally controlled, drought resistant, high-quality drinking water supply source. Increased interest in and accelerated development of water purification projects for potable reuse is tempered by the commitment to proceed deliberately to ensure that potable reuse is fully protective of public health and the environment.

A regulatory framework for potable reuse is key to increasing statewide reuse and meeting the State Water Resources Control Board's (SWRCB) goal of 1.5 million acre-ft/year (AFY) of recycled water production by 2020 and at least 2.5 million AFY by 2030. Successful training and certification of potable reuse operators is a critical element of a comprehensive program to maintain high-quality reuse supplies that are protective of public health; it will also be an important piece of successful large-scale implementation of direct potable reuse (DPR).

Operator certification has been identified as a major issue for consideration by the Expert Panel providing recommendations to the SWRCB on surface water augmentation regulations and the feasibility of establishing DPR criteria. It has been similarly cited by the Advisory Group to the Expert Panel on DPR issues and by the DDW. Good operator training and certification programs will be an intrinsic element of successful widespread implementation of AWT-based PR in California—this white paper is concerned with application of PR with the exception of groundwater recharge that relies on percolation from spreading basins, which does not require AWT as defined in the Groundwater Recharge Regulations.

This white paper is a collaborative effort with CUWA and its partners:

- WateReuse California (WRCA)
- California-Nevada Section of the American Water Works Association (CA-NV Section AWWA)
- California Water Environment Association (CWEA)
- California Association of Sanitation Agencies (CASA)
- State Water Resources Control Board Division of Drinking Water (DDW)

Background

Potable reuse is inclusive of indirect potable reuse and direct potable reuse. In California, IPR projects involve either: 1) the application of unrestricted non-potable recycled water through surface spreading, or 2) the application of full advanced-treated purified water for groundwater recharge or surface water augmentation upstream of a water treatment plant (WTP), using these environmental buffers as treatment and for response and retention time.

DPR is defined as "[introduction of] purified water[4]... directly into a potable water supply distribution system or into the raw water supply immediately upstream of a WTP" (Tchobanoglous et al., 2011). The water purification process involves the use of an advanced water treatment (AWT) train consisting of a series of advanced treatment processes designed to collectively provide a robust, multi-barrier purification approach for the protection of public health. As a result, advanced water purification facilities (AWPF) use additional treatment processes than those used in conventional wastewater treatment plants (WWTPs) and WTPs (Figure 2-1).

As with any treatment train, good operator knowledge and skill is critical to the proper control of an AWT process. Because potable reuse is not widely practiced, existing operator certification programs are based on conventional WWTP and WTP operations. Potable reuse requires knowledge of advanced treatment technologies, additional regulatory requirements, AWT train water quality monitoring, and additional drinking water distribution requirements. An understanding of both wastewater and water operations is valuable. However, operating a PR plant generally carries a greater level of risk and complexity associated with its proper operation than most WWTPs and WTPs.

The challenge for state regulators and municipalities implementing potable reuse is to determine the best way to verify that the operators assigned to operate an AWPF have an adequate level of experience and training to operate these complex and critically important systems to consistently produce a high-quality drinking water supply protective of public health.

Purpose

The intent of this white paper is to summarize current water and wastewater operator certification programs, describe existing standard practices for required certification and training of operators at potable reuse facilities, explore additional skills and training opportunities needed for operating potable reuse advanced treatment plants, review potential strategies for creating such a program, and make a recommendation to DDW on a standardized potable reuse certification approach. This was accomplished through a two-phased process:

- **Phase 1,** performed in collaboration with WateReuse CA, consisted of a literature review and utility survey that set the foundation for a preliminary white paper. The initial draft was used as the basis of discussion for a facilitated workshop in Phase 2.
- **Phase 2** involved a 2-day facilitated workshop attended by our collaborative partners (WateReuse CA, CA-NV Section AWWA, CWEA, and CASA), and several key stakeholders including DDW and agencies currently involved in or planning for potable reuse. Workshop participants collaborated to prioritize previously reviewed certification strategies and gain agreement on which approach to recommend to DDW. Participants also identified implementation issues that will need to be addressed moving forward.

[4] Where "purified water" refers to highly treated reclaimed wastewater.

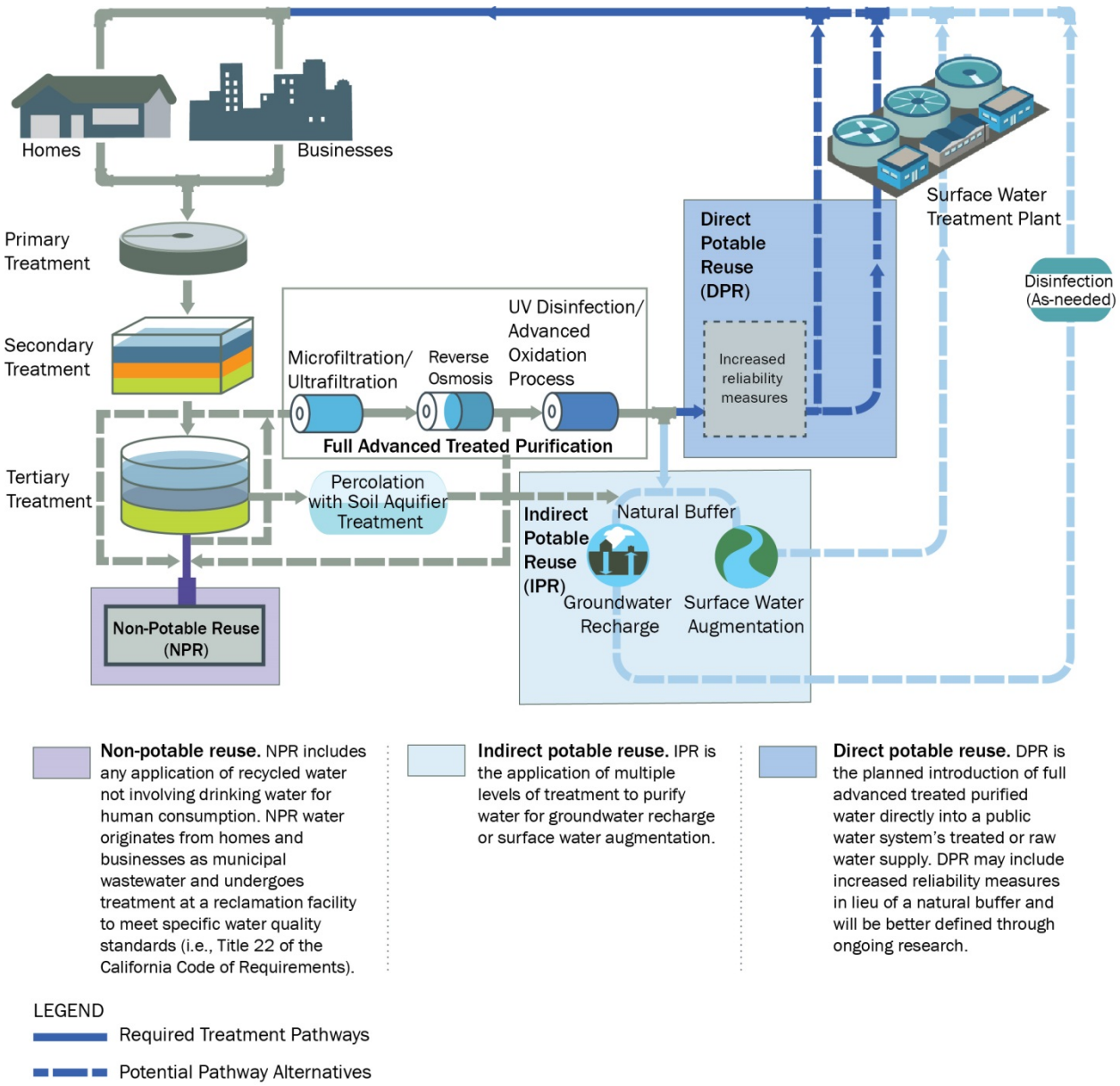


Figure 2-1. The water treatment process alternatives typical of non-potable and indirect potable reuse systems, and the basis for future direct potable reuse systems

While AWPF staffing needs may be the most pressing AWT certification need at this time, there is also a need for operator training and certification in other AWT facilities. For this reason, both a more general AWT program and potable reuse (PR)-specific program are being considered. This white paper includes discussion of both general AWT training and certification needs and PR-specific training and certification needs as there is a great deal of overlap and it is unclear which path (AWT-based or PR-based) future operator training and certification programming will take.

SECTION 3

Operator Certification Survey

As one of the collaborative partners on this joint certification effort, WateReuse California distributed a survey to their members, which includes a wide range of California municipal water and wastewater agencies. The survey aimed to identify gaps in the existing water and wastewater operator certification programs compared to the needs at an AWT facility for potable reuse water.

CUWA staff collaborated with the WRCA to develop a nineteen-question survey on potable reuse practices and preferences. Ninety-one respondents from 64 agencies answered the survey, covering a range of perspectives, as shown in Figures 3-1, 3-2, and 3-3. The respondents included water, wastewater, and combined utilities and represented diverse roles within their agency (i.e., upper management, operations, and others), providing a statewide snapshot of current utility thinking on reuse. Representatives from outside water/wastewater agencies also participated (i.e., a contract operator, wholesalers and groundwater management agencies, and a regulator). This white paper highlights survey results that capture key water and wastewater sector preferences on this topic.

These questions offered the option to select from a list of responses or manually enter an alternate descriptor. Some responses have been described within each figure. Other results from the survey are discussed later in this document.

The full survey instrument is provided in Attachment 2. The full suite of survey responses can be requested from WRCA.

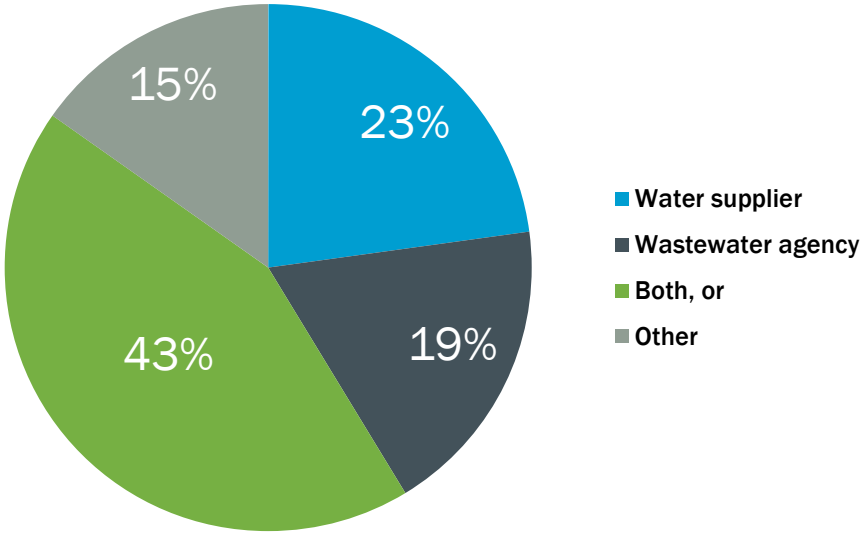


Figure 3-1. Type of agency providing survey responses ("Other" includes write-in respondents from similar groups such as plant supervisors, operations and maintenance supervisors, plant technicians).

