Appendix A:
Table of Project Description Text Changes to the PWM/GWR EIR

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Page	PWM/GWR EIR Section	**Expanded Advanced Water Treatment Facility Project Addendum to the PWM/GWR** EIR Changes from 2015 PWM/GWR Final EIR shown in Strike-out and Underline
2-2	Project Description 2.1.1 Overview of Proposed Project	**Amend Section 2.1.1 Overview of Proposed Project, as follows:** The Proposed Groundwater Replenishment Project (GWR Project or Proposed Project) consists of two primary components: the Pure Water Monterey Groundwater Replenishment improvements and operations (GWR Features) that would develop purified recycled water to replace existing urban supplies; and an enhanced agricultural irrigation (Crop Irrigation) component that would increase the amount of recycled water available to the existing Castroville Seawater Intrusion Project (CSIP) agricultural irrigation system in northern Monterey County. The GWR Project is now proposing to include provision of purified recycled water for two water supply demands: (1) for groundwater recharge to enable replacement of Carmel River water supplies within the California American Water Company (CalAm) Monterey District service area, and (2) to provide irrigation water for the Marina Coast Water District customers. Water supplies proposed to be recycled and reused by the Proposed Project include municipal wastewater, industrial wastewater, urban stormwater runoff and surface water diversions. The Proposed Project is being proposed by the Monterey Regional Water Pollution Control Agency (MRWPCA) in partnership with the Monterey Peninsula Water Management District (Water Management District). **Figure 2-1, Project Location Map,** shows the regional location of the Proposed Project.
2-3	Project Description 2.1.1.1 Source Waters for Recycling	**Amend Section 2.1.1.1 Source Waters for Recycling, Final bullet and subsequent paragraph, as follows:** • *Lake El Estero.* Although diversion of Lake El Estero is not currently being pursued for implementation, the City of Monterey and the agency may choose in the future to pursue this project component; therefore it is still included in the GWR Project as approved. The source waters above would be combined either within the wastewater collection system prior to the flow entering the headworks of the Regional Treatment Plant~~.~~ or at the headworks of the Regional Treatment Plant.
2-3	Project Description 2.1.1.1 Source Waters for Recycling (Footnote 1) 2.1.1.2 GWR Facilities (Footnote 3)	**Amend to add Two Footnotes**: [1] Tembladero Slough is no longer being pursued for implementation as part of the Pure Water Monterey Project based on the outcome of the State Water Resources Control Board Water Rights process for the Blanco Drain and Reclamation Ditch diversions. For the purpose of a conservative, worst-case analysis, the component is included in most of the impact analyses for the GWR Project. **And:** [3] Throughout the EIR and this Addendum, the term Advanced Water Treatment (or AWT) Facility is used for consistency. During design and bidding of this project component, the name of the same facility is also referred to as the Advanced Water Purification (or AWP) Facility. The two terms are interchangeable.
2-4	Project Description 2.1.1.2 GWR Facilities	**Amend Section 2.1.1.2 GWR Facilities by adding the following paragraph to the end of the section**: MRWPCA is now proposing to increase the GWR project AWT Facility maximum capacity (product water flowrate) from 4 million gallons per day (mgd) to 5 mgd to provide additional purified recycled water for urban irrigation for the Marina Coast Water District customers. The design and physical features of the facility that will be constructed will not change because the existing AWT Facility included additional redundant equipment with adequate hydraulic capacity to operate at this higher product water yield. With this change, the AWT Facility can operate at the higher flowrate to meet urban irrigation demands of up to 600 AFY in accordance with the MCWD existing demands and associated recycled water rights.
2-5	Project	**Amend the bulleted list under section 2.1.2 Project Benefits, as follows:**

	Description 2.1.2 Project Benefits	• Replace 3,500 AFY of unauthorized Carmel River diversions for municipal use with additional groundwater pumping enabled by recharge of purified recycled water; • Improve water quality in the Seaside Groundwater Basin; • Provide up to 5,290 AFY of additional recycled water to Salinas Valley growers for crop irrigation; • Provide up to 600 AFY of purified recycled water for use by Marina Coast Water District urban irrigation customers; • Reduce the volume of water pumped from Salinas Valley aquifers; • Increase water supply reliability and drought resistance; • Maximize the use of recycled water in compliance with the state Recycled Water Policy; • Reduce urban stormwater "first flush" pollutant loads to the Salinas River and Monterey Bay; • Reduce pollutant loads from agricultural areas to sensitive environmental areas including the Salinas River and the Monterey Bay; • Help meet requirements for improving water quality in several local impaired water bodies; • Reduce discharges of treated wastewater to Monterey Bay.~~;~~
2-6	Project Description Section 2.3 Project Background	**Amend Section 2.3 Project Background, as follows:** This section provides information on the impetus for the Proposed Project, including a description of the agencies that have primary responsibility for its development and implementation (MRWPCA and Water Management District), an overview of the Seaside Groundwater Basin, an overview of the water resources of the Salinas Valley, a discussion of the relationship of the GWR Features to the proposed CalAm desalination plant, and a discussion of the relationship of the Crop Irrigation component to the Salinas Valley Reclamation Plant and CSIP. In addition, this section provides information on the Marina Coast Water District aspects of the GWR Project.
2-6	Project Description 2.3.1 Monterey Regional Water Pollution Control Agency	**Amend the second paragraph of Section 2.3.1 Monterey Pollution Water Control Agency, as follows:** MRWPCA's Regional Treatment Plant is located two miles north of the City of Marina, on the south side of the Salinas River, and has a permitted average dry weather capacity to treat 29.6 mgd of wastewater effluent.[1] At the Regional Treatment Plant, water is treated to two different standards: (1) Title 22 California Code of Regulations standards (tertiary filtration and disinfection) for unrestricted agricultural irrigation use within a facility known as the Salinas Valley Reclamation Plant, and (2) secondary treatment for permitted discharge through the ocean outfall. Influent flow that has been treated to a tertiary level is distributed to nearly 12,000 acres of farmland in the northern Salinas Valley for irrigation use (recycled water is delivered using a distribution system called the CSIP). The Regional Treatment Plant primarily treats municipal wastewater, but also accepts some dry weather urban runoff and other discrete wastewater flows. MRWPCA also has been treating agricultural wash water from City of Salinas agricultural industries during peak irrigation seasons since 2014. Additional information about the existing wastewater collection and conveyance system and the Regional Treatment Plant is provided in **Section 2.5, Overview of Existing Systems**, below.
2-11	Project	**Add the following sentence as the last line of the second paragraph of Section 2.3.2.4 State**

[1] The Regional Treatment Plant currently treats approximately 16 to 17 million gallons per day of municipal wastewater from a total population of about 250,000 in the northern Monterey County area shown generally in **Figure 2-1, Project Location Map**.

	Description Section 2.3.2.4 State Orders to Reduce Carmel River Diversions	**Orders to Reduce Carmel River Diversions, as follows:** • Water demands in the CalAm service area have continued to decrease in recent years and based on that reduction and the timely implementation of the GWR Project, the SWRCB issued an extension on the timeframe for the region to comply with the Cease and Desist Order in July of 2016.
2-15	Project Description 2.3.3.3 Marina Coast Water District	**Amend the third paragraph of Section 2.3.3.3 Marina Coast Water District, as follows:** Water demands on the former Fort Ord are projected to increase with development envisioned in the Fort Ord Base Reuse Plan. To address the need for additional water supply, Marina Coast Water District is developing the Regional Urban Water Augmentation Project (RUWAP). The RUWAP would provide an additional 2,400 AFY of potable and/or recycled water. Marina Coast Water District certified the EIR for the RUWAP in 2005, and approved addenda to the EIR in 2007 and 2008 to address changes to the proposed pipeline alignment, construction assumptions, and water quantities. The trunk main of the RUWAP system is coincident with the Proposed Project's RUWAP Pipeline alignment option. The RUWAP recycled water distribution system has been designed and partially constructed, but is not yet in operation. This Addendum addresses the proposed use of MCWD's RUWAP pipeline for providing both 600 AFY of irrigation water to the MCWD customers and for the GWR Project primary objective of providing up to 3,700 AFY of purified recycled water to replace a portion of CalAm's water supply as required by state orders.
2-19	Project Description 2.4 Project Objectives	**Amend footnote 10 of 2.4 Project Objectives, as follows**: [10] The Monterey Peninsula Water Supply Project has been delayed ~~to the point where~~ such that it ~~is~~ may not be possible for CalAm to meet the State Water Resources Control Board ~~Cease and Desist~~ Water Rights ~~Order 2009-60~~ ~~deadline of December 31, 2016. Accordingly, representatives of the local agencies have been in discussion with the State Board to develop proposals for a CDO~~ and its extension ~~that would be acceptable to the public and have the potential to obtain State Board approval.~~ Order 2016-0016 deadlines.
2-19	Project Description 2.4 Project Objectives	**Amend Section 2.4 Project Objectives by adding the following paragraph to the end of the section**: In addition, with approval of the revised GWR Project, a cost-effective and environmentally preferable joint pipeline use solution would be implemented. MRWPCA and MCWD will share the use and thus the cost of the product water conveyance pipeline to achieve multiple water supply objectives; specifically, to provide purified recycled water for both urban irrigation and for replenishment for CalAm replacement supplies.
2-19	Project Description 2.5 Overview of Existing Systems	**Amend the first paragraph of Section 2.5 Overview of Existing Systems, as follows:** This section describes the existing wastewater and water infrastructure systems that are relevant to the Proposed Project. As explained in **Section 2.1, Introduction**, the Proposed Project would recycle and reuse water from the following existing wastewater and water infrastructure systems sources:
2-21 - 2.22	Project Description 2.5.1 MRWPCA Regional Treatment Plant, including Water Recycling Facilities and Ocean Outfall	**Amend last paragraph of Section 2.5.1 MRWPCA Regional Treatment Plant, including Water Recycling Facilities and Ocean Outfall, as follows:** **Section 2.7.1.2, Source Water Operation: Diversion, Treatment and Use**, describes how the Proposed Project would divert source waters ~~diversions~~ to augment wastewater flows only up to the demands for purified and/or tertiary recycled water. Between 2014 and 2017, flows of municipal wastewater have continued to decrease. That trend, combined with a historic drought, led to the decision by the City and MRWPCA (as approved by the Regional Board) to divert Salinas agricultural wash water to the Regional Treatment Plant for treatment and recycling during the irrigation seasons, increasing overall flows to the Regional Treatment Plant and availability of recycled water for CSIP growers by 3.5 to 4 million gallons per day.

2-32	Project Description Section 2.6.1 Proposed Project Facilities Overview	**Amend the bulleted list in Section 2.6.1 Proposed Project Facilities Overview, as follows:** • *Source water diversion and storage* – facilities to enable diversion of new source waters to the existing municipal wastewater collection system and conveyance of those waters ~~as municipal wastewater~~ to the Regional Treatment Plant to increase availability of wastewater for recycling. Modifications would also be made to the existing Salinas Industrial Wastewater Treatment Facility to allow the use of the existing treatment ponds for storage of excess winter source water flows and later delivery to the Regional Treatment Plant for recycling. • *Treatment facilities at Regional Treatment Plant* – use of existing primary and secondary treatment facilities at the Regional Treatment Plant, as well as new pre-treatment, advanced water treatment (AWT), product water stabilization, product water pump station, and concentrate disposal facilities, and modifications to the Salinas Valley Reclamation tertiary treatment plant. • *Product water conveyance* – new pipelines, ~~booster pump station,~~ appurtenant facilities along one of two optional pipeline alignments to move the product water from the Regional Treatment Plant to the Seaside Groundwater Basin injection well facilities. This component of the GWR Project is now proposed to be built by Marina Coast Water District. Specifically, MCWD and MRWPCA have reached a draft agreement to share the use and cost of the conveyance facilities for use of purified recycled water for urban irrigation and for groundwater replenishment. • *Injection well facilities* – new deep and vadose zone wells to inject Proposed Project product water into the Seaside Groundwater Basin, along with associated back-flush facilities, pipelines, electricity/ power distribution facilities, and electrical/motor control buildings. • *Distribution of groundwater from Seaside Groundwater Basin* – new CalAm distribution system improvements needed to convey extracted groundwater and deliver it to CalAm customers. These same CalAm distribution improvements also would be needed if CalAm were to implement the Monterey Peninsula Water Supply Project, which is undergoing separate CEQA review.
2-33 to 2-35	Project Description Section 2.6.2 Proposed Project Overview	**Amend Section 2.6.2 Proposed Project Overview as follows:** The Proposed Project would operate with annual and seasonal variations based on the amount of available runoff, the water year type, the varying irrigation demand for recycled water, and the amount of water stored in the Seaside Groundwater Basin as a drought reserve each year. The primary project objective is to replenish the Seaside Groundwater Basin to produce high quality water to replace CalAm water supply as required by State Orders. The ability of the project to meet the primary project objective of providing CalAm extractions of 3,500 AFY would not depend on water year type (wet, normal, or dry). The Proposed Project would also increase the amount of recycled water available for crop irrigation within the existing CSIP service area by approximately 4,500 to 4,750 AFY during normal and wet years, and by up to 5,900 AFY during drought conditions. For MRWPCA to secure the necessary rights and agreements to use the source waters needed for the Proposed Project, preliminary negotiations with stakeholders indicate that MRWPCA also would need to increase the amount of recycled water provided to the CSIP area. This amount is within the total permitted capacity of the Salinas Valley Reclamation Plant of 29.6 mgd. Irrigation demands vary seasonally, peaking in the spring and summer months, and also by water year type, increasing in dry and hotter years. Irrigation demand can also change in response to changes in cropping patterns and irrigation practices. The Salinas Valley Reclamation Plant produces tertiary-treated, disinfected water supply (recycled water) from treated municipal wastewater for the CSIP. Peak irrigation demands in the CSIP system exceed the amount of

		available treated municipal wastewater, so additional water is supplied from the Salinas River and the Salinas Groundwater Basin. The Proposed Project would increase the availability of recycled water during the peak demand periods by providing new sources of water supply to the Salinas Valley Reclamation Plant. The Project also would increase the availability of recycled water for crop irrigation during low demand periods by modifying the Salinas Valley Reclamation Plant to allow production and delivery at lower daily rates, thus further reducing pumping from supplementary groundwater wells. In addition, to better accommodate variable annual crop irrigation demands for recycled water, an additional 200 AFY would be produced and injected into the Seaside Groundwater Basin during most years to develop a drought reserve of up to 1,000 acre-feet of stored water. This would allow MRWPCA to reduce deliveries of product water to the Seaside Groundwater Basin during drought years, while still enabling CalAm to pump 3,500 AFY from the Seaside Groundwater Basin by using the reserved water. By reducing deliveries of product water to the Seaside Groundwater Basin during drought years, MRWPCA would be able to increase deliveries of recycled water to growers by a commensurate amount. In order to satisfy variations in the MCWD irrigation demand, the AWT Facility may operate in the range of production in order to meet irrigation demands; the variability is needed in order meet MCWD demand from urban irrigation customers. The Proposed Project's AWT Facility would be designed and constructed to allow production rates from 1.~~3~~2 mgd (~~900~~830 gpm) to ~~4~~5.0 mgd (~~2,700~~3,500 gpm). During a wet or normal year, the AWT Facility would operate at an average rate of ~~3.5~~4.0 mgd during the summer months (April to September). If the drought reserve is full (1,000 acre-feet additional have been "deposited" in the Seaside Groundwater Basin), the winter production rate would remain ~~3.5~~4.0 mgd. If the drought reserve is not full, the winter production rate would be increased to ~~4.0~~ 4.2 mgd to allow the production of an additional 200 AFY. During certain dry years, the AWT Facility production rate would be decreased in the summer months, ~~to rates as low as 1.38 mgd,~~ depending upon the amount of water "deposited" in the drought reserve and the demands of the CSIP irrigators. The Proposed Project would produce enough advanced treated water in each year so that the amount of injected water plus the amount of "withdrawn" drought reserve or operational reserve equals the 3,500 AFY extracted by CalAm. Water supplies not used for the AWT Facility would be used by the Salinas Valley Reclamation Plant to produce additional recycled water for the CSIP. **Table 2-9, Proposed Project Monthly Flows for Various Flow Scenarios** summarizes typical flow operations for the AWT Facility based on seasonal flow and demand conditions. Although presented as fixed water year types, actual system operation would require daily or weekly management of the production rates to address the variability in irrigation demands and supply availability. Source water diversions would be similarly managed to maximize water availability during the peak irrigation season, as discussed in **Section 2.7.1**. **Table 2-9** **Proposed Project Monthly Flows for Various Flow Scenarios**

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total (AFY)
Advanced Water Treatment Facility Reverse Osmosis Feed (acre-feet) (See Note 1)													
1. After drought reserve complete	367	331	367	355	367	355	367	367	355	367	355	367	4,321
Extra to build drought reserve	42	38	42	-	-	-	-	-	-	42	41	42	247
2. Wet and Normal Years	409	369	409	355	367	355	367	367	355	409	396	409	4,568
3. Drought Years when Full Drought Reserve	409	369	409	133	137	133	137	137	133	409	396	409	3,211

AWT Facility Influent/Feed

Purified Recycled Water Delivery

Note 1: These estimated flows exclude the membrane filtration backwash quantities that would be recirculated back

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

Maximum Monthly Injection Rates	Gallons per Minute (gpm)												Maximum Injection Rate (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

to the Regional Treatment Plant headworks and thus would not be considered to be new flows.

Operation of the Proposed Project facilities would require some additional staff at the MRWPCA Regional Treatment Plant and administrative office. The AWT Facility would require up to five personnel to operate the facility 24-hours a day, 7-days a week. The Salinas Valley Reclamation Plant would operate with the same number of staff as currently assigned, but operations would extend into the wet season. The source water diversion and product water conveyance and injection facilities would not require on-site staff, but would require periodic site visits and maintenance activities. These are discussed in detail in the sections below regarding each component.

The Proposed Project would require an estimated 10,952 megawatt-hours per year (mW-hr/yr). Power use for the Crop Irrigation component would peak during drought years when additional recycled water is being produced. Electrical power at the existing MRWPCA facilities comes from solar panels and from generators running on a mix of methane (from the Regional Treatment Plant) and natural gas (from PG&E), with back-up electrical service from PG&E. Additional power would be generated using increased methane from processing of new source water, and increased purchase of biogas from the adjacent landfill and natural gas from PG&E. Electrical power for the source water diversion facilities, ~~product water booster pump station,~~ and injection well facilities would be purchased from PG&E. Salinas Pump Station and future Salinas Ponds power would be from City of Salinas solar panels; refer to Revised Table 2-11 shown below.

Table 2-10, Overview of Typical Facility Operations – Proposed Project provides an overview of typical facility operations, truck trips and employees under the Proposed Project. **Table 2-11, Overview of Proposed Project Electricity Demand (all in megawatt-hours per year)** summarizes the power demands of the Proposed Project.

2-37	Project Description 2.6.1 Proposed Project Facilities Overview Table 2-11	**Update Table 2-11 Overview of Proposed Project Electricity Demand (all in megawatt-hours per year) to update energy demand and identify new renewable energy sources.** *Refer to Updated Tables in this section.*
2-59	Project Description Section 2.8.1 Overview of Treatment Facilities at the	**Amend Section 2.8.1 Overview of Treatment Facilities at the Regional Treatment Plant, as follows:** Under the Proposed Project, a new AWT Facility would be constructed to receive Regional Treatment Plant secondary effluent for advanced treatment and, ultimately, injection into the Seaside Groundwater Basin or provision to MCWD for urban landscape irrigation through its Water Augmentation Project.[2] In addition, modifications to the existing Salinas Valley

[2] As described in previous sections, the Proposed Project proposes to divert additional water sources and convey those waters with municipal effluent to the Regional Treatment Plant, including urban and

	Regional Treatment Plant	Reclamation Plant are proposed in order to enable increased use of tertiary treated wastewater for crop irrigation during winter months. The proposed new and modified treatment facilities at the Regional Treatment Plant, including the Advanced Water Treatment Facility (or AWT Facility) and the Salinas Valley Reclamation Plant Modifications, would be constructed on approximately 3.5 acres of land within the MRWPCA Regional Treatment Plant (Regional Treatment Plant) site west of the existing treatment facilities (see **Figure 2-10, Projected Regional Treatment Plant Flows).** The following is a list of the proposed structures and facilities proposed to be constructed at the Regional Treatment Plant (see **Figure 2-27, Advanced Water Treatment Facility Site Plan**): • ~~inlet source water~~ secondary effluent diversion structure, an ~~influent~~ approximately 60-foot long, 30-inch diameter pipeline to bring the secondary effluent to the source water pump station, the source water pump station, and an approximately ~~360~~ 300-foot long, 24-inch diameter pipeline to bring secondary effluent to the rest of the AWT Facility; • advanced treatment process facilities, including • chloramination, • ozonation, • booster pumping of the ozone effluent, • biologically active filtration (~~if~~approved for the Project, but determined to not be required), • automatic straining, • membrane filtration treatment, • booster pumping of the membrane filtration filtrate, • cartridge filtration, • reverse osmosis pre-treatment chemical addition, • booster pumping of the pre-treated reverse osmosis feed, • reverse osmosis membrane treatment, • advanced oxidation using ultraviolet light and hydrogen peroxide ~~(advanced oxidation)~~, • side stream decarbonation, and • product-water stabilization with ~~calcium, alkalinity and pH adjustment~~ liquid lime; • ~~final~~ product ~~storage and distribution pumping~~ water pump station; ~~• brine mixing facilities; and~~ • waste water equalization and pump station; and • modifications to the Salinas Valley Reclamation Plant (see **Section 2.8.2** for a detailed description this Proposed Project component). The proposed advanced treatment facilities would include several structures as tall as ~~31~~ 34 feet and totaling approximately ~~60~~ 50,000 square feet. ~~The proposed brine mixing facility would be up to 16 feet tall and totaling approximately 10,000 square feet. New pipes and pumps would be underground.~~ Additional information on each component of the AWT Facility is presented in the following sections. **Figure 2-28, Proposed Advanced Water Treatment Flow Diagram,** provides a simplified AWT Facility process flow diagram illustrating the proposed treatment facilities.
2-60 to 2-61	Project Description Section 2.8.1.1	**Amend Section 2.8.1.1 AWT Facility Design Flows and System Waste Streams, as follows:** The proposed new AWT Facility would have a design capacity of ~~4~~ 5.0 mgd of product water. As described in **Section 2.7.1**, a range of monthly source water flows has been estimated,

agricultural runoff, agricultural wash water flows, and excess/unused Regional Treatment Plant secondary-treated wastewater.

	AWT Facility Design Flows and System Waste Streams	depending upon the seasonal availability of source waters. The facility would be operated to produce up to 3,700 AFY of purified recycled water for injection and 600 AFY of purified recycled water to MCWD for urban landscape irrigation, which equates to an annual production rate of 3.~~3~~8 mgd. The ~~4~~5.0 mgd facility size is required to allow for peak seasonal operation and system down time. Similarly, the system components must be sized to allow for losses during treatment such as backwashing and ~~brine~~ concentrate disposal. Additional information on the proposed AWT Facility component design is presented in **Tables 2-18 and 2-19.** *See Updated Tables following this section.* In producing highly purified water, the proposed new AWT Facility would also produce two ~~to three~~ waste streams: ~~biological filtration backwash (if included in the system),~~ membrane filtration backwash, and reverse osmosis concentrate. ~~The biological filtration backwash and~~ The membrane filtration backwash would be diverted back to the Regional Treatment Plant headworks~~. The~~, while the reverse osmosis concentrate would be ~~piped to a proposed new brine and effluent receiving, mixing, and monitoring facility. The AWT~~ discharged ~~out~~ through the existing ocean outfall. The AWT Facility is expected ~~to be able~~ to produce water at up to 90% of design capacity, on average, due to some anticipated down time for membrane "clean in place" practices and repairs. The down time is assumed to be evenly distributed each month, though planned events would be scheduled for times when the least source water is available. The AWT Facility would need to be large enough to produce the required product water during the operational times (90% of each month). The resulting flow quantities for the AWT Facility are shown in **Table 2-19, Proposed Project AWT Facility Process Design Flow Assumptions** below. *See Updated Tables following this section* Based on these assumptions (including the 90% in-service, 81% reverse osmosis recovery, 90% microfiltration recovery), an AWT Facility design flow rate of ~~4~~5.0 mgd would be required to provide up to 3,700 AFY of high quality water for groundwater injection and 600 AFY to MCWD for urban landscape irrigation.
2-62	Project Description Section 2.8.1.3 Raw Water Pretreatment	**Amend Section 2.8.1.3 Raw Water Pretreatment, as follows:** Before membrane filtration, the secondary effluent would be pretreated using pre-screening and up to three separate subsystems: • Chloramination • Ozonation • Biologically active filtration (~~if~~ approved for the Project, but determined to not be required) *Chloramination*. Chloramines would be used to reduce biofouling of the membrane systems. The chloramination system would include sodium hypochlorite storage, ~~and~~ chemical feed pumps, and an inline injection and mixing system. Sodium hypochlorite would be injected upstream of ozonation or upstream of membrane filtration. Sodium hypochlorite reacts with ammonia present in the source water to form chloramine, which is an effective biocide that reduces biological fouling on the membrane filtration and reverse osmosis 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 and vaporizers or an onsite oxygen generator; a nitrogen boost system; an ozone generator and power supply unit; a cooling water system; a side-stream injection system; ozone contactor; and ozone destruct units. ~~There are two potential approaches for supplying high~~ High-purity oxygen for ozone generation~~: (1)~~ will be produced via 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. The liquid oxygen system is included in the 10% design, but an on-site generation system would occupy approximately the same amount of space~~. Ozone generators would convert oxygen gas into a mixture of oxygen and ozone gas. The mixture of oxygen and 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 parallel contactors~~ a pipeline contactor 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),[3] and (3) inactivation of pathogenic microorganisms. A quenching system to eliminate any ozone residual that remains in the water is included at the end of this process step. Quenching would be performed through the addition of sodium bisulfite, ~~hydrogen peroxide or calcium thiosulfate,~~ which would be stored on-site. *Biologically Active Filtration (~~if~~* approved for the Project, but determined to not be required*):* This process ~~may be~~ would have been used downstream of ozone treatment to reduce the concentration of ammonia and residual organic matter present in the ozone effluent and to reduce the solids loading on the membrane filtration process. The biologically active filtration system would ~~consist~~ have consisted of gravity-feed filter basins with approximately 12 feet of granular media, and an underdrain/media support system. Ancillary systems would ~~include~~ have included an alkalinity addition system for pH control, backwash water basin (also used for membrane filtration backwash), backwash pumps, an air compressor and supply system for an air scour system, an air compressor and supply system for process air, and a wash water basin to facilitate filter backwashing. ~~Depending upon the discharge permitting conditions, this~~ This process ~~step may~~ was approved for the Project, but was determined to not be required; therefore, it ~~may~~ would not be constructed until the AWT Facility completes initial start-up and testing.[13] **Added footnote 13:** [13] Although this facility is not needed for the AWT Facility, it is proposed as part of the future MPWSP desalination project because it may be needed to meet regulatory requirements for the discharge of desalination brine mixed with GWR RO concentrate and, when available, secondary effluent.
2-63	Project Description Section 2.8.1.4 Microfiltration/Ultrafiltration Membrane Treatment System	**Amend Section 2.8.1.4 Microfiltration/Ultrafiltration Membrane Treatment System, as follows:** The membrane filtration system would remove suspended and colloidal solids, including bacteria and protozoa through hollow fiber membrane modules. Additional components of the membrane filtration system include valve manifolds to direct the flow of feed, filtrate, cleaning system, backwash supply, backwash waste, and compressed air to the corresponding module piping. Feed pumps would draw water from the feed ~~clearwell~~ tank and supply a pressurized feed to pretreatment strainers and the membrane units. Cleaning chemicals would include acid, caustic, and sodium hypochlorite, which would be stored on-site. Backwash and screening residuals would be adjusted to a neutral pH in the waste water equalization basin and returned to the Regional Treatment Plant headworks, along with residuals associated with the cleaning system. The projected recovery of treated water from the membrane filter system is roughly 90%; this recovery accounts for waste residuals associated with backwashing, cleaning, and pretreatment straining.

[3] See **Chapter 3. Water Quality Permitting and Regulatory Overview** for more information about the current understanding and regulation of these substances.

2-63	Project Description Section 2.8.1.5 Reverse Osmosis Membrane Treatment System	**Amend Section 2.8.1.5 Reverse Osmosis Membrane Treatment System, as follows:** A reverse osmosis process that employs semi-permeable membranes is proposed to remove dissolved salts, inorganic and organic constituents, and pathogens from the membrane filtration treated water. The proposed reverse osmosis system would consist of ~~a~~ single pass, which separates the membrane filtration filtrate feed water into a purified product stream (permeate) and a concentrated ~~brine~~ stream (concentrate). The proposed reverse osmosis system would include a second stage to increase the product water recovery. The proposed reverse osmosis 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 reverse osmosis system would include a membrane cleaning system and permeate flush system. Reverse osmosis membrane cleaning chemicals would ~~likely~~ include proprietary ~~anticipant~~ anti-scalant chemicals, acid, and caustic detergent, stored on-site. Feed to the reverse osmosis system would be delivered from the upstream membrane filtration system through ~~an intermediate equalization tank. Low-pressure booster~~ a MF filtrate tank. Transfer pumps would move the water into the pretreatment system. Pretreatment would include cartridge filters, followed by the addition of an antiscalant and acid to lower the pH, which would be injected into a low-pressure line. High-pressure feed pumps would move the water from pretreatment into the reverse osmosis treatment trains. Concentrate from the reverse osmosis system would be discharged ~~to~~ into a ~~new brine mixing structure~~ wet well, where it would be combined with other effluent streams to enable adequate final ~~disposal~~ effluent sampling, and then disposed 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.
2-64	Project Description Section 2.8.1.6 Advanced Oxidation Process System	**Amend Section 2.8.1.6 Advanced Oxidation Process System, as follows:** The proposed advanced oxidation system would provide a final polishing step for pathogen disinfection and an additional chemical destruction barrier for the reverse osmosis permeate. The proposed advanced oxidation system would consist of a chemical feed to add hydrogen peroxide and reactors housing arrays of ultraviolet lamps along with ballasts to power the ultraviolet system. Ultraviolet light reacts with hydrogen peroxide to form hydroxyl radicals, which, along with the ultraviolet light, ~~oxidizes, destroys~~ oxidize, destroy, or ~~inactivates~~ inactivate chemicals of concern and pathogens. The system sizing would be driven by the requirement in the California Code of Regulations, Title 22, §60320.200 et seq., “Indirect Potable Reuse: Groundwater Replenishment – Subsurface Application” criteria for advanced oxidation. Support facilities for the reactors would include chemical storage and metering pumps, and ballasts. The advanced oxidation product water would be directed to the post-treatment system for stabilization.
2-64	Project Description Section 2.8.1.7 Post-Treatment System	**Amend Section 2.8.1.7 Post-Treatment System, as follows:** Product water from the advanced oxidation process would be sent to the proposed post-treatment system. Due to the high removal of minerals that is achieved through reverse osmosis treatment, post-treatment stabilization of the product water would be needed to prevent corrosion of pipe materials in the product water conveyance system. Stabilization would also be used to reduce the potential for product water to leach minerals and other chemicals from the soils within the Seaside Groundwater Basin upon injection. Reverse osmosis 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 would include decarbonation by air stripping to remove carbon dioxide (CO_2)~~, the addition of calcium and alkalinity, and pH adjustment with~~ ~~CO_2~~ ~~addition. There are two proposed options for calcium and alkalinity adjustment: (1) the addition of purchased hydrate lime slurry (calcium hydroxide~~

		~~slurry), or (2) addition of sodium hydroxide (NaOH) and calcium chloride ($CaCl_2$). Sodium hypochlorite may be added to the product water for secondary disinfection.~~) and the addition a hydrated lime slurry (calcium hydroxide slurry).
2-64 & 2-65	Project Description Section 2.8.1.9 Brine Mixing Facility	**Amend Section 2.8.1.9 Brine Mixing Facility, as follows:** As discussed above, the new AWT Facility would produce reverse osmosis concentrate water that would be disposed or discharged via the MRWPCA's existing ocean outfall. In addition to the AWT reverse osmosis reject water, other water that is currently discharged to the outfall includes secondary effluent from the Regional Treatment Plant, and brine waste collected from individual water softeners and private desalination facilities and delivered by truck to the Regional Treatment Plant. Proper disposal of these waste streams to the outfall, and eventually the ocean, requires flow metering and water quality sampling and monitoring. The proposed new brine mixing facility would be located west of the AWT Facility and would accomplish the required mixing, metering and sampling, using the following key processes and facilities: • ~~Two (2)~~ A diversion structure, comprised of a cast-in-place, two-chamber, concrete ~~vaults~~ structure on the existing 60-inch diameter land outfall, ~~one to divert secondary treated effluent to~~ pipeline, • Piping between the diversion structure on the land outfall and the brine mixing ~~facility and one approximately 170-ft downstream~~ basins, • Four (4), below grade, brine mixing basins, operating in parallel, each with a single mechanical mixer, and • A flow meter to measure the total mixed flow returned from the mixing basins to the diversion structure and outfall. Ancillary facilities would include the following: • A flow bypass system on the outfall to ~~return the blended~~ carry flows ~~to~~ in the land outfall~~. Both structures would be equipped with two~~ around the diversion structure, including valves, slide ~~gates~~ gate, pipe and fittings and a bypass manhole. The bypass system enables construction of the diversion structure and maintenance and repairs of the structure in dry conditions. • A trucked brine station to receive and measure trucked brine waste prior to ~~control the amount of secondary effluent diverted through the mixing facility and passed through~~ mixing with other flows and eventual discharge to the outfall. ~~• A cast-in-place concrete mixing structure, configured to receive secondary effluent and brine waste from separate inflow pipes and equipped with a 60-inch (nominal) static mixer in a fiberglass mixing pipe and an air release valve on the upstream end of the static mixer~~ ~~• A 54-inch pipeline (high density polyethylene) from the diversion vault to the mixing structure and then to the return vault~~ ~~• 48-inch flow meters on the pipelines entering and leaving the mixing structure, installed below-grade in concrete boxes~~ • ~~A sampling port in the return vault for access to measure total dissolved solids, pH, dissolved oxygen temperature, and other constituents of the blended effluent as required by permit conditions~~ Sampling pumps and pipeline to collect samples of pre- and post-mixed flows for analysis.

		• Flow bypass system for the CAW brine waste flow and trucked brine in the event the Diversion structure is out of service for maintenance or repair. • Class "C" water connection for washing down equipment and facilities. Only one new above-grade structure, the Lab and Control Building would be built and would receive architectural treatment similar to the other buildings at the Regional Treatment Plant. The maximum depth of excavation would be 30 to 32 feet. A new cast concrete driveway would extend from the existing road on the north side to the Lab and Control Building delivery door on the north side. A new four-foot wide concrete walkway would extend along the south side. Storm water drainage would be directed through site grading to a new retention basin at the west end of the site for percolation.
2-65	Project Description Section 2.8.1.10 Power Supply	**Amend Section 2.8.10 Power Supply, as follows:** The AWT Facility power would be supplied through ~~a~~ two new ~~PG&E~~ utility ~~connection~~ connections, one from the adjacent landfill who will supply landfill gas and one from PG&E to the Regional Treatment Plant. The system components would include a utility service, transformers, and switchgear. The major electrical loads would be from the new influent pumping, ~~oxygen generator (if liquid oxygen is not used), ozone generator, biological filtration backwash pumps (if included in the final system)~~, ozone generator, membrane filtration and reverse osmosis feedwater pumping, ultraviolet light reactors, and product water pumping. In the case of a power failure, the AWT Facility would shut down and the secondary treated influent water would bypass the AWT Facility and be discharged to Monterey Bay, if not used first by the Salinas Valley Reclamation Plant. The Regional Treatment Plant has three power supplies: cogeneration, utility connection, and a standby diesel generator. If all three power supplies fail, there are provisions to connect mobile generators to the critical facilities. See **Table 2.12** for a summary of the power demands of the proposed Treatment Facilities at the Regional Treatment Plant. (Source: V. Badani, E2 Consulting Engineers; A. Wesner, SPI Engineering; B. Holden' MRWPCA; and T.G. Cole, October 2014)
Page 2-65	Project Description Section 2.8.1.12 AWT Facility Operation	**Amend Section 2.8.1.12, Under AWT Facility Operation, as follows:** Waste residuals would include backwash ~~from the biological filtration system (if included), backwash~~ and cleaning wastes from the membrane filtration treatment system and concentrate and cleaning wastes from the reverse osmosis system. Cleaning wastes from each system would be neutralized in the waste water equalization basin and returned to the head of the Regional Treatment Plant~~, along with backwash waste residuals from the membrane treatment system.~~. Reverse osmosis concentrate would be discharged ~~through a new brine mixing structure to~~ using the existing Regional Treatment Plant ocean outfall. The AWT Facility would target an annual production rate of up to ~~3,700~~ 4,300 AFY, ~~requiring an average annual reverse osmosis feed supply of 4,568 AFY and producing waste residuals (reverse osmosis concentrate) of 868 AFY~~ during the typical normal building reserve conditions.
Page 2-84	Project Description Section 2.12 Proposed Project Construction Schedule	**Amend third paragraph under 2.12 Proposed Project Construction Summary, as follows:** A preliminary construction schedule is provided in **Figure 2-40, Proposed Project Construction Schedule** to show the general timeframes, durations, and overlap of construction activities of the various components of the Proposed Project. As shown, the Proposed Project is anticipated to require approximately 18 months to construct, plus 3-months of testing and start-up, and is planned for initial operation by ~~late 2017. MRWPCA is currently evaluating the use of alternative construction approaches, such as design-build, to expedite the construction schedule.~~ mid-2019. **Table 2-20, Construction Area of Disturbance and Permanent Footprint** summarizes the construction areas of disturbance and permanent footprint for each of the

		Proposed Project construction sites. General construction activities, equipment, and hours are summarized in **Table 2-21, Proposed Project Construction Assumptions**. In the sections following the table, the construction activities at each site are described in more detail.
Pages 2-84 and 2-85	Project Description, Table 2-20	**Amend Table 2-20. Construction Area of Disturbance and Permanent Footprint to update Product Water Conveyance Facilities and Product Water Pipelines (See Updated Information in Revised Table)** *See Updated Tables following this section* • RUWAP AWT ~~to Booster Pump Station~~ • ~~RUWAP Booster Pump Station~~ to Injection Wells • RUWAP Pipeline to Blackhorse Reservoir from General Jim Moore Blvd. • ~~Coastal AWT Facility to Booster Pump Station~~ • ~~Coastal Booster Pump Station to Injection Wells~~ • ~~Booster Pump Station (one of two optional sites)~~ Note 1: The existing 33-inch industrial wastewater conveyance pipeline would be slip-lined with the new 18-inch recovery pipeline. This would require the excavation of up to 12 sending/receiving pits measuring approximately 60-feet long by up to 20-feet wide. Note 2: The Product Water Conveyance Pipeline between the Regional Treatment Plant and the General Jim Moore Boulevard /Lightfighter Rd intersection would be built within ~~either~~ the RUWAP Alignment ~~or the Coastal Alignment, not both~~. Note 3: Pipeline trenches would generally be no more than seven (7) feet wide, except in areas with sandy soils and lack of constraints to a wider trench. Constraints include known sensitive or protected resources, geography such as steep slopes, existing utilities, buildings, or other facilities that restrict the construction area. A trench section with a ground surface width of up to approximately 10 to 15 feet would be potentially used in some soil types to increase efficiencies related to shoring the trench. **Replace footnote "16"** Many of the components listed in this table are no longer being pursued as part of the GWR Project, or are not being implemented within the timeframe of the other components. As noted previously, the MRWPCA PWM/GWR Project does not include Tembladero Slough or the Lake El Estero diversions. CalAm is currently constructing the Monterey Pipeline and Hilby Avenue Pump Station which will serve as the distribution pipeline and pump station (as an alternative to the Monterey and Transfer Pipelines, noted above) for delivery of water to CalAm customers. The MPWMD acting as a CEQA responsible agency approved CEQA Addendum No. 1 to the ASR EIR/EA and the PWM/GWR EIR for the Hilby Avenue Pump Station and Monterey Pipeline on June 20, 2016.
Page 2-87	Project Description Table 2-21	**Amend Table 2-21. Proposed Project Construction Assumptions to update AWT Facility (** *See Updated Tables following this section* **AWT Facility** Inlet source water diversion structure and influent pump station to bring secondary effluent AWT Facility, prescreening, ozonation, ~~upflow biologically active filtration (optional),~~ chemical addition, membrane filtration treatment, booster pumping of the membrane filtration filtrate (potentially with intermediate storage), cartridge filtration ~~(optional),~~, chemical addition, reverse osmosis membrane treatment, advanced oxidation using ultraviolet light and hydrogen peroxide (advanced oxidation), decarbonation ~~(optional),~~, product-water stabilization with ~~calcium, alkalinity and pH adjustment~~ liquid lime, product water pump station (AWT Pump Station), brine mixing facilities.