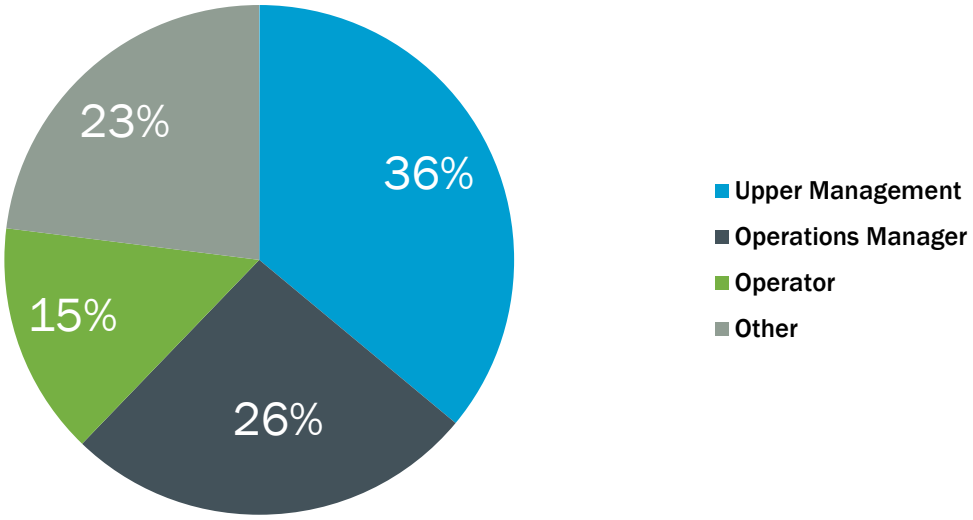


Figure 3-2. Survey respondents' roles at their respective agencies ("Other" includes write-in respondents from similar groups such as plant supervisors, operations and maintenance supervisors, and plant technicians).

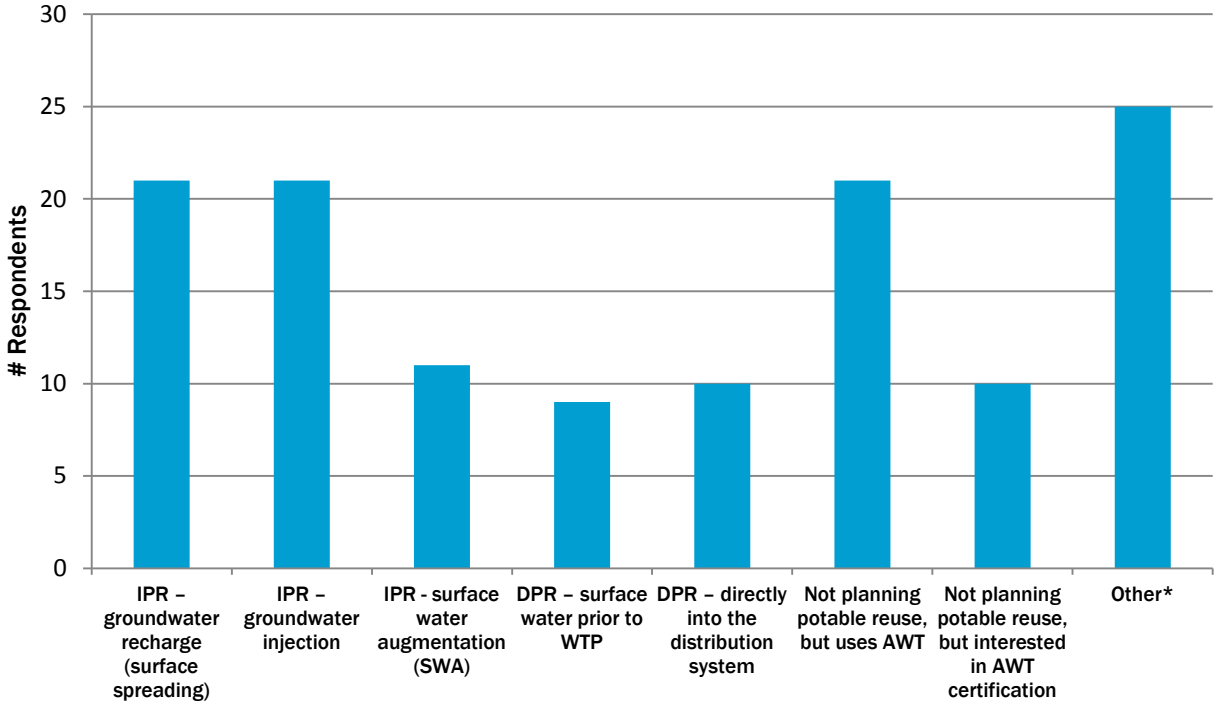


Figure 3-3. Types of potable reuse being performed or planned for by responding agencies

"Other" includes agencies looking at all types of potable reuse, those that have only unrestricted non-potable reuse water, and wholesalers.

SECTION 4

Current Operator Certification Practices

"Certification" is a formal process to identify and acknowledge individuals who have met an established standard of competency for a defined job using a psychometrically valid test. This process typically involves obtaining education and on-the-job experience, and passing an exam that measures job-critical knowledge and skills. When the individual has met these requirements, the certifying body "certifies" that the individual has the required level of skill and ability for the defined job. More information on the certification process is provided in Attachment 1.

Current California Operator Certification Programs

Wastewater and drinking water certification programs were developed separately and are operated through the Wastewater Operator Certification Program (WW-OCP) and the Drinking Water Operator Certification Program (DW-OCP), respectively. With the merger of the Drinking Water Program into the State Water Resources Control Board, both water and wastewater operator certification programs now operate under the State Board's Office of Operator Certification (OOC). The current management structure can help facilitate any solutions involving both programs.

Wastewater Operator Certification Program

The requirements for wastewater operator certification in California are contained in Title 23, Division 3, Chapter 26 of the California Code of Regulations (CCR, 2015b). These regulations were adopted pursuant to the California Water Code Section 13625 et seq. (included in Appendix A) and apply to wastewater treatment facilities used in the treatment or reclamation of sewage or industrial wastes. The Federal Water Pollution Control Act (i.e., the Clean Water Act) also includes provisions for support of operator training programs. There are five grades of operator certification (Grades I – V). To receive a certificate, a candidate must:

1. Meet minimum experience and education requirements,
2. Pass a written test, and
3. Apply for certification.

Certificate application must be within two years following an examination for Grade I and within four years following an examination for Grades II, III. IV, and V. WWTP classifications and operator requirements for each classification are summarized in Figure 4-1 and Table 4-1, respectively. It is illegal to operate a public or private WWTP regulated by the Public Utilities Commission without a valid certificate. The Grade level required for the chief plant operator and designated operator-in-charge depends upon the “Grade” level of the WWTP, which is a function of both its capacity and complexity.

	Examination + Education Requirements	Certification Qualifying Experience Requirements
GRADE I		
Path 1	High school diploma or equivalent and 6 educational points	1 year of full-time qualifying experience
GRADE II		
Path 1	High school diploma or equivalent and 9 educational points	18 months of full-time qualifying experience as a Grade I operator
or		
Path 2	High school diploma or equivalent and 12 educational points	2 years of full-time qualifying experience
or		
Path 3	Associate's degree, a higher degree, or a minimum of 60 college semester units, including a minimum of 15 semester units of science courses	1 year of full-time qualifying experience
GRADE III		
Path 1	High school diploma or equivalent and 12 educational points	3 years of full-time qualifying experience as a Grade II operator
or		
Path 2	High school diploma or equivalent and 18 educational points	4 years of full-time qualifying experience
or		
Path 3	Associate's degree or a minimum of 60 college semester units, including a minimum of 15 semester units of science courses	2 years of full-time qualifying experience
or		
Path 4	Bachelor's degree or a higher degree, including a minimum of 30 semester units of science courses	1 year of full-time qualifying experience

	Examination + Education Requirements	Certification Qualifying Experience Requirements
GRADE IV		
Path 1	High school diploma or equivalent and 32 educational points	6 years of full-time qualifying experience as a Grade II operator
or		
Path 2	Associate's degree or a minimum of 60 college semester units, including a minimum of 15 semester units of science courses	4 years of full-time qualifying experience
or		
Path 3	Bachelor's degree or a higher degree, including a minimum of 30 semester units of science courses	3 years of full-time qualifying experience
or		
Path 4	Valid registration as a chemical, civil, or mechanical engineer issued by the California Board for Professional Engineers and Land Surveyors or by another state, territory, or Indian tribe	2 year of full-time qualifying experience
GRADE V		
Path 1	High school diploma or equivalent and 48 educational points	10 years of full-time qualifying experience as a Grade II operator
or		
Path 2	Associate's degree or a minimum of 60 college semester units, including a minimum of 15 semester units of science courses	6 years of full-time qualifying experience
or		
Path 3	Bachelor's degree or a higher degree, including a minimum of 30 semester units of science courses	5 years of full-time qualifying experience
or		
Path 4	Valid registration as a chemical, civil, or mechanical engineer issued by the California Board for Professional Engineers and Land Surveyors or by another state, territory, or Indian tribe	4 year of full-time qualifying experience

Figure 4-1. California Wastewater Operator Certification Requirements (*Source*: *§3687(c)*)

Qualifying experience may be acquired in two ways:

1. Individuals may work part- or full-time performing operator duties while holding an Operator-in Training[5] certificate or a wastewater certificate at a lower grade level. Part-time experience is prorated, e.g., two years of half-time work equals one year of qualifying experience.
2. Individuals may use wastewater experience gained outside California, provided they are a certified wastewater operator and performing duties requiring certification in California.

The general topics covered by the wastewater certification exams include:

1. Source waters (domestic and industrial),
2. Wastewater treatment processes:
   a. Racks, screens, and grit removal, sedimentation and flotation, trickling filters, rotating biological contactors, activated sludge, oxidation ditches, ponds, sludge digestion, solids handling, and disinfection
3. WWTP operation and maintenance,
4. Collection system operation and maintenance,
5. Laboratory procedures, and
6. Wastewater regulatory requirements and administrative duties.

Table 4-1. WWTP Classification Table

Source: §3675(a)

WWTP Classification	Wastewater Treatment Process	Design Flow (mgd)
I	Primary	≤1.0
	Conventional Treatment Pond	All
II	Primary	>1.0 – 5.0
	Biofiltration	≤1.0
	Modified Treatment Pond	All
III	Primary	>5.0 – 20.0
	Biofiltration	>1.0 – 10.0
	Activated Sludge	≤5.0
	Sequencing Batch Reactor	≤1.0
	Tertiary	≤1.0
IV	Primary	>20.0
	Biofiltration	>10.0 – 30.0
	Activated Sludge	>5.0 – 20.0
	Sequencing Batch Reactor	>1.0 – 10.0
	Tertiary	>1.0 – 10.0
V	Primary	>30.0
	Activated Sludge	>20.0
	Sequencing Batch Reactor	>10.0
	Tertiary	>10.0

[5] The Operator-in-Training (OIT) certificate is a valid temporary certificate allowing someone to obtain experience as an operator. The regulations define an OIT as "any person who operates a WWTP under the direct supervision of a certified operator while gaining experience to qualify for an operator certificate." An owner may employ or train an OIT at any grade level, provided the OIT is under the direct supervision of an operator at the same or a higher grade level as the OIT and performing the duties at the grade level for which the certificate was issued. An OIT may not supervise operators or other OITs. An OIT may not be a chief plant operator, designated operator-in-charge, or lone operator.