Updated Tables

Table 2-11. Overview of Proposed Project Electricity Demand
Table 2-18. AWT Facilities Design Summary
Table 2-19. Proposed Project AWT Facility Process Design Flow Assumptions
Table 2-20 under Product Water Conveyance Facilities
Table 2-21. Proposed Project Construction Assumptions for AWT Facility Components
Table 4.9.6 Chemicals to be Utilized at the Advanced Water Treatment Facility

Updated Table 2-11. Overview of Proposed Project Electricity Demand

Updated Revised Table 2-11 Overview of Proposed Project Electricity Demand (all in megawatt-hours per year)	4.0 MGD EIR 2015	5.0 MGD Addendum
Source Water Diversion and Storage Sites (Source: Vinod Badani, E2 Consulting, October 2014, except as noted)		
Existing MRWPCA Wastew ater Collection System Pump Stations	1100	1100
(increased pumping for source w ater collection) (Source: Bob Holden, MRWPCA, October 2014)		
Proposed Salinas Pump Station Diversions	10	10
(lighting, SCADA, misc. electricity)[Note: this facility now operates almost exclusively using solar energy.]		
Proposed Salinas Industrial Wastew ater Treatment Plant Storage and Recovery Component	224	100
(pumping, lighting, SCADA, misc. electricity)		
Existing Salinas Treatment Facility and Stormw ater Operations	-1875	-1875
(reduction of pumping, Ron Cole, February 2014 modified by MRWPCA staff October 2014)		
Proposed Reclamation Ditch Diversion	250	250
(pumping, lighting, SCADA, misc. electricity)		
Proposed Tembladero Slough Diversion	461	0
(pumping, lighting, SCADA, misc. electricity)		
Proposed Blanco Drain Diversion	731	731
(pumping, lighting, SCADA, misc. electricity)		
Proposed Lake El Estero Diversion	10	0
(lighting, SCADA, misc. electricity)		
Treatment Facilities at Regional Treatment Plant (Source: Bob Holden, October 2014)		
Existing Primary and Secondary Processes	3673	3673
(existing on-site cogeneration facility w ould provide a reduction in this value, see below)		
(9,900 AFY more w astew ater flow s through treatment processes)		
Existing Salinas Valley Reclamation Plant	1300	1300
(existing plant operations use solar array electricity, w hich has reduced electricity demand by up to 1,400 mWhr/yr)		
(4,260 AFY more crop irrigation w ater produced)		
4.0 AWT Facility (2015 GWR EIR)	7007	0
(new treatment facilities, not including product w ater pumping; assumes 3,700 AFY of w ater production to build drought reserve; demand w ill be less w hen Drought Reserve is at full capacity and w hen Drought Reserve is being used by CSIP)		
5.0 AWT Facility (Kennedy Jenks September 2017 udpated demand) assumes 4,300 AFY of water production	0	12930
CSIP Supplemental Wells (Source: Bob Holden, MRWPCA, October 2014)		
Reduction of use of CSIP Supplemental Wells by 4,260 AFY	-1900	-1900
Product Water Conveyance (Source: TG Cole, October 2014)		
Pumping of product w ater to Injection Well Facilities under RUWAP (1)	1912	0
Injection Well Facilities (Source: Vinod Badani, E2 Consulting Engineers, October 2014)		
Back-flush of four (4) deep injection w ells, lighting, HVAC, meters, instruments, SCADA	147	147
CalAm Distribution System Changes (Source: CalAm, 2014)		
Increase by moving 3,500 AFY extractions from Carmel River to Seaside Basin w ells	630	630
Proposed New Electricity Generation at MRWPCA Existing Cogeneration Facility	-2726	-2726
New Purchased Electricity from Monterey Regional Waste Management District (2)		-14200
NET TOTAL (with reduction in energy demand from renewable energy sources)	**10,954**	**170**
(1) GWR EIR and RUWAP EIR each proposed two parallel pipelines; reduction to one pipeline and no pump stations along conveyance line		
(2) The Monterey Regional Waste Management District (MRWMD) utilizes biogas produced by the decomposition of waste		
material in the landfill to produce electrical energy. MRWMD will provide 1800KwH for AWPF operation at the site.		
The RTP is adjacent to the landfill and power generation facility operated by MRWMD.		
Source: MRWPCA and Kennedy Jenks email September 2017		

Updated Table 2-18. AWT Facilities Design Summary

Updated Table 2-18 AWT Facilities Design Summary

Component	Design Capacity (See Note a)
~~Pipeline from secondary treatment system outfall pipe to AWT Facility~~	~~N/A~~
~~AWT Facility Influent Wetwell~~	~~0.2 mg~~
Influent Pumping (see Note b)Secondary Effluent Diversion Structure, Source Water Pump Station, and Chloramination	2.7 to 56.9 mgd
Ozone System~~(see Note b)~~	~~5~~6.9 mgd
~~Biologically Active Filtration (if required) (see Note c)~~	~~5.5 mgd~~
Membrane Filtration System	~~4~~6.9 mgd
Reverse Osmosis System	6.2.2 to 4.9 mgd
Advanced Oxidation System, Product Water Stabilization and ~~Pumping~~ Product Water Pump Station	~~4~~5.0 mgd

Notes:
a. Capacities represent process feedwater flows; units are million gallons (mg) and million gallons per day (mgd).
~~b. For the case where biological filtration is not included, the range for the influent pumping would be 2.7 to 5.5 mgd, and the ozone system would be sized for 5.5 mgd.~~
~~c. The biologically active filtration would be sized to treat up to 80 percent of the process flow; the 5.5 mgd represents the total product flow when combined with the by-pass.~~

Updated Table 2-19. Proposed Project AWT Facility Process Design Flow Assumptions

Updated Table 2-19 Proposed Project AWT Facility Process Design Flow Assumptions

	Annual Flows[1]	Average Flow Conditions[1]	Maximum Flow Conditions[2]
AWT Facility Process	**AFY**	**mgd**	**mgd**
Source Water Pump Station and Ozone System Feed	5,~~496~~898	~~4.9~~5.3	~~5~~6.9
~~Biologically Active Filtration Feed~~	~~4,481~~	~~4.0~~	~~4.8~~
~~Biologically Active Filtration Backwash returned to Regional Treatment Plant Headworks~~	~~421~~	~~0.4~~	~~0.5~~
~~Biologically Active Filtration Bypass[3]~~	~~1,015~~	~~0.9~~	~~1.1~~
Membrane Filtration Feed	5,~~075~~898	~~4.~~5.3	~~5.5~~6.9
Membrane Filtration Backwash retuned to Regional Treatment Plant Headworks	~~508~~590	0.5	0.~~6~~7
Reverse Osmosis Feed	~~4,567~~5,309	4.~~1~~7	~~4.9~~6.2
Reverse Osmosis Concentrate	~~867~~1,009	0.~~8~~9	~~0.9~~1.2
Reverse Osmosis Product Water (AWT Facility Design Size)	~~3,700~~4,300	3.~~3~~8	~~4~~5.0
Advanced Oxidation Process, Product Water Stabilization, and Product Water Pump Station	~~3,700~~4,300	3.~~3~~8	~~4~~5.0

Notes:
[1]. Average annual flows reflect ~~3,700~~4,300 AFY, typical annual production while building the drought reserve.
[2]. Maximum flow condition reflects design peak production rate.
~~[3]. 80% of the flow would pass through the Biologically Active Filtration, and 20% may bypass directly to the membrane filtration~~

Updated Table 2-20 under Product Water Conveyance and Shared Facilities Construction Area of Disturbance and Permanent Footprint

Combined Product Water Conveyance Facilities and Blackhorse Reservoir Project Components	Construction Boundary (feet)		Permanent Component Footprint (feet)			
	Length	Width	Length	Width	Maximum Height (above ground surface)	Maximum Depth (below ground surface)
Product Water Pipelines						10 (trenched sections); 25 (trenchless sections and pits)
RUWAP Pipeline from AWT to Injection Wells	*46,900*	*10 – 15*	*46,900*	*<6*	*0*	
RUWAP Pipeline from Gen. Jim Moore to Blackhorse Reservoir	*3,840*	*"*	*3,840*	*"*	*0*	
TOTAL Conveyance Pipeline	*50,074*		*0*	*0*	*0*	
Approved Blackhorse Reservoir	**Diameter**					
Tank/Reservoir	120				32	
Eliminated Components ***Shared Components eliminates the following redundant facilities and areas of impact:***						
~~*RUWAP AWT to Booster Pump Station*~~	~~*28,000*~~	~~*10 – 15*~~	~~*28,000*~~	~~*<6*~~	~~*0*~~	
~~*RUWAP Booster Pump Station to Injection Wells*~~	~~*18,900*~~	~~*10 – 15*~~	~~*18,900*~~	~~*<6*~~	~~*0*~~	
~~**RUWAP Booster Pump Station (one of two optional sites)**~~	~~*100*~~	~~*60*~~	~~*80*~~	~~*60*~~	~~*25*~~	~~10~~
Note: 2.0 MG Blackhorse Reservoir (tank) would have a footprint of approximately 11,000 square feet (120 ft. diameter). Additional RUWAP Booster Pump Station in Marina also eliminated						

(Source: PWM/GWR EIR, October 2015)

Updated Table 2-21. Proposed Project Construction Assumptions for AWT Facility Components

Project Component	Excess Spoils/Debris to Off-Haul (cubic yards)	Construction Equipment	Construction Shifts and Work Hours (
Treatment Facilities at the Regional Treatment Plant			
AWT Facility Inlet source water diversion structure and influent pump station to bring secondary effluent AWT Facility, prescreening, ozonation, ~~upflow biologically active filtration (optional),~~ chemical addition, membrane filtration treatment, booster pumping of the membrane filtration filtrate (potentially with intermediate storage), cartridge filtration ~~(optional),~~, chemical addition, reverse osmosis membrane treatment, advanced oxidation using ultraviolet light and hydrogen peroxide (advanced oxidation), decarbonation ~~(optional),~~, product-water stabilization with ~~calcium, alkalinity and pH adjustment~~ liquid lime, product water pump station (AWT Pump Station), brine mixing facilities.	510	Excavators, backhoes, air compressors, loaders, boom trucks, cranes, pavers and rollers, concrete transport trucks, concrete pump trucks, flatbed trucks, generators, pickup trucks, trucks for materials delivery	Up to four (4) shifts with construction occurring 24-hours per day, 7 days per week

Replace Table 4.9.6 Under Hazardous Materials: Advanced Water Treatment Facility

The Proposed Project would involve the storage and use of hazardous materials. The types and amounts of chemicals that would be utilized at the Advanced Water Treatment Facility are listed in **Table 4.9-6, Chemicals to be Utilized at the Advanced Water Treatment Facility**. Bulk storage of these chemicals would be located in tanks within the Regional Treatment Plant site.

Updated Table 4.9-6
Chemicals to be Utilized at the Advanced Water Treatment Facility

Chemical	Application	Annual Usage (pounds)
Sodium Hypochlorite	Ozone Feed	270,000 (avg), 560,000 (max)
Liquid Oxygen (LOX)	Ozone Feed	2,200,000 (avg), 5,600,000 (max)
Sodium Bisulfite	Ozone Effluent	5,200 (avg), 10,000 (max)
Sodium Hypochlorite	MF Cleaning	50,000 (avg), 61,000 (max)
Sodium Hydroxide	MF Cleaning	72,000 (avg), 84,000 (max)
Sulfuric Acid	MF Cleaning	20 (avg), 23 (max)
Sulfuric Acid	Reverse Osmosis Feed	2,600,000 (avg), 5,100,0000 (max)
Threshold inhibitor	Reverse Osmosis Feed	43,000 (avg), 51,000 (max)
Hydrogen Peroxide	UV/AOP Feed	41,000 (avg), 82,000 (max)
Ammonium Sulfate	Product Water	22,00 (avg), 51,000 (max)
Sodium Hypochlorite	Product Water	23,000 (avg), 55,000 (max)
Slurry of Hydrated Lime	Product Water	530,000 (avg), 960,000 (max)
Sodium Bisulfite	Reverse Osmosis Concentrate Dechlorination	33,000 (avg), 38,000 (max)
Tri-Sodium Phosphate	Reverse Osmosis Cleaning	5,000 (avg), 5,900 (max)
Sodium Dodecyl Benzene Sulfonate	Reverse Osmosis Cleaning	5,000 (avg), 5,900 (max)
Sodium Hydroxide	Reverse Osmosis Cleaning	12 (avg), 14 (max)
Sulfuric Acid	Waste Equalization Basin	92,000 (avg), 110,000 (max)
Sodium Hydroxide	Waste Equalization Basin	17 (avg), 20 (max)
Sodium Bisulfite	Waste Equalization Basin	99,000 (avg), 120,000 (max)
Ferric Chloride	Waste Equalization Basin	34,000 (avg), 80,000 (max)
Note: Average annual usage based on average dose for building reserve scenario flow scenario (4,300 AFY production); maximum annual usage based on maximum dose and capacity (5 mgd with 10% downtime).		

Proposed Project construction would still result in a less-than-significant impact due to the routine transport, use, or disposal of hazardous materials during construction; therefore, no mitigation measures would be required.

Appendix B:
Adopted PWM/GWR and RUWAP Mitigation Monitoring and Reporting Program

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Table 1:
PWM/GWR MMRP

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MITIGATION MONITORING AND REPORTING PROGRAM

for the Pure Water Monterey Groundwater Replenishment Project:

Staff-Recommended Alternative (October 1, 2015)

INTRODUCTION

Section 21081.6 of the California Public Resources Code and Section 15091(d) and Section 15097 of the California Environmental Quality Act (CEQA) Guidelines require public agencies "to adopt a reporting or monitoring program for changes to the project which it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment." This Mitigation Monitoring and Reporting Program (MMRP) has been prepared for the Pure Water Monterey Groundwater Replenishment (GWR) Project, as modified by the Alternative Monterey Pipeline, and reflecting selection of the Regional Urban Water Augmentation Project (RUWAP) alignment for the Product Water Conveyance pipeline and booster pump station. This MMRP is based on the mitigation measures included in the Final Environmental Impact Report (EIR).

This MMRP is applicable to the Staff-Recommended Alternative of the GWR Project. The Staff-Recommended Alternative includes the RUWAP Alignment Option for the Product Water Conveyance pipeline and booster pump station and the Alternative Monterey Pipeline for the CalAm Distribution System Improvements. Therefore, this MMRP includes mitigation measures, monitoring and reporting requirements identified in the Final EIR for these two project components, and it does not include mitigation measures identified for the originally proposed Monterey or Transfer Pipelines of the CalAm Distribution System Improvements, nor the Coastal Alignment Option for the Product Water Conveyance pipeline and booster pump station, since those components are not recommended for approval. Mitigation measures, monitoring and reporting requirements for all other GWR Project components, as modified by the Alternative Monterey Pipeline, are included herein.

For a complete list of acronyms used in this document, please refer to the acronym list in the Draft EIR on pages xii through xvi.

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Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
Impact AE-2: Construction Impacts due to Temporary Light and Glare	**Mitigation Measure AE-2**: **Minimize Construction Nighttime Lighting**. As part of its contract specifications, MRWPCA shall require its construction contractors to implement site-specific nighttime construction lighting measures for nighttime construction at the proposed Injection Well Facilities site and for the CalAm Distribution System: Alternative Monterey Pipeline. The measures shall, at a minimum, require that lighting be shielded, directed downward onto work areas to minimize light spillover, and specify that construction lighting use the minimum wattage necessary to provide safety at the construction sites. MRWPCA shall ensure these measures are implemented at all times during nighttime construction at the Injection Well Facilities site and for the CalAm Distribution System: Alternative Monterey Pipeline and for the duration of all required nighttime construction activity at these locations.	Injection Well Facilities Site and CalAm Distribution System: Alternative Monterey Pipeline	In contract specifications and during project construction	MRWPCA, CalAm, construction contractors	During project construction	MRWPCA and CalAm
Impact AE-3: Degradation of Visual Quality of Sites and Surrounding Areas	**Mitigation Measure AE-3: Provide Aesthetic Screening for New Above-Ground Structures.** Proposed above-ground features at the Booster Pump Station and Injection Well Facilities (at a minimum, at the well clusters and back-flush basin), shall be designed to minimize visual impacts by incorporating screening with vegetation, or other aesthetic design treatments, subject to review and approval of the City of Seaside which has also requested that the buildings be designed with Monterey/Mission style architecture to match the design of the structures that have been built on the Santa Margarita ASR site and the Seaside Middle School ASR Site. All pipelines placed within the City of Seaside on General Jim Moore Boulevard shall be placed underground. MRWPCA shall coordinate with the City of Seaside on the location of injection wells and booster pumps in order to reduce conflicts with future commercial/residential development opportunities. Screening and aesthetic design treatments at the RUWAP Booster Pump Station component shall be subject to review and approval by the City of Marina. Use of standard, commercial-grade, chain link fencing and barbed wire should be discouraged.	RUWAP Booster Pump Station and Injection Well Facilities	Prior to City of Seaside and City of Marina issuance of grading, easements/ ROW permits	MRWPCA project engineers and contractors	During project construction	MRWPCA; Cities of Seaside and Marina (public works directors)
Impact AE-4: Impacts due to Permanent Light and Glare during Operations	**Mitigation Measure AE-4**: **Exterior Lighting Minimization.** To prevent exterior lighting from affecting nighttime views, the design and operation of lighting at the RUWAP Product Water Conveyance Booster Pump Station and Injection Well Facilities, shall adhere to the following requirements: • Use of low-intensity street lighting and low-intensity exterior lighting shall be required. No floodlights shall be allowed at night within the City of Marina. • Lighting fixtures shall be cast downward and shielded to prevent light from spilling onto adjacent offsite uses. • Lighting fixtures shall be designed and placed to minimize glare that could affect users of adjacent properties, buildings, and roadways. • Fixtures and standards shall conform to state and local safety and illumination requirements.	RUWAP Booster Pump Station and Injection Well Facilities	Prior to City of Seaside and Marina issuance of grading and easements/ ROW permits	MRWPCA project engineers and contractors	During project operation	MRWPCA; Cities of Seaside and Marina (public works directors)
Impact AQ-1: Construction Criteria Pollutant Emissions	**Mitigation Measure AQ-1**: **Construction Fugitive Dust Control Plan.** The following standard Dust Control Measures shall be implemented during construction to help prevent potential nuisances to nearby receptors due to fugitive dust and to reduce contributions to exceedances of the state ambient air quality standards for PM_{10}, in accordance with MBUAPCD's CEQA Guidelines. • Water all active construction areas as required with non-potable sources to the extent feasible; frequency should be based on the type of operation, soil, and wind exposure and minimized to prevent wasteful use of water. • Prohibit grading activities during periods of high wind (over 15 mph). • Cover all trucks hauling soil, sand, and other loose materials and require trucks to maintain at least 2 feet of freeboard. • Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas at construction sites. • Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets. • Enclose, cover, or water daily exposed stockpiles (dirt, sand, etc.). • Replant vegetation in disturbed areas as quickly as possible. • Wheel washers shall be installed and used by truck operators at the exits of the construction sites to the AWT Facility site, the	All components	During project construction	MRWPCA, CalAm project engineers and contractors	During project construction	MRWPCA, CalAm, and MBUAPCD

[1] CalAm Distribution System: Alternative Monterey Pipelines and the associated mitigation measures would be the responsibility of CalAm to implement and the local jurisdictions and/or the California Public Utilities Commission to monitor.

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	Injection Well Facilities, and the Booster Pump Station. • Post a publicly visible sign that specifies the telephone number and person to contact regarding dust complaints. This person shall respond to complaints and take corrective action within 48 hours. The phone number of the MBUAPCD shall also be visible to ensure compliance with MBUAPCD rules.					
Impact BF-1: Habitat Modification Due to Construction of Diversion Facilities	**Mitigation Measure BF-1a**: **Construction during Low Flow Season**. Implement Mitigation Measure BT-1a.Conduct construction of diversion facilities, including the directional drilling under the Salinas River, during periods of low flow outside of the SCCC steelhead migration periods, i.e. between June and November, which would be outside of the adult migration period from December through April and outside of the smolt migration period from March through May.	Reclamation Ditch, Tembladero Slough, and Blanco Drain Diversions	Prior to commencing construction	MRWPCA engineers and contractors	During construction	MRWPCA
	Mitigation Measure BF-1b: Relocation of Aquatic Species during Construction. Conduct pre-construction surveys to determine whether tidewater gobies or other fish species are present, and if so, implement appropriate measures in consultation with applicable regulatory agencies, which may include a program for capture and relocation of tidewater gobies to suitable habitat outside of work area during construction. Pre-construction surveys shall be consistent with requirements and approved protocols of applicable resource agencies and performed by a qualified fisheries biologist.	Reclamation Ditch and Tembladero Slough Diversions	Prior to project construction	Qualified biologists	Prior to construction	MRWPCA
	Mitigation Measure BF-1c: Tidewater Goby and Steelhead Impact Avoidance and Minimization. To ensure compliance with the federal Endangered Species Act (FESA) and the California Endangered Species Act (CESA), consultation with NFMS/NOAA, USFWS, and CDFW shall be conducted as required, and any necessary take permits or authorizations would be obtained. If suitable habitat for tidewater goby (Tembladero Slough) and steelhead cannot be avoided, any in-stream portions of each project component (where the Project improvements require in-stream work) shall be dewatered/ diverted. A dewatering/diversion plan shall be prepared and submitted to NMFS, USFWS, and CDFW for review and approval. Specific plan elements are noted below and will be refined through consultation with USFWS, NMFS and CDFW: • Required Pre-Construction surveys identified in Mitigation Measure BF-1b shall be consistent with requirements and approved protocol of applicable resource agencies and performed by a qualified fisheries biologist. • All dewatering/diversion activities shall be monitored by a qualified fisheries biologist. The fisheries biologist shall be responsible for capture and relocation of fish species out of the work area during dewatering/diversion installation. • The project proponents shall designate a qualified representative to monitor on-site compliance of all avoidance and minimization measures. The fisheries biologist shall have the authority to halt any action which may result in the take of listed species. • Only USFWS/NMFS/CDFW-approved biologists shall participate in the capture and handling of listed species subject to the conditions in the Incidental Take Permits as noted above. • No equipment shall be permitted to enter wetted portions of any affected drainage channel. All equipment operating within streams shall be in good conditions and free of leaks. • Spill containment shall be installed under all equipment staged within stream areas and extra spill containment and clean up materials shall be located in close proximity for easy access. • Work within and adjacent to streams shall not occur between November 1 and June 1 unless otherwise approved by NMFS and the CDFW. • If project activities could degrade water quality, water quality sampling shall be implemented to identify the pre-project baseline, and to monitor during construction for comparison to the baseline. If water is to be pumped around work sites, intakes shall be completely screen with wire mesh not larger than five millimeters to prevent animals from entering the pump system. • If any tidewater goby or steelhead are harmed during implementation of the project, the project biologist shall document the circumstances that led to harm and shall determine if project activities should cease or be altered in an effort to avoid further harm to the species.	Reclamation Ditch and Tembladero Slough Diversions	Prior to project construction	MRWPCA Qualified biologists	During construction	MRWPCA, NMFS/NOAA, USFWS, CDFW

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	• Water turbidity shall be monitored by a qualified biologist or water quality specialist during all instream work. Water turbidity shall be tested daily at both an upstream location for baseline measurement and downstream to determine if project activities are altering water turbidity. Turbidity measures shall be taken within 50 feet of construction activities to rule out other outside influences. Additional turbidity testing shall occur if visual monitoring indicates an increased in turbidity downstream of the work area. If turbidity levels immediately downstream of the project rise to more than 20 NTUs (Nephelometric Turbidity Units) above the upstream (baseline) turbidity levels, all construction shall be halted and all erosion and sediment control devices shall be thoroughly inspected for proper function, or shall be replaced with new devices to prevent additional sediment discharge into streams. The above mitigation is subject to review and approval for CESA and FESA requirements by approving agencies as identified above and may be modified to further reduce, avoid or minimize impacts to species.					
Impact BF-2: Interference with Fish Migration	**Mitigation Measure BF-2a: Maintain Migration Flows.** Implement BF-1a, BF-1b, and BF-1c. Operate diversions to maintain steelhead migration flows in the Reclamation Ditch based on two criteria – one for upstream adult passage in Jan-Feb-Mar and one for downstream juvenile passage in Apr-May. For juvenile passage, the downstream passage shall have a flow trigger in both Gabilan Creek and at the Reclamation Ditch, so that if there is flow in Gabilan Creek that would allow outmigration, then the bypass flow requirements, as measured at the San Jon Gage of the Reclamation Ditch, shall be applied (see Hagar Environmental Science, *Estimation of Minimum Flows for Migration of Steelhead in the Reclamation Ditch*, February 27, 2015, in Appendix G-2, of the Draft EIR and Schaaf & Wheeler, *Fish Passage Analysis: Reclamation Ditch at San Jon Rd. and Gabilan Creek at Laurel Rd.* July 15, 2015 in Appendix CC of this Final EIR). If there is no flow in Gabilan Creek, then only the low flow (minimum bypass flow requirement as proposed in the project description) shall be applied, and these flows for the dry season at Reclamation Ditch as measured at the San Jon USGS gage shall be met. *Note: If there is no flow gage in Gabilan Creek, then downstream passage flow trigger shall be managed based on San Jon Road gage and flows.*	Reclamation Ditch Diversion	During project operations	MRWPCA	During project operations	MRWPCA, NMFS/NOAA, USFWS, CDFW
	Alternately, as the San Jon weir located at the USGS gage is considered a barrier to steelhead migration and the bypass flow requirements have been developed to allow adult and smolt steelhead migration to have adequate flow to travel past this obstacle, if the weir were to be modified to allow steelhead passage, the mitigation above would not have to be met. Therefore, alternate Mitigation Measure BF-2a has been developed, as follows: **Mitigation Measure Alternate BF-2a**: **Modify San Jon Weir.** Construct modifications to the existing San Jon weir to provide for steelhead passage. Modifications could include downstream pool, modifications to the structural configuration of the weir to allow passage or other construction, and improvements to remove the impediment to steelhead passage defined above. The above mitigation is subject to compliance with CESA and FESA and appropriate approving agencies may modify the above mitigation to further reduce, avoid, or minimize impacts to species.	Reclamation Ditch Diversion	Prior to project operations	Project engineers, construction contractors	Prior to project operations	MRWPCA, NMFS/NOAA, USFWS, CDFW
Impact BT-1: Construction Impacts to Special-Status Species and Habitat	**Mitigation Measure BT-1a: Implement Construction Best Management Practices**. The following best management practices shall be implemented during all identified phases of construction (i.e., pre-, during, and post-) to reduce impacts to special-status plant and wildlife species: 1. A qualified biologist must conduct an Employee Education Program for the construction crew prior to any construction activities. A qualified biologist must meet with the construction crew at the onset of construction at the site to educate the construction crew on the following: 1) the appropriate access route(s) in and out of the construction area and review project boundaries; 2) how a biological monitor will examine the area and agree upon a method which would ensure the safety of the monitor during such activities, 3) the special-status species that may be present; 4) the specific mitigation measures that will be incorporated into the construction effort; 5) the general provisions and protections afforded by the USFWS and CDFW; and 6) the proper procedures if a special-status species is encountered within the site. 2. Trees and vegetation not planned for removal or trimming shall be protected prior to and during construction to the maximum extent possible through the use of exclusionary fencing, such as hay bales for herbaceous and shrubby vegetation, and protective wood barriers for trees. Only certified weed-free straw shall be used, to avoid the introduction of non-native, invasive species. A biological monitor shall supervise the installation of protective fencing and monitor at least once per week until construction is complete to ensure that the protective fencing remains intact. 3. Protective fencing shall be placed prior to and during construction to keep construction equipment and personnel from impacting	All components	Prior to, during and after project construction	MRWPCA, CalAm, construction contractors and qualified biologist	Prior to and during project construction	MRWPCA, CalAm, qualified biologist and construction biological monitor; City of Seaside for Injection Well Facilities

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	vegetation outside of work limits. A biological monitor shall supervise the installation of protective fencing and monitor at least once per week until construction is complete to ensure that the protective fencing remains intact. 4. Following construction, disturbed areas shall be restored to pre-construction contours to the maximum extent possible and revegetated using locally-occurring native species and native erosion control seed mix, per the recommendations of a qualified biologist. 5. Grading, excavating, and other activities that involve substantial soil disturbance shall be planned and carried out in consultation with a qualified hydrologist, engineer, or erosion control specialist, and shall utilize standard erosion control techniques to minimize erosion and sedimentation to native vegetation (pre-, during, and post-construction). 6. No firearms shall be allowed on the construction sites at any time. 7. All food-related and other trash shall be disposed of in closed containers and removed from the project area at least once a week during the construction period, or more often if trash is attracting avian or mammalian predators. Construction personnel shall not feed or otherwise attract wildlife to the area. 8. To protect against spills and fluids leaking from equipment, the project proponent shall require that the construction contractor maintains an on-site spill plan and on-site spill containment measures that can be easily accessed. 9. Refueling or maintaining vehicles and equipment should only occur within a specified staging area that is at least 100 feet from a waterbody (including riparian and wetland habitat) and that has sufficient management measures that will prevent fluids or other construction materials including water from being transported into waters of the state. Measures shall include confined concrete washout areas, straw wattles placed around stockpiled materials and plastic sheets to cover materials from becoming airborne or otherwise transported due to wind or rain into surface waters. 10. The project proponent and/or its contractors shall coordinate with the City of Seaside on the location of Injection Well Facilities and the removal of sensitive biotic material.					
Impact BT-1: Construction Impacts to Special-Status Species and Habitat (continued)	**Mitigation Measure BT-1b: Implement Construction-Phase Monitoring.** The project proponents shall retain a qualified biologist to monitor all ground disturbing construction activities (i.e., vegetation removal, grading, excavation, or similar activities) to protect any special-status species encountered. Any handling and relocation protocols of special-status wildlife species shall be determined in coordination with CDFW prior to any ground disturbing activities, and conducted by a qualified biologist with appropriate scientific collection permit. After ground disturbing project activities are complete, the qualified biologist shall train an individual from the construction crew to act as the on-site construction biological monitor. The construction biological monitor shall be the contact for any special-status wildlife species encounters, shall conduct daily inspections of equipment and materials stored on site and any holes or trenches prior to the commencement of work, and shall ensure that all installed fencing stays in place throughout the construction period. The qualified biologist shall then conduct regular scheduled and unscheduled visits to ensure the construction biological monitor is satisfactorily implementing all appropriate mitigation protocols. Both the qualified biologist and the construction biological monitor shall have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The qualified biologist and the construction monitor shall complete a daily log summarizing activities and environmental compliance throughout the duration of the project. The log shall also include any special-status wildlife species observed and relocated.	Salinas Pump Station, Salinas Treatment Facility, Blanco Drain Diversion, Product Water Conveyance: RUWAP Alignment (Pipeline and Booster Pump Station) and Injection Well Facilities	Prior to and during project construction	MRWPCA, qualified biologists	Prior to and during project construction	MRWPCA qualified biologist and construction biological monitor; CDFW
	Mitigation Measure BT-1c: Implement Non-Native, Invasive Species Controls. The following measures shall be implemented to reduce the introduction and spread of non-native, invasive species: 1. Any landscaping or replanting required for the project shall not use species listed as noxious by the California Department of Food and Agriculture (CDFA). 2. Bare and disturbed soil shall be landscaped with CDFA recommended seed mix or plantings from locally adopted species to preclude the invasion on noxious weeds in the Project Study Area. 3. Construction equipment shall be cleaned of mud or other debris that may contain invasive plants and/or seeds and inspected to reduce the potential of spreading noxious weeds, before mobilizing to arrive at the construction site and before leaving the construction site. 4. All non-native, invasive plant species shall be removed from disturbed areas prior to replanting.	All except Alternative Monterey Pipeline	During project construction	Construction contactors	During project construction	MRWPCA qualified biologist and construction biological monitor

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
Impact BT-1: Construction Impacts to Special-Status Species and Habitat (continued)	**Mitigation Measure BT-1d: Conduct Pre-Construction Surveys for California Legless Lizard.** The project proponents shall retain a qualified biologist to prepare and implement a legless lizard management plan in coordination with CDFW, which shall include, but is not limited to, the protocols for pre-construction surveys, construction monitoring, and salvage and relocation. The management plan shall include, but is not limited to, the following: • Pre-Construction Surveys. Pre-construction surveys for legless lizards shall be conducted in all suitable habitat proposed for construction, ground disturbance, or staging. The qualified biologist shall hold or obtain a CDFW scientific collection permit for this species. The pre-construction surveys shall use a method called "high-grading." The high grading method shall include surveying the habitat where legless lizards are most likely to be found, and the survey must occur under the conditions when legless lizards are most likely to be seen and captured (early morning, high soil moisture, overcast, etc.). The intensity of a continued search may then be adjusted, based on the results of the first survey in the best habitat. A "three pass method" shall be used to locate and remove as many legless lizards as possible. A first pass shall locate as many legless lizards as possible, a second pass should locate fewer lizards than the first pass, and a third pass should locate fewer lizards than the second pass. All search passes shall be conducted in the early morning when legless lizards are easiest to capture. Vegetation may be removed by hand to facilitate hand raking and search efforts for legless lizards in the soil under brush. If lizards are found during the first pass, an overnight period of no soil disturbance must occur before the second pass, and the same requirement shall be implemented after the second pass. If no lizards are found during the second pass, a third pass is not required. Installation of a barrier, in accordance with the three pass method, shall be required if legless lizards are found at the limits of construction (project boundaries) and sufficient soft sand and vegetative cover are present to suspect additional lizards are in the immediate vicinity on the adjacent property. A barrier shall prevent movement of legless lizards into the property. All lizards discovered shall be handled according to the salvage procedures outlined below. • Construction Monitoring. Monitoring by a qualified biologist shall be ongoing during construction. The onsite monitor shall be present during all ground disturbing construction activities. To facilitate the careful search for lizards during construction, vegetation may need to be removed. If removal by hand is impractical, equipment such as a chainsaw, string trimmer, or skid-steer may be used, if a monitor and crew are present. The task of the vegetation removal is to remove plants under the direction of the monitor, allowing the monitor to watch for legless lizards. After plants are removed, the monitor and crew shall search the exposed area for legless lizards. If legless lizards are found during preconstruction surveys or construction monitoring, the protocols for salvage and relocation identified below shall be followed. Upon completion of pre-construction surveys, construction monitoring, and any resulting salvage and relocation actions, a report shall be submitted to the CDFW. The CDFW must be notified at least 48 hours before any field activity begins. • Salvage and Relocation. Only experienced persons may capture or handle legless lizards. The monitor must demonstrate a basic understanding, knowledge, skill, and experience with this species and its habitat. Once captured, a lizard shall be placed in a lidded, vented box containing clean sand. Areas of moist and dry sand need to be present in the box. The boxes must be kept out of direct sunlight and protected from temperatures over 72°F. The sand must be kept at temperatures under 66°F. Ideal temperatures are closer to 60°F. On the same day as capture, the lizards shall be examined for injury and data recorded on location where found as well as length, color, age, and tail condition. Once data is recorded, lizards shall be relocated to appropriate habitat, as determined through coordination with the CDFW, qualified biologist, and potential landowners. Suitability of habitat for lizard release must be evaluated and presented in a management plan. The habitat must contain habitat factors most important to the health and survival of the species such as appropriate habitat based on soils, vegetated cover, native plant species providing cover, plant litter layer and depth, soil and ambient temperature, quality and composition of invertebrate population and prey availability. Potential relocation sites that contain the necessary conditions may exist within the habitat reserves on the former Fort Ord, including the Fort Ord National Monument. Lizards shall be marked with a unique tag (pit or tattoo) prior to release. Release for every lizard shall be recorded with GPS. GPS locations shall be submitted as part of the survey result report to document the number and locations of lizards relocated.	Product Water Conveyance: RUWAP Alignment (Pipeline and Booster Pump Station) and Injection Well Facilities	Prior to and during project construction	MRWPCA, qualified biologist	Prior to and during project construction	MRWPCA, qualified biologist

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	Mitigation Measure BT-1e: Prepare and Implement Rare Plant Restoration Plan to Mitigate Impacts to Sandmat Manzanita, Monterey Ceanothus, Monterey Spineflower, Eastwood's Goldenbush, Coast Wallflower, and Kellogg's Horkelia. Impacts to rare plant species individuals shall be avoided through project design and modification, to the extent feasible while taking into consideration other site and engineering constraints. If avoidance is not possible, the species shall be replaced at a 1:1 ratio for area of impact through preservation, restoration, or combination of both. A Rare Plant Restoration Plan, approved by the lead agency prior to commencing construction on the component site upon which the rare plant species would be impacted, shall be prepared and implemented by a qualified biologist. The plan shall include, but is not limited to, the following: a. A detailed description of on-site and/or off-site mitigation areas, salvage of seed and/or soil bank, plant salvage, seeding and planting specifications, including, if appropriate, increased planting ratio to ensure the applicable success ratio. Specifically, seed shall be collected from the on-site individuals that would be impacted and grown in a local greenhouse, and then transplanted within the mitigation area. Plants shall be transplanted while they are young seedlings in order to develop a good root system. Alternatively, the mitigation area may be broadcast seeded in fall; however, if this method is used, some seed shall be retained in the event that the seeding fails to produce viable plants and contingency measures need to be employed. b. A description of a 3-year monitoring program, including specific methods of vegetation monitoring, data collection and analysis, restoration goals and objectives, success criteria, adaptive management if the criteria are not met, reporting protocols, and a funding mechanism. The mitigation area shall be preserved in perpetuity through a conservation easement or other legally enforceable land preservation agreement. Exclusionary fencing shall be installed around the mitigation area to prevent disturbance until success criteria have been met.	RUWAP Pipeline Alignment, and , Injection Well Facilities,; does not apply to HMP species within the former Fort Ord.	Prior to project construction	Project engineers, project biologist, MRWPCA	For 3 years upon completion of construction	MRWPCA qualified biologist
Impact BT-1: Construction Impacts to Special-Status Species and Habitat (continued)	**Mitigation Measure BT-1f: Conduct Pre-Construction Protocol-Level Botanical Surveys within the remaining portion of the Project Study Area within the Injection Well Facilities site.** The project proponents shall retain a qualified biologist to conduct protocol-level surveys for special-status plant species within the Injection Well Facilities site not yet surveyed. Protocol-level surveys shall be conducted by a qualified biologist at the appropriate time of year for species with the potential to occur within the site. A report describing the results of the surveys shall be provided to the project proponents prior to any ground disturbing activities. The report shall include, but is not limited to: 1) a description of the species observed, if any; 2) map of the location, if observed; and 3) recommended avoidance and minimization measures, if applicable. The avoidance and minimization measures shall include, but are not limited to, the following: • Impacts to species individuals shall be avoided through project design and modification, to the extent feasible while taking into consideration other site and engineering constraints. • If impacts to State listed plant species cannot be avoided, the project proponents shall comply with the CESA and consult with the CDFW to determine whether authorization for the incidental take of the species is required prior to commencing construction. If it is determined that authorization for incidental take is required from the CDFW, the project proponents shall comply with the CESA to obtain an incidental take permit prior to commencing construction on the site upon which state listed plant species could be taken. Permit requirements typically involve preparation and implementation of a mitigation plan and mitigating impacted habitat at a 3:1 ratio through preservation and/or restoration. At a minimum, the impacted plant species shall be replaced at a 1:1 ratio through preservation and/or restoration, as described below. The project proponents shall retain a qualified biologist to prepare a mitigation plan, which shall include, but is not limited to identifying: avoidance and minimization measures; mitigation strategy, including a take assessment, avoidance and minimization measures, compensatory mitigation lands, and success criteria; and funding assurances. The project proponents shall be required to implement the approved plan and any additional permit requirements. • If impacts to non-State listed, special-status plant species cannot be avoided, the species shall be replaced at a 1:1 ratio for acreage and/or individuals impacted through preservation, restoration, or combination of both. A Rare Plant Restoration Plan, approved by the project proponents prior to commencing of construction on the site upon which the rare plant would be impacted, shall be prepared and implemented by a qualified biologist. The plan shall include, but is not limited to, the following: o A detailed description of on-site and/or off-site mitigation areas, salvage of seed and/or soil bank, plant salvage, seeding and planting specifications, including, if appropriate, increased planting ratio to ensure the applicable success ratio. Specifically, seed shall be	Non-HMP species at the Injection Well Facilities site	Prior to project construction	MRWPCA, qualified biologist	During construction and 3 years following completion of construction	MRWPCA qualified biologist

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	collected from the on-site individuals that will be impacted and grown in a local greenhouse, and then transplanted within the mitigation area. Plants shall be transplanted while they are young seedlings in order to develop a good root system. Alternatively, the mitigation area may be broadcast seeded in fall; however, if this method is used, some seed shall be retained in the event that the seeding fails to produce viable plants and contingency measures need to be employed. o A description of a 3-year monitoring program, including specific methods of vegetation monitoring, data collection and analysis, restoration goals and objectives, success criteria, adaptive management if the criteria are not met, reporting protocols, and a funding mechanism. The mitigation area shall be preserved in perpetuity through a conservation easement or other legally enforceable land preservation agreement. Exclusionary fencing shall be installed around the mitigation area to prevent disturbance until success criteria have been met.					
Impact BT-1: Construction Impacts to Special-Status Species and Habitat (continued)	**Mitigation Measure BT-1g: Conduct Pre-Construction Surveys for Special-Status Bats.** To avoid and reduce impacts to special-status bat species, the project proponents shall retain a qualified bat specialist or wildlife biologist to conduct site surveys during the reproductive season (May 1 through September 15) to characterize bat utilization of the component site and potential species present (techniques utilized to be determined by the biologist) prior to tree or building removal. Based on the results of these initial surveys, one or more of the following shall occur: • If it is determined that bats are not present at the component site, no additional mitigation is required. • If it is determined that bats are utilizing the component site and may be impacted by the Project, pre-construction surveys shall be conducted no more than 30 days prior to any tree or building removal (or any other suitable roosting habitat) within 100 feet of construction limits. If, according to the bat specialist, no bats or bat signs are observed in the course of the pre-construction surveys, tree and building removal may proceed. If bats and/or bat signs are observed during the pre-construction surveys, the biologist shall determine if disturbance would jeopardize a maternity roost or another type of roost (i.e., foraging, day, or night). • If a single bat and/or only adult bats are roosting, removal of trees, buildings, or other suitable habitat may proceed after the bats have been safely excluded from the roost. Exclusion techniques shall be determined by the biologist and would depend on the roost type. • If an active maternity roost is detected, avoidance is preferred. Work in the vicinity of the roost (buffer to be determined by biologist) shall be postponed until the biologist monitoring the roost determines that the young have fledged and are no longer dependent on the roost. The monitor shall ensure that all bats have left the area of disturbance prior to initiation of pruning and/or removal of trees that would disturb the roost. If avoidance is not possible and a maternity roost must be disrupted, authorization from CDFW shall be required prior to removal of the roost.	Salinas Pump Station, Salinas Treatment Facility, Blanco Drain Diversion, Product Water Conveyance: RUWAP Alignment and Injection Well Facilities	Prior to project construction	MRWPCA, qualified biologist (bat/wildlife specialist)	Prior to project construction	MRWPCA and qualified biologist
	Mitigation Measure BT-1h: Implementation of Mitigation Measures BT-1a and BT-1b to Mitigate Impacts to the Monterey Ornate Shrew, Coast Horned Lizard, Coast Range Newt, Two-Striped Garter Snake, and Salinas Harvest Mouse. If these species are encountered, implementation of Mitigation Measures BT-1a and BT- 1b, which avoid and minimize impacts through implementing construction best management practices and monitoring, would reduce potential impacts to these species to a less-than-significant level.	Blanco Drain Diversion, Product Water Conveyance: RUWAP Alignment and Injection Well Facilities	Prior to and during project construction	MRWPCA contractors and qualified biologists	Prior to and during project construction	MRWPCA qualified biologist
	Mitigation Measure BT-1i: Conduct Pre-Construction Surveys for Monterey Dusky- Footed Woodrat. To avoid and reduce impacts to the Monterey dusky-footed woodrat, the project proponents shall retain a qualified biologist to conduct pre-construction surveys in suitable habitat proposed for construction, ground disturbance, or staging within three days prior to construction for woodrat nests within the project area and in a buffer zone 100 feet out from the limit of disturbance. All woodrat nests shall be flagged for avoidance of direct construction impacts and protection during construction, where feasible. Nests that cannot be avoided shall be manually deconstructed prior to land clearing activities to allow animals to escape harm. If a litter of young is found or suspected, nest material shall be replaced, and the nest left alone for 2-3 weeks before a re-check to verify that young are capable of independent survival before proceeding with nest dismantling.	Blanco Drain Diversion, Product Water Conveyance: RUWAP Pipeline Alignment, and Injection Well Facilities	Prior to project construction	MRWPCA contractors and qualified biologists	Prior to project construction	MRWPCA qualified biologist