Drinking Water Operator Certification Program

In 1999, the Environmental Protections Agency (EPA) published guidance, as required by the Safe Drinking Water Act Amendments of 1996, establishing minimum requirements for state operator certification programs (EPA, 1999). Also in 1999, the California State legislature amended the Health and Safety Code to conform to the federal statute and guidelines (Chapter 755, 1999 statutes). These regulations have been adopted pursuant to that statute (Health & Safety Code §106875 et. seq.; included in Appendix B) in the CCR Title 22, Division 4, Chapter 13 (CCR, 2015a).

Unlike the wastewater certification process, the Drinking Water Operator Certification Program (DW-OCP) has two certification tracks: one for work "inside the fence" and one for work "outside the fence." It offers five levels of *water treatment plant* operator certification ("T" grades) for plant operators and five levels of *distribution system* operator certification ("D" grades) for those who work outside the plant in the transmission system. Treatment operator certification and distribution operator certification programs are independent of one another. Drinking water treatment certification requirements are described in this section.

Drinking Water Treatment Operator Certification

To receive a certificate as a Drinking Water Treatment Plant Operator, as with WWTP operator certification, a candidate must meet the minimum experience and education requirements and pass a written test (within the last three years for each level). A summary of the experience and education necessary for each treatment plant operator grade is presented in Figure 4-2.

For the most part, all public water systems with water treatment facilities require certified WTP operators. The only exception is water systems using disinfection facilities for groundwater where no *Giardia* or virus reduction is required. These systems can meet the operator certification requirements with a certified distribution operator. All community and non-transient, non-community public water systems with or without water treatment facilities must have certified distribution operators.

The Grade level required for the chief plant operator and designated operator-in-charge depends upon the classification level of the WTP, which is a function of both its capacity and its complexity. WTPs are classified using a points system based on source water type, influent microbial water quality and turbidity, influence water contaminants with primary maximum contaminant limits, and treatment and disinfection types (CCR §64412.1 and §64413.1). Operator requirements for each classification are summarized in Table 4-2.

Similar to WWTP operators, qualifying experience may be acquired in two ways:

1. Individuals may work either part-time or full-time performing operator duties; part-time experience is prorated, e.g., two years of half-time work equals one year of qualifying experience.
2. The Board can grant certification through reciprocity to operators holding a valid water treatment or distribution certificate issued by another state. Reciprocity is offered for Grades 1–3 for both water treatment and distribution.

"Operator experience" means the daily performance of control or oversight activities of any process or operation at a water treatment facility or in a distribution system that may affect water quality or quantity. Many operators perform both water treatment and water distribution duties, and the operator must provide the State with a letter from their immediate supervisor or chief operator to determine how much time he or she spends performing each function.

	Examination Education Requirements +	Additional Certification Qualifying Experience Requirements
T1	High school diploma or equivalent. **or** Successful completion of the "Basic Small Water System Operations" course provided by the SWRCB **or** One year as an operator of a facility that required an understanding of chemical feeds, hydraulic systems, and pumps.	None
T2	High school diploma or equivalent. **or** Successful completion of the "Basic Small Water System Operations" course provided by the SWRCB **or** One year as an operator of a facility that required an understanding of chemical feeds, hydraulic systems, and pumps. **+** Successfully completed at least one course of specialized training covering the fundamentals of drinking water treatment	None
T3	High school diploma or equivalent. **+** Successfully completed a total of at least two courses of specialized training that includes at least one course covering the fundamentals of drinking water treatment.	At least one year of operator experience working as a certified **T2** operator for a **T2** facility or higher. **+** At least one additional year of operator experience working as a certified treatment operator.
T4	A valid Grade **T3** operator certificate. **+** Successfully completed at least three courses of specialized training that includes at least two courses in drinking water treatment.	At least one year of operator experience working as a shift or chief operator, while holding a valid **T3** operator certificate, at a **T3** facility or higher. **+** At least three additional years of operator experience working as a certified treatment operator.
T5	A valid Grade **T4** operator certificate. **+** Successfully completed at least four courses of specialized training that includes at least two courses in drinking water treatment.	At least two years of operator experience working as a shift or chief operator, while holding a valid **T4** operator certificate, at a **T4** facility or higher. **+** At least three additional years of operator experience working as a certified treatment operator.

Notes:

1. An Associate degree or certificate in water or wastewater technology that includes at least 15 units of physical, chemical, or biological science may be used to fulfill 1 year of operator experience.
2. .A Bachelor's degree in engineering or in physical, chemical, or biological sciences may be used to fulfill 1.5 years of operator experience.
3. A Master's degree in engineering or in physical, chemical, or biological sciences may be used to fulfill 2 years of operator experience.

Figure 4-2. California WTP Operator Certification Requirements
(Sources: §63775 and §63800)

General topics covered by the water treatment certification exams include:

1. Source waters (surface and groundwaters),
2. Water treatment processes:
    a. Coagulation/flocculation/ sedimentation, filtration, disinfection, demineralization, corrosion control, iron and manganese removal, fluoridation, water softening, solids handling, and Best Available Technologies (BATs)
3. WTP operation and maintenance,
4. Laboratory procedures, and
5. Drinking water regulatory requirements and administrative duties.

Both certified WTP and distribution system operators must receive ongoing training to ensure that their knowledge of treatment, operations, and public health issues remains current. Water treatment and distribution certificates must be renewed every three years. Continuing education units (CEUs) are required for renewal. The number of hours needed depends on the level of certification. These contact hours must be obtained between the certificate's renewal dates.

Table 4-2. Certificate Requirements for Water Treatment Plants

Source: §63765(a) Table 63765-A

WTP Classification	Minimum Chief Operator Certification	Minimum Shift Operator Certification
T1	T1	T1
T2	T2	T1
T3	T3	T2
T4	T4	T3
T5	T5	T3

Table 4-3. Certificate Requirements for Water Recycling Treatment Plants

Source: §3670.1.(b)(1)

WWTP Classification	WTP Operator Certificate	WWTP Operator Certificate
I	T1	Grade I
II	T2	Grade II
III	T3	Grade III
IV	T4	Grade IV
V	T5	Grade V

Water Distribution Operator Certification

All community and non-transient, non-community public water systems are required to have certified distribution system operators. Like WWTP and WTP operators, to receive a distribution operator certificate a candidate must meet minimum experience and education requirements, pass a written test, and apply for certification. Also like wastewater operators, the grade level required for the chief distribution system operator and designated distribution system operator-in-charge depends upon the classification level of the distribution system.

The general topics covered by the water treatment certification exams include:

1. Disinfection,
2. Distribution system design and hydraulics,
3. Equipment operation/maintenance/inspections,
4. Water regulations, management and safety,
5. Water mains and piping, and
6. Water quality/water source.

Water Recycling Plant Operation

Water recycling treatment plants are defined as WWTPs "that receive and further treat secondary and/or tertiary effluent from another [WWTP] for the purpose of meeting [recycled water regulations] for the use of recycled water." An individual certified by the SWRCB as a Water Treatment operator may also operate a water recycling treatment plant at a Grade level appropriate for the class of WWTP as set forth in CCR sections §3680 and §3680.1. A WTP operator certificate is equivalent to a WWTP operator certificate as outlined in Table 4-3.

Differences in Water and Wastewater Operator Certification

Historically, water operator certification and wastewater operator certification programs were managed by separate agencies. Water operator certification (for treatment and distribution) was under the California Department of Public Health (CDPH) until CDPH was merged into the State Water Resources Control Board as the Division of Drinking Water in 2014. At that time, drinking water operator certification was moved under the OOC. The following explains some of the important differences between the two programs:

1. While both water treatment and wastewater licenses require a combination of written testing and experience for each level of certification, and both have five levels of certification, they are not identical from level-to-level in terms of requirements. For example, Grade I wastewater certification requires a year of experience, whereas level 1 and level 2 in water treatment (T1 and T2 licenses) do not. The wastewater program has an OIT certificate serving a function similar to a T1 or T2 license in the water program.
2. A wastewater license allows you to operate WWTPs and water recycling plants. There is no certification requirement for collection system operation, although it is included in the exam. On the water side, two separate licenses are needed to operate the WTP (a "T" license) and distribution system (a "D" license), although many operators have both.
3. Water treatment and water distribution licenses require CEUs be earned annually. Wastewater licenses do not.
4. Bases for WWTP and WTP classifications (that determine required certification levels) are different. Wastewater classification is based on system size and what treatment processes are used. Water plant classification is based on influent water quality characteristics, treatment processes, and system size.

SECTION 5

Existing Operator Training Opportunities

For a certification program to be successful, adequate training programs must be in place to provide potential applicants with reasonable opportunities to acquire required knowledge. Extensive training programs are available for wastewater and water treatment operator certification through community colleges, universities, and water/wastewater association-based organizations (e.g., CWEA and CA-NV Section AWWA). Training available for an AWT or PR program could be an expansion of existing training opportunities.

The basic purpose of training is to give individuals a knowledge base in the fundamental concepts associated with tasks for a defined job. They can then use this knowledge on the job as they gain experience. The level of knowledge (i.e., number of credit hours) is defined by the certification agency (see Figure 4-1 and Figure 4-2 for California wastewater operator and water treatment operator requirements, respectively).

Programs providing CEUs are intended to serve as a supplement to basic training programs to enhance operator knowledge on a particular topic and keep individuals up-to-date on advances in technology, regulations, and operational practices. This type of training is less intensive than training courses for preparing for certification tests; such education is typically gained through attendance at workshops and conferences hosted by CA-NV Section AWWA, CWEA, WRCA, and similar organizations.

Existing Sources of Training

Many training opportunities are available for existing wastewater and water treatment operator certification exams through community colleges, universities, and association-based organizations (e.g., CWEA and CA-NV Section AWWA). Some of the more well-known organizations offering courses and/or full training programs are listed in Table 5-1.

Table 5-1. Existing Wastewater and Water Treatment Operator Certification Programs		
Training Entity	Offers Water Courses	Offers Wastewater Courses
Community and Junior Colleges, For-Profit Colleges		
American Water College	X	
Antelope Valley College	X	
Bakersfield College	X	X
Citrus College	X	
College of the Canyons	X	X
College of the Redwoods	X	
College of the Sequoias	X	X
Columbia College	X	
Cuesta College	X	
Cuayamaca	X	
Folsom Lake College	X	X
Fresno City College	X	
Gavilan College	X	
Glendale Community College	X	
Hartnell College	X	X
Imperial Valley College	X	X
Los Angeles Trade Technical College	X	X
Mendocino College	X	
Merced College	X	X
Mesa College	X	
Mt. San Antonio College	X	
Mt. San Jacinto College	X	
Ohlone College	X	
Palomar College	X	X
Sacramento City College	X	X
San Bernardino College	X	X
San Jose/Evergreen Community College	X	
Santa Barbara City College	X	X
Santa Rosa Junior College	X	X
Santiago Canyon College	X	
Shasta College	X	X
Solano Community College	X	X
Ventura College	X	X
Yuba College	X	
4-Year Colleges and Universities		
California State University, Sacramento	X	X
San Jose State University	X	
UC Davis	X	
Water/Wastewater Associations		
CA-NV Section AWWA Water College	X	
CWEA	X	X
Water Environment Federation		X
Water Operator Association	X	
California Rural Water Association Academy of Water Education	X	X

Table 5-1. Existing Wastewater and Water Treatment Operator Certification Programs		
Training Entity	Offers Water Courses	Offers Wastewater Courses
Others		
OCT Water Quality Academy	X	
Golden State Water Company	X	
Note: The programs cited above are included in the master list from the OOC. It is likely not all inclusive.		