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
Impact BT-1: Construction Impacts to Special-Status Species and Habitat (continued)	**Mitigation Measure BT-1j: Conduct Pre-Construction Surveys for American Badger.** To avoid and reduce impacts to the American badger, the project proponents shall retain a qualified biologist to conduct focused pre-construction surveys for badger dens in all suitable habitat proposed for construction, ground disturbance, or staging no more than two weeks prior to construction. If no potential badger dens are present, no further mitigation is required. If potential dens are observed, the following measures are required to avoid potential significant impacts to the American badger: • If the qualified biologist determines that potential dens are inactive, the biologist shall excavate these dens by hand with a shovel to prevent badgers from reusing them during construction. • If the qualified biologist determines that potential dens may be active, the den shall be monitored for a period sufficient (as determined by a qualified biologist) to determine if the den is a maternity den occupied by a female and her young, or if the den is occupied by a solitary badger. • Maternity dens occupied by a female and her young shall be avoided during construction and a minimum buffer of 200 feet in which no construction activities shall occur shall be maintained around the den. After the qualified biologist determines that badgers have stopped using active dens within the project boundary, the dens shall be hand-excavated with a shovel to prevent re-use during construction. • Solitary male or female badgers shall be passively relocated by blocking the entrances of the dens with soil, sticks, and debris for three to five days to discourage the use of these dens prior to project construction disturbance. The den entrances shall be blocked to an incrementally greater degree over the three to five day period. After the qualified biologist determines that badgers have stopped using active dens within the project boundary, the dens shall be hand-excavated with a shovel to prevent re-use during construction.	Product Water Conveyance: RUWAP Pipeline Alignment	Prior to project construction	MRWPCA construction contractors and qualified biologists	Prior to project construction	MRWPCA qualified biologist
	Mitigation Measure BT-1k: Conduct Pre-Construction Surveys for Protected Avian Species, including, but not limited to, white-tailed kite and California horned lark. Prior to the start of construction activities at each project component site, a qualified biologist shall conduct pre-construction surveys for suitable nesting habitat within the component Project Study Area and within a suitable buffer area from the component Project Study Area. The qualified biologist shall determine the suitable buffer area based on the avian species with the potential to nest at the site. In areas where nesting habitat is present within the component project area or within the determined suitable buffer area, construction activities that may directly (e.g., vegetation removal) or indirectly (e.g., noise/ground disturbance) affect protected nesting avian species shall be timed to avoid the breeding and nesting season. Specifically, vegetation and/or tree removal can be scheduled after September 16 and before January 31. Alternatively, a qualified biologist shall be retained by the project proponents to conduct pre-construction surveys for nesting raptors and other protected avian species where nesting habitat was identified and within the suitable buffer area if construction commences between February 1 and September 15. Pre-construction surveys shall be conducted no more than 14 days prior to the start of construction activities during the early part of the breeding season (February through April) and no more than 30 days prior to the initiation of these activities during the late part of the breeding season (May through August). Because some bird species nest early in spring and others nest later in summer, surveys for nesting birds may be required to continue during construction to address new arrivals, and because some species breed multiple times in a season. The necessity and timing of these continued surveys shall be determined by the qualified biologist based on review of the final construction plans. If active raptor or other protected avian species nests are identified during the preconstruction surveys, the qualified biologist shall notify the project proponents and an appropriate no-disturbance buffer shall be imposed within which no construction activities or disturbance shall take place until the young have fledged and are no longer reliant upon the nest or parental care for survival, as determined by a qualified biologist.	All components	Prior to project construction and if found establish and comply with no-disturbance buffer	MRWPCA, CalAm, construction contractors, and qualified biologists	Prior to project construction	MRWPCA, CalAm, qualified biologist(s), USFWS
	Mitigation Measure BT-1l: Conduct Pre-Construction Surveys for Burrowing Owl. In order to avoid impacts to active burrowing owl nests, a qualified biologist shall conduct pre-construction surveys in suitable habitat within the construction footprint and within a suitable buffer, as determined by a qualified biologist, of the footprint no more than 30 days prior to the start of construction at a component site. If ground disturbing activities are delayed or suspended for more than 30 days after the pre-construction survey, the site shall be resurveyed. The survey shall conform to the DFG 1995 Staff Report protocol. If no burrowing owls are found, no further mitigation is required. If it is	Product Water Conveyance: RUWAP Pipeline Alignment	Prior to project construction	Construction contractor, MRWPCA, qualified biologist	Prior to project construction	MRWPCA qualified biologist

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	determined that burrowing owls occupy the site during the non-breeding season (September 1 through January 31), then a passive relocation effort (e.g., blocking burrows with one-way doors and leaving them in place for a minimum of three days) shall be undertaken to ensure that the owls are not harmed or injured during construction. Once it has been determined that the owls have vacated the site, the burrows shall be collapsed, and ground disturbance can proceed. If burrowing owls are detected within the construction footprint or immediately adjacent lands (i.e. within 250 feet of the footprint) during the breeding season (February 1 to August 31), a construction-free buffer of 250 feet shall be established around all active owl nests. The buffer area shall be enclosed with temporary fencing, and construction equipment and workers shall not enter the enclosed setback areas. Buffers shall remain in place for the duration of the breeding season or until it has been confirmed by a qualified biologist that all chicks have fledged and are independent of their parents. After the breeding season, passive relocation of any remaining owls shall take place as described above.					
Impact BT-1: Construction Impacts to Special-Status Species and Habitat (continued)	**Mitigation Measure BT-1m: Minimize Effects of Nighttime Construction Lighting.** Nighttime construction lighting shall be focused and downward directed to preclude night illumination of the adjacent open space area.	Injection Well Facilities and CalAm Distribution System: Alternative Monterey Pipeline	During project construction	MRWPCA and CalAm construction contractors	During project construction	MRWPCA, CalAm, City of Seaside, City of Monterey
	Mitigation Measure BT-1p: Avoid and Minimize Impacts to Western Pond Turtle. A qualified biologist shall survey suitable habitat no more than 48 hours before the onset of work activities at the component site for the presence of western pond turtle. If pond turtles are found and these individuals are likely to be killed or injured by work activities, the biologist shall be allowed sufficient time to move them from the site before work activities begin. The biologist shall relocate the pond turtles the shortest distance possible to a location that contains suitable habitat and would not be affected by activities associated with the project.	Blanco Drain Diversion	Prior to project construction	MRWPCA construction contractor and qualified biologist	Prior to project construction	MRWPCA qualified biologist
	Mitigation Measure BT-1q: Avoid and Minimize Impacts to California Red-Legged Frog. The following measures for avoidance and minimization of adverse impacts to California Red-Legged Frog (CRLF) during construction of the Project components are those typically employed for construction activities that may result in short-term impacts to individuals and their habitat. The focus of these measures is on scheduling activities at certain times of year, keeping the disturbance footprint to a minimum, and monitoring. • The MRWPCA shall annually submit the name(s) and credentials of biologists who would conduct activities specified in the following measures. No project construction activities at the component site would begin until the MRWPCA receives confirmation from the USFWS that the biologist(s) is qualified to conduct the work. • A USFWS-approved biologist shall survey the work site 48 hours prior to the onset of construction activities. If CRLF, tadpoles, or eggs are found, the approved biologist shall determine the closest appropriate relocation site. The approved biologist shall be allowed sufficient time to move the CRLF, tadpoles or eggs from the work site before work activities begin. Only USFWS-approved biologists shall participate in activities associated with the capture, handling, and moving of CRLF. • Before any construction activities begin on the project component site, a USFWS-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of the CRLF and its habitat, the importance of the CRLF and its habitat, general measures that are being implemented to conserve the CRLF as they relate to the project, and the boundaries within which the project construction activities may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. • A USFWS-approved biologist shall be present at the work site until such time as all removal of CRLF, instruction of workers, and disturbance of habitat have been completed. After this time, the biologist shall designate a person to monitor onsite compliance with all minimization measures and any future staff training. The USFWS-approved biologist shall ensure that this individual receives training outlined in Mitigation Measure Bt-1a and in the identification of CRLF. The monitor and the USFWS-approved biologist shall have the authority to stop work if CRLF are in harm's way. • The number of access routes, number and size of staging areas, and the total area of the activity shall be limited to the minimum necessary to achieve the project goal. Routes and boundaries shall be clearly demarcated, and these areas shall be outside of riparian and wetland areas to the extent practicable.	Salinas Treatment Facility and Blanco Drain Diversion	Prior to and during project construction	MRWPCA construction contractor and qualified biologist	Prior to and during project construction	MRWPCA, qualified biologist, USFWS

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	• Work activities shall be completed between April 1 and November 1, to the extent practicable. Should the project proponent demonstrate a need to conduct activities outside this period, the project proponent may conduct such activities after obtaining USFWS approval (applies to Blanco Drain site only). • If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than five millimeters (mm) to prevent CRLF from entering the pump system. Water shall be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. Upon completion of construction activities, any barriers to flow shall be removed in a manner that would allow flow to resume with the least disturbance to the substrate. • The Declining Amphibian Populations Task Force's Fieldwork Code of Practice shall be followed to minimize the possible spread of chytrid fungus or other amphibian pathogens and parasites.					
Impact BT-2: Construction Impacts to Sensitive Habitats	**Mitigation Measure BT-2a: Avoidance and Minimization of Impacts to Riparian Habitat and Wetland Habitats.** Implement Mitigation Measure BT-1a. When designing the facilities at these component sites, the MRWPCA shall site and design project features to avoid impacts to the riparian and wetland habitats shown in Attachment 8 of Appendix H and Appendix I, including direct habitat removal and indirect hydrology and water quality impacts, to the greatest extent feasible while taking into account site and engineering constraints. To protect this sensitive habitat during construction, the following measures shall be implemented: • Place construction fencing around riparian and wetland habitat (i.e., areas adjacent to or nearby the Project construction) to be preserved to ensure construction activities and personnel do not impact this area. • All proposed lighting shall be designed to avoid light and glare into the riparian and wetland habitat. Light sources shall not illuminate these areas or cause glare. In the event that full avoidance is not possible and a portion or all of the riparian and wetland habitat would be impacted, the following minimization measures shall be implemented: • Permanently impacted riparian and wetland habitat shall be mitigated at no less than a 2:1 replacement-to-loss ratio through restoration and/or preservation. The final mitigation amounts for both temporary and permanent impacts to riparian and wetland habitat shall be determined during the design phase but cannot be less than 2:1 for permanent impacts and 1:1 for temporary impacts, and must be approved by the relevant permitting agencies (USACOE, RWQCB, CDFW, and the entity issuing any Coastal Development Permit). The preserved mitigation land shall be managed to improve wetland and riparian conditions compared to existing conditions. It is expected that the mitigation can occur within the Locke Paddon Lake watershed, along the Tembladero Slough, and within the Salinas River corridor near the Blanco Drain near where impacts may occur. A Habitat Mitigation and Monitoring Plan (HMMP) shall be prepared by a qualified biologist to mitigate for impacts to riparian and wetland habitat. The HMMP shall outline the details of a riparian and wetland habitat restoration plan, including but not limited to, planting plan, success criteria, monitoring protocols to determine if the success criteria have been met, adaptive management protocols in the case that the success criteria are not met, and funding assurances. Plantings and revegetation conducted in compliance with this mitigation measure shall be monitored for a minimum of three years after project completion.	Reclamation Ditch, Tembladero Slough Diversion, Blanco Drain Diversion	Prior to and during project construction	MRWPCA construction contractor and qualified biologist	Prior to and during project construction	MRWPCA qualified biologist

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
Impact BT-2: Construction Impacts to Sensitive Habitats (continued)	**Mitigation Measure BT-2c**: The project proponents in coordination with the contractor shall prepare and implement a Frac-Out Plan to avoid or reduce accidental impacts resulting from horizontal directional drilling (HDD) beneath the Salinas River. The Frac-Out Plan shall address spill prevention, containment, and clean-up methodology in the event of a frac out. The proposed HDD component of the Blanco Drain diversion shall be designed and conducted to minimize the risk of spills and frac-out events. The Frac-Out Plan shall be prepared and submitted to United States Fish and Wildlife Services, California Department of Fish and Wildlife, National Marine Fisheries Services, and the Regional Water Quality Control Board prior to commencement of HDD activities for the Blanco Drain Diversion construction. The following are typical contents of a Frac-Out Plan: • Project description, including details of the HDD design and operations • Site description and existing conditions • Potential modes of HDD failure and HDD failure prevention and mitigation • Frac-out prevention measures (including for example, geotechnical investigations, planning for appropriate depths based on those investigations, presence of a qualified engineer during drilling to monitor the drilling process, live adjustments to the pace of drill advancement to ensure sufficient time for cutting and fluid circulation and to prevent or minimize plugging, maintaining the minimum drilling pressure necessary to maintain fluid circulation, etc.) • Monitoring requirements (for example, monitoring pump pressure circulation rate, ground surface and surface water inspection, advancing the drill only during daytime hours, on-site biological resource monitoring by a qualified biologist) • Response to accidental frac-out (including stopping drilling, permitting agency notification, surveying the area, containing the frac-out material, contacting the project biological monitor to identify and relocate species potentially in the area, turbidity monitoring, procedures for clean-up and mitigation of hazardous waste spill materials, preparation of documentation of the event, etc.) Coordination plan and contact list of key project proponents, biological monitor, and agency staff in the event of an accidental frac-out event.	Blanco Drain Diversion	Prior to project construction	MRWPCA, construction contractors	Prior to and during project construction	MRWPCA, USFWS, CDFW, NOAA/NMFS, RWQCB
Impact BT-4: Construction Conflicts with Local Policies, Ordinances, or Approved Habitat Conservation Plan	**Mitigation Measure BT-4**. **HMP Plant Species Salvage.** For impacts to the HMP plant species within the Project Study Area that do not require take authorization from USFWS or CDFW, salvage efforts for these species shall be evaluated by a qualified biologist per the requirements of the HMP and BO. A salvage plan shall be prepared and implemented by a qualified biologist, which shall would include, but is not limited to: a description and evaluation of salvage opportunities and constraints; a description of the appropriate methods and protocols of salvage and relocation efforts; identification of relocation and restoration areas; and identification of qualified biologists approved to perform the salvage efforts, including the identification of any required collection permits from USFWS and/or CDFW. Where proposed, seed collection shall occur from plants within the Project Study Area and topsoil shall be salvaged within occupied areas to be disturbed. Seeds shall be collected during the appropriate time of year for each species by qualified biologists. At the time of seed collection, a map shall also be prepared that identifies the specific locations of the plants for any future topsoil preservation efforts. The collected seeds shall be used to revegetate temporarily disturbed construction areas and reseeding and restoration efforts on- or off-site, as determined appropriate in the salvage plan.	Product Water Conveyance: RUWAP Pipeline Alignment, and Injection Well Facilities site within the former Fort Ord only	Prior to, during, and after construction	MRWPCA Biologist	During, and after construction	MRWPCA qualified biologist
Impact CR-1: Construction Impacts on Historic Resources	**Mitigation Measure CR-1: Avoidance and Vibration Monitoring for Pipeline Installation in the Presidio of Monterey Historic District, and Downtown Monterey.** Avoidance and Vibration Monitoring for Pipeline Installation in the Presidio of Monterey Historic District, and Downtown Monterey. (Applies to portion of the CalAm Distribution System: Alternative Monterey Pipeline) CalAm shall construct the section of the Alternative Monterey Pipeline located on Stillwell Avenue within the Presidio of Monterey Historic District, adjacent to the Spanish Royal Presidio, and within the Monterey Old Town National Historic Landmark District (including adjacent to Stokes Adobe, the Gabriel de la Torre Adobe, the Fremont Adobe, Colton Hall, and Friendly Plaza in downtown Monterey)[2] as close as possible to the centerlines of these streets to: (1) avoid direct impacts to the historic Presidio Entrance Monument, and (2) reduce impacts from construction vibration to below the 0.12 inches per second (in/sec) peak particle velocity vibration PPV) threshold. If CalAm determines that the pipeline	Portion of the CalAm Distribution System- Alternative Monterey Pipeline within historic districts and adjacent to historic buildings	During project construction	CalAm, project engineers, construction contractors	During project construction	CalAm and City of Monterey

[2] A modification to this mitigation measure has been made to clarify its applicability to the Staff-Recommendation Alternative of the GWR Project. Specifically, the text highlighted in gray has been added and the following text deleted: "and within W. Franklin Street in downtown Monterey." This change to the mitigation measure does not constitute significant new information; it merely clarifies the mitigation for the selected alternative.

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	cannot be located near the centerline of these street segments due to traffic concerns or existing utilities, the historic properties identified on Table 4.6-2 of the GWR Project Draft EIR (MRWPCA/DD&A, April 2015) shall be monitored for vibration during pipeline construction, especially during the use of jackhammers and vibratory rollers. If construction vibration levels exceed 0.12 in/sec PPV, construction shall be halted and other construction methods shall be employed to reduce the vibration levels below the standard threshold. Alternative construction methods may include using concrete saws instead of jackhammers or hoe-rams to open excavation trenches, the use of non-vibratory rollers, and hand excavation. If impact sheet pile installation is needed (i.e., for horizontal directional drilling or jack-and-bore) within 80 feet of any historical resource or within 80 feet of a historic district, CalAm shall monitor vibration levels to ensure that the 0.12-in/sec PPV damage threshold is not exceeded. If vibration levels exceed the applicable threshold, the contractor shall use alternative construction methods such as vibratory pile drivers.					
Impact CR-2: Construction Impacts on Archaeological Resources or Human Remains	**Mitigation Measure CR-2a**: **Archaeological Monitoring Plan.** Each of the project proponents shall contract a qualified archaeologist meeting the Secretary of the Interior's Qualification Standard (Lead Archaeologist) to prepare and implement an Archaeological Monitoring Plan, and oversee and direct all archaeological monitoring activities during construction. Archaeological monitoring shall be conducted for all subsurface excavation work within 100 feet of Presidio #2 in the Presidio of Monterey, and within the areas of known archaeologically sensitive sites in Monterey[3]. At a minimum, the Archaeological Monitoring Plan shall: • Detail the cultural resources training program that shall be completed by all construction and field workers involved in ground disturbance; • Designate the person(s) responsible for conducting monitoring activities, including Native American monitor(s), if deemed necessary; • Establish monitoring protocols to ensure monitoring is conducted in accordance with current professional standards provided by the California Office of Historic Preservation; • Establish the template and content requirements for monitoring reports; • Establish a schedule for submittal of monitoring reports and person(s) responsible for review and approval of monitoring reports; • Establish protocols for notifications in case of encountering cultural resources, as well as methods for evaluating significance, developing and implementing a plan to avoid or mitigate significant resource impacts, facilitating Native American participation and consultation, implementing a collection and curation plan, and ensuring consistency with applicable laws including Section 7050.5 of the California Health and Safety Code and Section 5097.98 of the Public Resources Code; • Establish methods to ensure security of cultural resources sites; • Describe the appropriate protocols for notifying the County, Native Americans, and local authorities (i.e. Sheriff, Police) should site looting and other illegal activities occur during construction with reference to Public Resources Code 5097.99. During the course of the monitoring, the Lead Archaeologist may adjust the frequency—from continuous to intermittent—of the monitoring based on the conditions and professional judgment regarding the potential to encounter resources. If archaeological materials are encountered, all soil disturbing activities within 100 feet of the find shall cease until the resource is evaluated. The Lead Archaeologist shall immediately notify the relevant Project proponent of the encountered archaeological resource. The Lead Archaeologist shall, after making a reasonable effort to assess the identity, integrity, and significance of the encountered archaeological resource, present the findings of this assessment to the lead agency, or CPUC, for the CalAm Distribution Pipeline. In the event archaeological resources qualifying as either historical resources pursuant to CEQA Section 15064.5 or as unique archaeological resources as defined by Public Resources Code 21083.2 are encountered, preservation in place shall be the preferred manner of mitigation. If preservation in place is not feasible, the applicable project proponent(s) shall implement an Archaeological Research Design and Treatment Plan (ARDTP). The Lead Archaeologist, Native American representatives, and the State Historic Preservation Office designee shall meet to determine the scope of the ARDTP. The ARDTP will identify a program for the treatment and recovery of important scientific data contained	Lake El Estero Diversion Site and CalAm Distribution System: Alternative Monterey Pipeline	Prior to and during project construction	MRWPCA (for Lake El Estero Diversion only), CalAm, qualified archaeologist	During project construction	MRWPCA, CalAm, qualified archaeologist

[3] A modification to this mitigation measure has been made to clarify its applicability to the Staff-Recommendation Alternative of the GWR Project. Specifically, the text highlighted in gray has been added and the following text deleted: "in downtown Monterey on W. Franklin Street between High and Figuero Streets, and at potentially sensitive archaeological sites at Lake El Estero"

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	within the portions of the archaeological resources located within the project Area of Potential Effects; would preserve any significant historical information obtained; and will identify the scientific/historic research questions applicable to the resources, the data classes the resource is expected to possess, and how the expected data classes would address the applicable research questions. The results of the investigation shall be documented in a technical report that provides a full artifact catalog, analysis of items collected, results of any special studies conducted, and interpretations of the resource within a regional and local context. All technical documents shall be placed on file at the Northwest Information Center of the California Historical Resources Information System.					
	Mitigation Measure CR-2b: **Discovery of Archaeological Resources or Human Remains.** If archaeological resources or human remains are unexpectedly discovered during any construction, work shall be halted within 50 meters (±160 feet) of the find until it can be evaluated by a qualified professional archaeologist. If the find is determined to be significant, appropriate mitigation measures shall be formulated and implemented. The County Coroner shall be notified in accordance with provisions of Public Resources Code 5097.98-99 in the event human remains are found and the Native American Heritage Commission shall be notified in accordance with the provisions of Public Resources Code section 5097 if the remains are determined to be of Native American origin.	All components	During project construction	MRWPCA, CalAm, and qualified archaeologists	During project construction	MRWPCA, CalAm, and qualified archaeologist
	Mitigation Measure CR-2c: **Native American Notification.** Because of their continuing interest in potential discoveries during construction, all listed Native American Contacts shall be notified of any and all discoveries of archaeological resources in the project area.	All components	During project construction	MRWCPA, CalAm and qualified archaeologist	During project construction	MRWCPA, CalAm and qualified archaeologist
Impact EN-1: Construction Impacts due to Temporary Energy Use	**Mitigation Measure EN-1**: **Construction Equipment Efficiency Plan.** MRWPCA (for all components except the CalAm Distribution System) or CalAm (for the Cal Am Distribution System) shall contract a qualified professional (i.e., construction planner/energy efficiency expert) to prepare a Construction Equipment Efficiency Plan that identifies the specific measures that MRWPCA or CalAm (and its construction contractors) will implement as part of project construction to increase the efficient use of construction equipment. Such measures shall include, but not necessarily be limited to: procedures to ensure that all construction equipment is properly tuned and maintained at all times; a commitment to utilize existing electricity sources where feasible rather than portable diesel-powered generators; consistent compliance with idling restrictions of the state; and identification of procedures (including the use of routing plans for haul trips) that will be followed to ensure that all materials and debris hauling is conducted in a fuel-efficient manner.	All components	Prior to project construction	MRWPCA, CalAm. energy efficiency expert, construction contractors	During project construction	MRWPCA and CalAm
Impact HH-2: Accidental Release of Hazardous Materials During Construction	**Mitigation Measure HH-2a**: **Environmental Site Assessment.** If required by local jurisdictions and property owners with approval responsibility for construction of each component, MRWPCA and CalAm shall conduct a Phase I Environmental Site Assessment in conformance with ASTM Standard 1527-05 to identify potential locations where hazardous material contamination may be encountered. If an Environmental Site Assessment indicates that a release of hazardous materials could have affected soil or groundwater quality at a project site, a Phase II environmental site assessment shall be conducted to determine the extent of contamination and to prescribe an appropriate course of remediation, including but not limited to removal of contaminated soils, in conformance with state and local guidelines and regulations. If the results of the subsurface investigation(s) indicate the presence of hazardous materials, additional site remediation may be required by the applicable state or local regulatory agencies, and the contractors shall be required to comply with all regulatory requirements for facility design or site remediation.	Lake El Estero Diversion, Product Water Conveyance RUWAP Pipeline Alignment, Injection Well Facilities and the CalAm Distribution System: Alternative Monterey Pipeline	Prior to project construction (if presence of hazardous materials is identified, site remediation or design changes may be required)	MRWPCA and CalAm project engineers, construction contractors	Only needed until owner/contractor deems each construction site is deemed safe for required construction	MRWPCA and CalAm
	Mitigation Measure HH-2b: **Health and Safety Plan.** The construction contractor(s) shall prepare and implement a project-specific Health and Safety Plan (HSP) for each site on which construction may occur, in accordance with 29 CFR 1910 to protect construction workers and the public during all excavation, grading, and construction. The HSP shall include the following, at a minimum: • A summary of all potential risks to construction workers and the maximum exposure limits for all known and reasonably foreseeable site chemicals (the HSP shall incorporate and consider the information in all available existing Environmental Site Assessments and remediation reports for properties within ¼-mile using the EnviroStor Database); • Specified personal protective equipment and decontamination procedures, if needed;	Lake El Estero Diversion, Product Water Conveyance RUWAP Pipeline Alignment , the Injection Well Facilities, and the CalAm Distribution System:	Prior to project construction	Construction contactors	During project construction	MRWPCA, CalAm, Monterey County Dept. of Environmental Health

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	• Emergency procedures, including route to the nearest hospital; Procedures to be followed in the event that evidence of potential soil or groundwater contamination (such as soil staining, noxious odors, debris or buried storage containers) is encountered. These procedures shall be in accordance with hazardous waste operations regulations and specifically include, but are not limited to, the following: immediately stopping work in the vicinity of the unknown hazardous materials release, notifying Monterey County Department of Environmental Health, and retaining a qualified environmental firm to perform sampling and remediation; and The identification and responsibilities of a site health and safety supervisor.	Alternative Monterey Pipeline				
	Mitigation Measure HH-2c: **Materials and Dewatering Disposal Plan.** MRWPCA and CalAm and/or their contractors shall develop a materials disposal plan specifying how the contractor will remove, handle, transport, and dispose of all excavated material in a safe, appropriate, and lawful manner. The plan must identify the disposal method for soil and the approved disposal site, and include written documentation that the disposal site will accept the waste. For areas within the Seaside munitions response areas called Site 39 (coincident with the Injection Well Facilities component), the materials disposal plans shall be reviewed and approved by FORA and the City of Seaside. The contractor shall develop a groundwater dewatering control and disposal plan specifying how the contractor will remove, handle, and dispose of groundwater impacted by hazardous substances in a safe, appropriate, and lawful manner. The plan must identify the locations at which potential contaminated groundwater dewatering are likely to be encountered (if any), the method to analyze groundwater for hazardous materials, and the appropriate treatment and/or disposal methods. If the dewatering effluent contains contaminants that exceed the requirements of the General WDRs for Discharges with a Low Threat to Water Quality (Order No. R3-2011-0223, NPDES Permit No. CAG993001), the construction contractor shall contain the dewatering effluent in a portable holding tank for appropriate offsite disposal or discharge. The contractor can either dispose of the contaminated effluent at a permitted waste management facility or discharge the effluent, under permit, to the Regional Treatment Plant.	Lake El Estero Diversion, Product Water Conveyance: RUWAP Pipeline Alignment , the Injection Well Facilities, and the CalAm Distribution System: Alternative Monterey Pipeline	Prior to and during project construction	MRWPCA, CalAm, construction contractors	During project construction	MRWPCA and CalAm; FORA and the City of Seaside for areas within Site 39
Impact HS-4: Operational Surface Water Quality Impacts due to Source Water Diversions	**Mitigation Measure HS-4**: **Management of Surface Water Diversion Operations**. Rapid, imposed water-level fluctuations shall be avoided when operating the Reclamation Ditch Diversion pumps to minimize erosion and failure of exposed (or unvegetated), susceptible banks. This can be accomplished by operating the pumps at an appropriate flow rate, in conjunction with commencing operation of the pumps only when suitable water levels or flow rates are measured in the water body. Proper control shall be implemented to ensure that mobilized sediment would not impair downstream habitat values and to prevent adverse impacts due to water/soil interface adjacent to the Reclamation Ditch and Tembladero Slough. During planned routine maintenance at the Reclamation Ditch Diversion, maintenance personnel shall inspect the diversion structures within the channel for evidence of any adverse fluvial geomorphological processes (for example, undercutting, erosion, scour, or changes in channel cross-section). If evidence of any substantial adverse changes is noted, the diversion structure shall be redesigned and the project proponents shall modify it in accordance with the new design.	Reclamation Ditch Diversion	During project operations	MRWPCA	During project operations	MRWPCA
Cumulative impacts to marine water quality	**Mitigation Measure HS-C: Implement Measures to Avoid Exceedances over Water Quality Objectives at the Edge of the Zone of Initial Dilution (ZID).** As part of the amendment process to modify the existing MRWPCA NPDES Permit (Order No. R3-2014-0013, NPDES Permit No. CA0048551) per 40 Code of Regulations Part 122.62, it would be necessary to conduct an extensive assessment in accordance with requirements to be specified by the RWQCB. It is expected that the assessment would include, at a minimum, an evaluation of the minimum probable initial dilution at the point of discharge based on likely discharge scenarios and any concomitant impacts on water quality and beneficial uses per the Ocean Plan. Prior to operation of the MPSWP desalination plant, the discharger(s) will be required to test the MPSWP source water in accordance with protocols approved by the RWQCB. If the water quality assessment indicates that the water at the edge of the ZID will exceed the Ocean Plan water quality objectives, the MRWPCA will not accept the desalination brine discharge at its outfall, and the following design features and/or operational measures shall be employed, individually or in combination, to reduce the concentration of constituents to below the Ocean Plan water quality objectives at the edge of the ZID: • ***Additional pre-treatment of MPWSP source water at the Desalination Plant:*** Feasible methods to remove PCBs and other organic compounds from the MPWSP source water at the desalination plant include additional filtration or use of granular activated carbon (GAC). GAC acts as a very strong sorbent and can effectively remove PCBs and other organic compounds from the desalination plant source water (Luthy, Richard G., 2015).	Ocean discharges upon implementation of cumulative project (specifically, the MPWSP with 6.4 mgd desalination plant)	Prior to operation of the MPWSP (with 6.4 mgd desalination plant)	MRWPCA	During operations of the MPWSP with 6.4 mgd desalination plant	MRWPCA (under regulations by the RWQCB)

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	• ***Treatment of discharge at the Desalination Plant:*** Feasible methods to remove residual compounds from the discharge to comply with water quality objectives at the edge of the ZID are use of GAC (similar to that under the additional pre-treatment of MPWSP source water) and advanced oxidation with ultraviolet light with concurrent addition of hydrogen peroxide. The method of using advanced oxidation with ultraviolet light with concurrent addition of hydrogen peroxide is used for the destruction of a variety of environmental contaminants such as synthetic organic compounds, volatile organic compounds, pesticides, pharmaceuticals and personal care products, and disinfection byproducts. This process is energy intensive, but requires a relatively small construction footprint. • ***Short-term storage and release of brine at the Desalination Plant:*** When sufficient quantities of treated wastewater from the Regional Treatment Plant to prevent an exceedance of Ocean Plan objectives at the edge of the ZID are not available, brine from the desalination plant would be temporarily stored at the MPWSP site in the brine storage basin,23 and discharged (pumped) in pulse flows (up to the capacity of the existing outfall), such that the flow rate allows the discharge to achieve a dilution level that meets Ocean Plan water quality objectives at the edge of the ZID. • ***Biologically Active Filtration at the Regional Treatment Plant:*** As part of the proposed AWT Facility at the Regional Treatment Plant, the GWR Project includes the potential for use of upflow biologically active filtration following ozone treatment to reduce the concentration of ammonia and residual organic matter present in the ozone effluent and to reduce the solids loading on the membrane filtration process. The biologically active filtration system would consist of gravity-feed filter basins with approximately 12 feet of granular media, and a media support system. Ancillary systems would include an alkalinity addition system for pH control, backwash waste water basin (also used for membrane filtration backwash waste water), backwash pumps, an air compressor and supply system for air scour, an air compressor and supply system for process air, and a wash water basin to facilitate filter backwashing (the wash water basin may be combined with the membrane filtration flow equalization basin). This biologically active filtration system may be needed to meet Ocean Plan water quality objectives at the edge of the ZID (if and/or when discharges from the Project are combined with discharges from the MPWSP with 6.4 million gallon per day, or mgd, desalination plant). This optional component of the Project is described in Chapter 2, Project Description (see Section 2.8.1.3), would become a required process if the MPWSP with 6.4 mgd desalination project is in operation and the other components of the mitigation do not achieve Ocean Plan compliance.					
Impact LU-1: Temporary Farmland Conversion during Construction	**Mitigation Measure LU-1: Minimize Disturbance to Farmland.** To support the continued productivity of designated Prime Farmland and Farmland of Statewide Importance, the following provisions shall be included in construction contract specifications: • Construction contractor(s) shall minimize the extent of the construction disturbance, including construction access and staging areas, in designated important farmland areas. • Prior to the start of construction, the construction contractor(s) shall mark the limits of the construction area and ensure that no construction activities, parking, or staging occur beyond the construction limits. • Upon completion of the active construction, the site shall be restored to pre-construction conditions.	Salinas Treatment Facility and a portion of the Blanco Drain Diversion	During project construction	Construction contractor	During project construction	MRWPCA
Impact LU-2: Operational Consistency with Plans, Policies, and Regulations	See the following mitigation measures: AQ-1, BF-1a, BF-1b, BF-1c, BF-2a or Alternate BF-2a, BT-1a through BT-1q, BT-2a through BT-2c, CR-2a through CR-2c, EN-1, NV-1a through NV-1d, NV-2a, NV-2b, PS-3, TR-2, TR-3, and TR-4.	All components	See other rows for specific timing of each mitigation measure	See other lines for responsibilities for each mitigation measure	See other rows for specific timing of each mitigation measure	See other rows for responsibilities for each mitigation measure
Cumulative impacts to marine	**Mitigation Measure MR-C. Implement Measures to Avoid Exceedances over Water Quality Objectives at the Edge of the Zone of Initial Dilution.** Implement Mitigation Measure HS-C above.	Ocean discharges upon implementation of cumulative project	Prior to operation of MPWSP (with	MRWPCA	During operations of the MPWSP	MRWPCA (under regulations by the RWQCB)

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
biological resources		(specifically, the MPWSP with 6.4 mgd desalination plant)	6.4 mgd desalination plant)		with 6.4 mgd desalination plant	
Impact NV-1: Construction Noise	**Mitigation Measure NV-1a: Drilling Contractor Noise Measures.** Contractor specifications shall include a requirement that drill rigs located within 700 feet of noise-sensitive receptors shall be equipped with noise reducing engine housings or other noise reducing technology and the line of sight between the drill rig and nearby sensitive receptors shall be blocked by portable acoustic barriers and/or shields to reduce noise levels such that drill rig noise levels are no more 75 dBA (or, A-Weighted Sound Level) at 50 feet. This would reduce the nighttime noise level to less than 60 dBA Leq (Equivalent Noise Level) at the nearest residence. The contractor shall submit to the MRWPCA and the Seaside Building Official, a "Well Construction Noise Control Plan" for review and approval. The plan shall identify all feasible noise control procedures that would be implemented during night-time construction activities. At a minimum, the plan shall specify the noise control treatments to achieve the specified above noise performance standard.	Injection Well Facilities	Prior to and during project construction	Construction contractors	During project construction	MWRPCA, Seaside building official
	Mitigation Measure NV-1b: **Monterey Pipeline Noise Control Plan for Nighttime Pipeline Construction.** CalAm shall submit a Noise Control Plan for all nighttime pipeline work to the California Public Utilities Commission for review and approval prior to the commencement of project construction activities. The Noise Control Plan shall identify all feasible noise control procedures to be implemented during nighttime pipeline installation in order to reduce noise levels to the extent practicable at the nearest residential or noise sensitive receptor. At a minimum, the Noise Control Plan shall require use of moveable noise screens, noise blankets, or other suitable sound attenuation devices be used to reduce noise levels during nighttime pipeline installation activities.	CalAm Distribution System: Alternative Monterey Pipeline	Prior to project construction	CalAm	During project construction	CalAm, CPUC and City of Monterey
	Mitigation Measure NV-1c: **Neighborhood Notice**. Residences and other sensitive receptors within 900 feet of a nighttime construction area shall be notified of the construction location and schedule in writing, at least two weeks prior to the commencement of construction activities. The notice shall also be posted along the proposed pipeline alignments, near the proposed facility sites, and at nearby recreational facilities. The contractor shall designate a noise disturbance coordinator who would be responsible for responding to complaints regarding construction noise. The coordinator shall determine the cause of the complaint and ensure that reasonable measures are implemented to correct the problem. A contact number for the noise disturbance coordinator shall be conspicuously placed on construction site fences and included in the construction schedule notification sent to nearby residences. The notice to be distributed to residences and sensitive receptors shall first be submitted, for review and approval, to the MRWPCA and city and county staff as may be required by local regulations.	Injection Well Facilities and CalAm Distribution System: Alternative Monterey Pipeline	Prior to project construction	MRWPCA, CalAm, construction contractor, noise disturbance coordinator	Prior to project construction	MRWPCA and CalAm

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	Mitigation Measure NV-1d: RUWAP Pipeline Construction Noise. The following measures will be implemented by the project proponents in response to comments from the Marina Coast Water District for the RUWAP alignment option of the Product Water Conveyance Pipeline: • The construction contractor shall limit exterior construction related activities to the hours of restriction consistent with the noise ordinance of, and encroachment permits issued by, the relevant land use jurisdictions. • The contractor shall locate all stationary noise-generating equipment as far as possible from nearby noise-sensitive receptors. Where possible, noise generating equipment shall be shielded from nearby noise-sensitive receptors by noise-attenuating buffers. Stationary noise sources located 500 feet from noise-sensitive receptors shall be equipped with noise reducing engine housings. Where possible and required by the local jurisdiction, portable acoustic barriers shall be placed around stationary noise generating equipment that is located less than 200 feet from noise-sensitive receptors. • The contractor shall assure that construction equipment powered by gasoline or diesel engines have sound control devices at least as effective as those provided by the original equipment manufacturer (OEM). No equipment shall be permitted to have an unmuffled exhaust. • The contractor shall assure that noise-generating mobile equipment and machinery are shut-off when not in use. Residences within 500 feet of a construction area shall be notified of the construction schedule in writing, prior to construction. The project proponent(s) and contractor shall designate a noise disturbance coordinator who would be responsible for responding to complaints regarding construction noise. The coordinator shall determine the cause of the complaint and ensure that reasonable measures are implemented to correct the problem. A contact number for the noise disturbance coordinator shall be conspicuously placed on construction site fences and written into the construction notification schedule sent to nearby residences.	RUWAP Pipeline Alignment	Prior to project construction	MRWPCA, construction contractor, noise disturbance coordinator	Prior to project construction	MRWPCA
Impact NV-2: Construction Noise That Exceeds or Violate Local Standards	**Mitigation Measure NV-2a: Construction Equipment.** Contractor specifications shall include a requirement that the contractor shall: • Assure that construction equipment with internal combustion engines has sound control devices at least as effective as those provided by the original equipment manufacturer. No equipment shall be permitted to have an un-muffled exhaust. • Impact tools (i.e., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler shall be placed on the compressed air exhaust to lower noise levels by approximately 10 dBA. External jackets shall be used on impact tools, where feasible, in order to achieve a further reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible. • The construction contractor(s) shall locate stationary noise sources (e.g., generators, air compressors) as far from nearby noise-sensitive receptors as possible. • For Product Water Conveyance pipeline segments within the City of Marina, noise controls shall be sufficient to not exceed 60 decibels for more than twenty-five percent of an hour.	Reclamation Ditch Diversion, Tembladero Slough Diversion, Blanco Drain Diversion, Product Water Conveyance: (RUWAP Pipeline) segments within the City of Marina and RUWAP Booster Station	During project construction	MRWPCA construction contractor	During project construction	MRWPCA
	Mitigation Measure NV-2b: Construction Hours. The construction contractor shall limit all noise-producing construction activities within the City of Marina to between the hours of 7:00 AM and 7:00 PM on weekdays and between 9:00 AM and 7:00 PM Saturdays.	Product Water Conveyance: RUWAP Pipeline and Booster Pump Station in Marina	During project construction	Construction contractor	During project construction	MRWPCA
Impact PS-3: Construction Solid Waste Policies and Regulations	**Mitigation Measure PS-3: Construction Waste Reduction and Recycling Plan**. The construction contractor(s) shall prepare and implement a construction waste reduction and recycling plan identifying the types of construction debris the Project will generate and the manner in which those waste streams will be handled. In accordance with the California Integrated Waste Management Act of 1989, the plan shall emphasize source reduction measures, followed by recycling and composting methods, to ensure that construction and demolition waste generated by the project is managed consistent with applicable statutes and regulations. In accordance with the California Green Building Standards Code and local regulations, the plan shall specify that all trees, stumps, rocks, and associated vegetation and soils, and 50% of all other nonhazardous construction and demolition waste, be diverted from landfill disposal. The plan shall be prepared in coordination with	All components	Prior to, during, and after project construction	MRWPCA and CalAm construction contractors	Upon project completion	MRWPCA and CalAm

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	the Monterey Regional Waste Management District and be consistent with Monterey County's Integrated Waste Management Plan. Upon project completion, MRWPCA and CalAm shall collect the receipts from the contractor(s) to document that the waste reduction, recycling, and diversion goals have been met.					
Impact TR-2: Construction-Related Traffic Delays, Safety and Access Limitations	**Mitigation Measure TR-2**: **Traffic Control and Safety Assurance Plan.** Prior to construction, MRWPCA and/or its contractor shall prepare and implement a traffic control plan or plans for the roadways and intersections affected by MRWPCA construction (Product Water Conveyance Pipeline) and CalAm shall prepare and implement a traffic control plan for the roadways and intersections affected by the CalAm Distribution System Improvements (Transfer and Monterey pipelines). The traffic control plan(s) shall comply with the affected jurisdiction's encroachment permit requirements and will be based on detailed design plans. For all project construction activities that could affect the public right-of-way (e.g., roadways, sidewalks, and walkways), the plan shall include measures that would provide for continuity of vehicular, pedestrian, and bicyclist access; reduce the potential for traffic accidents; and ensure worker safety in construction zones. Where project construction activities could disrupt mobility and access for bicyclists and pedestrians, the plan shall include measures to ensure safe and convenient access would be maintained. The traffic control and safety assurance plan shall be developed on the basis of detailed design plans for the approved project. The plan shall include, but not necessarily be limited to, the elements listed below: ***General*** a. Develop circulation and detour plans to minimize impacts on local streets. As necessary, signage and/or flaggers shall be used to guide vehicles to detour routes and/or through the construction work areas. b. Implement a public information program to notify motorists, bicyclists, nearby residents, and adjacent businesses of the impending construction activities (e.g., media coverage, email notices, websites, etc.). Notices of the location(s) and timing of lane closures shall be published in local newspapers and on available websites to allow motorists to select alternative routes. ***Roadways*** c. Haul routes that minimize truck traffic on local roadways and residential streets shall be used to the extent feasible. d. Schedule truck trips outside of peak morning and evening commute hours to minimize adverse impacts on traffic flow. e. Limit lane closures during peak hours. Travel lane closures, when necessary, shall be managed such that one travel lane is kept open at all times to allow alternating traffic flow in both directions along affected two-lane roadways. In the City of Marina, one-way traffic shall be limited to a maximum of 5 minutes of traffic delay. f. Restore roads and streets to normal operation by covering trenches with steel plates outside of normal work hours or when work is not in progress. g. Comply with roadside safety protocols to reduce the risk of accidents. Provide "Road Work Ahead" warning signs and speed control (including signs informing drivers of state legislated double fines for speed infractions in a construction zone) to achieve required speed reductions for safe traffic flow through the work zone. Train construction personnel to apply appropriate safety measures as described in the plan. h. Provide flaggers in school areas at street crossings to manage traffic flow and maintain traffic safety during the school drop-off and pickup hours on days when pipeline installation would occur in designated school zones. i. Maintain access to private driveways. j. Coordinate with MST so the transit provider can temporarily relocate bus routes or bus stops in work zones as deemed necessary. ***Pedestrian and Bicyclists*** k. Perform construction that crosses on street and off street bikeways, sidewalks, and other walkways in a manner that allows for safe access for bicyclists and pedestrians. Alternatively, provide safe detours to reroute affected bicycle/pedestrian traffic. ***Recreational Trails*** l. At least two weeks prior to construction, post signage along all potentially affected recreational trails; Class I, II, and II bicycle routes; and pedestrian pathways, including the Monterey Peninsula Recreational Trail, to warn bicyclists and pedestrians of construction activities. The signs shall include information regarding the nature of construction activities, duration, and detour routes. Signage shall be composed of or encased in weatherproof material and posted in conspicuous locations, including on park message boards, and existing wayfinding signage and kiosks, for the duration of the closure period. At the end of the closure period, CalAm, MRWPCA or either of its contractors shall	Product Water Conveyance: RUWAP Pipeline and CalAm Distribution System: Alternative Monterey Pipeline	Prior to project construction	MRWPCA and CalAm construction contractor	During project construction	MRWPCA, CalAm, and local jurisdictions

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	retrieve all notice materials. *Emergency Access* m. Maintain access for emergency vehicles at all times. Coordinate with facility owners or administrators of sensitive land uses such as police and fire stations, transit stations, hospitals, and schools. n. Provide advance notification to local police, fire, and emergency service providers of the timing, location, and duration of construction activities that could affect the movement of emergency vehicles on area roadways. o. Avoid truck trips through designated school zones during the school drop-off and pickup hours.					
Impact TR-3: Construction-Related Roadway Deterioration	**Mitigation Measure TR-3**: **Roadway Rehabilitation Program.** Prior to commencing project construction, MRWPCA (for all components other than the CalAm Distribution System Improvements) and CalAm (for CalAm Distribution System Improvements) shall detail the preconstruction condition of all local construction access and haul routes proposed for substantial use by project-related construction vehicles. The construction routes surveyed must be consistent with those identified in the construction traffic control and safety assurance plan developed under Mitigation Measure TR-2. After construction is completed, the same roads shall be surveyed again to determine whether excessive wear and tear or construction damage has occurred. Roads damaged by project-related construction vehicles shall be repaired to a structural condition equal to, or greater than, that which existed prior to construction activities. In the City of Marina, the construction in the city rights-way must comply with the City's design standards, including restoration of the streets from curb to curb, as applicable. In the City of Monterey, asphalt pavement of full travel lanes will be resurfaced without seams along wheel or bike paths.	All components	Prior to project construction, after project construction	MRWPCA and CalAm construction contractors	After project construction	MRWPCA, CalAm, and local jurisdictions
Impact TR-4: Construction Parking Interference	**Mitigation Measure TR-4**: **Construction Parking Requirements**. Prior to commencing project construction, the construction contractor(s) shall coordinate with the potentially affected jurisdictions to identify designated worker parking areas that would avoid or minimize parking displacement in congested areas of Marina, Seaside, and downtown Monterey. The contractors shall provide transport between the designated parking location and the construction work areas. The construction contractor(s) shall also provide incentives for workers that carpool or take public transportation to the construction work areas. The engineering and construction design plans shall specify that contractors limit time of construction within travel lanes and public parking spaces and provide information to the public about locations of alternative spaces to reduce parking disruptions.	Product Water Conveyance: RUWAP Pipeline Alignment in Marina and Seaside and CalAm Distribution System: Alternative Monterey Pipeline	Prior to project construction	MRWPCA and CalAm construction contractor	During project construction	MRWPCA City of Marina, City of Seaside, City of Monterey

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Table 2:
RUWAP MMRP

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MITIGATION MONITORING AND REPORTING PLAN
FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)

NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.*
For those project features outside of MCWD's service areas (specifically, at the Monterey Regional Water Pollution Control Association, Regional Treatment Plant and within the Monterey Peninsula/Cal-Am Service Area) the lead agency and/or project proponent shall replace "MCWD" with their name each time it occurs prior to implementation of those project components.

RUWAP EIR Mitigation Measure with text edits to apply specifically to the RWP shown in ~~strikeout~~ for deleted text and <u>underline</u> for added text.	**Timing of Imple-mentation**	**Responsibility for Implementation**	**Verified for Compliance by:**	**X**
4.1-R1: Prior to the finalization of project specific plans, the design engineer and MCWD should ensure that the design and placement of the ~~final treatment and filtration facility and~~ pump/~~lift~~ stations will minimize impacts on the aesthetic nature of their surrounding areas, by providing screening using ~~decorative~~ fencing, vegetation, and painting new buildings and facilities in a color that will blend in with the surrounding landscape.	Prior to finalizing project design	Contractor and MCWD	MCWD	
4.3-R1: The contractors shall adhere to the following ~~requirements~~ <u>as required</u> to reduce particulate matter emissions below the MBUAPCD threshold: • water all active construction areas as required with non-potable sources to the extent feasible; frequency should be based on the type of operation, soil, and wind exposure and minimized to prevent wasteful use of water. • prohibit grading activities during periods of high wind (over 15 mph). • cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard, • pave or apply water three times daily or apply non-toxic soil stabilizers on all unpaved access roads, parking areas & staging areas at construction sites, • sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites, • sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets, • hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more), • enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.), • limit traffic speeds on unpaved roads to 15 mph, • install appropriate best management practices or other erosion control measures to prevent silt runoff to public roadways, • replant vegetation in disturbed areas as quickly as possible, • install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site, • limit the area subject to excavation, grading and other construction activity at any one time, • post a publicly visible sign which specifies the telephone number and person to contact regarding dust complaints (the person shall respond to complaints and take corrective action within 48 hours), and • ensure that the phone number of MBUAPCD is visible to ensure compliance with Rule 402 (Nuisance). (Please note that mitigation measure 4.3-R1 is consistent with mitigation measure AQ-1 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During Construction	Contractor and MCWD	MBUAPCD	
4.3-R2: Subject to approval by the MBUAPCD prior to <u>and, as needed, during project</u> <u>construction</u> ~~approval and implementation~~, MCWD <u>and the contractor</u> shall implement measures to reduce or eliminate diesel exhaust emissions to meet identified thresholds of significance, such as reduction in hours of operation of equipment contributing to such emissions or by utilizing oxidation catalysts or catalytic particulate matter filters on all diesel powered equipment above 50 horsepower that require CARB-certified low-sulfur diesel fuel (less than or equal to 15 parts per million by weight (ppmw)). Site-specific risk assessment may be required to determine the appropriate measures to implement.	Confirm with MBUAPCD prior to project construction; implement measures during	Contractor and MCWD	MBUAPCD	

4.4-R1: Conduct Pre-Construction Survey. A qualified biologist shall conduct a pre-construction survey for ~~Hickman's onion~~ <u>special-status plant species</u> to determine presence of ~~this~~ <u>these</u> species. The biologist shall prepare a report that provides the results of the survey, including a description of the baseline habitat conditions, and, if found, the number of individuals and location of the populations identified within the area of impact. If no individual are found, no further mitigation is necessary. If individuals are found, the following measures shall be implemented:
• Based on the results of the report, the design of the alternative shall avoid individuals to the maximum extent possible.
• If avoidance is not feasible, a Rare Plant Restoration Plan shall be prepared by a qualified biologist and implemented. The plan shall include, but is not limited to, the following:
  ○ a description of the baseline conditions of the habitats within the area of impact, including the presence of any special-status species, their locations, and densities;
  ○ procedures to control non-native species invasion and elimination of existing non-native species within the area of impact;
  ○ provisions for ongoing training of facility maintenance personnel to ensure compliance with the requirements of the plan;
  ○ a detailed description of on-site and off-site restoration areas, salvage of seed and/or soil bank, plant salvage, seeding and planting specifications; and
  ○ a monitoring program that describes annual monitoring efforts which incorporate success criteria and contingency plans if success criteria are not met.
	Prior to project construction (within 30 days)	Qualified Biologist and Contractor	MCWD	

4.4-R2: Conduct Pre-Construction Surveys for Burrowing Owls and Implement CDFG Guidelines. Pre-construction surveys shall be conducted to locate active nesting burrows. Surveys will consist of visually checking the area within 500 feet of the proposed storage reservoir site within 30 days of initiating construction. If active nests are found, no-disturbance buffers shall be established around all active nesting burrows during the breeding season, and the CDFG burrowing owl guidelines shall be implemented during the non-breeding season. If no burrowing owls are found, no further mitigation measures are required. Breeding season: If active nests are found, biologist shall establish a 250-foot buffer zone around each burrow. No construction activities shall be permitted within the zone until after the breeding season, which extends from February 1 to August 21, or until it is determined that the young have fledged. Winter Season: Adult burrowing owls can occupy burrows year-round. Therefore, before construction activities begin in the vicinity of active burrows (and following the breeding season), CDFG mitigation guidelines for burrowing owls (1995) shall be implemented. The guidelines require that one-way doors be installed at least 48 hours before construction at all active burrows that exist	Prior to project construction (within 30 days)	Qualified Biologist and Contractor	MCWD	

NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.*

For those project features outside of MCWD's service areas (specifically, at the Monterey Regional Water Pollution Control Association, Regional Treatment Plant and within the Monterey Peninsula/Cal-Am Service Area) the lead agency and/or project proponent shall replace "MCWD" with their name each time it occurs prior to implementation of those project components.

RUWAP EIR Mitigation Measure with text edits to apply specifically to the RWP shown in ~~strikeout~~ for deleted text and underline for added text.	**Timing of Imple-mentation**	**Responsibility for Implementation**	**Verified for Compliance by:**	**X**
within the construction area so that the burrows are not occupied during construction. The guidelines also require installation of two artificial burrows for each occupied burrow that is removed. Qualified wildlife biologists shall conduct pre-construction surveys for burrowing owls within 30 days of initiating construction activities. The one-way doors shall be installed at that time to ensure that the owls can get out of the burrows and not back in. Artificial burrows shall be constructed within the area prior to installation of the one-way doors. (Please note that mitigation measure 4.4-R2 is consistent with mitigation measure BT-1l from Final Pure Water Monterey Groundwater Replenishment Project MMRP).				

MITIGATION MONITORING AND REPORTING PLAN FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)				
NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.* *For those project features outside of MCWD's service areas (specifically, at the Monterey Regional Water Pollution Control Association, Regional Treatment Plant and within the Monterey Peninsula/Cal-Am Service Area) the lead agency and/or project proponent shall replace "MCWD" with their name each time it occurs prior to implementation of those project components.*				
RUWAP EIR Mitigation Measure with text edits to apply specifically to the RWP shown in ~~strikeout~~ for deleted text and <u>underline</u> for added text.	**Timing of Imple-mentation**	**Responsibility for Implementation**	**Verified for Compliance by:**	**X**
4.4-R3: A Memorandum of Understanding (MOU) with CDFG shall be obtained to allow a qualified biologist to remove and relocate coast horned lizards from the construction area if encountered during construction activities. The MOU shall include, but is not limited to, the methods of capture and handling, an estimation of the number expected to be captured and handled, the duration of capture and handling, and a description of the established relocation area. If the relocation is proposed to occur outside of the project site, MCWD must coordinate and obtain approval from the landowner. Details of this procedure shall be reviewed by CDFG and implemented by a qualified biologist.	Prior to construction	Qualified Biologist and MCWD	CDFG	
4.4-R4: Conduct Construction Monitoring Program for coast horned lizards, which includes procedures for capture and release. A qualified biologist shall remain on-site during initial grading activities to salvage and move coast horned lizards that may be uncovered during earthmoving activities. Recovered individuals shall be placed in appropriate habitat outside of the within the project site in accordance with the MOU with CDFG. The monitor shall walk alongside the grading equipment in each new area of disturbance, and shall have the authority to halt construction temporarily if necessary to capture and relocate an individual. Any individual captured in the grading zone shall be relocated as soon as possible to adjacent suitable habitat outside of the area of impact.	During Construction	Qualified Biologist and Contractor	MCWD	
BT-1j: Conduct Pre-Construction Surveys for American Badger[1]. To avoid and reduce impacts to the American badger, the project proponents shall retain a qualified biologist to conduct focused pre-construction surveys for badger dens in all suitable habitat proposed for construction, ground disturbance, or staging no more than two weeks prior to construction. If no potential badger dens are present, no further mitigation is required. If potential dens are observed, the following measures are required to avoid potential significant impacts to the American badger: • If the qualified biologist determines that potential dens are inactive, the biologist shall excavate these dens by hand with a shovel to prevent badgers from reusing them during construction. • If the qualified biologist determines that potential dens may be active, the den shall be monitored for a period sufficient (as determined by a qualified biologist) to determine if the den is a maternity den occupied by a female and her young, or if the den is occupied by a solitary badger. • Maternity dens occupied by a female and her young shall be avoided during construction and a minimum buffer of 200 feet in which no construction activities shall occur shall be maintained around the den. After the qualified biologist determines that badgers have stopped using active dens within the project boundary, the dens shall be hand-excavated with a shovel to prevent re-use during construction. Solitary male or female badgers shall be passively relocated by blocking the entrances of the dens with soil, sticks, and debris for three to five days to discourage the use of these dens prior to project construction disturbance. The den entrances shall be blocked to an incrementally greater degree over the three to five day period. After the qualified biologist determines that badgers have stopped using active dens within the project boundary, the dens shall be hand-excavated with a shovel to prevent re-use during construction.	Prior to project construction	MCWD construction contractors and qualified biologists	MCWD qualified biologist	
BT-1k: Conduct Pre-Construction Surveys for Protected Avian Species, including, but not limited to, white-tailed kite and California horned lark. Prior to the start of construction activities, a qualified biologist shall conduct pre-construction surveys for suitable nesting habitat within the Project Study Area and within a suitable buffer area from the Project Study Area. The qualified biologist shall determine the suitable buffer area based on the avian species with the potential to nest at the site. In areas where nesting habitat is present within the project area or within the determined suitable buffer area, construction activities that may directly (e.g., vegetation removal) or indirectly (e.g., noise/ground disturbance) affect protected nesting avian species shall be timed to avoid the breeding and nesting season. Specifically, vegetation and/or tree removal can be scheduled after September 16 and before January 31. Alternatively, a qualified biologist shall be retained by the project proponents to conduct pre-construction surveys for nesting raptors and other protected avian species where nesting habitat was identified and within the suitable buffer area if construction commences between February 1 and September 15. Pre-construction surveys shall be conducted no more than 14 days prior to the start of construction activities during the early part of the breeding season (February through April) and no more than 30 days prior to the initiation of these activities during the late part of the breeding season (May through August). Because some bird species nest early in spring and others nest later in summer, surveys for nesting birds may be required to continue during construction to address new arrivals, and because some species breed multiple times in a season. The necessity and timing of these continued surveys shall be determined by the qualified biologist based on review of the final construction plans. If active raptor or other protected avian species nests are identified during the preconstruction surveys, the qualified biologist shall notify the project proponents and an appropriate no-disturbance buffer shall be imposed within which no construction activities or disturbance shall take place until the young have fledged and are no longer reliant upon the nest or parental care for survival, as determined by a qualified biologist. (Please note that mitigation measure BT-1k was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP. BT-1k is consistent with mitigation measure 4.4-R5 previously identified in this RWP MMRP and is more inclusive therefore has been added in place of 4.4-R5 to ensure compliance.).	Prior to Construction if it occurs between Aug. 1 & Apr. 14	Qualified Biologist and MCWD	MCWD	
4.4-R6: Conduct Pre-Construction Surveys for Coast Horned Larks and Loggerhead Shrike. A qualified biologist shall perform pre-construction surveys for active nests of these two species prior to construction (within 30 days of construction initiation). If active nests are found, a suitable construction buffer shall be established by a qualified biologist until the young of the year have fledged. Alternatively, construction activities that may affect nesting raptors can be timed to avoid the nesting season (generally the nesting season is April 15 to August 1).	Prior to Construction if it occurs between Aug. 1 & Apr. 14	Qualified Biologist and MCWD	MCWD	
4.4-R7: A Revegetation Plan shall be prepared by a qualified biologist to revegetate and restore impacted habitat. This plan shall include a list of appropriate species, planting specifications,	Prior to	Qualified	MCWD	

[1] Mitigation Measure BT-1j was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

MITIGATION MONITORING AND REPORTING PLAN
FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)

NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.*
For those project features outside of MCWD's service areas (specifically, at the Monterey Regional Water Pollution Control Association, Regional Treatment Plant and within the Monterey Peninsula/Cal-Am Service Area) the lead agency and/or project proponent shall replace "MCWD" with their name each time it occurs prior to implementation of those project components.

RUWAP EIR Mitigation Measure with text edits to apply specifically to the RWP shown in ~~strikeout~~ for deleted text and underline for added text.	**Timing of Imple-mentation**	**Responsibility for Implementation**	**Verified for Compliance by:**	**X**
monitoring procedures, success criteria, and contingency plan if success criteria are not met.	construction	Biologist and Contractor		
4.4-R8: Conduct an Employee Education Program for Construction Crew and MCWD staff prior to construction activities. A qualified biologist (if necessary, the biological monitor) shall meet with the construction crew at the onset of construction to educate the construction crew on the following: 1) the appropriate access route in and out of the construction area; 2) how biological monitor will examine the area and agree upon a method which will ensure the safety of the monitor during such activities, 3) the special-status species that may be present; 4) the specific mitigation measures that will be incorporated into the construction effort; 5) the general provisions and protections afforded by the USFWS and CDFW; and 6) the proper procedures if a special-status animal or any other animal is encountered within the project site. ~~Refer to Mitigation Measure 4.4 D8 above.~~ (Please note that mitigation measure 4.4-R8 is consistent with mitigation measure BT-1s #1 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	Prior to construction	Qualified Biologist and Contractor	MCWD	
4.4-R9: Trees and vegetation not planned for removal shall be protected during construction to the maximum extent possible. This includes the use of exclusionary fencing of herbaceous and shrubby vegetation, such as hay bales, and protective wood barriers for trees. Only certified weed-free straw shall be used to avoid the introduction of non-native, invasive species. A biological monitor shall supervise the installation of protective fencing and monitor at least once per week until construction is complete to ensure that the protective fencing remains intact. (Please note that mitigation measure 4.4-R9 is consistent with mitigation measure BT-1s #2 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	Prior, during, and post construction	Contractor	MCWD	
4.4-R10: Following construction, disturbed areas shall be restored to pre-project contours to the maximum extent possible and revegetated using locally-occurring native species and native erosion control seed mix, per the requirements of the Revegetation Plan. (Please note that mitigation measure 4.4-R10 is consistent with mitigation measure BT-1s #4 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	Following construction	Contractor	MCWD	
4.4-R11: Protective fencing shall be placed prior to and during construction so as to keep construction vehicles and personnel from impacting vegetation adjacent to the project site outside of work limits. A biological monitor shall supervise the installation of protective fencing and monitor at least once per week until construction is complete to ensure that the protective fencing remains intact. (Please note that mitigation measure 4.4-R11 is consistent with mitigation measure BT-1s #3 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	Prior, during, and post construction	Contractor	MCWD	
4.4-R12: Grading, excavating, and other activities that involve substantial soil disturbance shall be planned and carried out in consultation with a qualified hydrologist, engineer, or erosion control specialist, and shall utilize standard erosion control techniques to minimize erosion and sedimentation to native vegetation. (Please note that mitigation measure 4.4-R12 is consistent with mitigation measure BT-1a #5 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	Prior, during, and post construction	Contractor & qualified hydrolo-gist/engineer	MCWD	
4.4-R13: A representative shall be appointed by MCWD who will be the contact source for any employee or contractor who may inadvertently kill or injure a special-status species or find one dead, injured, or trapped. The representative shall be notified immediately to notify USFWS and CDFG. The representative shall be identified during the Employee Education Program and his/her contact information shall be provided to USFWS and CDFG.	Prior to construction	Appointed Representative and Contractor	MCWD	
4.4-R14: If maintenance activities require ground disturbance, the impacts shall be subject to the requirements of the Revegetation Plan described in Mitigation Measure 4.4-R7.	Ongoing if maintenance requires ground disturbance	MCWD	MCWD	
4.4-R15: Conduct an Employee Education Program for Maintenance ~~Construction~~ Crew and other MCWD staff prior to project implementation ~~construction activities~~. A biological monitor shall meet with the maintenance crew at the onset of project operations to educate the crew on the following: 1) the appropriate access route in and out of the facility area; 2) how biological monitor will examine the area and agree upon a method which will ensure the safety of the monitor during such activities, 3) the special-status species that may be present; 4) the specific mitigation measures that will apply to maintenance activities; 5) the general provisions and protections afforded by the USFWS and CDFW; and 6) the proper procedures if a special-status animal or any other animal is encountered within the project site. ~~Refer to Mitigation Measure 4.4 D8 above.~~ (Please note that mitigation measure 4.4-R8 is consistent with mitigation measure BT-1a #1 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	Prior to construction	Qualified Biologist and MCWD	MCWD	
BT-1a: Implement Construction Best Management Practices[2]. The following best management practices shall be implemented during all identified phases of construction (i.e., pre-, during, and post-) to reduce impacts to special-status plant and wildlife species: 1. No firearms shall be allowed on the construction sites at any time. 2. To protect against spills and fluids leaking from equipment, the project proponent shall require that the construction contractor maintains an on-site spill plan and on-site spill containment measures that can be easily accessed. 3. Refueling or maintaining vehicles and equipment should only occur within a specified staging area that is at least 100 feet from a waterbody (including riparian and wetland habitat) and that has sufficient management measures that will prevent fluids or other construction materials including water from being transported into waters of the state. Measures shall include confined concrete washout areas, straw wattles placed around stockpiled materials and plastic sheets to cover materials from becoming airborne or otherwise transported due to wind or rain into surface waters.	Prior to, during and after project construction	MCWD construction contractors and qualified biologist	MCWD qualified biologist and construction biological monitor;	

[2] Mitigation Measure BT-1a was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The other components of BT-1a as identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP, are identified within this MMRP. The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

MITIGATION MONITORING AND REPORTING PLAN FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)

NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.*

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BT-1b: Implement Construction-Phase Monitoring[3]. The project proponents shall retain a qualified biologist to monitor all ground disturbing construction activities (i.e., vegetation removal, grading, excavation, or similar activities) to protect any special-status species encountered. Any handling and relocation protocols of special-status wildlife species shall be determined in coordination with CDFW prior to any ground disturbing activities, and conducted by a qualified biologist with appropriate scientific collection permit. After ground disturbing project activities are complete, the qualified biologist shall train an individual from the construction crew to act as the on-site construction biological monitor. The construction biological monitor shall be the contact for any special-status wildlife species encounters, shall conduct daily inspections of equipment and materials stored on site and any holes or trenches prior to the commencement of work, and shall ensure that all installed fencing stays in place throughout the construction period. The qualified biologist shall then conduct regular scheduled and unscheduled visits to ensure the construction biological monitor is satisfactorily implementing all appropriate mitigation protocols. Both the qualified biologist and the construction biological monitor shall have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The qualified biologist and the construction monitor shall complete a daily log summarizing activities and environmental compliance throughout the duration of the project. The log shall also include any special-status wildlife species observed and relocated.	Prior to and during project construction	MCWD, qualified biologists	MCWD qualified biologist and construction biological monitor; CDFW	
BT-1c: Implement Non-Native, Invasive Species Controls[4]. The following measures shall be implemented to reduce the introduction and spread of non-native, invasive species: 1. Any landscaping or replanting required for the project shall not use species listed as noxious by the California Department of Food and Agriculture (CDFA). 2. Bare and disturbed soil shall be landscaped with CDFA recommended seed mix or plantings from locally adopted species to preclude the invasion on noxious weeds in the Project Study Area. 3. Construction equipment shall be cleaned of mud or other debris that may contain invasive plants and/or seeds and inspected to reduce the potential of spreading noxious weeds, before mobilizing to arrive at the construction site and before leaving the construction site. 4. All non-native, invasive plant species shall be removed from disturbed areas prior to replanting.	During project construction	Construction contactors	MCWD qualified biologist and construction biological monitor	
BT-1d: Conduct Pre-Construction Surveys for California Legless Lizard[5]. The project proponents shall retain a qualified biologist to prepare and implement a legless lizard management plan in coordination with CDFW, which shall include, but is not limited to, the protocols for pre-construction surveys, construction monitoring, and salvage and relocation. The management plan shall include, but is not limited to, the following: • Pre-Construction Surveys. Pre-construction surveys for legless lizards shall be conducted in all suitable habitat proposed for construction, ground disturbance, or staging. The qualified biologist shall hold or obtain a CDFW scientific collection permit for this species. The pre-construction surveys shall use a method called "high-grading." The high grading method shall include surveying the habitat where legless lizards are most likely to be found, and the survey must occur under the conditions when legless lizards are most likely to be seen and captured (early morning, high soil moisture, overcast, etc.). The intensity of a continued search may then be adjusted, based on the results of the first survey in the best habitat. A "three pass method" shall be used to locate and remove as many legless lizards as possible. A first pass shall locate as many legless lizards as possible, a second pass should locate fewer lizards than the first pass, and a third pass should locate fewer lizards than the second pass. All search passes shall be conducted in the early morning when legless lizards are easiest to capture. Vegetation may be removed by hand to facilitate hand raking and search efforts for legless lizards in the soil under brush. If lizards are found during the first pass, an overnight period of no soil disturbance must occur before the second pass, and the same requirement shall be implemented after the second pass. If no lizards are found during the second pass, a third pass is not required. Installation of a barrier, in accordance with the three pass method, shall be required if legless lizards are found at the limits of construction (project boundaries) and sufficient soft sand and vegetative cover are present to suspect additional lizards are in the immediate vicinity on the adjacent property. A barrier shall prevent movement of legless lizards into the property. All lizards discovered shall be handled according to the salvage procedures outlined below. • Construction Monitoring. Monitoring by a qualified biologist shall be ongoing during construction. The onsite monitor shall be present during all ground disturbing construction activities. To facilitate the careful search for lizards during construction, vegetation may need to be removed. If removal by hand is impractical, equipment such as a chainsaw, string trimmer, or skid-steer may be used, if a monitor and crew are present. The task of the vegetation removal is to remove plants under the direction of the monitor, allowing the monitor to watch for legless lizards. After plants are removed, the monitor and crew shall search the exposed area for legless lizards. If legless lizards are found during preconstruction surveys or construction monitoring, the protocols for salvage and relocation identified below shall be followed. Upon completion of pre-construction surveys, construction monitoring, and any resulting salvage and relocation actions, a report shall be submitted to the CDFW. The CDFW must be notified at least 48 hours before any field activity begins. • Salvage and Relocation. Only experienced persons may capture or handle legless lizards. The monitor must demonstrate a basic understanding, knowledge, skill, and experience with this species and its habitat. Once captured, a lizard shall be placed in a lidded, vented box containing clean sand. Areas of moist and dry sand need to be present in the box. The boxes must be kept out of direct sunlight and protected from temperatures over 72°F. The sand must be kept at temperatures under 66°F. Ideal temperatures are closer to 60°F. On the same day as capture, the lizards shall be examined for injury and data recorded on location where found as well as length, color, age, and tail condition. Once data is recorded, lizards shall be relocated to appropriate habitat, as determined through coordination with the CDFW, qualified biologist, and potential landowners.	Prior to and during project construction	MCWD qualified biologist	MCWD, qualified biologist	

[3] Mitigation Measure BT-1b was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

[4] Mitigation Measure BT-1c was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

[5] Mitigation Measure BT-1d was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

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Suitability of habitat for lizard release must be evaluated and presented in a management plan. The habitat must contain habitat factors most important to the health and survival of the species such as appropriate habitat based on soils, vegetated cover, native plant species providing cover, plant litter layer and depth, soil and ambient temperature, quality and composition of invertebrate population and prey availability. Potential relocation sites that contain the necessary conditions may exist within the habitat reserves on the former Fort Ord, including the Fort Ord National Monument. Lizards shall be marked with a unique tag (pit or tattoo) prior to release. Release for every lizard shall be recorded with GPS. GPS locations shall be submitted as part of the survey result report to document the number and locations of lizards relocated.				
BT-1e: Prepare and Implement Rare Plant Restoration Plan to Mitigate Impacts to Sandmat Manzanita, Monterey Ceanothus, Monterey Spineflower, Eastwood's Goldenbush, Coast Wallflower, and Kellogg's Horkelia[6]. Impacts to rare plant species individuals shall be avoided through project design and modification, to the extent feasible while taking into consideration other site and engineering constraints. If avoidance is not possible, the species shall be replaced at a 1:1 ratio for area of impact through preservation, restoration, or combination of both. A Rare Plant Restoration Plan, approved by the lead agency prior to commencing construction on the project site, shall be prepared and implemented by a qualified biologist. The plan shall include, but is not limited to, the following: a. A detailed description of on-site and/or off-site mitigation areas, salvage of seed and/or soil bank, plant salvage, seeding and planting specifications, including, if appropriate, increased planting ratio to ensure the applicable success ratio. Specifically, seed shall be collected from the on-site individuals that would be impacted and grown in a local greenhouse, and then transplanted within the mitigation area. Plants shall be transplanted while they are young seedlings in order to develop a good root system. Alternatively, the mitigation area may be broadcast seeded in fall; however, if this method is used, some seed shall be retained in the event that the seeding fails to produce viable plants and contingency measures need to be employed. b. A description of a 3-year monitoring program, including specific methods of vegetation monitoring, data collection and analysis, restoration goals and objectives, success criteria, adaptive management if the criteria are not met, reporting protocols, and a funding mechanism. The mitigation area shall be preserved in perpetuity through a conservation easement or other legally enforceable land preservation agreement. Exclusionary fencing shall be installed around the mitigation area to prevent disturbance until success criteria have been met.	Prior to project construction	Project engineers, project biologist, MCWD	MCWD qualified biologist	
BT-1g: Conduct Pre-Construction Surveys for Special-Status Bats[7]. To avoid and reduce impacts to special-status bat species, the project proponents shall retain a qualified bat specialist or wildlife biologist to conduct site surveys during the reproductive season (May 1 through September 15) to characterize bat utilization of the site and potential species present (techniques utilized to be determined by the biologist) prior to tree or building removal. Based on the results of these initial surveys, one or more of the following shall occur: • If it is determined that bats are not present at the site, no additional mitigation is required. • If it is determined that bats are utilizing the site and may be impacted by the Project, pre-construction surveys shall be conducted no more than 30 days prior to any tree or building removal (or any other suitable roosting habitat) within 100 feet of construction limits. If, according to the bat specialist, no bats or bat signs are observed in the course of the pre-construction surveys, tree and building removal may proceed. If bats and/or bat signs are observed during the pre-construction surveys, the biologist shall determine if disturbance would jeopardize a maternity roost or another type of roost (i.e., foraging, day, or night). • If a single bat and/or only adult bats are roosting, removal of trees, buildings, or other suitable habitat may proceed after the bats have been safely excluded from the roost. Exclusion techniques shall be determined by the biologist and would depend on the roost type. If an active maternity roost is detected, avoidance is preferred. Work in the vicinity of the roost (buffer to be determined by biologist) shall be postponed until the biologist monitoring the roost determines that the young have fledged and are no longer dependent on the roost. The monitor shall ensure that all bats have left the area of disturbance prior to initiation of pruning and/or removal of trees that would disturb the roost. If avoidance is not possible and a maternity roost must be disrupted, authorization from CDFW shall be required prior to removal of the roost.	Prior to project construction	MCWD qualified biologist (bat/wildlife specialist)	MCWD and qualified biologist	
BT-1h: Implementation of Mitigation Measures BT-1a and BT-1b to Mitigate Impacts to the Monterey Ornate Shrew, Coast Horned Lizard, Coast Range Newt, Two-Striped Garter Snake, and Salinas Harvest Mouse[8]. If these species are encountered, implementation of Mitigation Measures BT-1a and BT- 1b, which avoid and minimize impacts through implementing construction best management practices and monitoring, would reduce potential impacts to these species to a less-than-significant level.	Prior to and during project construction	MCWD contractors and qualified biologists	MCWD qualified biologist	
BT-1i: Conduct Pre-Construction Surveys for Monterey Dusky- Footed Woodrat[9]. To avoid and reduce impacts to the Monterey dusky-footed woodrat, the project proponents shall retain a qualified biologist to conduct pre-construction surveys in suitable habitat proposed for construction, ground disturbance, or staging within three days prior to construction for woodrat nests within the	Prior to project construction	MCWD contractors and	MCWD	

[6] Mitigation Measure BT-1e was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.
[7] Mitigation Measure BT-1g was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.
[8] Mitigation Measure BT-1h was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

MITIGATION MONITORING AND REPORTING PLAN
FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)

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RUWAP EIR Mitigation Measure with text edits to apply specifically to the RWP shown in ~~strikeout~~ for deleted text and underline for added text.	**Timing of Imple-mentation**	**Responsibility for Implementation**	**Verified for Compliance by:**	**X**
project area and in a buffer zone 100 feet out from the limit of disturbance. All woodrat nests shall be flagged for avoidance of direct construction impacts and protection during construction, where feasible. Nests that cannot be avoided shall be manually deconstructed prior to land clearing activities to allow animals to escape harm. If a litter of young is found or suspected, nest material shall be replaced, and the nest left alone for 2-3 weeks before a re-check to verify that young are capable of independent survival before proceeding with nest dismantling.		qualified biologists		
4.4-R18: A Memorandum of Understanding (MOU) with CDFG shall be obtained for a qualified biologist to remove and relocate black legless lizards~~, coast horned lizards, and globose dune beetles~~ from the construction area if encountered during construction activities. The MOU shall include, but is not limited to, the methods of capture and an estimation of the number of individuals expected to be captured and handled, the duration of capture and handling, and a description of the established relocation area. If the relocation is proposed to occur outside of the project site, MCWD must coordinate and obtain approval from the landowner. Details of this procedure shall be reviewed by CDFG and implemented by a qualified biologist.	Prior to construction	Qualified Biologist and MCWD	CDFG	
4.4-R19: Conduct Construction Monitoring Program for Black Legless Lizards, which includes procedures for capture and release. A qualified biologist shall remain on-site during initial grading activities to salvage and move lizards that may be uncovered during earthmoving activities. Recovered individuals shall be placed in appropriate habitat outside of the within the project site in accordance with the MOU with CDFG. The monitor shall walk alongside the grading equipment in each new area of disturbance, and shall have the authority to halt construction temporarily if necessary to capture and relocate an individual. Any individual captured in the grading zone shall be relocated as soon as possible to adjacent suitable habitat outside of the area of impact.	During Construction	Qualified Biologist and Contractor	MCWD	
4.4-R22: All food-related and other trash shall be disposed of in closed containers and removed from the project area at least once a week during the construction period, or more often if trash is attracting avian or mammalian predators. Construction personnel shall not feed or otherwise attract wildlife to the area. (Please note that mitigation measure 4.4-R22 is consistent with mitigation measure BT-1a #7 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During construction	Contractor	MCWD	
BT-4. **HMP Plant Species Salvage[10].** For impacts to the HMP plant species within the Project Study Area that do not require take authorization from USFWS or CDFW, salvage efforts for these species shall be evaluated by a qualified biologist per the requirements of the HMP and BO. A salvage plan shall be prepared and implemented by a qualified biologist, which shall would include, but is not limited to: a description and evaluation of salvage opportunities and constraints; a description of the appropriate methods and protocols of salvage and relocation efforts; identification of relocation and restoration areas; and identification of qualified biologists approved to perform the salvage efforts, including the identification of any required collection permits from USFWS and/or CDFW. Where proposed, seed collection shall occur from plants within the Project Study Area and topsoil shall be salvaged within occupied areas to be disturbed. Seeds shall be collected during the appropriate time of year for each species by qualified biologists. At the time of seed collection, a map shall also be prepared that identifies the specific locations of the plants for any future topsoil preservation efforts. The collected seeds shall be used to revegetate temporarily disturbed construction areas and reseeding and restoration efforts on- or off-site, as determined appropriate in the salvage plan.	Prior to, during, and after construction	MCWD Biologist	MCWD qualified biologist	
4.6-R1 See Note 1				
4.6-R2: If buried human remains are encountered during construction, work within 50 meters (±160 feet) of the find must halt and the archaeologist and the coroner immediately notified. If the find is determined to be significant, appropriate mitigation measures shall be formulated and implemented. If the remains are determined to be Native American, then the NAHC must be notified within 24 hours as required by Public Resources Code 5097. The NAHC will notify designated Most Likely Descendants who will provide recommendations for the treatment of the remains within 24 hours. The NAHC will mediate any disputes regarding treatment of remains. (Please note that mitigation measure 4.6-R2 is consistent with mitigation measure BT-1s #1 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During construction	Qualified Archaeologist and MCWD	MCWD	
CR-2c: **Native American Notification[11].** Because of their continuing interest in potential discoveries during construction, all listed Native American Contacts shall be notified of any and all discoveries of archaeological resources in the project area.	During project construction	MCWD and qualified archaeologist	MCWD and qualified archaeologis t	
4.6-R3: MCWD shall comply with the policies and programs for the Cities of Marina, Seaside, and Monterey, and Monterey County relating to protecting resources and identifying additional archaeological sites that may be affected by project implementation.	All phases of project	Qualified Archae-ologist & MCWD	MCWD	
4.6-R4: Unsurveyed areas within the areas proposed for ground disturbance or other construction activities shall be inventoried for the presence of cultural resources. This would include surface examination of the project site. Cultural resources, if found, shall be recorded on State Forms DPR 523 depending on the type of resource. After field studies are completed, an Archaeological Survey Report will be prepared, as appropriate, for documenting the type(s) of resources encountered.	Prior to and during construction	Qualified Archaeologist and MCWD	MCWD	
4.6-R5: If cultural resources cannot be avoided, they shall be evaluated for CEQA significance. The purpose of which would be to define a course of action to satisfy CEQA requirements for an Assessment of Effects. If cultural resources are considered significant resources per CEQA, then a data recovery program shall be implemented to reduce impacts to less-than-significant levels as required by CEQA Guidelines.	All phases of project	Qualified Archaeologist and MCWD	MCWD	

[9] Mitigation Measure BT-1i was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.
[10] Mitigation Measure BT-4 was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.
[11] Mitigation Measure CR-2c was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

MITIGATION MONITORING AND REPORTING PLAN
FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)

NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.*

For those project features outside of MCWD's service areas (specifically, at the Monterey Regional Water Pollution Control Association, Regional Treatment Plant and within the Monterey Peninsula/Cal-Am Service Area) the lead agency and/or project proponent shall replace "MCWD" with their name each time it occurs prior to implementation of those project components.