As discussed in Section 8, the current approach to AWT operator training is defined on a site-by-site basis. It combines hands-on training under supervision with some combination of in-house training manuals and exams, standard operational plans, and consultant- and/or treatment process vendor-supplied supplemental instruction. Some formalized training opportunities also exist on membrane processes from various water sector organizations and individuals, including the American Membrane Technology Association (AMTA), Southwest Membrane Operator Association (SMOA), and Southeast Desalting Association (SEDA).

SECTION 6

Advanced Water Treatment Processes Used in Potable Reuse

As illustrated in Figure 2-1, when permitted in California, except for some cases when spreading basins are used (where AWT is optional), potable reuse systems supplementing drinking water sources are expected to use complex treatment trains centered on reverse osmosis and advanced oxidation processes. These AWT processes are also used in some WTPs with challenging raw water qualities, and to a lesser extent in WWTP applications where meeting effluent discharge goals can be difficult without advanced treatment.

Water Quality Goals

In developing the regulations for Groundwater Replenishment Using Recycled Water (CDPH [now DDW], 2014), the State adopted a pathogenic microorganism control based on a goal of achieving a pathogen de minimus risk of annual infection ($<10^{-4}$ assuming a sewage influent of 10^5/L – i.e., a waterborne disease outbreak) via multibarrier treatment. This is expected to extend to Reservoir Augmentation IPR and eventually to DPR. This rule states:

> "A project sponsor shall design and operate a GRRP [Groundwater Replenishment Reuse Project] such that the recycled municipal wastewater used as recharge water for a GRRP receives treatment that achieves at least 12-log enteric virus reduction, 10-log *Giardia* cyst reduction, and 10-log *Cryptosporidium* oocyst reduction. The treatment train shall consist of at least three separate treatment processes. For each pathogen (i.e., virus, *Giardia* cyst, or *Cryptosporidium* oocyst), a separate treatment process may be credited with no more than 6-log reduction, with at least three processes each being credited with no less than 1.0-log reduction." - §60320.208, Pathogenic Microorganism Control.

A secondary goal is removal of microcontaminants that could pose a chronic health risk and degrade the environment. Treatment credits are awarded in the WWTP and recycled water purification process. If injected into the ground (and very likely if added to a reservoir or other drinking water

source), the water must also receive "full advanced treatment" (or an alternative equally protective of public health), defined as three-part (or more) multibarrier treatment[6] including reverse osmosis (RO) and advanced oxidation (AOP). AWT systems for indirect potable reuse are typically designed and operated to provide disinfection and microcontaminant removal in excess of the baseline statutory requirements.

The DDW is expected to propose Draft Surface Water Augmentation (IPR) rules in 2016. A report from the National Water Research Institute (NWRI)-sponsored expert panel on the feasibility of developing uniform criteria for DPR in California is also anticipated in late 2016.

Characteristics of Advanced Unit Processes

Advanced technologies currently being used in direct injection potable reuse projects are briefly summarized in Table 6-1, with key operating parameters highlighted. Other processes, like chemical pretreatment, post-treatment water conditioning, and brine minimization may also be used, but are not AWT processes and not included here. Most treatment processes listed are also used in other water treatment facilities. The treatment selected depends on source water quality and requirements to meet drinking water standards. Current water treatment certification testing requirements do not incorporate many of these treatment processes and are focused on chlorination, conventional surface water treatment trains (coagulation–sedimentation–filtration–disinfection), and other common treatment processes.

In DPR, it is critical that processes used begin with a wastewater treatment facility followed by advanced treatment processes. Furthermore, good performance of each subsequent process is dependent upon receiving acceptable water quality from the previous process. For example, wastewater effluent quality must be consistent to ensure proper performance of the downstream microfiltration (MF) system. Good performance of the MF system is essential to avoiding quick fouling of the downstream RO membranes.

Table 6-1. Advanced Water Treatment Processes Commonly Used in Potable Reuse

Process Description
Soil Aquifer Treatment (SAT) SAT is a passive process where water is introduced into the groundwater through soil percolation under controlled conditions. Water is introduced into a permeable pond where it percolates through the infiltration zone and the vadose zone on its way to aquifer storage. Natural treatment and attenuation occurs as it moves through the soil. In California, the water is later withdrawn after it has traveled through the aquifer for at least two months.
Ozone/Biologically Active Carbon (BAC) **Ozonation:** Ozone is added to the water to oxidize contaminants present in the water, particularly organic compounds and microorganisms. Ozone is the strongest oxidant of the common disinfecting agents. **Biologically Active Carbon:** BAC uses a stationary bed (typically granular activated carbon) on which biofilms of indigenous bacteria are allowed to develop. Biological filters remove contaminants by three main mechanisms: biodegradation, micropollutant adsorption, and suspended solids filtration. The microbial growth attached to the filter media (biofilm) consumes organic matter.
Membrane Filtration Low-pressure membrane systems use semi-permeable membranes to separate out suspended solids, turbidity and microbiological organisms from the feed water. Low-pressure membranes (microfiltration and ultrafiltration) do not remove appreciable amounts of dissolved organic materials, total dissolved solids (TDS), or viruses.

[6] A requirement included in the GRRP regulations for IPR groundwater injection projects.

Table 6-1. Advanced Water Treatment Processes Commonly Used in Potable Reuse
Process Description
Reverse Osmosis
RO systems use semi-permeable membranes to separate out contaminants from the feed water. The applied pressure must be in excess of the osmotic pressure of the dissolved constituents to allow flow through the membrane. It differs from low-pressure membranes in that: 1) it removes appreciable amounts of dissolved organic materials and TDS, 2) it is a physical-chemical removal process, as opposed to a size exclusion process. Rejected salts are concentrated into a small percentage of the flow (15 – 20% of the feed volume) and exit the system as a concentrated waste stream.
UV/AOP
Ultraviolet (UV) light can be used as an advanced oxidation process with the addition of hydrogen peroxide or chlorine. In these applications, a high dose of UV light (on the order of 400 – 1,000 millijoules per square centimeter, mJ/cm^2) is applied to catalyze the formation of hydroxyl radicals from the peroxide. These free radicals subsequently oxidize the microorganisms and organic contaminants present, including both synthetic and naturally-occurring organic chemicals of concern.

SECTION 7

Gaps in AWT System Operator Skill Needs

Applying only existing California wastewater or drinking water treatment operator certification requirements to AWT and PR plant operators does not address all current skill assessment needs, as existing exams do not cover advanced water treatment or potable reuse regulations and concerns.

Certification exams are regularly updated based on reassessments of what a "water/wastewater treatment plant operator" job requires at different grade levels. Periodically, surveys are sent to operators across the state to query them on aspects of their jobs. If a specific job task is not identified by at least 60% of the survey respondents, it is not added to the job description. Given that AWT processes are relatively rare, even in surface water treatment plants (WTPs), questions on advanced water treatment (AWT) processes have not yet been added to the test.

Potable reuse system operation is different from conventional wastewater and water treatment operations in a number of important ways:

1. The need to treat water from wastewater quality to drinking water quality requires multiple barriers using a variety of technologies and a more complex treatment train than conventional water and wastewater treatment processes.
2. Given that the feed water to the wastewater treatment plant (WWTP) is wastewater containing high levels of pathogens and trace levels of various chemical contaminants that will be treated to drinking water standards through the AWT treatment train, it is critical that all components are operated and maintained as intended.
3. Feedwater quality (both raw wastewater into the WWTP and secondary or tertiary effluent feedwater to the AWT process) can vary. This can impact daily operation of the advanced treatment plant as well as the purified water quality.
4. Regulations exist in California for IPR through groundwater recharge applications and the State is actively working toward similar regulations for surface water augmentation and DPR. However, potable reuse (PR) water is not clearly regulated under any one existing Federal program. In the course of making recycled water for potable use, it could be interpreted to be regulated under the California Water Code (Porter-Cologne) jurisdiction (to produce an acceptable effluent) and under the State and Federal Safe Drinking Water Act jurisdiction to produce an acceptable drinking water source and provide treatment to potable water standards. Neither operator certification program covers both wastewater and drinking water regulations.

There is an additional problem with the application of the Water Treatment (T-license) experience credit under the existing Operator Certification structure. Because the recycled water certification program was initially developed under the umbrella of the wastewater certification program to produce water almost exclusively for non-potable applications (typically relying on tertiary treatment only), there are problematic rules for Water Treatment operators to earn equal experience credit working at advanced treatment facilities producing water for non-potable applications using advanced treatment like membrane and oxidation systems similar to potable applications. Water Treatment Operators working at an AWT facility can only accrue Water Treatment Operator-qualified experience at half time because the plant is not technically a potable water treatment facility (i.e., for every year a Water Treatment Operator works at an advanced recycled water facility, he/she only accrues six months of experience credit for their Water Treatment Operator's certificate.) This reduced credit for experience does a disservice to the operators, who run these sophisticated and complex advanced treatment systems.

The lower experience credit allowance for Water Treatment operators working at AWT facilities for recycled potable-quality water (as opposed to AWT facilities for drinking water) has become an issue at the Santa Clara Valley Water District's (SCVWD's) Silicon Valley Advanced Water Purification Center (SVAWPC), which processes tertiary effluent from a nearby water reclamation plant. At the SVAWPC, operators are Water Treatment-certified at Grade T3 or higher, when hired at the journey level. Although all job openings are available to both Water Treatment and Wastewater operators, at this time all staff are T-operators. Because of the way current operator certification regulations are written, staff receive only six months credit for operating the AWT facility each year, whereas the same type of job would earn 12 months of credit if the plant's water source was characterized as a potable water source. This issue must be considered in the development of a new potable reuse operator certification strategy.

Table 7-1. Aspects of current operator training or certification program(s) considered essential for potable reuse operations by respondents

Answer Choice	Percent Respondents
Wastewater treatment processes	77%
Drinking water regulatory requirements	72%
Wastewater treatment plant operation/maintenance	67%
Wastewater regulatory requirements	66%
Water treatment processes	63%
Laboratory procedures	57%
Water treatment plant operation/maintenance	52%
Distribution system operation/maintenance	52%
Source water	43%
Administrative duties	30%
Collection system operation/maintenance	28%
Other (list)	11%

Many survey respondents reported that knowledge of both water treatment and wastewater treatment processes was important (Table 7-1). Advanced processes were the most common certification deficiencies identified by those who had potable reuse facilities, although other related topics, like emergency response and monitoring, were also commonly cited (Table 7-2).

Table 7-2. Gaps in existing certification programs needed for potable reuse facility operation identified by respondents	
Answer Choices	Percent Respondents
UV-advanced oxidation	44%
Microfiltration	39%
Reverse osmosis	39%
Ozone	36%
Unified approach to failure analysis, prediction, and avoidance	36%
Automation and process control	30%
Other (list)	30%
Monitoring (e.g., contaminant and TOC detection) protocol	25%
UV disinfection	23%
Biologically active filters	18%
Emergency response	18%
Drinking water regulatory requirements	18%
Multiple discharge requirements	18%
Control of discharges to sewer system	18%
Monitoring of wastewater quality	7%

SECTION 8

Exploring Possible Paths Forward

To date, managers of advanced water treatment (AWT) and potable reuse (PR) plants have had to develop their own internal training programs. A formal AWT/PR certification program defining and verifying skill and knowledge needs for PR system operators could follow a number of different paths. The ideas presented here reflect thinking and discussion from different water sector individuals and groups considering the PR operator certification question. They were captured prior to the CUWA Operator Certification Workshop discussed in Section 9 and represent the range of possibilities explored by workshop participants.