RUWAP EIR Mitigation Measure with text edits to apply specifically to the RWP shown in ~~strikeout~~ for deleted text and <u>underline</u> for added text.	**Timing of Imple-mentation**	**Responsibility for Implementation**	**Verified for Compliance by:**	**X**
4.6-R6: To insure that no inadvertent damage occurs to cultural resources, the resource boundaries should be marked as exclusion zones both on the ground and on construction maps. Construction supervisory personnel should be notified of the existence of these resources and required to keep personnel and equipment away from these areas. Periodic monitoring of cultural resources to be avoided should be completed by MCWD to insure that no inadvertent damage to the resources occurs as a result of construction or construction-related activities.	Prior to construction	Qualified Archaeologist and MCWD	MCWD	
4.6-R7: Prior to the initiation of construction or ground-disturbing activities adjacent to cultural resources, all construction personnel should be alerted to the possibility of buried cultural remains. Personnel should be instructed that upon discovery of cultural materials, no collection is to be undertaken and work in the immediate area of the find should be halted and MCWD be notified. During construction and operation, personnel and equipment will be restricted to the corridor surveyed for archaeological resources.	All phases of project	Qualified Archaeologist and MCWD	MCWD	
4.6-R8: Unsurveyed areas within proposed areas of ground disturbance or other construction activities shall be inventoried for the presence of historical resources. This would include surface examination of the project site. Historical resources, if found, shall be recorded on State Forms DPR 523 depending on the type of resource. The proposed alternative shall comply with the Office of Historic Preservation's instructions for recording historical resources. Refer to http://www.ohp.parks.ca.gov/ for more information.	All phases of project	Qualified Archaeologist and MCWD		
4.6-R9: If historical resources cannot be avoided, they shall be evaluated for CEQA significance and eligibility for the CRHP. The purpose of which would be to define a course of action to satisfy CEQA requirements for an Assessment of Effects. Historical resource mitigation measures may include further study to evaluate the sites, detailed recording, and/or excavation. If the historical resources per CEQA are significant or eligible for the CRHP, then a data recovery program shall be implemented to reduce impacts to less-than-significant levels as required by CEQA Guidelines.	When resources are encountered	Qualified Archaeologist and MCWD		
4.6-R10: Prior to the initiation of construction or ground-disturbing activities adjacent to cultural resources, all construction personnel should be alerted to the possibility of buried cultural remains. This would include prehistoric and/or historic resources. Personnel should be instructed that upon discovery of prehistoric and/or historic resources, no collection is to be undertaken and work in the immediate area of the find should be halted and MCWD be notified.	Prior to construction	Qualified Archaeologist and MCWD	MCWD	
EN-1: **Construction Equipment Efficiency Plan[12].** MCWD shall contract a qualified professional (i.e., construction planner/energy efficiency expert) to prepare a Construction Equipment Efficiency Plan that identifies the specific measures that MCWD (and its construction contractors) will implement as part of project construction to increase the efficient use of construction equipment. Such measures shall include, but not necessarily be limited to: procedures to ensure that all construction equipment is properly tuned and maintained at all times; a commitment to utilize existing electricity sources where feasible rather than portable diesel-powered generators; consistent compliance with idling restrictions of the state; and identification of procedures (including the use of routing plans for haul trips) that will be followed to ensure that all materials and debris hauling is conducted in a fuel-efficient manner.	Prior to project construction	MCWD energy efficiency expert, construction contractors	MCWD	
4.7-R1: To minimize the potential effects from strong seismic ground shaking on the project, a project specific geotechnical analysis shall be performed by a registered professional engineer with geotechnical expertise prior to the development of project level plans. <u>The recommendations of the geotechnical analysis shall be incorporated into project plans and implemented during construction, as appropriate.</u>	Prior to final design	Registered geotechnical engineer	MCWD	
4.7-R2: The engineer shall develop project level plans based upon and in response to the observations and recommendations made in the project specific geotechnical analysis.	Prior to final design and after geotech	Design engineer and MCWD		
4.7-R3: <u>MCWD,</u> the contractor and engineer <u>(as appropriate)</u> shall develop emergency response procedures in order to control and stop the release of recycled water in the event that seismic ground shaking causes a leak or rupture in the <u>earthen or tank</u> reservoir<u>s</u> or pipelines.	Prior to project completion	MCWD, engineer, contractor, as appropriate	MCWD	
HH-2a: **Environmental Site Assessment[13].** If required by local jurisdictions and property owners with approval responsibility for construction , MCWD shall conduct a Phase I Environmental Site Assessment in conformance with ASTM Standard 1527-05 to identify potential locations where hazardous material contamination may be encountered. If an Environmental Site Assessment indicates that a release of hazardous materials could have affected soil or groundwater quality at a project site, a Phase II environmental site assessment shall be conducted to determine the extent of contamination and to prescribe an appropriate course of remediation, including but not limited to removal of contaminated soils, in conformance with state and local guidelines and regulations. If the results of the subsurface investigation(s) indicate the presence of hazardous materials, additional site remediation may be required by the applicable state or local regulatory agencies, and the contractors shall be required to comply with all regulatory requirements for facility design or site remediation.	Prior to project construction (if presence of hazardous materials is identified, site remediation or design changes may be	MCWD project engineers, construction contractors	MCWD	

[12] Mitigation Measure EN-1 was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

[13] Mitigation Measure HH-2a was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

MITIGATION MONITORING AND REPORTING PLAN
FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)

NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.*
For those project features outside of MCWD's service areas (specifically, at the Monterey Regional Water Pollution Control Association, Regional Treatment Plant and within the Monterey Peninsula/Cal-Am Service Area) the lead agency and/or project proponent shall replace "MCWD" with their name each time it occurs prior to implementation of those project components.

RUWAP EIR Mitigation Measure with text edits to apply specifically to the RWP shown in ~~strikeout~~ for deleted text and underline for added text.	**Timing of Imple-mentation**	**Responsibility for Implementation**	**Verified for Compliance by:**	**X**
	required)			
HH-2b: **Health and Safety Plan[14].** The construction contractor(s) shall prepare and implement a project-specific Health and Safety Plan (HSP) for each site on which construction may occur, in accordance with 29 CFR 1910 to protect construction workers and the public during all excavation, grading, and construction. The HSP shall include the following, at a minimum: • A summary of all potential risks to construction workers and the maximum exposure limits for all known and reasonably foreseeable site chemicals (the HSP shall incorporate and consider the information in all available existing Environmental Site Assessments and remediation reports for properties within ¼-mile using the EnviroStor Database); • Specified personal protective equipment and decontamination procedures, if needed; • Emergency procedures, including route to the nearest hospital; Procedures to be followed in the event that evidence of potential soil or groundwater contamination (such as soil staining, noxious odors, debris or buried storage containers) is encountered. These procedures shall be in accordance with hazardous waste operations regulations and specifically include, but are not limited to, the following: immediately stopping work in the vicinity of the unknown hazardous materials release, notifying Monterey County Department of Environmental Health, and retaining a qualified environmental firm to perform sampling and remediation; and The identification and responsibilities of a site health and safety supervisor.	Prior to project construction	Construction contactors	MCWD Monterey County Dept. of Environmental Health	
HH-2c: **Materials and Dewatering Disposal Plan[15].** MCWD and/or their contractors shall develop a materials disposal plan specifying how the contractor will remove, handle, transport, and dispose of all excavated material in a safe, appropriate, and lawful manner. The plan must identify the disposal method for soil and the approved disposal site, and include written documentation that the disposal site will accept the waste. The contractor shall develop a groundwater dewatering control and disposal plan specifying how the contractor will remove, handle, and dispose of groundwater impacted by hazardous substances in a safe, appropriate, and lawful manner. The plan must identify the locations at which potential contaminated groundwater dewatering are likely to be encountered (if any), the method to analyze groundwater for hazardous materials, and the appropriate treatment and/or disposal methods. If the dewatering effluent contains contaminants that exceed the requirements of the General WDRs for Discharges with a Low Threat to Water Quality (Order No. R3-2011-0223, NPDES Permit No. CAG993001), the construction contractor shall contain the dewatering effluent in a portable holding tank for appropriate offsite disposal or discharge. The contractor can either dispose of the contaminated effluent at a permitted waste management facility or discharge the effluent, under permit, to the Regional Treatment Plant.	Prior to and during project construction	Contractor and MCWD	MCWD	

[14] Mitigation Measure HH-2b was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

[15] Mitigation Measure HH-2c was identified in the Final Pure Water Monterey Groundwater Replenishment Project MMRP as mitigation necessary for the construction and project implementation of the RWP and therefore has been added to this MMRP to ensure compliance , The Pure Water Monterey Groundwater Replenishment Project Final EIR and MMRP approved and certified by Monterey Regional Water Pollution Control Agency (MRWPCA) on October 8, 2015.

MITIGATION MONITORING AND REPORTING PLAN
FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)

NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.*
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4.8-R1: The MCWD shall require review of construction plans for the pipeline by the Fort Ord BRAC office to confirm that construction is planned in ~~cleared~~ areas cleared of Military Munitions (MM) before construction is initiated. An Army-approved MM monitor shall be present during grading in areas where excavation exceeds two feet and any MM encountered shall be properly managed. Access shall be restricted to adjacent areas by means of temporary fencing and signage.	Prior and during to construction	MCWD and Contractors	MCWD	
4.8-R2: For areas recommended or required by Army's BRAC Fort Ord (see EPA Superfund Record of Decision; EPA ID CA7210020676, dated 4/6/05), the MCWD shall require that all pipeline construction workers receive an Army ~~OE~~ MM safety briefing from the BRAC Fort Ord office prior to starting construction and, as needed thereafter. In the event ~~OE~~ MM is suspected or discovered, the following actions shall be taken: • MCWD and their contractors shall immediately suspend actions which may affect the item, • the item shall not be touch or disturbed, ~~work shall be stopped immediately~~, • the location shall be clearly marked, ~~all personnel evacuated,~~ and • the local law enforcement agency (Presidio of Monterey (POM) Police or applicable City Police Department) shall be contacted immediately for further investigation. Upon notification, the police shall secure the area and make arrangements to have the item identified and destroyed.	Prior and during to construction	MCWD and Contractors	MCWD	
4.11-R1: The construction contractor shall limit exterior construction related activities to the hours of restriction consistent with the noise ordinance of, and encroachment permits issued, by the relevant land use jurisdictions ~~between 7:00 a.m. and 7:00 p.m. on weekdays and Saturdays, and between 10:00 a.m. and 7:00 p.m. on Sundays and holidays~~. If alternative traffic control measures are unavailable and if approved by staff of the relevant City identified below through their encroachment permit, nighttime construction may be conducted for the following segments of road (as identified in the Higgins' Associates letter dated October 17, 2006) provided that sensitive receptors (in this case, residences, nursing homes, and hotels/motels) are located an adequate distance from construction activities (as determined by the relevant land use jurisdiction): • Reservation Road between Seacrest Avenue and Crescent Avenue [Marina - preferred alignment] • Fremont Street between Kimball Avenue and Airport Boulevard [Seaside – preferred alignment] • Del Monte Avenue between Park Avenue and Camino Aguajito [Monterey – alternative alignment] • Del Monte Avenue between Camino Aguajito and Figueroa Street [Monterey – preferred alignment] (Please note that mitigation measure 4.11-R1 is consistent with mitigation measure NV-1d from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	Prior to construction	MCWD and Contractors	MCWD	
4.11-R2: The contractor shall locate all stationary noise-generating equipment as far as possible from nearby noise-sensitive receptors. Where possible, noise-generating equipment shall be shielded from nearby noise-sensitive receptors by the use of noise-attenuating buffers. Stationary noise sources located 500 feet from noise-sensitive receptors shall be equipped with noise reducing engine housings. Portable acoustic barriers shall be placed around noise-generating equipment that is located less than 200 feet from noise-sensitive receptors. (Please note that mitigation measure 4.11-R2 is consistent with mitigation measure NV-1d from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During construction	Contractor	MCWD	
4.11-R3: The contractor shall assure that construction equipment powered by gasoline or diesel engines have sound control devices at least as effective as those provided by the original equipment manufacturer (OEM). No equipment shall be permitted to have an un-muffled exhaust. (Please note that mitigation measure 4.11-R3 is consistent with mitigation measure NV-1d from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During construction	Contractor	MCWD	
NV-2b: Construction Hours. The construction contractor shall limit all noise-producing construction activities within the City of Marina to between the hours of 7:00 AM and 7:00 PM on weekdays and between 9:00 AM and 7:00 PM Saturdays.	During project construction	Construction contractor	MCWD	
4.11-R4: The contractor shall assure that noise-generating mobile equipment and machinery are shut-off when not in use. (Please note that mitigation measure 4.11-R4 is consistent with mitigation measure NV-1d from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During construction	Contractor	MCWD	
4.11-R5: Residences within 500 feet of a construction area shall be notified of the construction schedule in writing, prior to construction. ~~The Project Applicant~~ MCWD and contractor shall designate a noise disturbance coordinator who would be responsible for responding to complaints regarding construction noise. The coordinator shall determine the cause of the complaint and ensure that reasonable measures are implemented to correct the problem. A contact number for the noise disturbance coordinator shall be conspicuously placed on construction site fences and written into the construction notification schedule sent to nearby residences.	Prior to and during construction	MCWD and Contractor	MCWD	
NV-2a: **Construction Equipment.** Contractor specifications shall include a requirement that the contractor shall: • Assure that construction equipment with internal combustion engines has sound control devices at least as effective as those provided by the original equipment manufacturer. No equipment shall be permitted to have an un-muffled exhaust. • Impact tools (i.e., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler shall be placed on the compressed air exhaust to lower noise levels by approximately 10 dBA. External jackets shall be used on impact tools, where feasible, in order to achieve a further reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible. • The construction contractor(s) shall locate stationary noise sources (e.g., generators, air compressors) as far from nearby noise-sensitive receptors as possible. For Product Water Conveyance pipeline segments within the City of Marina, noise controls shall be sufficient to not exceed 60 decibels for more than twenty-five percent of an hour.	During project construction	Contractor and MCWD	MCWD	

MITIGATION MONITORING AND REPORTING PLAN FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)				
NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.* *For those project features outside of MCWD's service areas (specifically, at the Monterey Regional Water Pollution Control Association, Regional Treatment Plant and within the Monterey Peninsula/Cal-Am Service Area) the lead agency and/or project proponent shall replace "MCWD" with their name each time it occurs prior to implementation of those project components.*				
RUWAP EIR Mitigation Measure with text edits to apply specifically to the RWP shown in ~~strikeout~~ for deleted text and <u>underline</u> for added text.	**Timing of Imple-mentation**	**Responsibility for Implementation**	**Verified for Compliance by:**	**X**
4.13-R1: During construction, the contractor shall insure that adequate access to open space, park and public areas is made available to the public at all times. If construction activities require temporary closing of an existing entrance or exit, the contractor shall provide an alternate entrance/exit for the duration of construction within the vicinity. The appropriate City or County shall approve the alternate entrance/exit prior to installation. The contractor shall also provide adequate noticing and/or signage, as directed by the City or County, for public notification and safety.	During construction	Contractor and MCWD	MCWD/ staff at affected City or County	
PS-3: **Construction Waste Reduction and Recycling Plan**. The construction contractor(s) shall prepare and implement a construction waste reduction and recycling plan identifying the types of construction debris the Project will generate and the manner in which those waste streams will be handled. In accordance with the California Integrated Waste Management Act of 1989, the plan shall emphasize source reduction measures, followed by recycling and composting methods, to ensure that construction and demolition waste generated by the project is managed consistent with applicable statutes and regulations. In accordance with the California Green Building Standards Code and local regulations, the plan shall specify that all trees, stumps, rocks, and associated vegetation and soils, and 50% of all other nonhazardous construction and demolition waste, be diverted from landfill disposal. The plan shall be prepared in coordination with the Monterey Regional Waste Management District and be consistent with Monterey County's Integrated Waste Management Plan. Upon project completion, MCWD shall collect the receipts from the contractor(s) to document that the waste reduction, recycling, and diversion goals have been met.	Prior to, during, and after project construction	Contractor and MCWD	MCWD	
4.14-R1: The construction contractor shall prepare traffic control/management management plans for construction of the pipeline within each of the affected jurisdictions including the Cities of Monterey, Seaside and Marina, Monterey County, and Caltrans as appropriate. These traffic control plans shall be reviewed and approved by the affected public agency prior to the commencement of work <u>and an encroachment permit obtained based upon the traffic control plan(s) or other information prepared by a qualified traffic engineer</u>. The traffic control/management plan shall specify the times during which construction activities would occur and times when travel lanes cannot be blocked (e.g., peak traffic periods as directed by the affected City Engineer). The plans shall provide details regarding the placement of traffic control and warning devices, detours, and that the trench must be covered and/or plated during times of non-construction. (Please note that mitigation measure 4.14-R1 is consistent with mitigation measure TR-2 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	Prior to construction within each jurisdiction	Contractor and MCWD	MCWD and staff at affected City or County	
4.14-R2: The traffic control/management plan must include a program that provides continual coordination program with the affected Agencies to allow for adjustments and refinements to the plan once construction is underway. (Please note that mitigation measure 4.14-R2 is consistent with mitigation measure TR-2 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During construction within each jurisdiction	Contractor and MCWD	MCWD and staff at affected City or County	

MITIGATION MONITORING AND REPORTING PLAN
FOR THE REGIONAL URBAN RECYCLED WATER PROJECT (RWP)

NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.*
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4.14-R3: As a supplement to the traffic control/management plan, the construction contractor shall coordinate with the affected agencies to determine the need for a public information program that would inform area residents, employers, and business owners of the details concerning construction schedules and expected travel delays. The public information program could utilize various media venues (e.g. newspaper, radio, television, telephone hot lines, Internet, etc.) to disseminate information such as: 1) Overview of construction project. 2) Updates on location of construction zone. 3) Identification on street(s) locations anticipated to be affected by construction. 4) Times when construction activities would occur and when traffic delays can be expected. 5) Identification of alternate travel routes that could be used to avoid construction delays. (Please note that mitigation measure 4.14-R3 is consistent with mitigation measure TR-2 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	Prior to and during construction within each jurisdiction	Contractor and MCWD	MCWD and staff at affected City or County	
4.14-R4: During the preparation and implementation of traffic control/management plans, special consideration shall be given to the locations where direct driveway access is being impacted. Measures shall be developed and coordinated with the individual property owners who are affected by project construction to minimize access disruption to their private residences and/or businesses. (Please note that mitigation measure 4.14-R4 is consistent with mitigation measure TR-2 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During the preparation / implementation of traffic control/management plans	Contractor and MCWD	MCWD	
4.14-R5: A component of the traffic control/management plan public information program shall include provisions for informing area residents, major employers, and commercial businesses that access restrictions/disruptions would occur. Additional information shall be prepared to advise the affected public of alternative access routes if local affected agencies determine that such a plan is necessary. (Please note that mitigation measure 4.14-R5 is consistent with mitigation measure TR-2 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During the preparation / implementation of traffic control/management plans	Contractor and MCWD	MCWD	
4.14-R6: The construction contractor shall coordinate with MST to identify routes affected by the pipeline construction. It is suggested that MST post notices at bus stops and on buses along affected routes to notify passengers of potential delays or service adjustments on these routes. Sufficient notification as to the exact dates when delays can be expected or service adjustments would be necessary would be given to MST to allow for timely posting of these notices. (Please note that mitigation measure 4.14-R6 is consistent with mitigation measure TR-2 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During construction along MST routes	Contractor and MCWD	MST	
4.14-R7: Traffic control/management plans which need to be prepared for the affected jurisdictions or agencies shall identify all bus stops in the immediate vicinity of construction zones and shall make provisions for these bus stops to remain accessible throughout the duration of the localized construction impact. In cases where the blockage of existing bus stops cannot be avoided the construction contractor shall coordinate with MST to provide temporary bus stop locations. (Please note that mitigation measure 4.14-R7 is consistent with mitigation measure TR-2 from Final Pure Water Monterey Groundwater Replenishment Project MMRP).	During construction along MST routes	Contractor and MCWD	MST	
TR-3: Roadway Rehabilitation Program. Prior to commencing project construction, MCWD shall detail the preconstruction condition of all local construction access and haul routes proposed for substantial use by project-related construction vehicles. The construction routes surveyed must be consistent with those identified in the construction traffic control and safety assurance plan developed under Mitigation Measure TR-2. After construction is completed, the same roads shall be surveyed again to determine whether excessive wear and tear or construction damage has occurred. Roads damaged by project-related construction vehicles shall be repaired to a structural condition equal to, or greater than, that which existed prior to construction activities. In the City of Marina, the construction in the city rights-way must comply with the City's design standards, including restoration of the streets from curb to curb, as applicable. In the City of Monterey, asphalt pavement of full travel lanes will be resurfaced without seams along wheel or bike paths.	Prior to project construction, after project construction	MCWD construction contractors	MCWD, and local jurisdictions	
TR-4: Construction Parking Requirements. Prior to commencing project construction, the construction contractor(s) shall coordinate with the potentially affected jurisdictions to identify designated worker parking areas that would avoid or minimize parking displacement in congested areas of Marina, and Seaside. The contractors shall provide transport between the designated parking location and the construction work areas. The construction contractor(s) shall also provide incentives for workers that carpool or take public transportation to the construction work areas. The engineering and construction design plans shall specify that contractors limit time of construction within travel lanes and public parking spaces and provide information to the public about locations of alternative spaces to reduce parking disruptions.	Prior to project construction	MCWD construction contractor	MCWD, City of Marina, City of Seaside,	
CUM-R2: Conduct pre-construction and post-construction biological surveys for special-status plant and wildlife species and their habitat for projects affecting undeveloped ~~dune~~ habitat, compensate for losses, and conduct construction monitoring. ~~Each project proponent for other projects that would contribute to this cumulative impact (see Table 5.3-1) will retain a qualified botanist to conduct pre-construction and post-construction surveys for Hickman's onion to quantify the number of plants and size of the population removed by construction and to determine appropriate habitat compensation. The project proponent will compensate for habitat loss related to dune habitats by contributing to the habitat restoration and enhancement program implemented by the California Department of Parks and Recreation at the Marina State Beach. Each project proponent~~ MCWD will retain a qualified biologist to conduct pre-construction and post-construction surveys for burrowing owl, loggerhead shrike, California horned lark, California horned lizard, black legless lizards, and raptors to determine whether species are present. ~~The project proponent~~ MCWD will implement the recommendations of the biologist. Recommendations could include relocating the species, altering the construction schedule to avoid breeding season, educating construction workers, and monitoring construction activities. ~~These measures are described in more detail in Chapter 4.4~~ (see Mitigation Measures 4.4-R1, through 4.4-R23).	Prior to, during and after construction	Qualified Biologist and MCWD	MCWD	
CUM-R3: MCWD ~~and/or MRWPCA~~ shall coordinate with Relevant Local Agencies to Develop and Implement a Phased Construction Plan to Reduce Cumulative Traffic, and Noise Impacts. The MCWD ~~and/or MRWPCA~~ will contact local agencies that have projects planned in the same area (i.e., project sites within 1 mile or projects that affect the same roadways) and that have construction	Prior to construction	Contractor and MCWD	MCWD and staff at	

NOTES: *Section 21081.6 of the Public Resources Code requires all state and local agencies to establish monitoring or reporting programs whenever approval of a project relies upon an environmental impact report (EIR). The purpose of the monitoring or reporting program is to ensure implementation of the measures being imposed to mitigate or avoid the significant adverse environmental impacts identified in the EIR as amended in Addendum No. 1 to the certified Final EIR for the MCWD Regional Urban Water Augmentation Project.*

For those project features outside of MCWD's service areas (specifically, at the Monterey Regional Water Pollution Control Association, Regional Treatment Plant and within the Monterey Peninsula/Cal-Am Service Area) the lead agency and/or project proponent shall replace "MCWD" with their name each time it occurs prior to implementation of those project components.

RUWAP EIR Mitigation Measure with text edits to apply specifically to the RWP shown in ~~strikeout~~ for deleted text and <u>underline</u> for added text.	**Timing of Imple-mentation**	**Responsibility for Implementation**	**Verified for Compliance by:**	**X**
schedules that overlap with construction of the Recycled Water Alternative. MCWD (or their contractor) will coordinate with local agencies responsible for said projects to develop a phased construction plan that includes the following components. • Evaluate roadways affected by construction activities and minimize roadway and traffic disturbance (e.g., lane closures and detours) and the number of construction vehicles using the roadways. This may involve scheduling some construction activities simultaneously or phasing. • Prepare compatible traffic control plans for construction projects. If one traffic control plan cannot be prepared, the construction contractor for the Recycled Water Alternative and the relevant local agencies (or their construction contractors) will ensure that the traffic control plans for projects affecting the same roadways are compatible. The traffic control plan can be modeled after that required for the Recycled Water Alternative (refer to Mitigation 4.14-R1 through 4.14-R3). • Implement noise reductions measures for each project with overlapping construction timeframes. These measures~~, which are described in more detail in Section 4.11,~~ include: limiting hours of construction activities, employing noise-control construction practices, and implementing a noise control plan (4.11-R1 through 4.11-R5).	within each jurisdiction		affected City or County	

NOTES:
Note 1: A preliminary archaeological survey for the project Areas of Potential Effects will be completed in October 2006. At this time, no resources have been identified in or near the Ord Community and Central Marina segments of the project. The portion of the pipeline within the City of Monterey has been revised to avoid impacts to the cultural resources identified in and near the alignment proposed by the RURWDP and RUWAP. It is preferred the impacts to cultural resources be avoided wherever possible and mitigated where avoidance is not feasible. A survey of the Armstrong Ranch alignment is under way and should be completed in October 2006.

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Appendix C:
Trussell Tech September 2017 Ocean Plan Compliance Assessment for the PWM/GWR Project

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Ocean Plan Compliance Assessment for the Pure Water Monterey Groundwater Replenishment Project

Technical Memorandum
September 2017

Prepared for:

Partners for Pure Water Solutions

MRWPCA

Monterey Peninsula Water Management District

Trussell
TECHNOLOGIES INC
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Oakland, CA 94612

Ocean Plan Compliance Assessment for the Pure Water Monterey Groundwater Replenishment Project

Technical Memorandum

Pure Water Monterey
A Groundwater Replenishment Project

September 2017

Prepared By:

Trussell Technologies, Inc.
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1 Executive Summary

Monterey Regional Water Pollution Control Agency (MRWPCA) and the Monterey Peninsula Water Management District ("Project Partners") are implementing the Pure Water Monterey Groundwater Replenishment Project ("Project"). The Project involves treating secondary effluent from MRWPCA's Regional Treatment Plant (RTP) through the proposed Advanced Water Purification Facility (AWPF) and then injecting this highly purified recycled water into the Seaside Groundwater Basin, with subsequent withdrawal for use as a municipal water supply. The Project will also provide additional tertiary recycled water for agricultural irrigation in the northern Salinas Valley as part of the Castroville Seawater Intrusion Project (CSIP). A waste stream, the reverse osmosis concentrate ("RO concentrate"), will be generated by the AWPF and discharged through the existing MRWPCA ocean outfall, which currently discharges secondary effluent from the RTP. The goal of this technical memorandum is to analyze whether discharge of the Project's RO concentrate to the Pacific Ocean (Monterey Bay) through the existing outfall would comply with numeric water quality objectives in the California Ocean Plan to protect marine aquatic life and human health.

The California Ocean Plan sets forth numeric and narrative water quality objectives for ocean waters with the intent of protecting the ocean's beneficial uses, which include recreation, aesthetics, navigation, fishing, mariculture, areas of special biological significance, rare and endangered species, habitat, fish migration, fish spawning, and shellfish harvesting (SWRCB, 2015). For typical wastewater discharges, when released from an outfall, the wastewater and ocean water undergo rapid mixing due to the momentum and buoyancy of the discharge. The mixing that occurs in the rising plume is affected by the buoyancy and momentum of the discharge, a process referred to as initial dilution (NRC, 1993). The numeric Ocean Plan objectives are to be met after the initial dilution of the discharge into the ocean. The initial dilution occurs in an area known as the zone of initial dilution (ZID), and the Ocean Plan objectives are to be met at the edge of the ZID. The extent of dilution in the ZID is quantified as the minimum probable initial dilution (D_m). The water quality objectives established in the Ocean Plan are adjusted by the D_m to derive NPDES permit limits that are applied to a wastewater discharge prior to ocean dilution.

Trussell Technologies, Inc. (Trussell Tech) estimated worst-case in-pipe discharge water quality (*i.e.*, prior to being discharged through the outfall and diluted in the ocean) for the Project and used the dilution modeling results determined by Dr. Philip Roberts to provide an assessment of whether the Project would consistently meet Ocean Plan water quality objectives. The resulting concentrations for each constituent in each scenario were compared to its minimum Ocean Plan objective to assess compliance. The estimated concentrations for eight different flow scenarios are presented in the following technical memorandum (TM) (Tables 3 and 4). None of the constituents are expected to exceed their Ocean Plan objective[1]. Ammonia is estimated to reach a concentration closest to its minimum objective, with the highest estimated concentration at the edge of the ZID at 71% of the objective.

[1] Aldrin, benzidine, 3,3-dichlorobenzidine and heptachlor were not detected in any source waters, however their MRLs are greater than the Ocean Plan objective. Therefore, no percentages are presented Table 4 as no compliance conclusions can be drawn for these constituents. This is a common occurrence for ocean discharges since the MRL is higher than the Ocean Plan objective for some constituents.

The purpose of the analysis documented in this TM was to assess the ability of the Project to comply with the Ocean Plan objectives. Trussell Tech used a conservative approach to estimate the water qualities of the RTP secondary effluent, RO concentrate, and hauled waste (blended with secondary effluent) for the Project. These water quality data were then combined for various discharge scenarios, and a concentration at the edge of the ZID was calculated for each constituent and discharge scenario. Compliance assessments could not be made for selected constituents due to analytical limitations, but this is a common occurrence for these Ocean Plan constituents. Based on the data, assumptions, modeling, and analytical methodology presented in this technical memorandum, the Project will comply with all numeric Ocean Plan objectives.

2 Introduction

Monterey Regional Water Pollution Control Agency (MRWPCA) and the Monterey Peninsula Water Management District ("Project Partners") are in the process of implementing the Pure Water Monterey Groundwater Replenishment Project ("Project"). The Project involves treating secondary effluent from MRWPCA's Regional Treatment Plant (RTP) through the proposed Advanced Water Purification Facility (AWPF) and then injecting this highly purified recycled water into the Seaside Groundwater Basin, with subsequent withdrawal for use as a municipal water supply. The Project will also provide additional tertiary recycled water for agricultural irrigation in the northern Salinas Valley as part of the Castroville Seawater Intrusion Project (CSIP). A waste stream, the reverse osmosis concentrate ("RO concentrate"), will be generated by the AWPF and discharged through the existing MRWPCA ocean outfall, which currently discharges secondary effluent from the RTP. The goal of this technical memorandum is to analyze whether discharge of the Project's RO concentrate to the Pacific Ocean (Monterey Bay) through the existing outfall would comply with numeric water quality objectives in the California Ocean Plan to protect marine aquatic life and human health.

The original version of this document (Trussell Technologies, 2015b) and an addendum report to that document (Trussell Technologies, 2015c) was included in the Project's Consolidated Final Environmental Impact Report (CFEIR). This version has been updated to reflect an increase in capacity of the AWPF to produce more product water and thus more RO concentrate. In addition, new water quality data have been included since the original analysis (including years 2012 – 2017), and the ocean dilution modeling has correspondingly been revised. Further details regarding these updates are included in the following sections.

2.1 Treatment through the RTP and AWPF

The existing RTP treatment process includes screening, primary sedimentation, secondary biological treatment through trickling filters (TFs), followed by a solids contactor (*i.e.*, bio-flocculation), and then clarification (Figure 1). Much of the secondary effluent undergoes tertiary treatment (coagulation, flocculation, granular media filtration and disinfection) to produce recycled water used for agricultural irrigation. The unused secondary effluent is discharged to the Monterey Bay through an existing ocean outfall. The RTP also accepts trucked brine waste ("hauled waste") for ocean disposal, which is stored in a pond and mixed with secondary effluent prior to being discharged.

The AWPF will include several advanced treatment technologies for purifying the secondary effluent water: ozone (O_3), membrane filtration (MF), reverse osmosis (RO), an advanced oxidation process (AOP) using ultraviolet light (UV) and hydrogen peroxide, and finished water stabilization. The Project Partners conducted a pilot-scale study of the ozone, MF, and RO processes of the AWPF from December 2013 through July 2014, successfully demonstrating the ability of the various treatment processes to produce highly-purified recycled water that complies with the California Water Recycling Criteria for Indirect Potable Reuse: Groundwater Replenishment – Subsurface Application (Groundwater Replenishment Regulations) (SWRCB, 2014) and Central Coast Water Quality Control Plan (Basin Plan) standards, objectives and guidelines for groundwater (CCWQCB, 2011). After the pilot-scale study, an advanced water purification demonstration facility was built to gain additional experience operating ozone, MF, and RO processes; the new facility also includes a UV/hydrogen peroxide AOP and stabilization treatment. The demonstration facility is operated and maintained by MRWPCA.

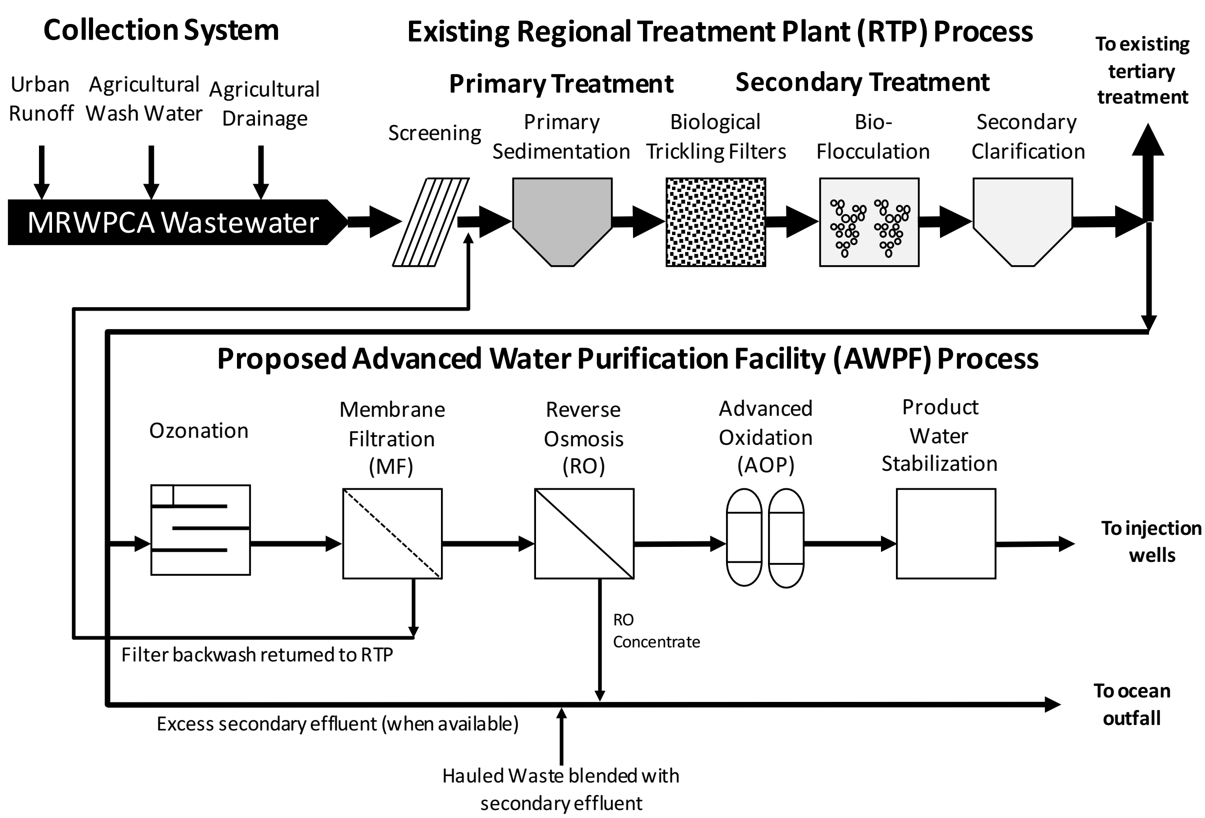

Figure 1 – Simplified diagram of existing MRWPCA RTP and Future AWPF treatment processes

Reverse osmosis is an excellent removal process, separating out most dissolved constituents from the recycled water. The dissolved constituents removed through RO are concentrated into a waste stream known as the RO concentrate. Unlike the waste from the MF, the RO concentrate cannot be recycled back to the RTP headworks and would be discharged through the existing ocean outfall. Discharges through the outfall are subject to National Pollution Discharge Elimination System (NPDES) permitting based on requirements specified in the California State Water Resources Control Board 2015 Ocean Plan ("Ocean Plan") (SWRCB, 2015). Monitoring of the RO concentrate was conducted during the Project's pilot-scale study.

2.2 California Ocean Plan

The California Ocean Plan sets forth numeric and narrative water quality objectives for ocean waters with the intent of protecting the ocean's beneficial uses, which include recreation, aesthetics, navigation, fishing, mariculture, areas of special biological significance, rare and endangered species, habitat, fish migration, fish spawning, and shellfish harvesting (SWRCB, 2015). For typical wastewater discharges, when released from an outfall, the wastewater and ocean water undergo rapid mixing due to the momentum and buoyancy of the discharge.[2] The mixing that occurs in the rising plume is affected by the buoyancy and momentum of the discharge, a process referred to as initial dilution (NRC, 1993). The numeric Ocean Plan objectives are to be met after the initial dilution of the discharge into the ocean. The initial dilution occurs in an area known as the zone of initial dilution (ZID), and the Ocean Plan objectives are to be met at the edge of the ZID. The extent of dilution in the ZID is quantified as the minimum probable initial dilution (D_m). The water quality objectives established in the Ocean Plan are adjusted by the D_m to derive NPDES permit limits that are applied to a wastewater discharge prior to ocean dilution.

The current RTP wastewater discharge is governed by Order No. R3-2014-0013 (NPDES permit No. CA0048551) issued by the Central Coast Regional Water Quality Control Board (RWQCB). Because the current NPDES permit for the existing ocean outfall must be amended to include RO concentrate in the waste discharge, comparing future discharge concentrations to current NPDES permit limits would not be an appropriate metric or threshold for determining whether the Project would have a significant impact on marine water quality. Instead, compliance with the Ocean Plan objectives was selected as an appropriate threshold for determining whether the Project would result in a significant impact requiring mitigation. Dilution modeling of the Project's ocean discharge was conducted by Dr. Philip Roberts
, a Professor in the School of Civil and Environmental Engineering at the Georgia Institute of Technology, to determine D_m values for the various discharge scenarios at different ambient ocean conditions. The dilution modeling results were combined with projected discharge water quality to assess compliance with the Ocean Plan.

2.3 Objective of Technical Memorandum

Trussell Technologies, Inc. (Trussell Tech) estimated worst-case in-pipe discharge water quality (*i.e.*, prior to being discharged through the outfall and diluted in the ocean) for the Project and used the dilution modeling results determined by Dr. Roberts to provide an assessment of whether the Project would consistently meet Ocean Plan water quality objectives. The purpose of this technical memorandum (TM) is to summarize the assumptions, methodology, results and conclusions of the Ocean Plan compliance assessment.

3 Methodology for Ocean Plan Compliance Assessment

To analyze impacts due to ocean discharge of RO concentrate, the Project technical team (Trussell Tech with MRWPCA staff) conducted a thorough water quality and flow characterization of the current secondary effluent and the new sources of water to be diverted

[2] Municipal wastewater effluent, being low in salinity, is less dense than seawater and thus rises (due to buoyancy) while it mixes with ocean water.

into the wastewater collection system. After primary and secondary treatment, this effluent will be used as influent to the AWPF. The team collected all available water quality data for secondary effluent and water quality monitoring results for the Project's new source waters through a one-year monitoring program conducted from July 2013 to June 2014. The new source waters included in the monitoring program were agricultural wash water, and waters from the Blanco Drain, Lake El Estero, and Tembladero Slough. 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. Additional data from routine monitoring of the Reclamation Ditch and Salinas Urban Stormwater Runoff was also incorporated into the analysis (for years 2012 to 2017).

Lake El Estero and the Tembladero Slough are no longer included as new source waters for the Project, and so the monitoring data for those source waters were not included in this analysis. For the Reclamation Ditch, water quality data related to the Ocean Plan were only available for ammonia, copper, zinc, arsenic, cadmium, lead, nickel, and total phenols. For the remaining constituents identified in the Ocean Plan, the concentrations in the Reclamation Ditch waters were conservatively assumed to be the higher of either the Blanco Drain or Tembladero Slough concentrations.

Using the full suite of data, the team estimated the future worst-case water quality of the combined ocean discharge. With the results of dilution modeling, concentrations at the edge of the ZID were estimated to determine the ability of the Project to comply with the Ocean Plan objectives. The purpose of this section is to outline the methodology used to make this determination. A summary of the methodology is presented in Figure 2.

3.1 Methodology for Determination of Discharge Water Quality

Water quality data for three types of discharge waters were used to estimate the future combined water quality in the ocean outfall discharge under Project conditions: (1) the RTP secondary effluent, (2) hauled waste (discussed in Section 3.1.3), and (3) the Project RO concentrate. First, Trussell Tech estimated the potential influence of the new source waters (*e.g.*, agricultural wash water, stormwater and agricultural drainage waters) on the worst-case water quality for each of the three types of discharge water. The volumetric contribution of each new source water will change under the different flow scenarios that can occur under the Project. MRWPCA staff worked with Schaaf and Wheeler consultants to estimate the available volume of source waters for each month of the different types of operational years for the Project (Andrew Sterbenz, Schaaf and Wheeler, June 05, 2017). The monthly flows for each source water were estimated for three types of operational years: (1) wet/normal years where a drought reserve is being built, (2) wet/normal years where the drought reserve has been met, and (3) a drought year. All the different flow scenarios were considered in developing the assumed worst-case concentrations for the Ocean Plan constituents in the secondary effluent. This conservative approach used the highest observed concentrations from all data sources for each source water in the analysis[3].

Cyanide has been detected in the RTP effluent and other new source waters (Agricultural Wash Water and the Blanco Drain) at relatively high levels compared to the discharge requirements. The maximum detected value in the RTP effluent was 81 µg/L; the maximum seen in the Agricultural Wash Water and the Blanco Drain was 89 µg/L and 127 µg/L, respectively.

Several investigations have been conducted into the accuracy of sampling, preservation, and analytical methods for cyanide. These have shown that sample holding time and preservation have a significant impact on measured cyanide concentrations. Pandit et al. (2006) demonstrated that when sodium hydroxide was added to adjust the pH higher than 12, as specified in accepted methods for cyanide measurement in order to preserve the sample, the measured cyanide concentrations were consistently higher than those for samples preserved at pH 10 to 11. Pandit et al. also showed that cyanide levels increased within the recommended holding times of the approved cyanide methods (at pH 12).

In addition, the 2015 California Ocean Plan specifies the following:

If a discharger can demonstrate to the satisfaction of the Regional Water 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.

Based on the above information, it is recommended that additional cyanide sampling be conducted using different methods (*e.g.,* analysis within 15 minutes with no preservation) to determine if the current laboratory method leads to inaccurately high cyanide values. It is also recommended to determine if a method can be performed that distinguishes between weakly and strongly complexed cyanide. Until this evaluation is completed, all cyanide concentrations presently available are used in this Ocean Plan compliance assessment.

It was also assumed that no constituent removal occurred through the RTP when considering the new source waters, and so the concentration detected through the source water monitoring program was used to calculate the concentration in the RTP secondary effluent. The exceptions to this statement are dieldrin and DDT. RTP sampling and bench-scale testing were conducted for these constituents to determine removal through the RTP, ozone and MF processes. The minimum removal through the RTP and ozone process was observed to be 91% and 96% for dieldrin and DDT, respectively (Trussell Tech, 2016b). The MF process was observed to remove

[3] The exception to this statement is copper. The median copper concentration was used to estimate the water quality impact of the additional source waters, as the maximum values detected appear to be outliers. Additionally, the minimum Ocean Plan objective for copper is a 6-month median value, and so it is reasonable to use the median value detected from the new source waters to estimate compliance.

a minimum of 97% and 92% for dieldrin and DDT, respectively (Trussell Tech, 2016b). However, the MF system only removes the constituents from the RO concentrate, as the MF backwash water is returned to the RTP headworks.

Once the estimated worst-case water quality was determined for the RTP secondary effluent, these values were used in estimating the worst-case water qualities for the hauled waste and the RO concentrate, as appropriate. The methodology for each type of water is further described in the following sections.

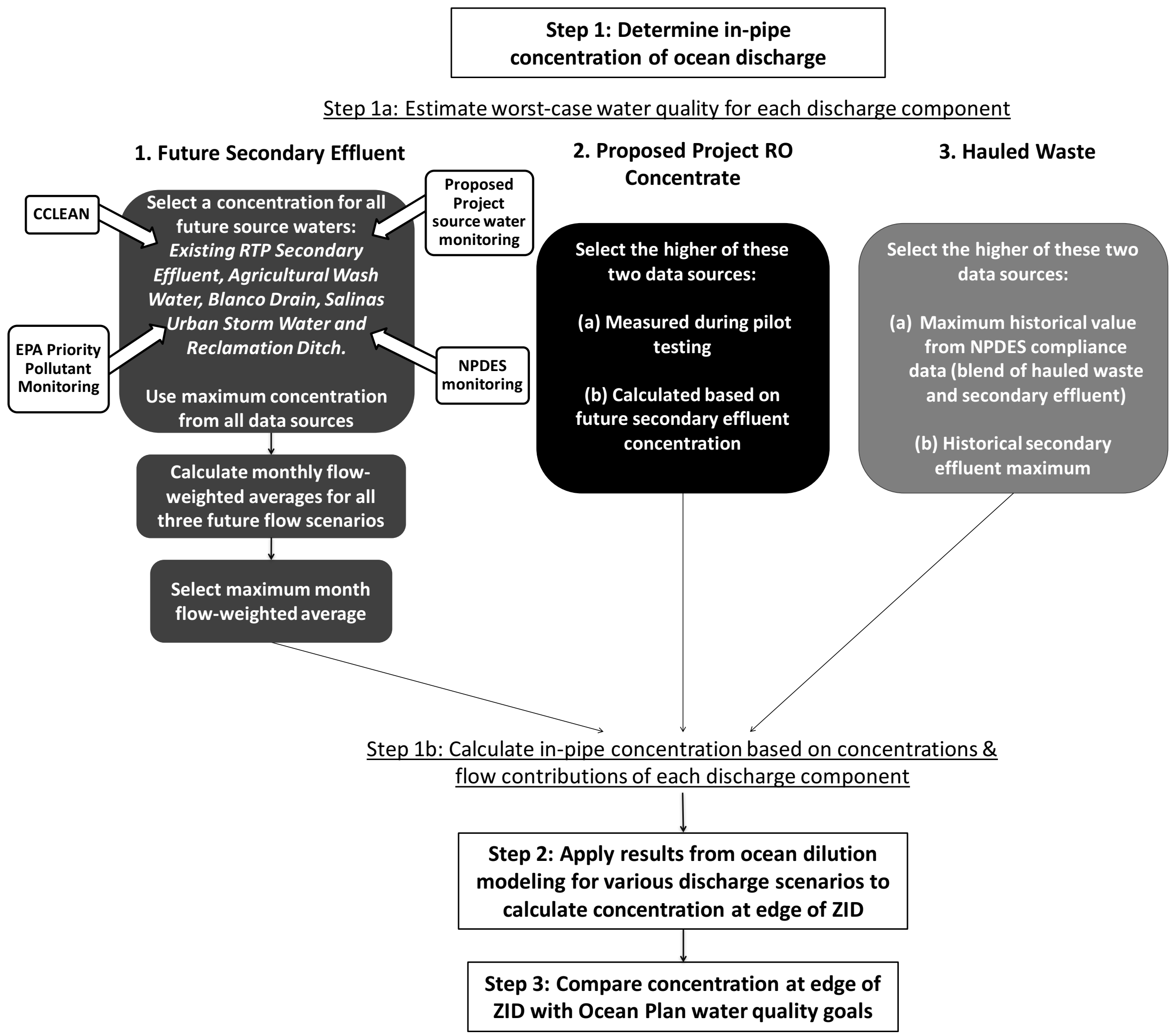

Figure 2 – Logic flow-chart for determination of project compliance with the Ocean Plan objectives

3.1.1 Future Secondary Effluent

The Project involves bringing new source waters into the RTP, and so the water quality of those source waters, as well as the existing secondary effluent, was taken into account to estimate the water quality of the future secondary effluent. Although the new source waters will be brought into the RTP influent, it was assumed that no removal of constituents occurred through the RTP when calculating the secondary effluent concentration (except dieldrin and DDT, as described in the previous section). The following sources of data were considered for selecting an existing secondary effluent concentration for each constituent in the analysis:

- Source water monitoring conducted for the Project from July 2013 through June 2014
- NPDES storm water discharge monitoring for the City of Salinas (2012 – 2017) and the Salinas Industrial Ponds (2017)
- RTP historical NPDES compliance data collected semi-annually by MRWPCA (2005-Spring 2017)
- Historical NPDES RTP Priority Pollutant data collected annually by MRWPCA (2004-2016)
- Data collected semi-annually by the Central Coast Long-Term Environmental Assessment Network (CCLEAN) (2008-2016)

The existing secondary effluent concentration for each constituent selected for the analysis was the maximum reported value from the above sources.

Limited data sources were available for several of the new source waters (*i.e.*, agricultural wash water, Blanco Drain, and the Reclamation Ditch). Agricultural wash water and Blanco Drain water quality data was collected during the source water monitoring conducted for the Project. NPDES storm water discharge monitoring for the City of Salinas (2012 – 2017) and Salinas Industrial Ponds monitoring (2017) provided additional data for the Reclamation Ditch and the agricultural wash water. For these new source waters, the maximum observed concentration was selected for Ocean Plan compliance analysis.[4]

Source water flows used for calculation of blended future secondary effluent concentrations were taken from the three projected operational conditions prepared by MRWPCA: (a) normal/wet year, building reserve, (b) normal/wet year, full reserve, and (c) drought year. For each constituent, a total of 36 future concentrations were calculated – 12 months of the year for the three projected future source water flow contributions. Of these concentrations, the maximum monthly flow-weighted concentration was selected for each constituent to be used for the Ocean Plan compliance analysis.

When a constituent could not be quantified or was not detected, it was reported as less than the Method Reporting Limit (<MRL).[5] Because the actual concentration could be any value equal to or less than the MRL, the conservative approach is to use the value of the MRL in the flow-

[4] Except for copper, where instead the median was calculated from the data for each new source water because the maximum values detected seemed to be outliers, and the Ocean Plan objective for copper considered in this assessment is the 6-month median concentration.

[5] The lowest amount of an analyte in a sample that can be quantitatively determined with stated, acceptable precision and accuracy under stated analytical conditions (*i.e.*, the lower limit of quantitation). Therefore, acceptable quality control and quality assurance procedures are calibrated to the MRL, or lower. To take into account day-to-day fluctuations in instrument sensitivity, analyst performance, and other factors, the MRL is established at three times the Method Detection Limit (or greater). The 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. (40 Code of Federal Regulations Section136 Appendix B).

weighting calculations. In some cases, constituents were not detected above the MRL in any of the source waters, so the concentrations for these constituents were reported as ND (<MRL) in this TM. In cases where the analysis of a constituent was detected but was not quantifiable, the results were also reported in this TM as less than the Method Reporting Limit, ND (<MRL). For some non-detected constituents, the MRL exceeds the Ocean Plan objective, and thus no compliance determination could be made.[6]

The following approaches were used for addressing the cases where a constituent was reported as less than the MRL:

- **Aggregate constituents with multiple congeners or sub-components:** Some Ocean Plan constituents are a combination of multiple congeners or sub-components (*e.g.*, chlordane, PAHs, PCBs, and TCDD equivalents, among others). Per the Ocean Plan, if individual congeners or sub-components are below the MRL, they are assumed to be zero for the purposes of calculating the aggregate parameter.
- **Combining different types of waters:** The same approach was used for both combining different source waters (*i.e.*, estimating future secondary effluent concentrations based on a flow-weighted average of source water contributions) and for combining the different discharge components (*i.e.*, RTP secondary effluent, hauled waste, and RO concentrate). For each constituent:
    - ***When all waters had maximum values reported above the MRL*:** The flow-weighted average of the maximum detected concentrations was used when all waters had values reported above the MRL.
    - ***When some or all waters had maximum values reported as less than the MRL*:**
        - When the MRL was at least two orders of magnitude greater (*i.e.*, at least 100 times greater) than the highest detected value from the other waters, the waters with maximum concentrations below the MRL were ignored. This case is exclusive to times when CCLEAN data were reported as detections for the RTP secondary effluent, and all the other source waters were below the MRL[7] (*i.e.*, hexachlorobutadiene was detected at a concentration of 9.0×10^{-6} µg/L in the secondary effluent via CCLEAN, and the MRL of all other source waters was 0.5 µg/L). The analytical methods used for CCLEAN can detect concentrations many orders of magnitude below the detection limits for traditional methods, and thus to include the MRL value from the other methods would overshadow the CCLEAN data. Additionally, in cases where the traditional analytical method had an MRL greater than the Ocean Plan objective, performing the analysis using the high MRL from the non-CCLEAN methods would result in an inability to make a compliance determination for these constituents.

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[6] This phenomenon is common in the implementation of the Ocean Plan where for some constituents, suitable analytical methods are not capable of measuring low enough to quantify the minimum toxicologically relevant concentrations. For these constituents, a discharge is considered compliant if the monitoring results are less than the MRL.

[7] Specifically, this case applies to endrin, fluoranthene, chlordane, heptachlor epoxide, hexachlorobenzene, hexachlorobutadiene, PCBs, and toxaphene.

- When the MRL was less than two orders of magnitude greater (*i.e.*, less than 100 times greater) than the highest detected value from the other waters, the constituents were reported as less than the MRL and were assumed to have a concentration equal to the MRL for the purposes of calculating a flow-weighted average (*i.e.*, mercury was detected in the secondary effluent at a concentration of 0.019 µg/L, but was not detected in any other source waters, where the MRL was 0.2 µg/L).

3.1.2 GWR RO Concentrate

Two potential worst-case estimates of constituent concentrations were available for assessing the Project's RO concentrate:

- Measured in the concentrate during pilot testing
- Calculated from the blended future secondary effluent concentration, using the following treatment assumptions[8]:
  - No removal prior to the RO process (*i.e.,* no removal through the RTP or AWPF ozone or MF), except for dieldrin and DDT
  - 81% RO recovery (*i.e.,* of the water feeding into the RO system, 81% is product water, also known as permeate, and 19% is the RO concentrate)
  - Complete rejection of each constituent by the RO membrane (i.e., 100% of the constituent is in the RO concentrate)

The higher of these two values was selected as the final concentration of the RO concentrate for all constituents, except as noted in the Table 1 footnotes.

3.1.3 Hauled Waste

Currently, small volumes of brine are trucked to the RTP and blended with secondary effluent in a brine pond. The blended waste from this pond ("hauled waste") is then discharged along with the secondary effluent bound for ocean discharge (when there is excess secondary effluent to discharge). For the Project, the hauled waste will be discharged with both secondary effluent and RO concentrate (see Figure 1). The point where the hauled waste is added to the ocean discharge water is downstream of the AWPF intake, and thus will not impact the quality of the Project product water or the RO concentrate. Currently, all sampling of the hauled waste takes place after dilution by secondary effluent in the brine pond, so the data represent a mix of secondary effluent and brine water. It is appropriate to use these data for the hauled waste quality since the practice of diluting with secondary effluent will continue in the future. Two potential values were available for the hauled waste constituent concentrations:

- Historical NPDES compliance data collected semi-annually by MRWPCA (2005-Spring 2017) of hauled waste water diluted with existing secondary effluent
- Calculated future secondary effluent constituent concentrations, as previously described.

The higher of these two values was selected for all constituents; because the hauled waste is diluted by secondary effluent prior to discharge, it is also appropriate to use future secondary effluent concentrations to represent the concentration within the hauled waste. Even if a

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[8] Based on the treatment assumptions, the RO concentrate would equal 5.3 times the AWPF influent (*i.e.*, blended future secondary effluent) concentration.

constituent was not present in the hauled waste, if it was present in the secondary effluent it would be present in the combined discharge.

3.1.4 Combined Ocean Discharge Concentrations

Having calculated the worst-case future concentrations for each of the three discharge components (i.e., secondary effluent, RO concentrate, blended hauled waste), the combined concentration prior to discharge was determined as a flow-weighted average of the contributions of each of these three discharge components. Depending on drought conditions and water usage for agricultural irrigation, the amount of secondary effluent discharged to the ocean will vary. A range of potential discharge scenarios was considered to encompass the worst-case water quality conditions of the combined discharge, as described in Section 4.2.

3.2 Ocean Modeling and Ocean Plan Compliance Analysis Methodology

In order to determine Ocean Plan compliance, Trussell Tech used the following information: (1) the in-pipe concentration (*i.e.*, pre-ocean dilution) of a constituent ($C_{in\text{-}pipe}$) that was calculated as discussed in the previous section, (2) the minimum probable dilution for ocean mixing (D_m) for the relevant discharge flow scenarios that was modeled by Dr. Roberts[9] (Roberts, P. J. W, 2017), and (3) the background concentration of the constituent in the ocean ($C_{Background}$) that is specified in the Ocean Plan's "Table 3." With this information, the concentration at the edge of the zone of initial dilution (C_{ZID}) was calculated using the following equation:

$$C_{ZID} = \frac{C_{In-pipe} + D_m * C_{Background}}{1 + D_m} \qquad (1)$$

The C_{ZID} was then compared to the Ocean Plan objectives[10] in the Ocean Plan's "Table 1" (SWRCB, 2015). As described previously, the in-pipe concentration was estimated as a flow-weighted average of the future secondary effluent, Project RO concentrate, and hauled waste with the concentrations determined as discussed above. The D_m values for various flow scenarios were determined by modeling. Note that this approach could not be applied for some constituents (*e.g.*, acute toxicity, chronic toxicity, and radioactivity[11]).

[9] The Ocean Plan defines D_m differently than Dr. Roberts. Dr. Roberts provided results defined as S = [total volume of a sample]/[volume of effluent contained in the sample]. The D_m referenced in Equation 1 of the California Ocean Plan is defined as $D_m = S – 1$. A value of 1 was subtracted from the dilution estimates provided by Dr. Roberts prior to using Equation 1.

[10] Note that the Ocean Plan (see Ocean Plan Table 2) also defines effluent limitations for oil and grease, suspended solids, settable solids, turbidity, and pH. These parameters were not evaluated in this assessment. It is assumed that, if necessary, the pH of the water would be adjusted to be within acceptable limits prior to discharge; the current AWPF design does not include to ability to change the RO concentrate pH because pilot testing and RO performance modeling indicated it was not necessary. Oil and grease, suspended solids, settable solids, and turbidity in the RO concentrate would be significantly lower than the secondary effluent. Prior to the RO treatment, the process flow would be treated by MF, which will reduce these parameters, and the waste stream from the MF will be returned to RTP headworks.

[11] Calculating flow-weighted averages for toxicity (acute and chronic) and radioactivity (gross beta and gross alpha) is not appropriate based on the nature of the constituents. These constituents were measured individually for the RO concentrate, and these individual concentrations would comply with the Ocean Plan objectives (Trussell

Two methods were used when modeling the ocean mixing: (1) the mathematical model UM_3 in the United States Environmental Protection Agency's (EPA's) Visual Plume suite, and (2) the NRFIELD model (for positively buoyant plumes only), also from the EPA's Visual Plume suite (Roberts, P. J. W., 2017). When results were provided from both methods, the D_m value estimated with the UM_3 model was selected for consistency, such that all dilution results used for this analysis were determined using the same model.

Dr. Roberts documented the dilution modeling assumptions and results in a technical memorandum (Roberts, P. J. W., 2017, Appendix A). Additional analysis assumptions were made as follows:

- **Flow**: A sensitivity analysis of the relationship between D_m and flow rate was performed for the various discharge types. The greatest D_m sensitivity to flow changes was determined to be from variations in the RTP secondary effluent flow. To simplify the analysis, the flow scenarios used in the compliance analysis only considered the maximum flows for the hauled waste and the RO concentrate because these flows result in the lowest D_m, thus making the analysis conservative. The flows considered for each discharge type are as follows:
    - ***Secondary effluent*:** a range of conditions was modeled that reflect realistic future discharge scenarios (minimum flow, moderate flow, and maximum flow).
    - ***Project RO concentrate*:** 1.17 million gallons per day (mgd), which would be the resulting RO concentrate flow when the AWPF is producing 5.0 mgd of highly-purified recycled water (corresponding AWPF influent is 6.86 mgd of RTP secondary effluent). Although the AWPF will not be operated at this influent flowrate year-round, this is the highest potential RO concentrate flow and therefore the most conservative assessment.
    - ***Hauled waste:*** A sensitivity analysis was conducted to determine the impacts of hauled waste on the modeled D_m results. It was concluded that neither the flow nor TDS from the addition of hauled waste had a significant impact on the modeled D_m result, and was therefore excluded when determining the D_m value. However, the impact of hauled waste on assumed in-pipe water quality was still assessed. A hauled waste flow of 0.03 mgd blended with secondary effluent for a total flow of 0.1 mgd was used for calculating the in-pipe concentrations of each constituent.
- **Total Dissolved Solids (TDS)**: the greatest dilution is achieved when the salinity of the discharge water is lower and the most different from the ambient ocean salinity; therefore, the most conservative TDS will be the highest (*i.e.*, closest to ambient salinity) of:
    - ***Secondary effluent:*** 1,100 milligram per liter (mg/L), which is the maximum expected future TDS, taking into account the flow contribution of each source water and the maximum observed TDS value from each source water

Technologies, 2015c and 2016a). Current discharges of the secondary effluent and hauled waste are monitored semiannually for acute toxicity, chronic toxicity, and radioactivity per the existing NPDES permit. See section 4.4.

  - ***Project RO concentrate***: 5,800 mg/L, which is the maximum expected future TDS based on the maximum expected future secondary effluent TDS and the RO treatment assumptions listed in the section above (*i.e.* in a drought year).
- **Ocean salinity**: 33,340 mg/L – 33,890 mg/L, depending on the ocean condition
- **Temperature**:
  - ***Secondary effluent***: 20˚C
  - ***Project RO concentrate***: 20˚C

An additional consideration of the ocean dilution modeling is the variation in ocean conditions throughout the year. Three conditions were modeled for all flow scenarios: Davidson (December to February), Upwelling (March to September), and Oceanic (October to November)[12]. To conservatively demonstrate Ocean Plan compliance, the lowest D_m from the applicable ocean conditions was used for each flow scenario.

Ocean dilution modeling covered the range of potential operating conditions, and the results showed that Ocean Plan compliance would be achieved when considering all potential secondary effluent flowrates. To simplify the calculation and presentation of these results, representative flowrate ranges were chosen. To select the representative flow scenarios for compliance assessment, the balance between in-pipe dilution and dilution through the outfall was considered. In general, higher secondary effluent flows discharged to the ocean would provide dilution of the Project RO concentrate; however, greater dilution due to ocean water mixing would be provided at lower wastewater discharge flows. The balance of these influences was considered in determining compliance under the eight representative discharge conditions that are described in Section 4.2 for the Project.

4 Ocean Plan Compliance Results

4.1 Water Quality of Combined Discharge

As described above, the first step in the Ocean Plan compliance analysis was to estimate the worst-case water quality for each of the three future discharge components: future RTP effluent, Project RO concentrate, and blended hauled waste. A summary of the estimated water qualities of these components is given in Table 1. Additional considerations and assumptions for each constituent are documented in the Table 1 notes section.

Table 1 – Summary of estimated worst-case water quality for the three waste streams that would be discharged through the ocean outfall

Constituent	Units	Secondary Effluent	Hauled Waste	RO Concentrate	Notes
Ocean Plan water quality objectives for protection of marine aquatic life					
Arsenic	µg/L	45	45	12	1,12
Cadmium	µg/L	1.2	1.2	6.5	2,11
Chromium (Hexavalent)	µg/L	2.5	130	13	2,11

[12] Note that these ranges assign the transitional months (March, September, and November) to the ocean condition that is typically more restrictive at relevant discharge flows.

Constituent	Units	Secondary Effluent	Hauled Waste	RO Concentrate	Notes
Copper	µg/L	11	39	58	2,11,17
Lead	µg/L	2.69	2.69	14.2	2,11
Mercury	µg/L	0.085	0.085	0.510	5,12
Nickel	µg/L	12.2	12.2	64	2,11
Selenium	µg/L	6.4	75	34	2,11
Silver	µg/L	0.77	0.77	4.05	5,11
Zinc	µg/L	57.5	170	303	2,11
Cyanide	µg/L	89.7	89.7	143	2,12,13
Total Chlorine Residual	µg/L	ND(<200)	ND(<200)	ND(<200)	10
Ammonia (as N), 6-month median	µg/L	42,900	42,900	225,789	1,11,18
Ammonia (as N), daily maximum	µg/L	49,000	49,000	257,895	1,11,18
Acute Toxicity	TUa	2.3	2.3	0.77	7,12,13
Chronic Toxicity	TUc	40	40	100	7,12,13
Phenolic Compounds (non-chlorinated)	µg/L	69	69	363	1,9,11
Chlorinated Phenolics	µg/L	ND(<20)	ND(<20)	ND(<20)	4,14
Endosulfan	µg/L	0.046	0.046	0.24	5,9,11
Endrin	µg/L	0.000112	0.000112	0.00059	3,11
HCH (Hexachlorocyclohexane)	µg/L	0.059	0.059	0.312	5,9,11
Radioactivity (Gross Beta)	pCi/L	32	307	34.8	1,7,12,13
Radioactivity (Gross Alpha)	pCi/L	18	457	14.4	1,7,12,13
Objectives for protection of human health - noncarcinogens					
Acrolein	µg/L	8.3	8.3	44	2,11
Antimony	µg/L	0.78	0.78	4.1	2 ,11
Bis (2-chloroethoxy) methane	µg/L	ND(<4.0)	ND(<4.0)	ND(<1)	4,14
Bis (2-chloroisopropyl) ether	µg/L	ND(<4.0)	ND(<4.0)	ND(<1)	4,14
Chlorobenzene	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
Chromium (III)	µg/L	6.9	87	36	2,11
Di-n-butyl phthalate	µg/L	ND(<7)	ND(<7)	ND(<1)	4,14
Dichlorobenzenes	µg/L	1.6	1.6	8	5,11
Diethyl phthalate	µg/L	ND(<5)	ND(<5)	ND(<1)	4,14
Dimethyl phthalate	µg/L	ND(<2)	ND(<2)	ND(<0.5)	4,14
4,6-dinitro-2-methylphenol	µg/L	ND(<19)	ND(<19)	ND(<5)	4,14
2,4-dinitrophenol	µg/L	ND(<9)	ND(<9)	ND(<5)	4,14
Ethylbenzene	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
Fluoranthene	µg/L	0.00684	0.00684	0.0360	3,11
Hexachlorocyclopentadiene	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.05)	4,14
Nitrobenzene	µg/L	ND(<2.1)	ND(<2.1)	ND(<1)	4,14
Thallium	µg/L	0.68	0.68	3.6	2,11
Toluene	µg/L	0.48	0.48	2.5	5,11
Tributyltin	µg/L	ND(<0.05)	ND(<0.05)	ND(<0.02)	8,14
1,1,1-trichloroethane	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
Objectives for protection of human health - carcinogens					
Acrylonitrile	µg/L	2.5	2.5	13	2,11
Aldrin	µg/L	ND(<0.007)	ND(<0.007)	ND(<0.01)	4,14
Benzene	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
Benzidine	µg/L	ND(<18.6)	ND(<18.6)	ND(<0.05)	4,14
Beryllium	µg/L	ND(<0.68)	0.0052	ND(<0.5)	4,14
Bis(2-chloroethyl)ether	µg/L	ND(<4.0)	ND(<4.0)	ND(<1)	4,14
Bis(2-ethyl-hexyl)phthalate	µg/L	78	78	411	1,11
Carbon tetrachloride	µg/L	0.50	0.50	2.66	2,11
Chlordane	µg/L	0.00122	0.00122	0.0064	3,9,11
Chlorodibromomethane	µg/L	2.2	2.2	12	2,11

Constituent	Units	Secondary Effluent	Hauled Waste	RO Concentrate	Notes
Chloroform	µg/L	34	34	180	2,11
DDT	µg/L	0.001	0.001	0.0003	2,9,11,15
1,4-dichlorobenzene	µg/L	1.6	1.6	8.4	1,11
3,3-dichlorobenzidine	µg/L	ND(<18)	ND(<18)	ND(<2)	4,14
1,2-dichloroethane	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
1,1-dichloroethylene	µg/L	ND(<0.5)	0.5	ND(<0.5)	4,14
Dichlorobromomethane	µg/L	2.4	2.4	12	2,11
Dichloromethane (methylenechloride)	µg/L	0.88	0.88	4.6	2,11
1,3-dichloropropene	µg/L	0.56	0.56	3.0	2,11
Dieldrin	µg/L	0.0015	0.0015	0.0001	2,11,15
2,4-dinitrotoluene	µg/L	ND(<2)	ND(<2)	ND(<0.1)	4,14
1,2-diphenylhydrazine (azobenzene)	µg/L	ND(<4)	ND(<4)	ND(<1)	4,14
Halomethanes	µg/L	1.3	1.3	6.9	2,9,11
Heptachlor	µg/L	ND(<0.01)	ND(<0.01)	ND(<0.01)	4,14
Heptachlor epoxide	µg/L	0.000088	0.000088	0.000463	3,11
Hexachlorobenzene	µg/L	0.000078	0.000078	0.000411	3,11
Hexachlorobutadiene	µg/L	0.000009	0.000009	0.000047	3,11
Hexachloroethane	µg/L	ND(<2.1)	ND(<2.1)	ND(<0.5)	4,14
Isophorone	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
N-Nitrosodimethylamine	µg/L	0.086	0.086	0.150	2,12,13
N-Nitrosodi-N-Propylamine	µg/L	0.076	0.076	0.019	1,12,13
N-Nitrosodiphenylamine	µg/L	ND(<2.1)	ND(<2.1)	ND(<1)	4,14
PAHs	µg/L	0.04	0.04	0.21	2,9,11
PCBs	µg/L	0.00068	0.00068	0.00357	3,9,11
TCDD Equivalents	µg/L	1.39E-7	1.39E-7	7.29E-7	2,8,9,11
1,1,2,2-tetrachloroethane	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
Tetrachloroethylene	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
Toxaphene	µg/L	0.0071	0.0071	0.0373	3,11
Trichloroethylene	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
1,1,2-trichloroethane	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14
2,4,6-trichlorophenol	µg/L	ND(<2.1)	ND(<2.1)	ND(<1)	4,14
Vinyl chloride	µg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	4,14

Table 1 Notes:

RTP Effluent and Hauled Waste Data

[1] Existing RTP effluent exceeds concentrations observed in other proposed source waters; the value reported is the existing secondary effluent value.

[2] The proposed new source waters may increase the secondary effluent concentration; the value reported is based on estimated source water blends.

[3] RTP effluent value is based on CCLEAN data; no other source waters were considered due to MRL differences.

[4] MRL provided represents the maximum flow-weighted MRL based on the blend of source waters.

[5] The only water with a detected concentration was the RTP effluent, however the flow-weighted concentration increases due to higher MRLs for the proposed new source waters.

[6] Additional source water data are not available; the reported value is for RTP effluent.

[7] Calculation of the flow-weighted concentration was not feasible due to the constituent, and so the maximum observed value is reported.

[8] Agricultural Wash Water data are based on an aerated sample, instead of a raw water sample.

[9] This value in the Ocean Plan is an aggregate of several congeners or compounds. Per the approach described in the Ocean Plan, for cases where the individual congeners/compounds were less than the MRL, a value of 0 is assumed in calculating the aggregate value.

[10] For all waters, dechlorination will be provided when needed such that the total chlorine residual will be below detection.

RO Concentrate Data
[11] The value presented represents a calculated value assuming no removal prior to RO, complete rejection through RO membrane, and an 81% RO recovery.
[12] The value represents the maximum value observed during the pilot testing study.
[13] The calculated value for the RO concentrate data (described in note 11) was not used in the analysis because it was not considered representative. It is expected that the value would increase as a result of treatment through the AWPF (*e.g.* formation of N-Nitrosodimethylamine as a disinfection by-product), or that it will not concentrate linearly through the RO (*e.g.* toxicity and radioactivity).
[14] The MRL provided represents the limit from the source water and pilot testing monitoring programs.
[15] The value presented represents a calculated value assuming 93% and 84% removal through primary and secondary treatment for DDT and dieldrin, respectively, 36% and 44% removal through ozone for DDT and dieldrin, respectively, 92% and 97% removal through MF for DDT and dieldrin, respectively, recycling of the MF backwash to the RTP, complete rejection through the RO membrane, and an 81% RO recovery. The assumed removals are based on results from ozone bench-scale testing of Blanco Drain water blended with secondary effluent and low detection sampling through the RTP.

General
[16] Footnote not used
[17] The value reported for the secondary effluent was calculated using the median of the data collected for the new source waters and is an estimate of the potential increase in concentration of the secondary effluent based on estimated source water blends. The median value was used because the maximum values detected in new source waters appear to be outliers, and because the Ocean Plan objective is a 6-month median concentration, it is reasonable to use the median value detected from these source waters.
[18] Ammonia (as N) represents the total ammonia concentration, *i.e.* the sum of unionized ammonia (NH_3) and ionized ammonia (NH_4).

4.2 Ocean Modeling Results

Dr. Roberts performed dilution modeling of various discharge scenarios that included combinations of RTP secondary effluent, hauled waste, and Project RO concentrate (Appendix A, Table C3). Year-round compliance with the Ocean Plan objectives was assessed through the evaluation of eight representative discharge scenarios covering the expected range of secondary effluent discharge flows. All scenarios assume the maximum flow rates for the RO concentrate and hauled waste, which is a conservative assumption in terms of constituent loading and minimum dilution.

To assess potential future discharge compositions, various secondary effluent flow rates were included in this analysis. These scenarios encompass the range of operating conditions that is expected to occur for the Project, as well as the best- and worse-case ocean dilution conditions. The eight scenarios used for the compliance assessment, in terms of secondary effluent flow rates to be discharged with the other waste streams, are shown in Table 2, and include:

- **Minimum Wastewater Flow (Upwelling) – Scenario 1:** the maximum influence of the Project RO concentrate on the ocean discharge (*i.e.*, no secondary effluent discharged). The Upwelling ocean condition was used since it represents the worst-case dilution for this flow scenario.
- **Low Wastewater Flow (Upwelling) – Scenarios 2-3:** significant influence of the Project RO concentrate on the ocean discharge (*i.e.*, minimal secondary effluent discharged). The

Upwelling ocean condition was used as it represents the worst-case dilution for this flow scenario.

- **Moderate Wastewater Flow (Upwelling) – Scenarios 4-7:** conditions with a moderate wastewater flow when the Project RO concentrate has a greater influence on the in-pipe water quality than in Scenario 8, but where the ocean dilution (D_m) is reduced due to the higher overall discharge flow (*i.e.*, compared to Scenarios 1-3). The Upwelling ocean condition was used as it represents the worst-case dilution for these scenarios.
- **High Wastewater Flow (Upwelling) – Scenario 8:** the highest expected flow that will be discharged. The Upwelling ocean condition was used as it represents the worst-case dilution for this flow scenario.

Table 2 – Flow scenarios and modeled D_m values used for Ocean Plan compliance analysis

No.	Discharge Scenario (Ocean Condition)	Flows (mgd)			D_m
		Secondary Effluent	RO Concentrate	Blended Hauled Waste[1]	
1	Minimum wastewater flow (Upwelling)	0	1.17	0	498
2	Low wastewater flow (Upwelling)	0.4	1.17	0	460
3	Low Wastewater Flow (Upwelling)	0.6	1.17	0	442
4	Moderate wastewater flow (Upwelling)	2	1.17	0	358
5	Moderate wastewater flow (Upwelling)	4	1.17	0	299
6	Moderate wastewater flow (Upwelling)	4.5	1.17	0	289
7	Moderate wastewater flow (Upwelling)	5	1.17	0	281
8	High wastewater flow (Upwelling)	23.4	1.17	0	174

[1]A sensitivity analysis was conducted to determine the impacts of hauled waste on the modeled D_m results. It was concluded that neither the flow nor TDS from the addition of hauled waste had a significant impact on the modeled D_m result, and was therefore excluded from the D_m calculation.

4.3 Ocean Plan Compliance Results

The flow-weighted in-pipe concentration for each constituent was calculated for each modeled discharge scenario using the water quality presented in Table 1 and the flows presented in Table 2. The in-pipe concentration was then used to calculate the concentration at the edge of the ZID using the D_m values presented in Table 2[13]. The resulting concentrations for each constituent in each scenario were compared to the Ocean Plan objective to assess compliance. The estimated concentrations for all eight flow scenarios are presented as concentrations at the edge of the ZID

[13] The Ocean Plan defines D_m differently than Dr. Roberts. Dr. Roberts provided dilution results defined as S = [total volume of a sample]/[volume of effluent contained in the sample]. The D_m referenced in Equation 1 of the California Ocean Plan is defined as $D_m = S - 1$. A value of 1 was subtracted from the dilution estimates provided by Dr. Roberts prior to using Equation 1.

(Table 3) and as a percentage of the Ocean Plan objective (Table 4). As shown, none of the constituents are expected to exceed their Ocean Plan objective[14]. Ammonia is estimated to reach a concentration closest to its objective, where it is 71% of the objective in Scenario 1.

Table 3 – Estimated concentrations of Ocean Plan constituents at the edge of the ZID

Constituent	Units	Ocean Plan Objective	Estimated Concentrations at Edge of ZID by Discharge Scenario							
			1	2	3	4	5	6	7	8
Objectives for protection of marine aquatic life										
Arsenic	µg/L	8	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.2
Cadmium	µg/L	1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chromium (Hexavalent)	µg/L	2	0.04	0.04	0.04	0.03	0.02	0.02	0.02	0.02
Copper	µg/L	3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Lead	µg/L	2	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Mercury	µg/L	0.04	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Nickel	µg/L	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Selenium	µg/L	15	0.1	0.1	0.1	0.05	0.05	0.05	0.04	0.05
Silver	µg/L	0.7	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Zinc	µg/L	20	8.6	8.5	8.5	8.4	8.4	8.3	8.3	8.4
Cyanide	µg/L	1	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.5
Total Chlorine Residual	µg/L	2	--	--	--	--	--	--	--	--
Ammonia (as N) - 6-mo median	µg/L	600	424	371	355	302	278	276	273	295
Ammonia (as N) - Daily Max	µg/L	2,400	484	424	406	345	318	315	312	337
Acute Toxicity[a]	TUa	0.3								
Chronic Toxicity[a]	TUc	1								
Phenolic Compounds (non-chlorinated)	µg/L	30	0.7	0.6	0.6	0.5	0.4	0.4	0.4	0.5
Chlorinated Phenolics	µg/L	1	0.04	0.04	0.05	0.1	0.1	0.1	0.1	0.1
Endosulfan	µg/L	0.009	4.5E-04	4.0E-04	3.8E-04	3.2E-04	3.0E-04	3.0E-04	2.9E-04	3.2E-04
Endrin	µg/L	0.002	1.1E-06	9.7E-07	9.3E-07	7.9E-07	7.3E-07	7.2E-07	7.1E-07	7.7E-07
HCH (Hexachlorocyclohexane)	µg/L	0.004	5.9E-04	5.1E-04	4.9E-04	4.2E-04	3.9E-04	3.8E-04	3.8E-04	4.1E-04
Radioactivity (Gross Beta)[a]	pci/L	–								
Radioactivity (Gross Alpha)[a]	pci/L	–								
Objectives for protection of human health - noncarcinogens										
Acrolein	µg/L	220	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Antimony	µg/L	1200	0.01	0.01	0.01	0.01	0.01	0.005	0.005	0.01
Bis (2-chloroethoxy) methane	µg/L	4.4	<0.002	<0.004	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02
Bis (2-chloroisopropyl) ether	µg/L	1200	<0.002	<0.004	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02
Chlorobenzene	µg/L	570	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
Chromium (III)	µg/L	190000	0.1	0.1	0.1	0.06	0.05	0.05	0.05	0.05
Di-n-butyl phthalate	µg/L	3500	<0.003	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.04
Dichlorobenzenes	µg/L	5100	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Diethyl phthalate	µg/L	33000	<0.003	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02	<0.03

[14] Aldrin, benzidine, 3,3-dichlorobenzidine and heptachlor were not detected in any source waters, however their MRLs are greater than the Ocean Plan objective. Therefore, no percentages are presented Table 4 as no compliance conclusions can be drawn for these constituents. This is a common occurrence for ocean discharges since the MRL is higher than the ocean plan objective for some constituents.

Constituent	Units	Ocean Plan Objective	Estimated Concentrations at Edge of ZID by Discharge Scenario							
			1	2	3	4	5	6	7	8
Dimethyl phthalate	µg/L	820000	<0.001	<0.002	<0.002	<0.00	<0.01	<0.01	<0.01	<0.01
4,6-dinitro-2-methylphenol	µg/L	220	<0.01	<0.02	<0.02	<0.04	<0.1	<0.1	<0.1	<0.1
2,4-Dinitrophenol	µg/L	4.0	<0.01	<0.01	<0.01	<0.02	<0.03	<0.03	<0.03	<0.05
Ethylbenzene	µg/L	4100	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
Fluoranthene	µg/L	15	6.8E-05	5.9E-05	5.7E-05	4.8E-05	4.4E-05	4.4E-05	4.4E-05	4.7E-05
Hexachlorocyclopentadiene	µg/L	58	<0.0002	<0.0004	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.003
Nitrobenzene	µg/L	4.9	<0.002	<0.003	<0.003	<0.005	<0.01	<0.01	<0.01	<0.01
Thallium	µg/L	2	0.01	0.01	0.01	0.005	0.004	0.004	0.004	0.005
Toluene	µg/L	85000	0.005	0.004	0.004	0.003	0.003	0.003	0.003	0.003
Tributyltin	µg/L	0.0014	<4.5E-05	<6.3E-05	<7.0E-05	<1.1E-04	<1.4E-04	<1.5E-04	<1.6E-04	<2.8E-04
1,1,1-Trichloroethane	µg/L	540000	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
Objectives for protection of human health - carcinogens										
Acrylonitrile	µg/L	0.10	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Aldrin[b]	µg/L	0.000022	<2.0E-05	<2.0E-05	<2.0E-05	<2.2E-05	<2.6E-05	<2.6E-05	<2.7E-05	<4.1E-05
Benzene	µg/L	5.9	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
Benzidine[b]	µg/L	0.000069	<0.003	<0.01	<0.02	<0.03	<0.0	<0.1	<0.1	<0.1
Beryllium	µg/L	0.033	0.0009	0.0011	0.0012	0.0017	0.0021	0.0022	0.0023	0.0038
Bis(2-chloroethyl)ether	µg/L	0.045	<0.002	<0.004	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02
Bis(2-ethyl-hexyl)phthalate	µg/L	3.5	0.8	0.7	0.6	0.5	0.5	0.5	0.5	0.5
Carbon tetrachloride	µg/L	0.90	0.00	0.004	0.004	0.004	0.003	0.003	0.003	0.003
Chlordane	µg/L	0.000023	1.2E-05	1.1E-05	1.0E-05	8.5E-06	7.9E-06	7.8E-06	7.7E-06	8.3E-06
Chlorodibromomethane	µg/L	8.6	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.02
Chloroform	µg/L	130	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
DDT	µg/L	0.00017	6.3E-07	1.0E-06	1.2E-06	2.0E-06	2.7E-06	2.8E-06	3.0E-06	5.3E-06
1,4-Dichlorobenzene	µg/L	18	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3,3-Dichlorobenzidine[b]	µg/L	0.0081	<0.01	<0.01	<0.02	<0.03	<0.05	<0.1	<0.1	<0.1
1,2-Dichloroethane	µg/L	28	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
1,1-Dichloroethylene	µg/L	0.9	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003
Dichlorobromomethane	µg/L	6.2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Dichloromethane (methylenechloride)	µg/L	450	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
1,3-dichloropropene	µg/L	8.9	0.01	0.005	0.005	0.004	0.004	0.004	0.004	0.004
Dieldrin	µg/L	0.00004	4.9E-07	1.2E-06	1.5E-06	2.8E-06	4.0E-06	4.3E-06	4.5E-06	8.3E-06
2,4-Dinitrotoluene	µg/L	2.6	<0.001	<0.001	<0.002	<0.004	<0.01	<0.01	<0.01	<0.01
1,2-Diphenylhydrazine (azobenzene)	µg/L	0.16	<0.002	<0.004	<0.005	<0.01	<0.01	<0.01	<0.01	<0.02
Halomethanes	µg/L	130	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Heptachlor[b]	µg/L	0.00005	<2.0E-05	<2.2E-05	<2.3E-05	<2.8E-05	<3.3E-05	<3.4E-05	<3.5E-05	<5.7E-05
Heptachlor Epoxide	µg/L	0.00002	8.7E-07	7.6E-07	7.3E-07	6.2E-07	5.7E-07	5.7E-07	5.6E-07	6.0E-07
Hexachlorobenzene	µg/L	0.00021	7.7E-07	6.7E-07	6.5E-07	5.5E-07	5.1E-07	5.0E-07	5.0E-07	5.4E-07
Hexachlorobutadiene	µg/L	14	8.9E-08	7.8E-08	7.5E-08	6.3E-08	5.8E-08	5.8E-08	5.7E-08	6.2E-08
Hexachloroethane	µg/L	2.5	<0.001	<0.002	<0.003	<0.004	<0.01	<0.01	<0.01	<0.01
Isophorone	µg/L	730	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
N-Nitrosodimethylamine	µg/L	7.3	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0005
N-Nitrosodi-N-Propylamine	µg/L	0.38	0.00005	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0004
N-Nitrosodiphenylamine	µg/L	2.5	<0.002	<0.003	<0.003	<0.005	<0.01	<0.01	<0.01	<0.01
PAHs	µg/L	0.0088	0.0004	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
PCBs	µg/L	0.000019	6.7E-06	5.9E-06	5.6E-06	4.8E-06	4.4E-06	4.4E-06	4.3E-06	4.7E-06
TCDD Equivalents	µg/L	3.9E-09	1.4E-09	1.2E-09	1.1E-09	9.7E-10	9.0E-10	8.9E-10	8.8E-10	9.5E-10
1,1,2,2-Tetrachloroethane	µg/L	2.3	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
Tetrachloroethylene	µg/L	2.0	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
Toxaphene	µg/L	2.1E-04	7.0E-05	6.1E-05	5.9E-05	5.0E-05	4.6E-05	4.6E-05	4.5E-05	4.9E-05
Trichloroethylene	µg/L	27	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
1,1,2-Trichloroethane	µg/L	9.4	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003
2,4,6-Trichlorophenol	µg/L	0.29	<0.002	<0.003	<0.003	<0.005	<0.01	<0.01	<0.01	<0.01
Vinyl chloride	µg/L	36	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.003

[a] Calculating flow-weighted averages for toxicity (acute and chronic) and radioactivity (gross beta and gross alpha) is not appropriate based the nature of the constituents. These constituents were measured individually for the secondary effluent and RO concentrate, and these individual concentrations would comply with the Ocean Plan objectives.
[b] All observed values from all data sources were below the MRL, and the flow-weighted average of the MRLs is higher than the Ocean Plan objective. No compliance conclusions can be drawn for these constituents.