Existing Potable Reuse Operator Training Practices

Given that PR and AWT plants do not have a formal certification process to verify that operators have a minimum skill and knowledge level of AWT, utilities have had to develop their own internal programs[7]. As with advanced processes for standard drinking water or wastewater treatment, operators that currently run AWT processes for potable water reclamation can be water- or wastewater-certified. Training program content and tests have historically been site-specific and developed in-house.

For example, at the **Orange County Water District (OCWD) Groundwater Replenishment System (GWRS)**, the AWT system, employing MF, RO, and UV-AOP, is operated mostly by wastewater operators. Due to its size (100 MGD), the GWRS must have 50% or more of its operators certified at least a Grade 2 or higher. These plants do not fall neatly into the categories referenced in Table 4-1, but are closest to Grade V tertiary facilities.

[7] It is expected that all PR facilities will retain some internal, on-the-job training specific to each facility's process train and operational plan. In this section, "training" refers to uniform, basic instruction regarding how AWT processes work and what related training (e.g., regulations, monitoring) is included in the formal PR/AWT job description similar to that already in place for conventional drinking water and wastewater treatment certification programs.

OCWD's job descriptions have the following requirements:

- Shift supervisors are required to have Grade IV or V certification.
- Leads and operators at a Plant Operator III level are required to have minimum Grade III certification.
- Operators at a Plant Operator II level are required to have minimum Grade II certification.
- Operators at a Plant Operator I level are required to have minimum Grade I certification.

OCWD has also created an internal training and testing program. This program involves a combination of internal trainers and external experts engaged periodically to provide additional theoretical and hands-on training. Operators are encouraged to also obtain their water treatment operator's license, but it is not required.

City of Los Angeles Sanitation (LASAN) has an AWT train at their Terminal Island facility including MF and RO plus lime stabilization. Product water has been sent to a seawater intrusion barrier for the past eight years. They are currently in the process of expanding the facility to include UV AOP. Their permit calls for wastewater operators. Similar to OCWD, LASAN has instituted its own formal internal training program above and beyond state requirements. LASAN has developed a detailed operators training manual covering all aspects of the advanced treatment system, from the MF feedwater wet well to the outfall dechlorination system. Both process-specific operations and safety training is included.

Other facilities have less formalized training programs, but in essence do the same type of training on an individual-by-individual basis. **Santa Clara Valley Water District** holds extensive internal hands-on training for the personnel working at their Silicon Valley Advanced Water Purification Center (SVAWPC), where they operate an AWT process with MF, RO, and UV disinfection (with addition of UV-AOP planned). At SVAWPC, operators can be either water treatment- or wastewater-certified and must be Grade III wastewater or Grade T3 or higher. At this time, all SVAWPF staff are water treatment operators.

The approaches in use to train and verify competence of operators at advanced recycled water treatment facilities such as those cited above are in line with approaches reported by survey respondents for developing advanced treatment expertise. As would be expected given the lack of formal training and certification requirements, the primary means of gaining potable reuse advanced treatment system experience is on-the-job (Figure 8-1).

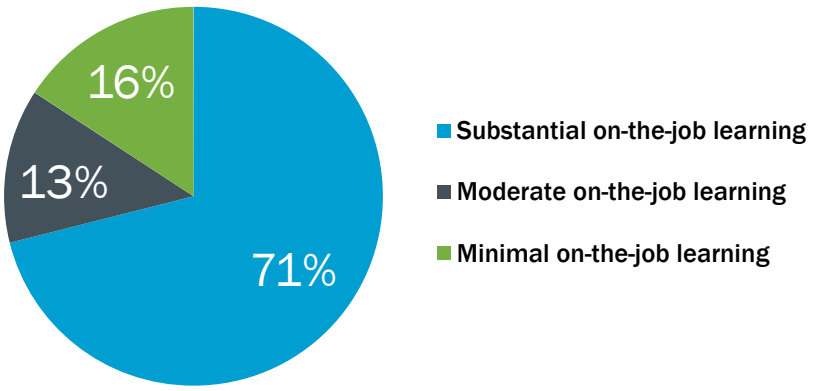


Figure 8-1. Contribution of on-the-job experience to potable reuse facility operators' knowledge of AWT

As potable reuse becomes more prevalent, the need for a potable reuse operator certification program grows to ensure continued delivery of high-quality reuse water from a wide range of agencies. This white paper provides a framework for development of a certification program to facilitate an appropriate alignment between the risk/criticality of the application and the knowledge/experience of the operators. In initial discussions, some individuals suggested that, given AWPFs are often co-located with a WWTP and the flexibility to operate both would be beneficial to some municipal agencies, PR facilities could be certified as wastewater systems with wastewater operators. PR operators and managers also highlighted the importance of good (educated) communication with WWTP operators to manage the source water quality and maintain AWT system performance.

However, DPR produces potable water supply with limited to no environmental buffer, so it needs to be held to the standards and regulations that apply to potable water and a drinking water treatment operator's skills and knowledge will be needed. Current operator certification programs do not adequately verify the level of skill and knowledge operators need to successfully run these systems and therefore pose a potential obstacle to implementation of potable reuse programs more widely. Individual utilities must develop their own training and education programs. This collaborative effort, led by CUWA, is intended to reach agreement on operator certification that will instill public confidence that operators meet a basic standard of expertise by providing a concrete demonstration of operator proficiency. It will also help overcome the current challenge that municipal agencies face in recruiting and training future operators.

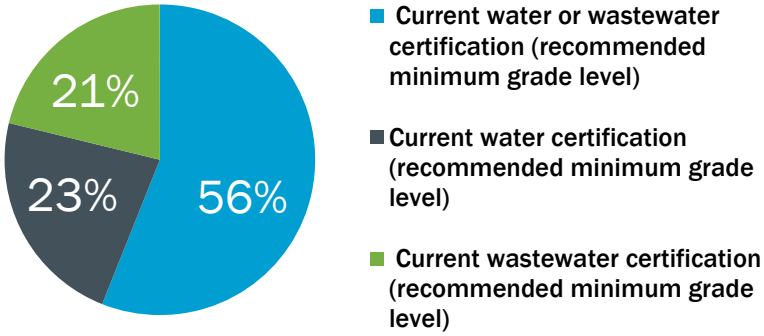
Utility Needs and Preferences

Representatives of the water and wastewater sector responding to our survey in California prefer new certification options to fill the "holes" in the existing programs and allow both water treatment and wastewater operators to obtain advanced treatment certification for potable reuse (Figure 8-2). A minority preferred one type of existing operator certification over another, depending on the operator type used within their facilities—i.e., water purveyors were more likely to state that potable reuse systems should be operated by water treatment operators and wastewater agencies were more likely to state that potable reuse systems should be operated by wastewater operators. This indicates an area of some disagreement that might need to be addressed in the certification program development process. However, over 70% of respondents agreed that whatever certification process is developed, it should be one approach for all potable reuse water system types (both indirect and direct).

70%

of survey respondents agree that one certification process for all potable reuse water system types should be developed.

Figure 8-2. Stated preferences for operator certification type for enhancement with advanced treatment certification for potable reuse



Potential Approaches to Developing an AWT or PR Certification Program

A certification program that helps define and verify skill and knowledge needs for potable reuse system operators could be developed as an independent, stand-alone program, or incorporated under an existing certification program. A number of different paths could be taken to develop an advanced water treatment/potable reuse (AWT/PR) operator certification program. The ideas presented here reflect thinking and discussion from different water sector individuals and groups looking at the potable reuse operator certification question, particularly the CA-NV Section AWWA's Advanced Water Treatment Certification Workgroup, comprised of utility members (including some CUWA member agencies), California and federal regulators, and consultant potable water experts. This list is not intended to reflect the ideas of any one group or person, but rather capture and reflect some of the avenues of thought and discussion on the topic considered prior to the October 2015 CUWA Operator Certification Workshop. The options presented below represent the range of possibilities explored by workshop participants.

1 Separate Potable Reuse Operator Certification Program

With this approach, a separate certification program would be developed exclusively for PR system operators to validate an individual has a defined level of PR system-specific knowledge, skill, and experience. This would incorporate advanced treatment material along with water and wastewater topics critical to the operation of an AWPF. This concept is illustrated in Figure 8-3.

DW-OCP		PR-OCP	WW-OCP
• T1	• D1	• PR1	• Grade I
• T2	• D2	• PR2	• Grade II
• T3	• D3	• PR3	• Grade III
• T4	• D4	• …	• Grade IV
• T5	• D5		• Grade V

Figure 8-3. Illustration of potential PR certification program Option 1, a stand-alone program; where DW-OCP = Water Treatment Operator Certification Program, PR-OCP = PR Operator Certification Program, and WW-OCP = Wastewater Operator Certification Program; PR*i* = PR Operator Certification Level *i*.

2 & 3 DPR or AWT Operator Certification Program Supplement

With this approach, a PR or more general AWT[8] certification program would verify that an individual has a defined level of advanced treatment-specific knowledge, skill, and experience. It might also include water or wastewater topics critical to the operation of an AWPF and missing from the operator's standard certification exams.

As a WW-OCP Supplement

If a supplemental certification program was developed under the WW-OCP, its content would enhance the existing wastewater certification requirements. In this scenario, it is assumed that DPR plant operators would need WW-OCP + PR or AWT supplement certification. This concept is illustrated in Figure 8-4.

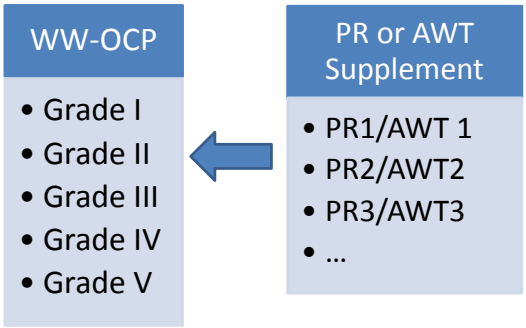


Figure 8-4. Illustration of potential PR or AWT certification program Option 2, as a supplement to wastewater certification; where WW-OCP = Wastewater Operator Certification Program; PR*i*/AWT*i* = PR or AWT certification level *i*.

As a DW-OCP Supplement

If a supplemental certification program was developed under the DW-OCP, its content would enhance existing water treatment certification requirements. In this scenario, it is assumed that DPR plant operators would need DW-OCP + PR or AWT supplement certification. This concept is illustrated in Figure 8-5.

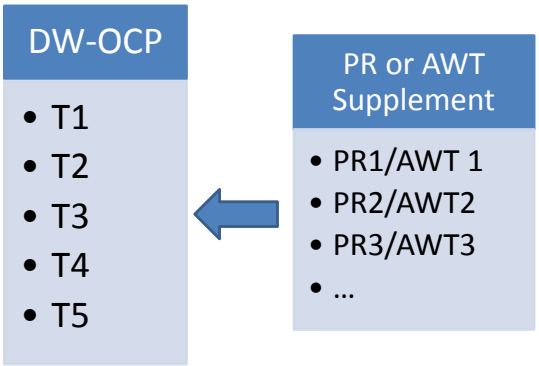


Figure 8-5. Illustration of potential PR or AWT certification program Option 3, as a supplement to drinking water treatment certification; where DW-OCP = Drinking Water Treatment Operator Certification Program; PR*i*/AWT*i* = PR or AWT certification level *i*.

[3] A more general AWT program would include all standard PR technologies (e.g., MF/UF, RO, UV-AOP) plus other advanced technologies like ion exchange. A general AWT certification could be used to certify operators running advanced systems in conventional drinking water plants, as well as in PR facilities. This would both expand opportunities for recruiting high enough numbers of participants to support a certification program through CA-NV Section AWWA, or similar organization and provide utilities with the opportunity to raise their formal standards for AWT operators.

4 DPR or AWT Hybrid Added on to Either License

With this approach, either a separate PR or more general AWT[4] supplemental certification program would be developed under the Operator Certification Program to certify that a WWTP or WTP operator has a defined level of advanced treatment-specific knowledge, skill, and experience. This approach might have different components for water treatment-certified and wastewater-certified operators to fill in their different knowledge gaps.[9] This concept is illustrated in Figure 8-6.

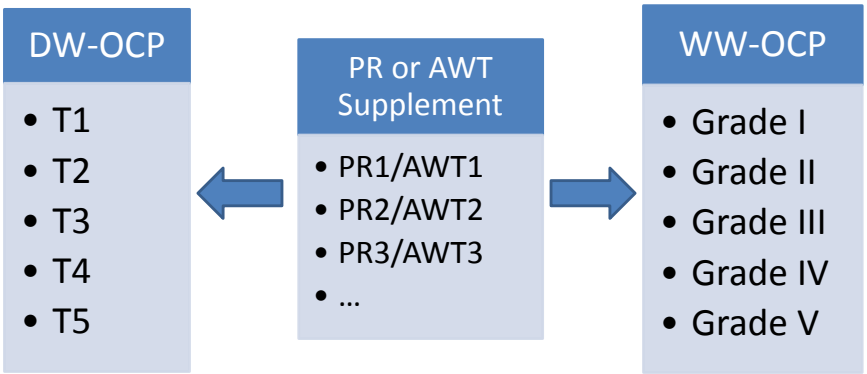


Figure 8-6. Illustration of potential PR or AWT certification program Option 4, as a hybrid supplement that can be used with either water treatment certification or wastewater certification; where DW-OCP = Water Treatment Operator Certification Program, and WW-OCP = Wastewater Operator Certification Program; PR*i* = PR Operator Certification Level *i*.

When queried as to which approaches would be preferred, a large majority of survey respondents ranked a special potable reuse or AWT module to enhance existing certifications highest among the options. However, respondents were again split on which program should offer the module (water treatment, wastewater, or both, as shown in Figure 8-7). Definitions for what would comprise the certification module were not provided with the survey.

[9] This would be the case if it was determined that direct PR operators should have knowledge of both water and wastewater topics.

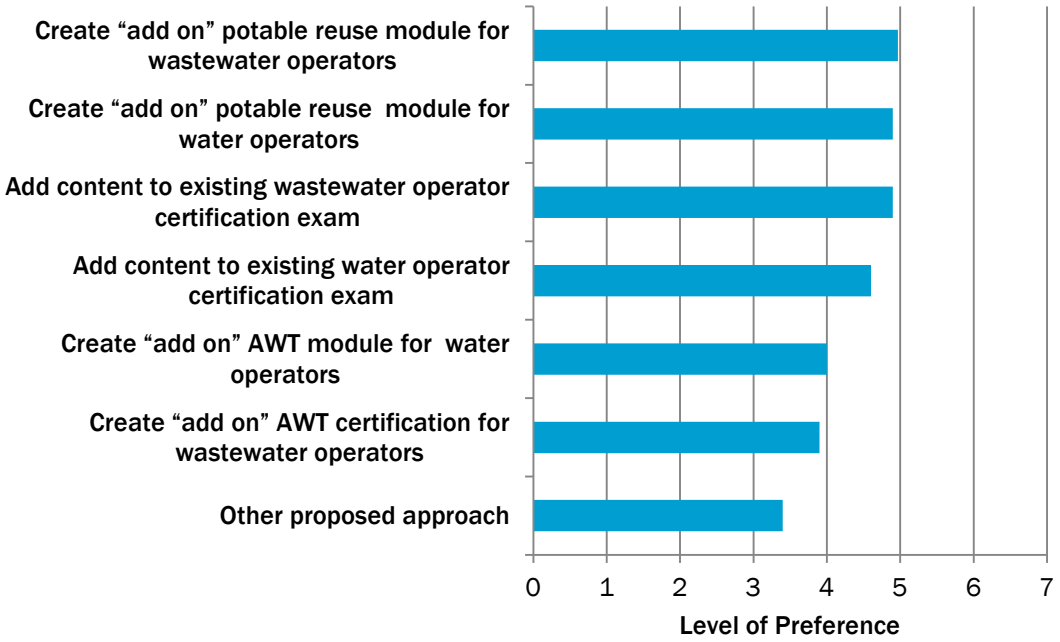


Figure 8-7. Preferences for modifying water and wastewater certification programs to advance PR, ranked in order of preference, where 7 is most preferred and 1 is least preferred.

Benefits and limitations of these approaches are presented in Table 8-1. Whichever certification path is selected, there will be a number of questions and issues to consider and settle. The most critical questions identified prior to the workshop included:

- What key elements must be covered in the job description for this test?
- How will training to prepare candidates be handled? Who might be able to offer the needed training?
- Is there a large enough market for the AWT/PR certification program to support its development (expense question)?
- Could the selected approach limit the available pool of existing PR operators (availability of workers question)?
- What type of experience would be acceptable to operate a potable reuse facility and sit for the proposed certification exam (WTP operation, WWTP operation, or either/both)?
- Would this approach result in unacceptable knowledge and/or experience gaps to some parties?
- How would the State/plant managers address knowledge and/or experience gaps?
- If the program developed is not explicitly for PR, would this negatively impact public perception regarding the safety of potable reuse to supplement drinking water?
- If both drinking water treatment and wastewater operators are used, would senior supervisors be experienced enough to effectively manage a diversity of staff backgrounds?

Selecting the location and focus of a new add-on certification program will need to balance two primary needs: covering knowledge elements necessary for operating potable reuse systems—which by their nature straddle the wastewater and drinking water fields—and developing a program that will draw a high enough number of participants that it is economically viable to maintain and creates a large enough pool of certified operators to meet utility hiring needs.

Table 8-1. Summary of Potential Potable Reuse/AWT Operator Certification Approaches

Certification Approach	Description	Benefits	Limitations
Separate DPR Operator Certification Program	A separate certification program developed solely for potable reuse system operators. A wastewater or water treatment operator with some pre-specified Grade level (perhaps Grade-II or T3) would start a new program and get everything he/she needs to operate an advanced potable reuse plant.	– Would be specifically tailored to the needs of the job of operating a potable reuse plant.	– Would likely result in a very small pool of qualified operators. – Would not cover other water/wastewater systems with advanced technologies.
Add-on to WWTP Certification	A supplemental certificate for existing wastewater operator certification that verifies a defined skill level in potable reuse/AWT.	– Would allow wastewater agencies to use internal staff in new potable reuse projects.	– Might not require knowledge of drinking water-specific treatment, rules and protocols. – Would preclude WTP operators from operating potable reuse systems.
Add-on to WTP Certification	A supplemental certificate for existing water treatment operator certification that verifies a defined skill level in potable reuse/AWT.	– Would staff potable reuse plants with individuals that are well-versed in potable water requirements and protocols.	– Might not require knowledge of wastewater-specific treatment, rules and protocols. – Would preclude WWTP operators from operating potable reuse systems.
Hybrid that can be added on to either license	A supplemental certification program that supplements both WW-OCP and the W-OCP that verifies a defined skill level in PR/AWT. A wastewater or water treatment operator with some pre-specified Grade level (perhaps Grade-II or T3) would acquire this certification as a supplement or rider to their existing license.	– Would allow potable reuse plants to hire a diverse staff.	– If focused solely on advanced treatment, WTP operators would potentially miss exposure to wastewater topics and vice versa. There might be inevitable knowledge gaps for all operators (wastewater- or water-related). – If focused solely on potable reuse, it might not draw enough potential applicants

Potential Future Sources of Training

In order to create a substantial pool of potential AWPF operators, training available for an AWT or PR program would need to be expanded beyond existing opportunities. This could include new training programs developed under the same sorts of entities as have developed conventional DW and WW operator training courses. Historically, initial (and for some topics relatively exclusive) sources of training for many operator certification topics has come from CA-NV Section AWWA and CWEA for water and wastewater training, respectively.

Some similar effort may be needed for AWT training. The WateReuse Research Foundation is preparing to issue RFP 15-05, *Developing Curriculum and Content for Operator Training* to help address this shortfall. This WateReuse project will develop recommendations on what content is needed to train operators in AWT processes and to impart critical knowledge about the operations and management of a potable reuse system.This effort could serve as the foundation for the development of new curricula in AWT and potable reuse.

SECTION 9

CUWA Potable Reuse Operator Certification Workshop Outcomes

CUWA facilitated a workshop on October 19 and 20, 2015 at the Orange County Water District to provide an opportunity for collaborative partners and stakeholders to reach agreement on a framework for advanced water treatment (AWT) and potable reuse (PR) operator training and certification for recommendation to DDW. The results of this workshop are summarized below.

There is much ongoing work related to the development of PR operator training and certification in California by a few motivated entities. CUWA hosted a workshop to bring many of these stakeholders together, including collaborative partners WRCA, CA-NV Section AWWA, CWEA, and CASA, representatives of several water and wastewater agencies from across the state engaged in or planning to implement PR, and representatives from the SWRCB, DDW and OOC. The intent was to provide a forum to advance the AWT or PR certification dialog and set the stage for further collaboration. In this two-day workshop, CUWA Executive Director Cindy Paulson facilitated a series of presentations, group discussions, and break-out sessions designed to reach agreement on a proposed strategy for PR operator training and certification. Topics included current practices and certification rules and requirements, training and certification gaps as they relate to PR and AWT, options for implementing a new certification program, and implementation needs, challenges, and alternatives.

By coming together face-to-face, the group was able to make great progress and reach agreement on a number of critical issues and questions. At the conclusion of the workshop, the group had achieved consensus on the basic structure of the future certification program and a strategy to move it forward. The group also identified key foundational needs for the new certification program and explored a wide range of institutional, financial, and technical issues related to implementing an AWT and/or PR operator certification program. The following sections summarize the key findings and remaining challenges that emerged from the workshop.

Strategic Approach for Developing a Certification Program

Key elements of the strategy include the following:

1. The certification program should be a robust training and testing program centered on AWT technologies used in the purification of wastewater effluent for potable reuse and should include risk management concepts (e.g., emergency response and Critical Control Points protocols).
2. It should be a stand-alone certification "add on" or "supplement" to an existing certification available to both wastewater and water treatment operators with an acceptable level of training and experience (e.g., Grade II wastewater operators and T3 water treatment operators[10]).
3. Those with a qualifying background in either wastewater or water treatment should be evaluated on the same competencies and therefore take the same certification test.
4. The program should provide an adequate population of certified operators from which utilities can hire new PR treatment plant operators and be broad enough to draw a large enough testing population to be financially viable.

Foundational Needs for a New AWT/Potable Reuse Certification Program

The essential elements to a new AWT/PR certification program center around three main categories: fielding enough candidates, implementation strategy, and technologies.