Table 4 – Estimated concentrations of all COP constituents, expressed as percent of Ocean Plan Objective

Constituent	Units	Ocean Plan Objective	Estimated Percentage of Ocean Plan Objective at Edge of ZID by Discharge Scenario[c]							
			1	2	3	4	5	6	7	8
Objectives for protection of marine aquatic life										
Arsenic	µg/L	8	38%	38%	38%	39%	39%	39%	39%	40%
Cadmium	µg/L	1	1%	1%	1%	1%	1%	1%	1%	1%
Chromium (Hexavalent)	µg/L	2	2%	2%	2%	1%	1%	1%	1%	1%
Copper	µg/L	3	70%	70%	70%	69%	69%	69%	69%	69%
Lead	µg/L	2	1%	1%	1%	1%	1%	1%	1%	1%
Mercury	µg/L	0.04	4%	3%	3%	3%	3%	3%	3%	3%
Nickel	µg/L	5	2%	2%	2%	2%	2%	2%	2%	2%
Selenium	µg/L	15	0.5%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%	0.3%
Silver	µg/L	0.7	24%	24%	24%	24%	23%	23%	23%	23%
Zinc	µg/L	20	43%	42%	42%	42%	42%	42%	42%	42%
Cyanide	µg/L	1	28%	28%	28%	30%	34%	35%	35%	53%
Total Chlorine Residual	µg/L	2	--	--	--	--	--	--	--	--
Ammonia (as N) - 6-mo median	µg/L	600	71%	62%	59%	50%	46%	46%	46%	49%
Ammonia (as N) - Daily Max	µg/L	2,400	20%	18%	17%	14%	13%	13%	13%	14%
Acute Toxicity[a]	TUa	0.3								
Chronic Toxicity[a]	TUc	1								
Phenolic Compounds (non-chlorinated)	µg/L	30	2%	2%	2%	2%	1%	1%	1%	2%
Chlorinated Phenolics	µg/L	1	4%	4%	5%	6%	7%	7%	7%	11%
Endosulfan	µg/L	0.009	5%	4%	4%	4%	3%	3%	3%	4%
Endrin	µg/L	0.002	0.1%	0.05%	0.05%	0.04%	0.04%	0.04%	0.04%	0.04%
HCH (Hexachlorocyclohexane)	µg/L	0.004	15%	13%	12%	10%	10%	10%	9%	10%
Radioactivity (Gross Beta)[a]	pci/L	–								
Radioactivity (Gross Alpha)[a]	pci/L	–								
Objectives for protection of human health - noncarcinogens										
Acrolein	µg/L	220	0.04%	0.03%	0.03%	0.03%	0.02%	0.02%	0.02%	0.03%
Antimony	µg/L	1200	0.001%	0.001%	0.001%	0.0005%	0.0004%	0.0004%	0.000%	0.000%
Bis (2-chloroethoxy) methane	µg/L	4.4	<0.1%	<0.1%	<0.1%	<0.2%	<0.3%	<0.3%	<0.3%	<0.5%
Bis (2-chloroisopropyl) ether	µg/L	1200	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Chlorobenzene	µg/L	570	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Chromium (III)	µg/L	190000	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Di-n-butyl phthalate	µg/L	3500	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Dichlorobenzenes	µg/L	5100	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Diethyl phthalate	µg/L	33000	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Dimethyl phthalate	µg/L	820000	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
4,6-dinitro-2-methylphenol	µg/L	220	<0.01%	<0.01%	<0.01%	<0.02%	<0.02%	<0.02%	<0.03%	<0.0%
2,4-Dinitrophenol	µg/L	4.0	<0.3%	<0.3%	<0.4%	<1%	<1%	<1%	<1%	<1%
Ethylbenzene	µg/L	4100	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Fluoranthene	µg/L	15	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Hexachlorocyclopentadiene	µg/L	58	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Nitrobenzene	µg/L	4.9	<0.04%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.2%
Thallium	µg/L	2	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%
Toluene	µg/L	85000	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Tributyltin	µg/L	0.0014	<3%	<4%	<5%	<8%	<10%	<11%	<11%	<20%
1,1,1-Trichloroethane	µg/L	540000	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Objectives for protection of human health - carcinogens										

Constituent	Units	Ocean Plan Objective	Estimated Percentage of Ocean Plan Objective at Edge of ZID by Discharge Scenario[c]							
			1	2	3	4	5	6	7	8
Acrylonitrile	µg/L	0.10	25%	21%	21%	17%	16%	16%	16%	17%
Aldrin[b]	µg/L	0.000022	--	--	--	--	--	--	--	--
Benzene	µg/L	5.9	<0.02%	<0.02%	<0.02%	<0.02%	<0.03%	<0.03%	<0.03%	<0.0%
Benzidine[b]	µg/L	0.000069	--	--	--	--	--	--	--	--
Beryllium	µg/L	0.033	3%	3%	4%	5%	6%	7%	7%	12%
Bis(2-chloroethyl)ether	µg/L	0.045	<5%	<9%	<11%	<18%	<24%	<26%	<27%	<49%
Bis(2-ethyl-hexyl)phthalate	µg/L	3.5	22%	19%	18%	16%	14%	14%	14%	15%
Carbon tetrachloride	µg/L	0.90	1%	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%
Chlordane	µg/L	0.000023	52%	46%	44%	37%	34%	34%	34%	36%
Chlorodibromomethane	µg/L	8.6	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Chloroform	µg/L	130	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
DDT	µg/L	0.00017	0.4%	1%	1%	1%	2%	2%	2%	3%
1,4-Dichlorobenzene	µg/L	18	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
3,3-Dichlorobenzidine[b]	µg/L	0.0081	--	--	--	--	--	--	--	--
1,2-Dichloroethane	µg/L	28	<0.01%	<0.01%	<0.01%	<0.01%	0.01%	0.01%	0.01%	0.01%
1,1-Dichloroethylene	µg/L	0.9	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%
Dichlorobromomethane	µg/L	6.2	0.4%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.3%
Dichloromethane (methylenechloride)	µg/L	450	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
1,3-dichloropropene	µg/L	8.9	0.1%	0.1%	0.1%	0.04%	0.04%	0.04%	0.04%	0.04%
Dieldrin	µg/L	0.00004	1%	3%	4%	7%	10%	11%	11%	21%
2,4-Dinitrotoluene	µg/L	2.6	<0.02%	<0.1%	<0.1%	<0.1%	<0.2%	<0.2%	<0.2%	<0.4%
1,2-Diphenylhydrazine (azobenzene)	µg/L	0.16	<2%	<3%	<3%	<5%	<7%	<7%	<8%	<14%
Halomethanes	µg/L	130	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Heptachlor[b]	µg/L	0.00005	<40%	<43%	<45%	<56%	<67%	<69%	<71%	--
Heptachlor Epoxide	µg/L	0.00002	4%	4%	4%	3%	3%	3%	3%	3%
Hexachlorobenzene	µg/L	0.00021	0.4%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.3%
Hexachlorobutadiene	µg/L	14	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
Hexachloroethane	µg/L	2.5	<0.05%	<0.1%	<0.1%	<0.2%	<0.2%	<0.2%	<0.3%	<0.5%
Isophorone	µg/L	730	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
N-Nitrosodimethylamine	µg/L	7.3	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	0.01%
N-Nitrosodi-N-Propylamine	µg/L	0.38	0.01%	0.02%	0.02%	0.0%	0.1%	0.1%	0.1%	0.1%
N-Nitrosodiphenylamine	µg/L	2.5	<0.1%	<0.1%	<0.1%	<0.2%	<0.3%	<0.3%	<0.3%	<0%
PAHs	µg/L	0.0088	5%	4%	4%	3%	3%	3%	3%	3%
PCBs	µg/L	0.000019	35%	31%	30%	25%	23%	23%	23%	25%
TCDD Equivalents	µg/L	3.9E-09	35%	31%	29%	25%	23%	23%	23%	24%
1,1,2,2-Tetrachloroethane	µg/L	2.3	<0.04%	<0.05%	<0.05%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Tetrachloroethylene	µg/L	2.0	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Toxaphene	µg/L	2.1E-04	33%	29%	28%	24%	22%	22%	21%	23%
Trichloroethylene	µg/L	27	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%
1,1,2-Trichloroethane	µg/L	9.4	<0.01%	<0.01%	<0.01%	<0.01%	<0.02%	<0.02%	<0.02%	<0.03%
2,4,6-Trichlorophenol	µg/L	0.29	<1%	<1%	<1%	<2%	<2%	<2%	<2%	<4%
Vinyl chloride	µg/L	36	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%

[a] Calculating flow-weighted averages for toxicity (acute and chronic) and radioactivity (gross beta and gross alpha) is not appropriate based the nature of the constituents. These constituents were measured individually for the secondary effluent and RO concentrate, and these individual concentrations would comply with the Ocean Plan objectives (see Section 4.4).
[b] All observed values from all data sources were below the MRL, and the flow-weighted average of the MRLs is higher than the Ocean Plan objective. No compliance conclusions can be drawn for these constituents.
[c] Note that if the percentage was determined to be less than 0.01 percent, then a minimum value is shown as "<0.01%" (*e.g.*, if the constituent was estimated to be 0.000001% of the objective, for simplicity, it is displayed as <0.01%). Also, shading indicates constituent is expected to be greater than 80 percent (orange shading) or exceed (red shading) the ocean plan objective for that discharge scenario.

4.4 Toxicity

The NPDES permit includes daily maximum effluent limitations for acute and chronic toxicity that are based on the current allowable D_m of 145. The acute toxicity effluent limitation is 4.7 TUa (acute toxicity units) and the chronic toxicity effluent limitation is 150 TUc (chronic toxicity units). The permit requires that toxicity testing be conducted twice per year, with one sample collected during the wet season when the discharge is primarily secondary effluent and once during the dry season when the discharge is primarily trucked brine waste. The MRWPCA ocean discharge has consistently complied with these toxicity limits (CCRWQCB, 2014).

Toxicity testing of RO concentrate generated by the pilot testing was conducted in support of the Project (Trussell Technologies, 2015). On April 9, 2014, a sample of RO concentrate was sent to Pacific EcoRisk for acute and chronic toxicity analysis. Based on these results (RO concentrate values presented in Table 1), the Project concentrate requires a minimum D_m of 16:1 and 99:1 for acute and chronic toxicity, respectively, to meet the Ocean Plan objectives. These D_m values were compared to estimated D_m values for the discharge of RO concentrate only from the Project's full-scale AWPF and the discharge of RO concentrate combined with secondary effluent from the RTP. The minimum dilution modeled for the various Project discharge scenarios was 174:1, which is when the secondary effluent discharge is at the highest expected flow for future discharges. Given that the lowest expected D_m value for the various Project ocean discharge scenarios is greater than the required dilution factor for compliance with the Ocean Plan toxicity objectives, this sample illustrates that the discharge scenarios would comply with Ocean Plan objectives.

5 Conclusions

The purpose of the analysis documented in this technical memorandum was to assess the ability of the Project to comply with the numeric Ocean Plan water quality objectives. Trussell Tech used a conservative approach to estimate the water qualities of the RTP secondary effluent, RO concentrate, and hauled waste (blended with secondary effluent) for the Project. These water quality data were then combined for various discharge scenarios, and a concentration at the edge of the ZID was calculated for each constituent and scenario. Compliance assessments could not be made for select constituents, as noted, due to analytical limitations, but this is a common occurrence for these Ocean Plan constituents. Based on the data, assumptions, modeling, and analytical methodology presented in this technical memorandum, the Project would comply with all Ocean Plan objectives.

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Appendix A

Modeling Brine Disposal into Monterey Bay – Supplement

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Final Report

Prepared for
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San Francisco, California

September 22, 2017

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EXECUTIVE SUMMARY

Additional dilution simulations are presented for the disposal of brine concentrate resulting from reverse osmosis (RO) seawater desalination into Monterey Bay, California. The report is a supplement to Roberts (2016) and addresses new flow scenarios and other issues that have been raised.

It has been suggested to replace the opening in the end gate of the diffuser with a check valve. A 6-inch valve was proposed, and analyses of the internal hydraulics of the diffuser and outfall were conducted. The check valve had minimal effect on the flow distribution between the diffuser ports and minimal effect on head loss. The flow from the end gate was reduced slightly and the exit velocity considerably increased. The effect of the valve orientation on dilution of brine discharges was investigated. It was found that any upward angle greater than about 20° would result in dilutions that meet the BMZ salinity requirements. The optimum angle to maximize dilution is 60°.

Dilutions were computed for all new flow scenarios assuming the 6-inch check valve was installed in the end gate.

The effect of currents on the brine jets was addressed. Dilutions were predicted using the mathematical model UM3 for the pure brine discharges for various anticipated current speeds. Jets discharging into the currents were bent back and dilutions were increased by the current. Jets discharging with the current were swept downstream and impacted the seabed farther from the diffuser. All dilutions with currents were greater than those with zero current, and all impact points were well within the BMZ.

It has been suggested to orient the nozzles along the diffuser upwards (from their present horizontal angles) to increase the dilution of dense effluents. This would decrease the dilution of buoyant effluents, however. Dilutions were predicted for dense and buoyant effluents. For dense effluents, increasing the nozzle angle increased dilution considerably; for buoyant effluents, the dilutions reduced slightly.

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1. Introduction

It is proposed to dispose of the brine concentrate resulting from reverse osmosis (RO) seawater desalination into Monterey Bay, California. Discharge will be through an existing outfall and diffuser usually used for domestic wastewater disposal. Because of varying flow scenarios, the effluent and its composition vary from pure secondary effluent to pure brine. Sixteen scenarios, with flows ranging from 9.0 to 33.8 mgd (million gallons per day) and densities from 998.8 to 1045.2 kg/m^3, were previously analyzed in Roberts (2016). The internal hydraulics of the outfall and diffuser were computed and dilutions predicted for flow scenarios resulting in buoyant and dense effluents. It was found that, for all dense discharge conditions, the salinity requirements in the new California Ocean Plan were met within the BMZ (Brine Mixing Zone).

Since that report was completed, new flow scenarios have been proposed that include higher volumes of brine and GWR effluent, the inclusion of hauled brine, and situations where the desalination plant is offline. It has been requested to analyze dilutions for many more flow combinations for typical and variant cases. And it is proposed to replace the opening in the diffuser's end gate, which allows some brine to be released at a low velocity and therefore low dilution, with a check valve that would increase the exit velocity and therefore increase dilution. The check valve would be angled upwards, further increasing dilution. Finally, it has been suggested to replace the horizontal 4-inch check valves along the diffuser with upwardly oriented valves that would increase the dilution of dense effluents.

The specific tasks addressed in this report are:

- Analyze internal hydraulics accounting for the effect of the new proposed end gate check valve;
- Compute dilutions for new scenarios with dense and buoyant flow effluents accounting for the effect of the valve;
- Assess the effects of currents on dense discharges;
- Compute the dilution of dense discharges from the end gate;
- Analyze the effect of varying the nozzle angle on the dilution of dense and buoyant effluents.

2. MODELING SCENARIOS

2.1 Introduction

To address the additional concerns and issues that have been raised, the revised dilution analyses will include the following:

- **End-Gate**: The outfall hydraulics will be revised assuming the end-gate has been replaced with one Tideflex valve. The assumed end-gate configuration may be modified depending on the California Ocean Plan (COP) compliance analysis results.
- **Effluent Water Quality:** The salinity and temperature of the secondary effluent and GWR effluent shall remain unchanged from prior analyses presented in the 2017 Draft EIR/EIS.
- **Ocean Conditions**: Dilution analyses shall incorporate conditions related to the ocean seasons consistent with previous analyses. Worst-case conditions shall be assessed and presented.
- **Mitigation:** Preliminary assessments of the impact of diffuser nozzle orientation on dilution of dense and buoyant effluents will be made.
- **Currents:** The effects of currents on the advection and dispersion of dense effluents will be assessed.

All revised discharge scenarios will incorporate consideration of a modified end-gate on outfall diffuser hydraulics and dilution.

Model analyses will be done for typical and high brine discharge scenarios with a range of secondary and GWR effluent flows. Modeling the highest RO concentrate flow expected follows the conservative approach previously used on COP compliance evaluations for this project. Also, scenarios involving high flows of secondary effluent will be assessed for typical operations of the Variant both with and without GWR effluent. In addition, it has been requested that discharge scenarios where brine is absent be included in dilution model analyses to cover times when the desalination plant is offline.

2.2 Environmental and Discharge Conditions

In the previous report, Roberts (2016), oceanographic measurements obtained near the diffuser were discussed. Traditionally, three oceanic seasons have been defined in Monterey Bay: Upwelling (March-September), Oceanic (September-November), and Davidson (November-March). Density profiles were averaged by season to obtain representative profiles for the dilution simulations. The profiles are shown in Figure 1 and are tabulated in Appendix A. The salinities and temperatures near the depth of the diffuser were averaged seasonally as summarized in Table 1.

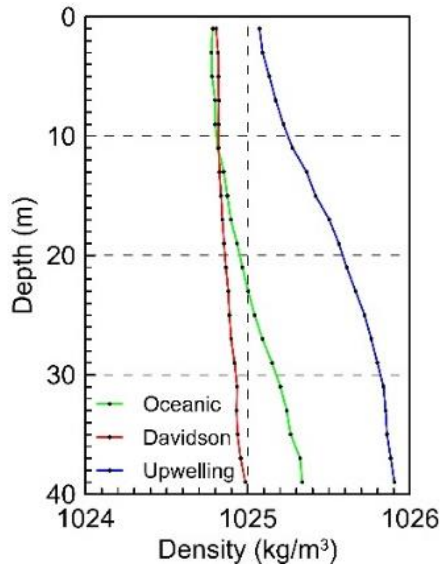


Figure 1. Seasonally averaged density profiles used for dilution simulations.

Table 1. Seasonally Averaged Properties at Diffuser Depth

Season	Temperature (°C)	Salinity (ppt)	Density (kg/m³)
Davidson	14.46	33.34	1024.8
Upwelling	11.48	33.89	1025.8
Oceanic	13.68	33.57	1025.1

The assumed constituent properties are summarized in Table 2.

Table 2. Assumed Properties of Effluent Constituents

Constituent	Temperature (°C)	Salinity (ppt)	Density (kg/m³)
Secondary effluent	20.0	0.80	998.8
Brine	9.9	58.23	1045.2
GWR	20.0	5.80	1002.6
Hauled brine	20.0	40.00	1028.6

2.3 Discharge Scenarios

Following publication of the 2017 MPWSP Draft EIR/EIS, the MRWPCA commented on several concerns related to the impact analysis regarding Ocean Plan and NPDES compliance. Specifically, discharge scenarios involving higher volumes of desalination brine (following a shut down for repair or routine maintenance) had not been assessed. Also, it was requested that higher resolution model analysis be conducted for scenarios involving low and moderate flows of secondary effluent for all project alternatives. Additionally, the MRWPCA requested that increased GWR effluent flows be assessed as part of planning for an increased capacity PWM project. Finally, it was requested that hauled brine be included in the dilution analysis for the Proposed Project.

It is proposed that revised model analysis be completed for typical and high brine discharge scenarios with secondary effluent flows ranging from 0 to 10 mgd and with the inclusion of hauled brine. Additionally, scenarios involving high flows of secondary effluent (15 and 19.78 mgd) will be assessed for typical operations. In addition, MPWPCA has requested that discharge scenarios where brine is absent be included in dilution model analyses to cover times when the desal plant is offline and to revise dilution model estimates based on the modified end-gate which may alter the outfall diffuser hydraulics.

Table 3 details the revised discharge scenarios for dilution model analysis of the Proposed Project (full size desalination facility and no implementation of GWR/PWM).

Table 4 details revised discharge scenarios for dilution model analysis of the Variant (MPWSP Alternative, reduced capacity desalination facility with PWM/GWR).

Table 3. Modeled Discharge Scenarios – Project (no GWR)

Case ID	Scenario	Constituent flows (mgd)				Combined effluent		
		Brine	Secondary effluent	GWR	Hauled brine	Flow (mgd)	Salinity (ppt)	Density (kg/m^3)
T1	SE Only	0.00	19.78	0	0.1	19.88	1.00	999.0
T2	Brine only	13.98	0.00	0	0.1	14.08	58.10	1045.1
T3	Brine + Low SE	13.98	1.00	0	0.1	15.08	54.30	1042.0
T4	Brine + Low SE	13.98	2.00	0	0.1	16.08	50.97	1039.4
T5	Brine + Low SE	13.98	3.00	0	0.1	17.08	48.04	1037.0
T6	Brine + Low SE	13.98	4.00	0	0.1	18.08	45.42	1034.9
T7	Brine + Moderate SE	13.98	5.00	0	0.1	19.08	43.08	1033.0
T8	Brine + Moderate SE	13.98	6.00	0	0.1	20.08	40.98	1031.3
T9	Brine + Moderate SE	13.98	7.00	0	0.1	21.08	39.07	1029.7
T10	Brine + Moderate SE	13.98	8.00	0	0.1	22.08	37.34	1028.3
T11	Brine + Moderate SE	13.98	9.00	0	0.1	23.08	35.76	1027.1
T12	Brine + High SE	13.98	10.00	0	0.1	24.08	34.30	1025.9
T13	Brine + High SE	13.98	15.00	0	0.1	29.08	28.54	1021.2
T14	Brine + High SE	13.98	19.78	0	0.1	33.86	24.63	1018.1
T15	High Brine only	16.31	0.00	0	0.1	16.41	58.12	1045.1
T16	High Brine + Low SE	16.31	1.00	0	0.1	17.41	54.83	1042.5
T17	High Brine + Low SE	16.31	2.00	0	0.1	18.41	51.89	1040.1
T18	High Brine + Low SE	16.31	3.00	0	0.1	19.41	49.26	1038.0
T19	High Brine + Low SE	16.31	4.00	0	0.1	20.41	46.89	1036.1
T20	High Brine + Moderate SE	16.31	5.00	0	0.1	21.41	44.73	1034.3

Table 4. Modeled Discharge Scenarios – Variant

Case ID	Scenario	Constituent Flows (mgd)				Combined effluent		
		Brine	Secondary effluent	GWR	Hauled brine	Flow (mgd)	Salinity (ppt)	Density (kg/m^3)
V1	Brine only	8.99	0.00	0	0.0	8.99	58.23	1045.2
V2	Brine + Low SE	8.99	1.00	0	0.0	9.99	52.48	1040.6
V3	Brine + Low SE	8.99	2.00	0	0.0	10.99	47.78	1036.8
V4	Brine + Low SE	8.99	3.00	0	0.0	11.99	43.86	1033.6
V5	Brine + Low SE	8.99	4.00	0	0.0	12.99	40.55	1030.9
V6	Brine + Moderate SE	8.99	5.00	0	0.0	13.99	37.70	1028.6
V7	Brine + Moderate SE	8.99	5.80	0	0.0	14.79	35.71	1027.0
V8	Brine + Moderate SE	8.99	7.00	0	0.0	15.99	33.09	1024.9
V9	Brine + High SE	8.99	14.00	0	0.0	22.99	23.26	1017.0
V10	Brine + High SE	8.99	19.78	0	0.0	28.77	18.75	1013.3
V11	GWR Only	0.00	0.00	1.17	0.0	1.17	5.80	1002.6
V12	Low SE + GWR	0.00	0.40	1.17	0.0	1.57	4.53	1001.6
V13	Low SE + GWR	0.00	3.00	1.17	0.0	4.17	2.20	999.9
V14	High SE + GWR	0.00	23.70	1.17	0.0	24.87	1.04	999.0
V15	High SE + GWR	0.00	24.70	1.17	0.0	25.87	1.03	999.0
V16	Brine + High GWR only	8.99	0.00	1.17	0.0	10.16	52.19	1040.3
V17	Brine + High GWR + Low SE	8.99	1.00	1.17	0.0	11.16	47.59	1036.6
V18	Brine + High GWR + Low SE	8.99	2.00	1.17	0.0	12.16	43.74	1033.5
V19	Brine + High GWR + Low SE	8.99	3.00	1.17	0.0	13.16	40.48	1030.9
V20	Brine + High GWR + Low SE	8.99	4.00	1.17	0.0	14.16	37.67	1028.6
V21	Brine + High GWR + Moderate SE	8.99	5.00	1.17	0.0	15.16	35.24	1026.6
V22	Brine + High GWR + Moderate SE	8.99	5.30	1.17	0.0	15.46	34.57	1026.1
V23	Brine + High GWR + Moderate SE	8.99	6.00	1.17	0.0	16.16	33.11	1024.9
V24	Brine + High GWR + Moderate SE	8.99	7.00	1.17	0.0	17.16	31.23	1023.4
V25	Brine + High GWR + High SE	8.99	11.00	1.17	0.0	21.16	25.48	1018.7
V26	Brine + High GWR + High SE	8.99	15.92	1.17	0.0	26.08	20.82	1015.0
V27	Brine + Low GWR only	8.99	0.00	0.94	0.0	9.93	53.27	1041.2
V28	Brine + Low GWR + Low SE	8.99	1.00	0.94	0.0	10.93	48.47	1037.3
V29	Brine + Low GWR + Low SE	8.99	3.00	0.94	0.0	12.93	41.09	1031.4
V30	Brine + Low GWR + Moderate SE	8.99	5.30	0.94	0.0	15.23	35.01	1026.4
V31	Brine + Low GWR + High SE	8.99	15.92	0.94	0.0	25.85	20.95	1015.1
V32	High Brine only	11.24	0.00	0.00	0.0	11.24	58.23	1045.2
V33	High Brine + Low SE	11.24	0.50	0.00	0.0	11.74	55.78	1043.3
V34	High Brine + Low SE	11.24	1.00	0.00	0.0	12.24	53.54	1041.4
V35	High Brine + Low SE	11.24	2.00	0.00	0.0	13.24	49.55	1038.2
V36	High Brine + Low SE	11.24	3.00	0.00	0.0	14.24	46.13	1035.5
V37	High Brine + Low SE	11.24	4.00	0.00	0.0	15.24	43.16	1033.0
V38	High Brine + Moderate (5) SE	11.24	5.00	0.00	0.0	16.24	40.55	1030.9
V39	High Brine + GWR only	11.24	0.00	1.17	0.0	12.41	53.29	1041.2
V40	High Brine + GWR + Low SE	11.24	0.50	1.17	0.0	12.91	51.25	1039.6
V41	High Brine + GWR + Low SE	11.24	1.00	1.17	0.0	13.41	49.37	1038.0
V42	High Brine + GWR + Low SE	11.24	2.00	1.17	0.0	14.41	46.00	1035.3
V43	High Brine + GWR + Low SE	11.24	3.00	1.17	0.0	15.41	43.07	1033.0
V44	High Brine + GWR + Low SE	11.24	4.00	1.17	0.0	16.41	40.49	1030.9
V45	High Brine + GWR + Moderate SE	11.24	5.00	1.17	0.0	17.41	38.21	1029.0

3. OUTFALL HYDRAULICS

3.1 Introduction

The outfall and diffuser is described in Roberts (2016) (see Figure 1 in that report) as follows:

The Monterey Regional Water Pollution Control Agency (MRWPCA) outfall at Marina conveys the effluent to the Pacific Ocean to a depth of about 100 ft below Mean Sea Level (MSL). The ocean segment extends a distance of 9,892 ft from the Beach Junction Structure (BJS). Beyond this there is a diffuser section 1,406 ft long. The outfall pipe consists of a 60-inch internal diameter (ID) reinforced concrete pipe (RCP), and the diffuser consists of 480 ft of 60-inch RCP with a single taper to 840 ft of 48-inch ID. The diffuser has 171 ports of two-inch diameter: 65 in the 60-inch section and 106 in the 48-inch section. The ports discharge horizontally alternately from both sides of the diffuser at a spacing of 16 ft on each side except for one port in the taper section that discharges vertically for air release. The 42 ports closest to shore are presently closed, so there are 129 open ports distributed over a length of approximately 1024 ft. The 129 open ports are fitted with four inch Tideflex "duckbill" check valves (the four inch refers to the flange size not the valve opening). The valves open as the flow through them increases so the cross-sectional area is variable. The end gate has an opening at the bottom about two inches high. The hydraulic characteristics of the four-inch valves and the procedure to compute the flow distribution in the diffuser with the end gate opening was detailed in Roberts (2016) Appendix A.

It is proposed to replace the end gate opening with a Tideflex check valve. A suitable valve is a 6 inch Tideflex check valve, Hydraulic Code 355. The hydraulic characteristics of this valve are shown in Figure 2.

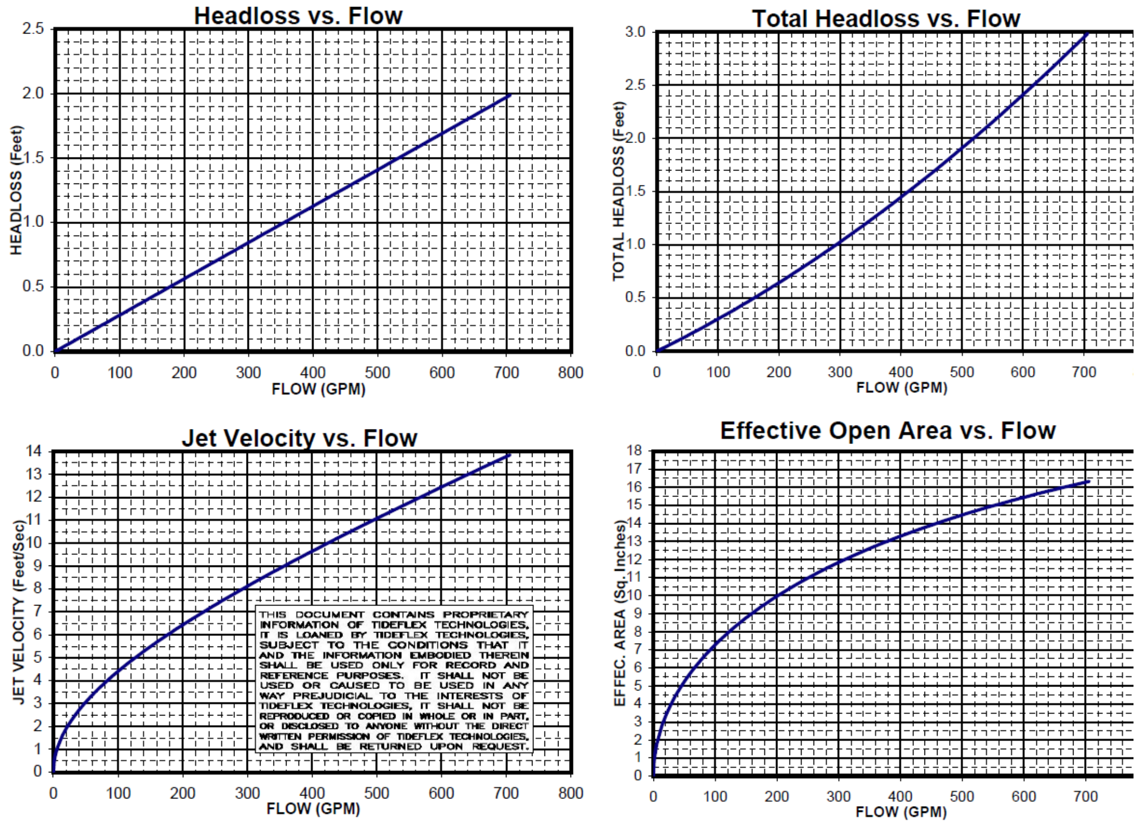


Figure 2. Characteristics of 6-inch TideFlex check valve Hydraulic Code 355.

The same methodology to compute the internal hydraulics as outlined in Roberts (2016) was used. For the purposes of the hydraulic computations, the relationship between the total head loss across the valve, E' and the flow Q of Figure 2 was approximated by:

$$Q = -28.24E'^2 + 319.8E' \tag{1}$$

The calculation procedure followed that in Roberts (2016) except that the open end gate relationship was replaced by Eq. 1.

Typical flow variations with and without the end gate valve are shown in Figure 3. This shows Case T1, mostly secondary effluent with a total flow of 19.88 mgd, density 999.0 kg/m3, and case T2, almost pure brine with a flow of 14.08 mgd, density 1045.1 kg/m3. The flow distributions with and without the Tideflex valve are virtually indistinguishable. The flow exiting from the end gate is reduced slightly from 4% to 3% of the total for T1 and from 5% to 4% for T2. The velocity from the end gate is increased significantly by the check valve, from 6.7 to 10.7 ft/s for T1 and from 6.1 to 9.7 ft/s for T2. The additional total head loss through the outfall due to the check valve is negligible, about 0.01 ft.

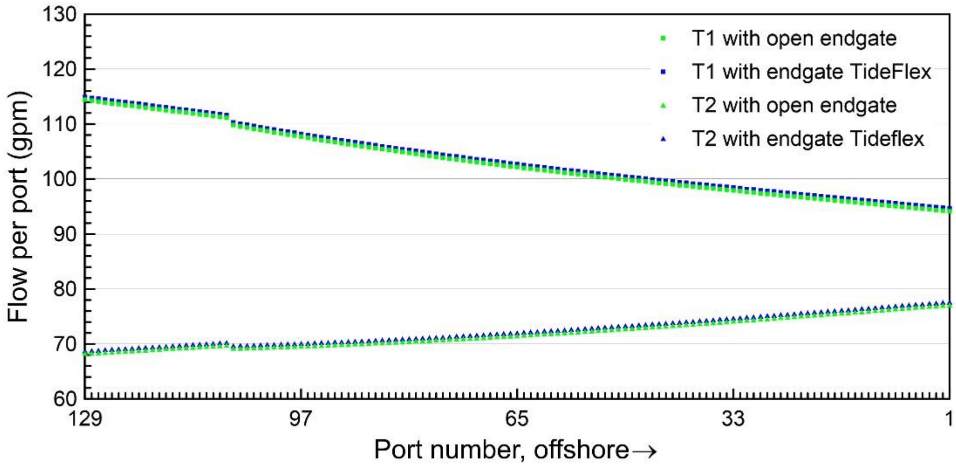


Figure 3. Typical port flow distributions with and without the endgate check valve for cases T1 and T2.

3.2 Effect of End Gate Valve on Dilution

The end gate check valve decreases the flow from the end gate and increases the flow from the two-inch ports. The dilution calculations later in this report assume the check valve is in place. To assess the effect of the valve on dilution from the main diffuser, dilutions were calculated for cases T1 and T2.

For T1, the total flow through the two-inch ports increased from 19.1 to 19.2 mgd (0.5%) and the port diameter increased from 2.00 to 2.01 inches. This had no effect on dilution (when rounded to a whole number).

For T2, the total flow through the two-inch ports increased from 13.4 to 13.5 mgd (0.8%) and the port diameter was unchanged at 1.84 inches. This had no effect on dilution (when rounded to a whole number).

4. DENSE DISCHARGE DILUTION

4.1 Introduction

The calculation procedure was similar to that in Roberts (2016), where dilutions were predicted by two methods. First was the semi-empirical equation due to Cederwall (1968) (Eq. 3 in Roberts, 2016):

$$\frac{S_i}{F_j} = 0.54\left(0.66 + 0.38\frac{z}{dF_j}\right)^{5/3} \tag{2}$$

where S_i is the impact dilution, F_j the jet densimetric Froude number, and z the height of the nozzle above the seabed. Second, the dilution and trajectories of the jets were predicted by UM3, a Lagrangian entrainment model in the mathematical modeling suite Visual Plumes (Frick et al. 2003, Frick 2004, and Frick and Roberts 2016).

First, the internal hydraulics program was run to determine the flow variation along the diffuser. Dilutions were then computed for the flow and equivalent nozzle diameter for the innermost and outermost nozzles and the lowest dilution chosen. Worst-case oceanic conditions were assumed, which corresponds to the lowest oceanic density, the "Davidson" condition (Table 1), i.e. salinity = 33.34 ppt, density = 1024.8 kg/m^3.

4.2 Results

The results for the Project scenarios (Table 3) are summarized in Table 5, and for the Variant (Table 4) in Table 6. For large density differences, the Cederwall equation gives the lowest dilutions but as the effluent density approaches the ambient density, UM3 gives lower dilutions. To be conservative, the lowest of the two model predictions was chosen, as shown in last columns of Tables 5 and 6. The increase in dilution from the impact point to the edge of the BMZ was assumed to be 20% as discussed in Roberts (2016).

All dense discharges meet the Ocean Plan requirement of a 2 ppt increment in salinity at the edge of the BMZ.

Table 5. Summary of Dilution Simulations for Dense Effluent Scenarios – Project (no GWR)

Case ID	Effluent conditions			Port conditions				Predictions						
								Cederwall	UM3		At impact (ZID)		At BMZ	
	Flow (mgd)	Salinity (ppt)	Density (kg/m^3)	Flow (gpm)	Diam. (inch)	Velocity (ft/s)	Froude no.	Dilution	Dilution	Distance (ft)	Dilution	Salinity increment (ppt)	Dilution	Salinity increment (ppt
T2	14.08	58.10	1045.1	77.8	1.88	9.0	28.5	15.4	16.2	10.2	15.4	1.61	18.5	1.34
T3	15.08	54.30	1042.0	82.8	1.91	9.3	31.6	16.0	16.1	10.4	16.0	1.31	19.2	1.09
T4	16.08	50.97	1039.4	80.8	1.89	9.2	34.5	16.8	17.6	11.6	16.8	1.05	20.1	0.88
T5	17.08	48.04	1037.0	86.2	1.92	9.6	38.6	17.7	18.5	12.7	17.7	0.83	21.2	0.69
T6	18.08	45.42	1034.9	91.6	1.95	9.8	43.4	18.8	19.5	13.8	18.8	0.64	22.5	0.54
T7	19.08	43.08	1033.0	97.1	1.98	10.1	49.2	20.1	20.9	15.3	20.1	0.48	24.2	0.40
T8	20.08	40.98	1031.3	103.1	2.01	10.4	56.5	21.9	22.2	16.8	21.9	0.35	26.3	0.29
T9	21.08	39.07	1029.7	108.7	2.02	10.9	67.4	24.8	24.9	19.2	24.8	0.23	29.7	0.19
T10	22.08	37.34	1028.3	114.2	2.05	11.1	80.6	28.2	27.5	21.9	27.5	0.15	33.0	0.12
T11	23.08	35.76	1027.1	119.8	2.07	11.4	103.3	34.2	27.7	22.3	27.7	0.09	33.2	0.07
T12	24.08	34.30	1025.9	125.3	2.10	11.6	150.4	46.7	39.2	33.0	39.2	0.02	47.0	0.02
T15	16.41	58.12	1045.1	82.4	1.90	9.3	29.3	15.5	16.3	10.5	15.5	1.60	18.6	1.33
T16	17.41	54.83	1042.5	87.8	1.93	9.6	32.3	16.1	16.9	11.3	16.1	1.34	19.3	1.11
T17	18.41	51.89	1040.1	93.3	1.96	9.9	35.4	16.7	17.5	12.1	16.7	1.11	20.1	0.92
T18	19.41	49.26	1038.0	98.7	1.99	10.2	38.9	17.5	18.4	13.1	17.5	0.91	21.0	0.76
T19	20.41	46.89	1036.1	104.8	2.01	10.6	43.6	18.6	19.3	14.2	18.6	0.73	22.3	0.61
T20	21.41	44.73	1034.3	110.3	2.04	10.8	48.1	19.6	20.4	15.4	19.6	0.58	23.6	0.48

Table 6. Summary of Dilution Simulations for Dense Effluent Scenarios – Variant

Case ID	Effluent conditions			Port conditions				Predictions						
								Cederwall	UM3		At impact (ZID)		At BMZ	
	Flow (mgd)	Salinity (ppt)	Density (kg/m³)	Flow (gpm)	Diam. (inch)	Velocity (ft/s)	Froude no.	Dilution	Dilution	Distance (ft)	Dilution	Salinity increment (ppt)	Dilution	Salinity increment (ppt)
V1	9.0	58.23	1045.2	51.6	1.68	7.5	23.9	15.7	16.0	8.6	15.7	1.59	18.8	1.32
V2	10.0	52.48	1040.6	55.8	1.72	7.7	28.9	16.3	16.9	9.6	16.3	1.17	19.6	0.98
V3	11.0	47.78	1036.8	54.9	1.71	7.7	33.1	17.4	18.1	10.5	17.4	0.83	20.8	0.69
V4	12.0	43.86	1033.6	61.5	1.76	8.1	40.3	18.8	19.8	12.4	18.8	0.56	22.6	0.47
V5	13.0	40.55	1030.9	67.3	1.81	8.4	49.2	20.9	21.6	14.4	20.9	0.35	25.0	0.29
V6	14.0	37.70	1028.6	73.4	1.85	8.8	64.3	24.6	24.9	17.5	24.6	0.18	29.5	0.15
V7	14.8	35.71	1027.0	76.8	1.87	9.0	86.0	30.3	29.4	21.4	29.4	0.08	35.3	0.07
V8	16.0	33.09	1024.9	76.3	1.87	8.9	382.9	110.2	67.6	51.4	67.6	0.00	81.1	0.00
V16	10.2	52.19	1040.3	56.8	1.72	7.8	29.7	16.5	17.3	9.9	16.5	1.14	19.8	0.95
V17	11.2	47.59	1036.6	56.1	1.72	7.8	33.6	17.4	18.3	10.8	17.4	0.82	20.9	0.68
V18	12.2	43.74	1033.5	63.5	1.79	8.1	40.1	18.7	19.3	12.3	18.7	0.56	22.4	0.46
V19	13.2	40.48	1030.9	68.3	1.81	8.5	50.3	21.1	21.8	14.5	21.1	0.34	25.4	0.28
V20	14.2	37.67	1028.6	73.8	1.85	8.8	65.0	24.8	24.9	17.5	24.8	0.17	29.8	0.15
V21	15.2	35.24	1026.6	80.9	1.89	9.3	97.2	33.2	31.7	23.5	31.7	0.06	38.0	0.05
V22	15.5	34.57	1026.1	79.8	1.89	9.1	114.2	37.7	34.3	25.6	34.3	0.04	41.2	0.03
V23	16.2	33.11	1024.9	83.3	1.91	9.3	395.8	113.5	68.5	53.5	68.5	0.00	82.2	0.00
V27	9.9	53.27	1041.2	55.3	1.71	7.7	28.5	16.3	16.9	9.5	16.3	1.22	19.6	1.02

Table 6. Summary of Dilution Simulations for Dense Effluent Scenarios – Variant

Case ID	Effluent conditions			Port conditions				Predictions						
								Cederwall	UM3		At impact (ZID)		At BMZ	
	Flow (mgd)	Salinity (ppt)	Density (kg/m^3)	Flow (gpm)	Diam. (inch)	Velocity (ft/s)	Froude no.	Dilution	Dilution	Distance (ft)	Dilution	Salinity increment (ppt)	Dilution	Salinity increment (ppt)
V28	10.9	48.47	1037.3	59.3	1.75	7.9	33.1	17.1	17.8	10.7	17.1	0.88	20.6	0.74
V29	12.9	41.09	1031.4	67.0	1.80	8.5	48.1	20.6	21.1	13.9	20.6	0.38	24.7	0.31
V30	15.2	35.01	1026.4	78.3	1.88	9.1	100.6	34.1	32.6	24.1	32.6	0.05	39.1	0.04
V32	11.2	58.23	1045.2	63.3	1.78	8.2	26.5	15.4	16.1	9.3	15.4	1.61	18.5	1.34
V33	11.7	55.78	1043.3	57.1	1.73	7.8	27.0	15.8	16.5	9.2	15.8	1.42	19.0	1.18
V34	12.2	53.54	1041.4	67.3	1.81	8.4	29.9	16.1	16.8	10.3	16.1	1.26	19.3	1.05
V35	13.2	49.55	1038.2	66.4	1.80	8.4	33.3	16.9	17.8	11.0	16.9	0.96	20.3	0.80
V36	14.2	46.13	1035.5	72.7	1.84	8.8	38.8	18.1	19.0	12.4	18.1	0.71	21.7	0.59
V37	15.2	43.16	1033.0	78.9	1.88	9.1	45.3	19.6	20.3	13.9	19.6	0.50	23.5	0.42
V38	16.2	40.55	1030.9	85.0	1.92	9.4	53.7	21.5	22.0	15.8	21.5	0.33	25.9	0.28
V39	12.4	53.29	1041.2	61.5	1.76	8.1	29.5	16.2	17.0	10.0	16.2	1.23	19.5	1.02
V40	12.9	51.25	1039.6	64.5	1.79	8.2	31.3	16.5	17.3	10.5	16.5	1.09	19.8	0.91
V41	13.4	49.37	1038.0	67.6	1.81	8.4	33.7	17.0	17.8	11.1	17.0	0.95	20.4	0.79
V42	14.4	46.00	1035.3	73.9	1.85	8.8	39.1	18.1	18.8	12.4	18.1	0.70	21.7	0.58
V43	15.4	43.07	1033.0	80.0	1.89	9.2	45.6	19.6	20.2	14.0	19.6	0.50	23.5	0.41
V44	16.4	40.49	1030.9	85.8	1.92	9.5	54.4	21.7	22.3	16.0	21.8	0.33	26.1	0.27
V45	17.4	38.21	1029.0	90.3	1.95	9.7	66.0	24.7	24.7	18.4	24.7	0.20	29.6	0.16

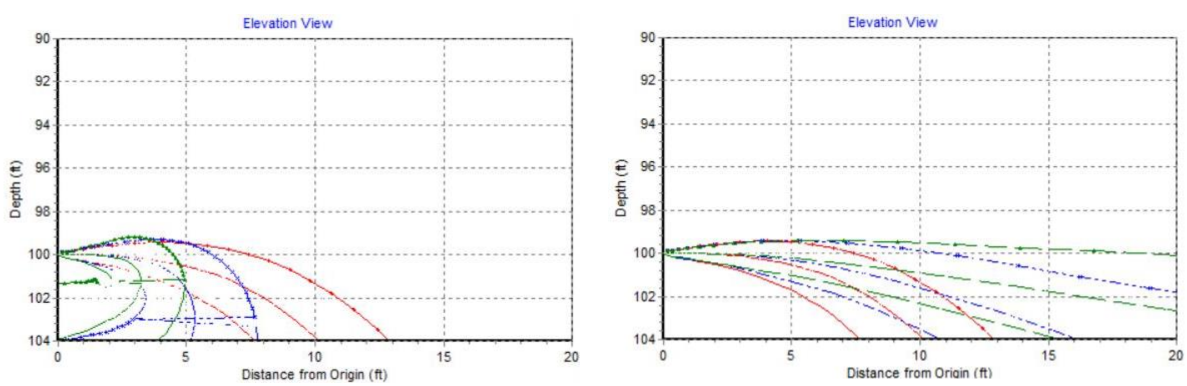
4.3 Effect of Currents

The effect of currents on the dynamics of dense jets has been questioned. All simulations have been done with zero current speed, as this is usually the worst case that results in lowest dilutions. According to the Research Activity Panel of the Monterey Bay National Marine Sanctuary, currents in the vicinity of the diffuser are commonly 5 to 10 cm/s and can reach 20 cm/s.

The effect of currents on dense jets is determined by the dimensionless parameter $u_r F_j$ (Gungor and Roberts 2009) where $u_r = u_a/u$ is the ratio of the ambient current speed, u_a, to the jet velocity, u. If $u_r F_j \ll 1$ the current does not significantly affect the jet; if $u_r F_j \gg 1$ the jet will be significantly deflected by the current and dilution increases significantly. Gungor and Roberts (2009) investigated the effects of currents on vertical dense jets; experiments on multiport diffusers with 60° nozzles were reported by Abessi and Roberts (2017).

There are no known experiments on horizontal dense jets in flowing currents so we investigated the phenomenon using the UM3 model in Visual Plumes. We simulated the pure brine case, T2 (Table 3) at current speeds of zero, 5, 10, and 20 cm/s. Because of the orientation of the MRWPCA diffuser (see Figure 1 of Roberts 2016) the predominant current direction is expected to be perpendicular to the diffuser axis. The nozzles are perpendicular to the diffuser, so the current direction relative to the individual jets is either counter-flow (jets directly opposing the current), or co-flow (jets in the same direction as the currents.

UM3 was run for all cases. Screen shots of the jet trajectories for counter- and co-flowing jets are shown in Figure 4.



a) Counter-flow **b) Co-flow**

Figure 4. Screen shots of UM3 simulations of dense jet trajectories (Case T2) in counter- and co-flowing currents. Red: zero current; Blue: 10 cm/s; Green: 20 cm/s.

In counter flowing currents, the jets are bent backwards and impact the seabed closer to the diffuser. In co-flowing currents, the jets are advected downstream and impact the seabed farther from the diffuser. The numerical results are summarized in Table 7.

Table 7. UM3 Simulations of Case T2 with Current

Current	Counter-flow		Co-flow	
Speed (cm/s)	Dilution	Impact distance (ft)	Dilution	Impact distance (ft)
0	16.2	10	16.2	10
5	17.3	8	22.6	13
10	18.9	5	38.4	16
20	32.6	0	78.0	27

It can be seen that the effect of the currents is to increase dilution compared to the zero current case. The maximum impact distance from the diffuser occurs with co-flowing currents and increases as the current speed increases. In this case, the maximum impact distance (for u_a = 20 cm/s) is 27 ft (8.2 m). Clearly, this is much less than the distance to the edge of the BMZ (100 m) so we conclude that neglecting the effect of currents is indeed conservative, and the Ocean Plan regulations will be met for all anticipated currents.

4.4 Dilution of End Gate Check Valve

As discussed in Section 3, it has been proposed to replace the opening in the end gate with a 6-inch Tideflex check valve. We simulated the dilution of this valve for various nozzle angles for the worst case of pure brine, T2 (Table 3). The flow distributions along the diffuser for this case were shown in Figure 3. The exit velocity from the end gate check valve is 9.7 ft/s and the equivalent round diameter is 4.1 inches, yielding a densimetric Froude number, F_j = 20.7.

The effect of nozzle angle on the dilution of dense jets is discussed in Section 6.2. Using Figure 6, the impact dilutions for various angles were calculated. The results are summarized in Table 8.

The corresponding dilution for the main diffuser nozzles is 15.4 (Table 5). It is therefore apparent that any nozzle angle greater than about 20° will result in dilutions greater than the main diffuser and will meet the BMZ requirements. Dilution is maximized for a 60° nozzle.

Table 8. Effect of Nozzle Angle on Impact Dilution for Flow from End Gate Check Valve for Case T2 (14.08 mgd, 1045.1 kg/m^3).

Nozzle angle (Degrees)	Impact dilution
0	8.9
10	12.3
20	18.9
30	25.6
40	31.6
50	35.7
60	36.9

5. Buoyant Discharge Dilution

5.1 Introduction

The same procedures and models discussed in Roberts (2016) were used except that all three seasonal profiles were used for each flow scenario to determine the worst-case condition. Inspection of Tables 3 and 4 show that there are 14 cases of buoyant discharges, i.e., the effluent density is less than the receiving water density. Three are for the Project and 11 for the Variant. Two models in the US EPA modeling suite Visual Plumes were used: NRFIELD and UM3. Zero current speed was assumed in all cases.

5.2 Results

The following procedure was used: The internal hydraulics program was first run for each scenario and the average diameter and flow for each nozzle was obtained. UM3 and NRFIELD were then run for each oceanic season.

As was observed in Roberts (2016), for very buoyant cases, the average dilution predicted by UM3 is close to the minimum (centerline) dilution predicted by NRFIELD. They diverge as the effluent becomes only slightly buoyant (i.e. the effluent density approaches the ambient density), with UM3 dilutions being considerably higher.

NRFIELD is based on experiments conducted for parameters typical of domestic wastewater discharges into coastal waters and estuaries. For this situation, dilution and mixing are mainly dependent on the source buoyancy flux with momentum flux playing a minor role. As the effluent density approaches the background density, buoyancy becomes less important and the mixing becomes dominated by momentum. In that situation, NRFIELD continues to give predictions but issues a warning that "The results are extrapolated" when the parameters are outside the range of the original experiments. Table 9 summarizes the results; NRFIELD predictions are only given when they fall within the experimental range on which it is based.

The plume behavior depends strongly on the shape of the density profile (Figure 1) but dilutions are generally very high. The Upwelling profile always gives deepest submergence and lowest dilutions. The plumes are always submerged with the Upwelling and Oceanic profiles but some plumes surface with the weak Davidson stratification. Dilutions are very high for surfacing plumes, up to 842 (Case V12) when the flow is very low.

Table 9. Summary of Dilution Simulations for Buoyant Effluent Scenarios – Project and Variant

Case ID	Season	Effluent conditions			Port conditions				UM3 simulations		NRFIELD simulations		
		Flow (mgd)	Salinity (ppt)	Density (kg/m^3)	Flow (gpm)	Diam. (inch)	Velocity (ft/s)	Froude no.	Average dilution	Rise height (centerline) (ft)	Minimum dilution	Rise height (centerline) (ft)	Rise height (top) (ft)
T1	Upwelling	19.88	1.00	999.0	103.7	2.01	10.5	27.9	188	57	179	41	57
	Davidson								327	100	349	100	100
	Oceanic								239	80	238	50	72
T13	Upwelling	29.08	28.54	1021.2	151.6	2.18	13.0	80.6	93	28			
	Davidson								127	57			
	Oceanic								94	27			
T14	Upwelling	33.86	24.63	1018.1	176.4	2.25	14.2	66.7	99	36			
	Davidson								147	76			
	Oceanic								104	41			
V9	Upwelling	22.99	23.26	1017.0	119.6	2.10	11.1	50.3	110	37			
	Davidson								172	75			
	Oceanic								116	42			
V10	Upwelling	28.77	18.75	1013.3	149.9	2.18	12.9	48.3	118	44	100	39	41
	Davidson								202	96	215	97	100
	Oceanic								132	58	134	57	59
V11	Upwelling	1.17	5.80	1002.6	6.5	0.71	5.3	25.4	495	30			
	Davidson								974	48			
	Oceanic								549	35			
V12	Upwelling	1.57	4.53	1001.6	8.4	0.81	5.2	23.1	457	31	385	25	32
	Davidson								842	50	652	33	45
	Oceanic								520	37	460	28	36

Table 9. Summary of Dilution Simulations for Buoyant Effluent Scenarios – Project and Variant

Case ID	Season	Effluent conditions			Port conditions				UM3 simulations		NRFIELD simulations		
		Flow (mgd)	Salinity (ppt)	Density (kg/m^3)	Flow (gpm)	Diam. (inch)	Velocity (ft/s)	Froude no.	Average dilution	Rise height (centerline) (ft)	Minimum dilution	Rise height (centerline) (ft)	Rise height (top) (ft)
V13	Upwelling	4.17	2.20	999.9	21.7	1.24	5.8	19.9	324	39	301	30	40
	Davidson								547	66	687	51	74
	Oceanic								376	47	378	35	47
V14	Upwelling	24.87	1.04	999.0	129.6	2.11	11.9	30.9	174	60	165	56	59
	Davidson								290	100	301	67	100
	Oceanic								223	86	235	55	81
V15	Upwelling	25.87	1.03	999.0	134.8	2.13	12.1	31.4	172	60	163	57	59
	Davidson								281	100	293	67	100
	Oceanic								221	87	232	56	82
V24	Upwelling	17.16	31.23	1023.4	89.3	1.94	9.7	87.3	91	20			
	Davidson								131	46			
	Oceanic								91	18			
V25	Upwelling	21.16	25.48	1018.7	109.8	2.03	10.9	56.2	107	33			
	Davidson								159	65			
	Oceanic								111	37			
V26	Upwelling	26.08	20.82	1015.0	135.6	2.13	12.2	49.7	115	41			
	Davidson								191	89			
	Oceanic								124	49			
V31	Upwelling	25.85	20.95	1015.1	134.4	2.13	12.1	49.5	115	41			
	Davidson								191	89			
	Oceanic								124	49			

6. Dilution Mitigation – Effect of Nozzle Angle

6.1 Introduction

Orienting the nozzles upwards from horizontal will increase the dilution of brine mixtures that are more dense than the receiving water. For buoyant effluents, it will decrease dilution slightly. In this section, we investigate the effect on dilution of varying nozzle orientations for dense and buoyant effluents.

6.2 Dense Effluents

The effect of nozzle angle on dense jets has been recently investigated by Abessi and Roberts (2015). Figure 5 shows central plane tracer concentrations (inverse of dilution) obtained by laser-induced fluorescence for dense jets with angles ranging from 15° to 85°. For very shallow angles, e.g. 15°, the jet impacts the bed quickly, reducing dilution. For steep angles, e.g. 85°, the trajectory is also truncated and the jet falls back on itself, which also reduces dilution.

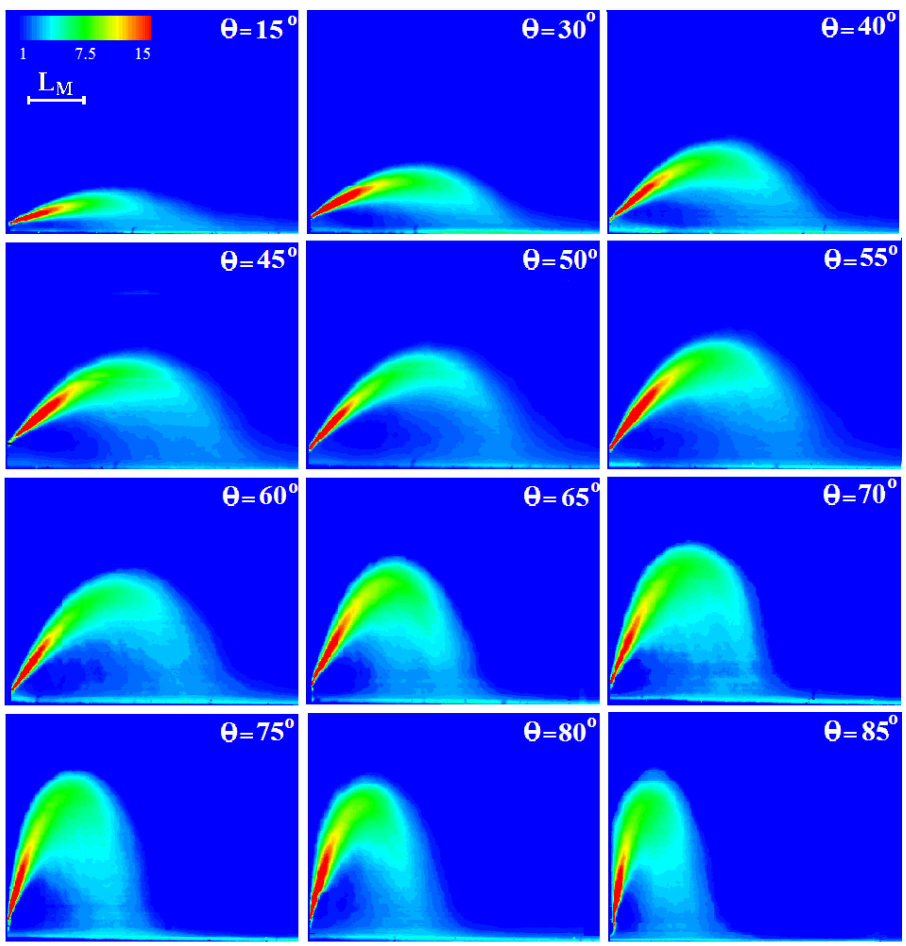


Figure 5. Central plane tracer concentrations for dense jets at various nozzle angles from 15° to 85°. After Abessi and Roberts (2015).

The optimum angle for dilution is 60°. This is illustrated by Figure 6, which shows the variation with nozzle angle on normalized impact dilution (S_i/F_j) and near field dilution (S_n/F_j) for single jets.

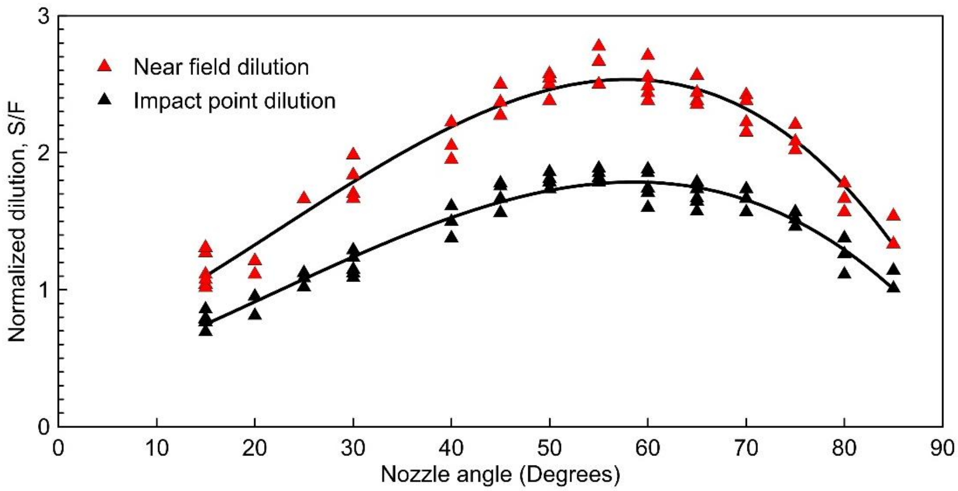


Figure 6. Effect of nozzle angle on normalized dilution of dense jets. After Abessi and Roberts (2015).

Impact dilutions were computed for the "worst-case" of brine only (T2, for conditions, see Table 3) using Figure 6. The results are tabulated in Table 10 and plotted in Figure 7. The effect of the height of the nozzle above the seabed, z, is determined by the dimensionless parameter z/dF_j, where d is the nozzle diameter. For Monterey, the nozzles are four feet above the seabed, so for case T2 we have $z/dF_j \approx 0.93$. The experiments of Abessi and Roberts were done with nozzles closer to the bed, with h/dF_j ranging from 0.12 to 0.39, so actual dilutions are expected to be higher than predicted in Table 10.

Dilution calculations with UM3 are also shown for completeness with other simulations. However, it is known that UM3 considerably underestimates dilutions for inclined jets (Palomar et al. 2012), therefore only the Abessi and Roberts results are used.

Table 10. Effect of Nozzle Angle on Dense Jets Case T2.
(for conditions, see Table 3)

Case ID	Nozzle angle	Dilution predictions				At impact		At BMZ	
		Cederwall	Abessi and Roberts (2015a)		UM3	Dilution	Salinity increment	Dilution	Salinity increment
	(deg)	Impact	Impact	Near field	Impact		(ppt)		(ppt)
T2	0	15.4	-	-	16.1	15.4	1.61	18.5	1.34
	10	-	16.9	25.2	18.7	16.9	1.47	20.3	1.22
	20	-	25.9	37.8	20.9	25.9	0.95	31.1	0.80
	30	-	35.3	50.8	22.8	35.3	0.70	42.3	0.59
	40	-	43.4	62.3	24.3	43.4	0.57	52.1	0.48
	50	-	49.0	70.0	24.5	49.0	0.50	58.9	0.42
	60	-	50.7	71.9	24.4	50.7	0.49	60.9	0.41

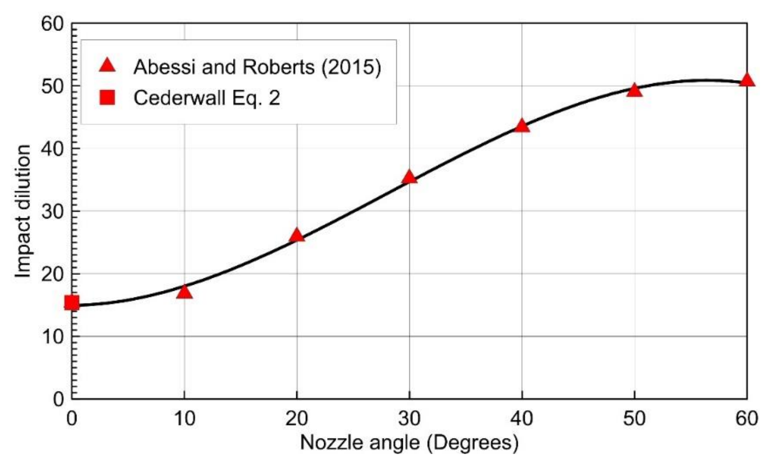


Figure 7. Effect of nozzle angle on dilution of dense jets, case T2.

Increasing the angle from horizontal (0°) to 60° increases dilution considerably, from 15 to 51. A 30° angle more than doubles the dilution compared to the horizontal jets.

The dilution at the BMZ is computed as 120% of the impact dilution. Note that in Table 10 the increase in dilution from the impact point to the end of the near field is more than 20%. This result, however, is for a single jet, and the increase for merged jets is less than this, and is conservatively assumed to be 20%, as explained in Roberts (2016).

6.3 Buoyant Effluents

Diffusers for buoyant effluents are usually designed with horizontal nozzles to maximize the length of the jet trajectory up to the terminal rise height, and therefore maximize dilution. Inclining the nozzles upwards will usually reduce dilution, although for very buoyant discharges in deep water the effect may be minimal. This is because the dynamics are then buoyancy dominated and the effect of momentum flux and therefore nozzle orientation is unimportant.

For very buoyant discharges, NRFIELD is the preferred model. NRFIELD, however, assumes the nozzles to be horizontal, so UM3 was used to assess the effect of nozzle orientation.

Simulations were run with UM3 for selected cases to bracket the expected results. The chosen cases were for the project scenarios (Table 3): T1 (mainly pure secondary effluent) and T13 (brine plus high secondary effluent). The latter case is only slightly buoyant and resulted in the lowest dilution of the buoyant cases. The simulations were run only for the oceanic conditions that gave the highest dilutions (Upwelling) and lowest dilutions (Davidson).

The results are summarized in Table 11 and plotted in Figure 8.

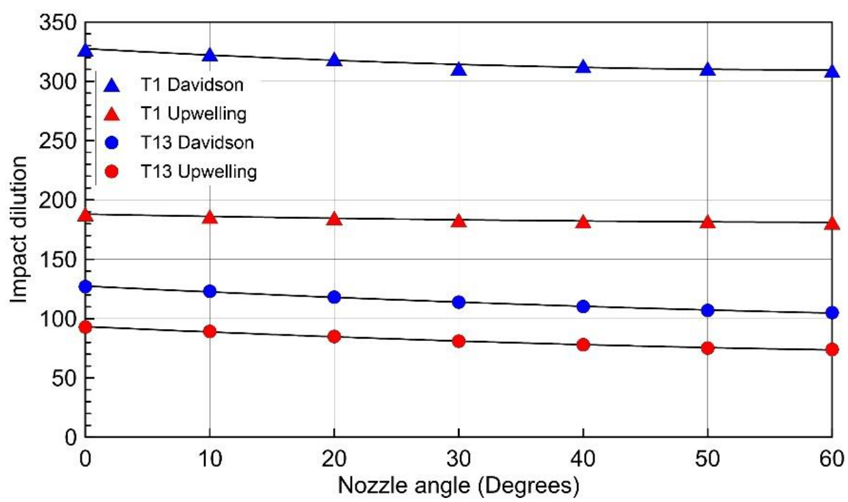


Figure 8. Effect of nozzle angle on dilution for selected buoyant discharge scenarios.

The results are insensitive to nozzle angle, especially for the very buoyant case of mainly pure secondary effluent (T1). Changing the nozzles from horizontal to 60° for the Davidson condition reduces dilution from 327 to 309, and for Upwelling condition from 188 to 181. For case T13 the corresponding reductions are from 127 to 105 and from 93 to 75. The percentage reductions for T13 are greater due to the increased effect of momentum flux, and therefore nozzle angle. More modest changes in orientation result in lesser effect; for a 30° nozzle the dilution reductions range from 3 to 13%.

Table 11. Effect of nozzle Angle on Dilution for Selected Buoyant Effluent Scenarios

Case ID	Oceanic Season	Effluent conditions			Nozzle angle	UM3 simulations	
		Flow (mgd)	Salinity (ppt)	Density	(deg)	Average dilution	Rise height (centerline) (ft)
T1	Upwelling	19.88	1.00	999.0	0	188	57
					10	186	58
					20	185	58
					30	183	59
					40	182	60
					50	182	61
					60	181	61
T1	Davidson	19.88	1.00	999.0	0	327	100
					10	323	100
					20	319	100
					30	311	100
					40	313	100
					50	311	100
					60	309	100
T13	Upwelling	29.08	28.54	1021.2	0	93	28
					10	89	29
					20	85	30
					30	81	31
					40	78	33
					50	75	35
					60	74	37
T13	Davidson	29.08	28.54	1021.2	0	127	57
					10	123	57
					20	118	57
					30	114	58
					40	110	60
					50	107	61
					60	105	63

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APPENDIX A. DENSITY PROFILES

The seasonally averaged density profiles assumed for modeling purposes are summarized below.

Depth (m)	Density (kg/m^3)		
	Upwelling	Davidson	Oceanic
1	1025.1	1024.8	1024.8
3	1025.1	1024.8	1024.8
5	1025.1	1024.8	1024.8
7	1025.2	1024.8	1024.8
9	1025.2	1024.8	1024.8
11	1025.3	1024.8	1024.8
13	1025.4	1024.8	1024.9
15	1025.4	1024.8	1024.9
17	1025.5	1024.8	1024.9
19	1025.6	1024.9	1024.9
21	1025.6	1024.9	1025.0
23	1025.7	1024.9	1025.0
25	1025.7	1024.9	1025.0
27	1025.8	1024.9	1025.1
29	1025.8	1024.9	1025.1
31	1025.8	1024.9	1025.2
33	1025.9	1024.9	1025.2
35	1025.9	1024.9	1025.3

Appendix B. Additional Scenarios

In a memorandum from Trussell Technologies, Inc. dated July 21, 2017, dilution simulations for some additional scenarios were requested. They were contained in table 9 of that memo, which is reproduced below.

Table 9 –Proposed Flow Scenarios for Additional Modeling

No.	RTP Secondary Effluent	Hauled Waste	GWR Concentrate	Desal Brine	Ocean Condition[1]
MPWSP with high Desal Brine flow					
1	6	0	--	16.31	All
2	7	0	--	16.31	All
3	8	0	--	16.31	All
4	9	0	--	16.31	All
5	10	0	--	16.31	All
6	12	0	--	16.31	All
7	14	0	--	16.31	All
8	16	0	--	16.31	All
Variant with Desal Off					
9	8	0	1.17	0	All
Variant with GWR Concentrate off and high Desal Brine flow					
10	6	0	--	11.24	All
11	7	0	--	11.24	All
12	8	0	--	11.24	All
13	9	0	--	11.24	All
14	10	0	--	11.24	All
15	12	0	--	11.24	All
16	14	0	--	11.24	All
17	16	0	--	11.24	All
Variant with high Desal Brine flow					
18	6	0	1.17	11.24	All
19	7	0	1.17	11.24	All
20	8	0	1.17	11.24	All
21	9	0	1.17	11.24	All
22	10	0	1.17	11.24	All
23	12	0	1.17	11.24	All
24	14	0	1.17	11.24	All
25	16	0	1.17	11.24	All

1: All ocean conditions should be modeled when using the UM3 and NRFIELD models. For dense plumes that are modeled with Cederwall and UM3, the worst-case ocean condition should be used.

The flow conditions for these additional scenarios are summarized in Table B1. Dilutions were simulated according to the same procedures as outlined in Sections 4 and 5. The results for dense discharges are summarized in Table B2 and for buoyant discharges in Table B3.

Table B1. Additional Modeled Discharge Scenarios

Case ID	Scenario	Constituent flows (mgd)				Combined effluent		
		Brine	Secondary effluent	GWR	Hauled brine	Flow (mgd)	Salinity (ppt)	Density (kg/m^3)
AT1	MPWSP with high desal brine flow	16.31	6.00	0.00	0.0	22.31	42.78	1032.7
AT2		16.31	7.00	0.00	0.0	23.31	40.98	1031.3
AT3		16.31	8.00	0.00	0.0	24.31	39.33	1030.0
AT4		16.31	9.00	0.00	0.0	25.31	37.81	1028.7
AT5		16.31	10.00	0.00	0.0	26.31	36.40	1027.6
AT6		16.31	12.00	0.00	0.0	28.31	33.89	1025.6
AT7		16.31	14.00	0.00	0.0	30.31	31.70	1023.8
AT8		16.31	16.00	0.00	0.0	32.31	29.79	1022.2
AV9	Variant with desal off	0.00	8.00	1.17	0.0	9.17	1.44	999.3
AV10	Variant with GWR concentrate off and high desal brine flow	11.24	6.00	0.00	0.0	17.24	38.24	1029.1
AV11		11.24	7.00	0.00	0.0	18.24	36.19	1027.4
AV12		11.24	8.00	0.00	0.0	19.24	34.35	1025.9
AV13		11.24	9.00	0.00	0.0	20.24	32.69	1024.6
AV14		11.24	10.00	0.00	0.0	21.24	31.19	1023.4
AV15		11.24	12.00	0.00	0.0	23.24	28.58	1021.3
AV16		11.24	14.00	0.00	0.0	25.24	26.38	1019.5
AV17		11.24	16.00	0.00	0.0	27.24	24.50	1018.0
AV18	Variant with high desal brine flow	11.24	6.00	1.17	0.0	18.41	36.18	1027.4
AV19		11.24	7.00	1.17	0.0	19.41	34.36	1025.9
AV20		11.24	8.00	1.17	0.0	20.41	32.71	1024.6
AV21		11.24	9.00	1.17	0.0	21.41	31.22	1023.4
AV22		11.24	10.00	1.17	0.0	22.41	29.87	1022.3
AV23		11.24	12.00	1.17	0.0	24.41	27.48	1020.4
AV24		11.24	14.00	1.17	0.0	26.41	25.46	1018.7
AV25		11.24	16.00	1.17	0.0	28.41	23.73	1017.3

Table B2. Summary of Dilution Simulations for Dense Additional Scenarios

Case ID	Effluent conditions			Port conditions				Predictions			At impact (ZID)		At BMZ	
	Flow (mgd)	Salinity (ppt)	Density (kg/m3)	Flow (gpm)	Diam. (inch)	Velocity (ft/s)	Froude no.	Dilution	Dilution	Impact distance (ft)	Dilution	Salinity increment (ppt)	Dilution	Salinity increment (ppt)
AT1	22.3	42.78	1032.7	116.0	2.06	11.2	57.9	22.1	21.4	16.6	21.4	0.42	25.7	0.35
AT2	23.3	40.98	1031.3	120.7	2.08	11.4	60.7	22.8	22.8	18.1	22.8	0.34	27.4	0.28
AT3	24.3	39.33	1030.0	125.5	2.10	11.6	69.2	25.0	24.5	19.8	24.5	0.24	29.4	0.20
AT4	25.3	37.81	1028.7	130.3	2.11	12.0	81.4	28.2	27.2	22.3	27.2	0.16	32.6	0.14
AT5	26.3	36.40	1027.6	135.1	2.13	12.2	97.8	32.5	30.2	25.3	30.2	0.10	36.2	0.08
AT6	28.3	33.89	1025.6	144.7	2.16	12.7	195.3	58.6	44.9	39.0	44.9	0.01	53.9	0.01
AV10	17.2	38.24	1029.1	89.4	1.94	9.7	66.0	24.7	24.6	18.2	24.6	0.20	29.5	0.17
AV11	18.2	36.19	1027.4	93.6	1.96	10.0	86.1	30.0	28.8	22.0	28.8	0.10	34.6	0.08
AV12	19.2	34.35	1025.9	98.4	1.99	10.2	133.0	42.4	37.4	29.7	37.4	0.03	44.9	0.02
AV18	18.4	36.18	1027.4	94.7	1.97	10.0	86.4	30.0	28.7	22.0	28.7	0.10	34.4	0.08
AV19	19.4	34.36	1025.9	99.5	1.99	10.3	135.0	42.9	37.6	29.8	37.6	0.03	45.1	0.02

Table B3. Summary of Dilution Simulations for Buoyant Additional Scenarios

Case ID	Season	Effluent conditions			Port conditions				UM3 simulations		NRFIELD simulations		
		Flow (mgd)	Salinity (ppt)	Density	Flow (gpm)	Diam. (inch)	Velocity (ft/s)	Froude no.	Average dilution	Rise height centerline (ft)	Minimum dilution	Rise height centerline (ft)	Rise height top (ft)
AT7	Upwelling	30.31	31.70	1023.8	157.8	2.20	13.3	123.3	88	19			
	Davidson								120	45			
	Oceanic								90	17			
AT8	Upwelling	32.31	29.79	1022.2	179.2	2.26	14.3	98.6	90	26			
	Davidson								118	53			
	Oceanic								88	23			
AV9	Upwelling	9.17	1.44	999.3	55.9	1.72	7.7	22.4	244	48	234	35	48
	Davidson								467	100	584	67	100
	Oceanic								309	66	315	42	60
AV13	Upwelling	20.24	32.69	1024.6	108.9	2.03	10.8	133.6	91	17			
	Davidson								100	15			
	Oceanic								138	41			
AV14	Upwelling	21.24	31.19	1023.4	114.9	2.06	11.1	96.5	88	20			
	Davidson								124	47			
	Oceanic								88	18			
AV15	Upwelling	23.24	28.58	1021.3	126.9	2.08	12.0	76.2	96	28			
	Davidson								133	55			
	Oceanic								95	26			
AV16	Upwelling	25.24	26.38	1019.5	138.7	2.11	12.7	68.1	100	32			
	Davidson								144	64			
	Oceanic								104	35			
AV17	Upwelling	27.24	24.50	1018.0	151.1	2.15	13.4	63.6	103	36			
	Davidson								155	73			
	Oceanic								109	41			

Table B3. Summary of Dilution Simulations for Buoyant Additional Scenarios

Case ID	Season	Effluent conditions			Port conditions				UM3 simulations		NRFIELD simulations		
		Flow (mgd)	Salinity (ppt)	Density	Flow (gpm)	Diam. (inch)	Velocity (ft/s)	Froude no.	Average dilution	Rise height centerline (ft)	Minimum dilution	Rise height centerline (ft)	Rise height top (ft)
AV20	Upwelling	20.41	32.71	1024.6	110.1	2.02	11.0	136.9	92	17			
	Davidson								139	41			
	Oceanic								101	15			
AV21	Upwelling	21.41	31.22	1023.4	116.1	2.02	11.6	102.6	91	20			
	Davidson								126	64			
	Oceanic								91	18			
AV22	Upwelling	22.41	29.87	1022.3	116.4	2.06	11.2	81.3	93	24			
	Davidson								128	51			
	Oceanic								90	21			
AV23	Upwelling	24.41	27.48	1020.4	134.0	2.10	12.4	71.8	98	30			
	Davidson								138	59			
	Oceanic								101	31			
AV24	Upwelling	26.41	25.46	1018.7	145.8	2.14	13.0	65.4	101	34			
	Davidson								149	68			
	Oceanic								106	38			
AV25	Upwelling	28.4	23.73	1017.3	157.6	2.17	13.7	62.3	105	37			
	Davidson								161	78			
	Oceanic								110	43			

APPENDIX C. EFFECT OF NOZZLE ANGLE ON DILUTION

In order to further investigate the effect of nozzle angle on dilution for various scenarios, additional model runs were undertaken for horizontal and 60° nozzles. Most were previously analyzed cases, whose flow properties are given in Tables 3 and 4. Table C1 summarizes the properties of the new cases.

Dilutions were simulated according to the same procedures as outlined in Sections 4 and 5. Table C2 summarizes the results for dense discharges. For the buoyant cases, only Upwelling and Davidson conditions were run to bracket the expected results. Because NRFIELD only allows for horizontal nozzles, only results for UM3 are shown in Table C3.

Table C1. Further Modeled Discharge Scenarios

Case ID	Scenario	Constituent flows (mgd)				Combined effluent		
		Brine	Secondary effluent	GWR	Hauled brine	Flow (mgd)	Salinity (ppt)	Density (kg/m^3)
1	GWR only	0.00	0.00	1.17	0.0	1.17	5.80	1002.6
5		0.00	0.40	1.17	0.0	1.57	4.53	1001.6
7		0.00	0.60	1.17	0.0	1.77	4.11	1001.3
12		0.00	2.00	1.17	0.0	3.17	2.65	1000.2
16		0.00	4.00	1.17	0.0	5.17	1.93	999.7
17		0.00	4.50	1.17	0.0	5.67	1.83	999.6
18		0.00	5.00	1.17	0.0	6.17	1.75	999.5
32		0.00	23.40	1.17	0.0	24.57	1.04	999.0
New	Variant with normal flows and GWR offline	8.99	10.00	0.00	0.0	18.99	27.99	1020.8
New2		8.99	6.50	1.17	0.0	16.66	32.14	1024.1
New3		8.99	7.00	1.17	0.0	17.16	31.23	1023.4

Table C2. Summary of Dilution Simulations for Dense Scenarios

Case ID	Nozzle angle (deg)	Effluent conditions: Flow (mgd)	Salinity (ppt)	Density (kg/m³)	Port conditions: Flow (gpm)	Diam. (in.)	Velocity (ft/s)	Froude no.	Impact dilution predictions: Cederwall	Abessi & Roberts 2015a	UM3	At impact (ZID): Dilution	Salinity increment (ppt)	AT BMZ: Dilution	Salinity increment (ppt)
T5	0	17.08	48.04	1037.0	86.2	1.92	9.6	38.6	17.7	-	18.5	17.7	0.83	21.2	0.69
	60	17.08	48.04	1037.0	86.2	1.92	9.6	38.6	-	68.9	-	68.9	0.21	82.6	0.18
T10	0	22.08	37.34	1028.3	114.2	2.05	11.1	80.6	28.2	-	27.5	27.5	0.15	33.0	0.12
	60	22.08	37.34	1028.3	114.2	2.05	11.1	80.6	-	143.7	-	143.7	0.03	172.4	0.02
T20	0	21.41	44.73	1034.3	110.3	2.04	10.8	48.1	19.6	-	20.4	19.6	0.58	23.6	0.48
	60	21.41	44.73	1034.3	110.3	2.04	10.8	48.1	-	85.7	-	85.7	0.13	102.8	0.11
AT6	0	28.31	33.89	1025.6	144.7	2.16	12.7	194.0	58.3	-	44.9	44.9	0.01	53.9	0.01
	60	28.31	33.89	1025.6	144.7	2.16	12.7	194.0	-	345.6	-	345.6	0.00	414.8	0.00
V2	0	9.99	52.48	1040.6	55.8	1.72	7.7	28.9	16.3	-	16.9	16.3	1.17	19.6	0.98
	60	9.99	52.48	1040.6	55.8	1.72	7.7	28.9	-	51.5	-	51.5	0.37	61.9	0.31
V4	0	11.99	43.86	1033.6	61.5	1.76	8.1	40.3	18.8	-	19.8	18.8	0.56	22.6	0.47
	60	11.99	43.86	1033.6	61.5	1.76	8.1	40.3	-	71.8	-	71.8	0.15	86.1	0.12
V6	0	13.99	37.70	1028.6	73.4	1.85	8.8	64.3	24.6	-	24.9	24.6	0.18	29.5	0.15
	60	13.99	37.70	1028.6	73.4	1.85	8.8	64.3	-	114.6	-	114.6	0.04	137.5	0.03
V8	0	15.99	33.09	1024.9	76.3	1.87	8.9	382.9	110.2	-	67.6	67.6	0.00	81.1	0.00
	60	15.99	33.09	1024.9	76.3	1.87	8.9	382.9	-	682.3	-	682.3	0.00	818.8	0.00
V16	0	10.16	52.19	1040.3	56.8	1.72	7.8	29.7	16.5	-	17.3	16.5	1.14	19.8	0.95
	60	10.16	52.19	1040.3	56.8	1.72	7.8	29.7	-	52.9	-	52.9	0.36	63.5	0.30
V17	0	11.16	47.59	1036.6	56.1	1.72	7.8	33.6	17.4	-	18.3	17.4	0.82	20.9	0.68
	60	11.16	47.59	1036.6	56.1	1.72	7.8	33.6	-	59.9	-	59.9	0.24	71.9	0.20
V19	0	13.16	40.48	1030.9	68.3	1.81	8.5	50.3	21.1	-	21.8	21.1	0.34	25.4	0.28
	60	13.16	40.48	1030.9	68.3	1.81	8.5	50.3	-	89.6	-	89.6	0.08	107.6	0.07
V22	0	15.46	34.57	1026.1	79.8	1.89	9.1	114.2	37.7	-	34.3	34.3	0.04	41.2	0.03
	60	15.