Fielding Enough Candidates

In order to be supportable, and to provide utilities with enough qualified job applicants to be able to fill their future AWPF needs, the Certification Program should be founded on the following elements:

1. Provides a clearly outlined path to certification.
2. Is inclusive of water treatment and wastewater operators.
3. Offers career mobility and bridging to and from the AWT/PR track and between Water and Wastewater Operator Certification Programs, as it would be advantageous for recruiting.
4. Grandfathers in existing PR plant operators for a period of time or unless facility treatment or purpose changes is needed.
5. Focuses on the operator role, accountability, and end use rather than get overly focused on technologies, as they can change.
6. Requires a minimum level of water treatment operator and wastewater operator certification. The group did not officially settle on the most appropriate level, but a suggestion of Grade II (wastewater) or T3 (water) was made.

[10] The difference in recommended certification grade level reflects differences in experience requirements between the wastewater certification and water treatment certification programs. While both have five grades of certification, the requirements for each grade are not identical.

Facilitating Program Development

Timely development of training and certification is needed for direct potable reuse (DPR) to move forward. To achieve this goal, the water sector will have to address a number of critical implementation needs.

1. The structure developed must be manageable and enforceable by the State Water Resources Control Board (SWRCB).
2. It must be accepted by regulators, decision makers, operators and the public.
3. There must be a test-able, viable mechanism for training. This will need to be association-led.
    a. The State could allow for certification through CA-NV Section AWWA, CWEA, or a joint CA-NV Section AWWA—CWEA effort in the near term. Draft regulations for potable reuse could maintain flexibility to allow for this approach. There is precedence set for Association-led training and certification evolving to a State-led program on both the water and the wastewater sides.
    b. The CA-NV Section AWWA and the CWEA could collaborate together to facilitate development of this program. It naturally crosses the borders of both wastewater and water treatment knowledge and activities. (However, no formal agreements are currently in development.)

Included Technologies

The exam should be based on the standard elements of an AWT train for potable reuse, including those being considered for DPR and should be practical and responsive to the changing nature of technology.

1. Technologies to be covered in training and certification exams should include at least the following:
    a. MF/UF
    b. RO/NF
    c. Chemical disinfection
    d. Advanced Oxidation
    e. Ozone + BAC
2. Other knowledge that could be included in testing for the first level of certification:
    a. Advanced disinfection, stabilization, advanced separation, brine management
    b. Critical Control Points
    c. Basic instrumentation
    d. Source water
3. The program should evolve in content over time as technology changes.
4. It should effectively address differences between technical knowledge (including continuing education units, or CEUs) and hands-on experience for each existing certification program.

Remaining Challenges to Developing a New AWT/PR Certification Program

The group identified and discussed a number of remaining technical and institutional challenges associated with developing a new program. These centered on implementation, mobility, and career path questions, and program boundaries.

Implementation

1. Sufficient resources will be necessary to run the program. This includes financing the development of training and certification programs *and* financing administration of the certification process within the California State Water Resources Control Board Operator Certification Program.
2. There needs to be sufficient training opportunities for potential candidates to gain the knowledge they need to pass the test.
    a. Design engineers, vendors, and associations are an important part of the alternative competency demonstration process.

Mobility and Career Path

1. Utilities (i.e., potential employers) will have to establish clear treatment tracks, address pay implications, and determine job requirements for different operator types.
2. The minimum entry point for operators and required level of knowledge and water or wastewater experience must be defined. The requirements for transitions between PR1, PR2, PR3,... need to be established. Each level will require knowledge and experience elements including technologies, regulations, and end use. Increasing levels address increasing knowledge and accountability.
3. Advanced grades (e.g., grades T5 and [wastewater] V) should allow an operator to jump above a PR1. However, they would still have to take the required tests.
4. Advanced treatment experience with reuse systems should count toward experience requirements for water treatment and wastewater operator certification.
5. An "in-training" process like the wastewater Operator-in-Training (OIT) program is not desirable.

Program Boundaries

1. As the program will be open to both water treatment and wastewater operators, there is a need to address gaps in "crossover" knowledge (wastewater operators need to understand water treatment and regulations, and water treatment operators must learn similar things about wastewater). Every gap does not necessarily need to be covered as experience and system-specific training will help address remaining gaps.
2. The test focus should change depending upon the certification level. Lower level AWT/PR certifications could focus on technology basics. Upper level AWT/PR certifications could test more advanced monitoring, emergency response, and regulations concepts.
3. The benefits of broadening from a more narrow PR focus to AWT should be considered. For example, it could provide a more robust economic engine to drive the program, making it

more viable. AWWA Cal-NV members have interests in AWT certification that go beyond PR, although that is still a central need. Thus, it could address other concerning source waters such as stormwater and contaminated groundwater.

4. As a compromise, calling it an advanced water purification (AWP) certification program with a focus on potable reuse would speak to the public's interests and provide confidence. One suggestion was that the program could be phased. For example, it could start with source water as wastewater and evolve to other impaired source waters.

It is anticipated that these issues will be resolved as certification program development work moves forward.

Remaining Unresolved Issues Related to Developing a New AWT/Potable Reuse Certification Program

The group was able to achieve consensus on the critical foundational structure of the future certification program. No consensus was reached on the target audience for the certification program. Consensus is needed to complete the initial "job analysis" step, whereby the content of the certification exam topics is identified. What "job(s)" are to be certified (AWT or PR operations) will, in turn, clarify the scope and content of the program.

The other critical question to be resolved is what organization(s) will create and maintain the program. As mentioned previously, there is an effort underway through the CA-NV Section AWWA's AWT Operator Certification Committee to explore the possibility of developing an AWT or PR-focused certification program. At the CUWA Workshop, representatives from CA-NV Section AWWA and CWEA agreed that it might be beneficial to collaborate. It was also recognized that each organization would need to further explore with their leadership how such a partnership could work. As of publication, conversations between these groups are on-going but no formal agreements have been made.

An entity or entities will need to commit to developing training and certification programs for an AWT or PR supplement. This step will allow the OOC to create a program. The institutional complexities and financial contributions needed for program development will take time to resolve. Continuous coordination with the DDW and OOC is necessary.

SECTION 10

Conclusions and Recommendations

Water reuse, including potable reuse (PR), is a critical element of California's water supply portfolio. Yet current operator certification programs do not adequately test the range of skill and knowledge operators need to successfully run these systems and, as a result, pose a potential obstacle to implementation of PR programs. New training and certification programs are needed to provide advanced water treatment (AWT) and PR skill-specific operator endorsements and reassure the public that PR systems are being operated by highly-trained, qualified individuals. In a CUWA-facilitated workshop, a wide range of utility and State regulatory agency representatives came together and achieved consensus on the basic structure of the future certification program and a strategy to move it forward.

A number of different strategies for potable reuse operator certification programs have been described including: 1) a separate PR operator certification program, 2) an AWT or PR supplement to the current water treatment *or* wastewater certification program, 3) an AWT or PR rider or supplement that could be added on to either license. CUWA workshop participants and survey respondents both agreed that a special AWT or PR supplement to enhance water or wastewater operator certification is the best option. Workshop participants developed a number of strategic recommendations:

1 The certification program should be centered on AWT technologies used in the purification of wastewater effluent for potable reuse and should include risk management concepts.

2 It should be a stand-alone certification AWT or PR "add on" available to both wastewater and water treatment operators with an acceptable level of training and experience.[11]

[11] This is Option 4 in Section 8, "DPR or AWT Hybrid that Can Be Added on to Either License."

3 There should be one test for each level of certification.

4 The program should provide an adequate population of certified operators from which utilities can hire new PR treatment plant operators and be broad enough to draw a large enough testing population to be financially viable.

In the workshop, it was agreed that development of this new program would be done in coordination with the existing water and wastewater training and certification programs. The ultimate target audience for the certification program has yet to be defined by the water/wastewater community—whether it should be centered on potable reuse specifically, or a more general AWT program with water and wastewater elements. Considerable time was spent in the workshop on this topic with no final resolution. The need for certified PR operators is the strongest driver for developing a new certification program, but there are other groups both in municipal water treatment and industrial applications that may want to use an AWT training and certification program.

Funding is an equally important topic intrinsic to the discussion. Training and certification programs are expensive to create, and the expense of creating and maintaining a training program and a certification program using water/wastewater organization member dollars must be justified. The funding decision will turn largely on: 1) comforts and endorsement by State regulators, and 2) the broadness of the program needed and sponsoring agency's/agencies' fiscal ability to support the program.

Agreement on the target audience and scope of certification is needed to perform the initial "job analysis" step. This step identifies the content of the certification exam topics. CA-NV Section AWWA is surveying California and Nevada utilities to determine the potential audience for the exam. This data should clarify the scope and content of the program—whether it should be a PR-specific program or a more general AWT program.

The other critical question to be resolved is what organization or organizations will create and maintain the training certification programs[12]. The CA-NV Section AWWA AWT Operator Certification Committee is currently exploring development of an AWT or PR-focused certification program. At the CUWA Workshop, representatives from CA-NV Section AWWA and CWEA agreed that it is beneficial to collaborate. As of publication, however, no formal agreements have been made. Both water and wastewater perspectives are needed to train and certify potable reuse operators.

Many utilities are considering moving forward with PR programs while formal DPR regulatory mechanisms and requirements are in development. Therefore, a program for training and certification needs to be implemented in the near future.

Potable reuse operator certification would establish a minimum standard level of skills and knowledge for operating a PR system and reassure the public that PR is being managed by individuals with the proper background, education, and experience.

[12] It should be noted that training and certification programs are separate efforts and are not necessarily both done by the same organization.

Regardless of the selected strategy, legislation and/or regulations will need to address the proposed new certification requirements. Additional work will also be needed to determine details on the range of knowledge and criteria for qualifications. Any certification program would need to be developed in coordination with the Office of Operator Certification and the DDW. It is anticipated that these issues will be resolved as work moves forward on developing a training and certification program.

SECTION 11

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SECTION 12

Acronyms

AFY	acre-feet/year
AMTA	American Membrane Technology Association
AOP	advanced oxidation processes
AWPF	advanced water purification facilities
AWT	advanced water treatment
BAC	biologically active carbon
BAT	Best Available Technology
CA-NV Section AWWA	California-Nevada Section of the American Water Works Association
CASA	California Association of Sanitation Agencies
CCR	California Code of Regulations
CDPH	California Department of Public Health
CE	continuing education
CEU	Continuing Education Unit
CUWA	California Urban Water Agencies
CWEA	California Water Environment Association
DDW	State Water Resources Control Board, Division of Drinking Water
DPR	direct potable reuse
DW-OCP	Drinking Water Operator Certification Program
EPA	Environmental Protections Agency
Grade I	Level I Wastewater Operator Certification
Grade II	Level II Wastewater Operator Certification
Grade III	Level III Wastewater Operator Certification
Grade VI	Level VI Wastewater Operator Certification
Grade V	Level V Wastewater Operator Certification
GRRP	Groundwater Replenishment Reuse Program
IPR	indirect potable reuse
LASAN	Los Angeles Sanitation
MF	microfiltration
mJ/cm^2	millijoules per square centimeter
NWRI	National Water Research Institute
OIT	Operator-in-Training

OOC	State Water Resources Control Board Office of Operator Certification
PR	potable reuse
PR1	Level 1 Potable Reuse Operator Certification
PR2	Level 2 Potable Reuse Operator Certification
PR3	Level 3 Potable Reuse Operator Certification
PR4	Level 4 Potable Reuse Operator Certification
PR5	Level 5 Potable Reuse Operator Certification
RO	reverse osmosis
SAT	soil aquifer treatment
SEDA	Southeast Desalting Association
SMOA	Southwest Membrane Operator Association
SVAWPC	Silicon Valley Advanced Water Purification Center
SWRCB	State Water Resources Control Board
T1	Level 1 Water Treatment Operator Certification
T2	Level 2 Water Treatment Operator Certification
T3	Level 3 Water Treatment Operator Certification
T4	Level 4 Water Treatment Operator Certification
T5	Level 5 Water Treatment Operator Certification
TDS	total dissolved solids
UV	ultraviolet light
UV-AOP	ultraviolet light advanced oxidation process
WRCA	WateReuse California
WTP	water treatment plant
WW-OCP	Wastewater Operator Certification Program
WWTP	Wastewater treatment plant

Attachment 1 - The Certification Process

"Certification" is a formal process to identify and acknowledge individuals who have met an established standard of competency for a defined job. This process typically involves obtaining education and on-the-job experience, and passing an exam that measures job-critical knowledge and skills. When the individual has met these requirements, the administering agency "certifies" that the individual has the required level of skill and ability for the defined job.

Development of a certification program is complex, time-consuming, and labor-intensive. An example of how a DPR certification program might be developed is presented in Figure 1.1. The process is typically done by a committee of stakeholders and technical experts with the help of certification program consultants. It requires consideration of technical issues related to the certification topic, water sector needs and other economic assessments, a job analysis, eligibility requirements, consultation with regulators to ensure the program is acceptable from the DDW's standpoint, and more. The current certification programs aren't adequate for robust DPR operator certification. There is great value in coming together as an group to determine the best approach for certifying DPR operators so that we can get the cumbersome process of program development underway and create a program that has widespread support and regulator buy-in.

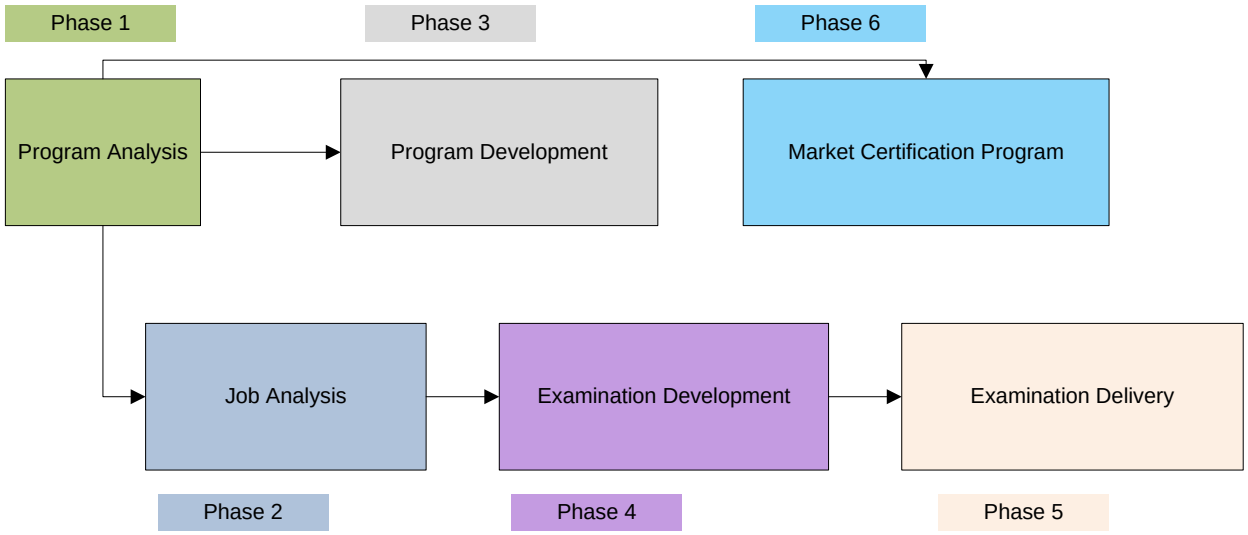

Figure A.1. CA-NV Section AWWA Certification Program Development Process. NOTE: This is representative of the basic process involved in developing a certification program and is not intended to be an exhaustive portrayal.

Attachment 2 - WateReuse California Survey Instrument

Potable Reuse: Operator Certification
Background:

The Expert Panel providing recommendations to the State Board on the Surface Water Augmentation Regulations and the feasibility of direct potable reuse (DPR), the Advisory Group which advises the Expert Panel in DPR issues and the State Water Resources Control Board-Division of Drinking Water (DDW) have identified operator certification as a major issue for consideration in ensuring that potable reuse projects are reliably operated. At this time DDW does not have adequate staffing with which to begin developing a new operator certification program for advanced treatment systems, and there remain some critical outstanding policy issues about the nature of a new or revised certification for potable reuse since this includes advanced technologies and crosses into treatment for both water supply and wastewater.

WateReuse California (WRCA) and the California Urban Water Agencies (CUWA) are developing a white paper that will identify key components for consideration for a revised or new operator certification program for advanced purified recycled water for potable reuse. Collaborative partners such as the American Water Works Association (AWWA) and California Water Environment Association (CWEA) will provide input as they will likely be involved in the implementation of a program as it moves forward. As part of this effort, WRCA is interviewing operators at existing potable reuse facilities to better assess what unique operational issues they face and what range of knowledge is needed for operation of indirect potable reuse (IPR) and DPR facilities.

Currently, operators of agencies producing advanced purified recycled water are mostly certified wastewater treatment operators (Grade V). As the state of California seeks to expand potable reuse for IPR for groundwater, surface water augmentation and eventually DPR, additional certification requirements may be needed to help ensure public safety and public confidence in the process.

Potable Reuse Operational Issues

1. What is the name of the agency you work for? (Note: This is for tracking purposes only; your agency name will not be included in any survey results)
   _____

2. What is the population served by the agency?
   _____

3. Describe your employer:
   ___ Water supplier
   ___ Wastewater agency
   ___ Both, or
   ___ Other (describe)

4. What type of potable reuse does your agency currently employ and/or what type of potable reuse are you planning for?
   ____ IPR – groundwater recharge (surface spreading)
   ____ IPR – groundwater recharge (injection)
   ____ IPR – surface water augmentation

____ DPR – augmenting source water with advanced purified water prior to the Water Treatment Plant (WTP)
____ DPR – introducing advanced purified water directly into the distribution system (after the WTP)
____ Our agency is not planning for potable reuse projects, but does use advanced treatment process in its operations
____ Our agency is not planning for potable reuse projects, but I am interested in being certified in this area
____ Other (describe)

4a. If your agency does/has done groundwater recharge, what type of reclaimed water is/was used?
____ Tertiary filtered and disinfected (i.e., "Title 22 water")
____ Advanced treated (i.e., reverse osmosis with UV advanced oxidation)
____ Other (describe)

5. What is your role in the organization?
____ Upper Management
____ Operations Manager
____ Operator
____ Other (describe)

6. How many years of experience do you have at the facility?
_____

7. What water or wastewater treatment certificates or other licenses do you hold?
____ Water Treatment (Grade: select one 1 2 3 4 5)
____ Grade 1
____ Grade 2
____ Grade 3
____ Grade 4
____ Grade 5
____ Wastewater Treatment (Grade: select one 1 2 3 4 5)
____ Grade 1
____ Grade 2
____ Grade 3
____ Grade 4
____ Grade 5
____ Registered Civil Engineer
____ Registered Chemical Engineer
____ Other technical certifications (list)
____ None

8. What aspects of your current operator training or certification program(s) do you consider essential for potable reuse operations?

____ Source Water

____ *Water* Treatment Processes

____ *Wastewater* Treatment Processes

____ *Water* Treatment Plant Operation/Maintenance

____ *Wastewater* Treatment Plant Operation/Maintenance

____ *Distribution System* Operation/Maintenance

____ *Collection System* Operation/Maintenance

____ Laboratory Procedures

____ *Drinking water* regulatory requirements

____ *Wastewater* regulatory requirements

____ Administrative Duties

____ Other (list)

9. If you are currently operating a potable reuse facility, which of the following unique operational or treatment requirements needed for a potable reuse facility that are not currently addressed by <u>your</u> existing certification program(s)(water or wastewater) Check all that apply:

____ Microfiltration

____ Reverse Osmosis

____ Biologically active filters

____ UV Disinfection

____ UV-Advanced Oxidation

____ Ozone

____ Monitoring (e.g., contaminant and TOC detection) protocol

____ Unified approach to failure analysis, prediction, and avoidance

____ Automation and process control

____ Emergency response

____ Drinking water regulatory requirements

____ Multiple discharge requirements

____ Control of discharges to sewer system

____ Monitoring of wastewater quality

____ Other (list)

10. If you are currently operating a potable reuse facility, is there additional training or information that could help you do your job better? Please describe.

____ College degree (describe)

____ On-site plant operations training

____ Certification courses (describe)

____ Non-certification specialized course(s) (describe)

____ Industry conferences
____ Industry training
____ Pilot plant operations
____ Other (describe)

Comments:

11. If you are currently operating a potable reuse facility, how much has on-the-job experience contributed to your knowledge of operating a potable reuse facility?
____ Substantially
____ Moderately
____ Minimally

Please describe:

12. How many years of experience do you believe is sufficient to operate a potable reuse facility?
_____

13. How can the water and wastewater certification programs be modified to give you more opportunity or flexibility to advance in the area of potable reuse to supplement drinking water supplies? (Rank approach in order of preference)
___ Add content to existing water operator certification exams to address potable reuse
___ Add content to existing wastewater operator certification exams to address potable reuse
___ Create an "add on" certification module for certified *water* operators that addresses potable reuse
___ Create an "add on" certification module for certified *wastewater* operators that addresses potable reuse
___ Create an "add on" certification module for certified *water* operators that addresses advanced treatment processes
___ Create an "add on" certification for certified *wastewater* operators that addresses advanced treatment processes
___ Other proposed approach (describe)

14. What qualifications do you think should be <u>required</u> for an operator of a potable reuse facility (check all that should apply)?
____ Current water certification
____ Current wastewater certification
____ Current water or wastewater certification
____ Advanced treatment certification
____ Potable reuse certification with advanced treatment content
____ Minimum number of years of experience in water or wastewater operations (List minimum number of years)
____ 2-year college degree in water/wastewater
____ 4-year college degree in science or engineering-related field
____ Post-graduate degree in science or engineering-related field

____ Specialized training or certificate (describe)
____ Other (describe)

15. What qualifications should be required to obtain an advanced treatment certification if one is offered?
    a. Operator Certification (pick one)

    ____ Current water certification (recommended minimum grade level)
    ____ Current wastewater certification (recommended minimum grade level)
    ____ Current water or wastewater certification (recommended minimum grade level)

    b. Work Experience (in addition to certification)
    ____ Minimum number of years of experience in water or wastewater operations (List minimum)

16. Should education, training or engineering registration be used as an alternative qualification to current operator certification or work experience?

    ___ Yes

    ___ No

17. If so, which of the following should be allowed?

    ____ 2 year college degree in water/wastewater
    ____ 4 year college degree in science or engineering related field
    ____ Registered civil or chemical engineer
    ____ Specialized training (describe)
    ____ Other (describe)

18. Do you think the operator certification requirements should be the same for projects that do groundwater injection, surface spreading, surface water (reservoir) augmentation, raw water augmentation or direct treated water augmentation?
    ____ Yes
    ____ No

    Comments:

19. Is there anything we missed that you would like to comment on related to this subject?

    Comments: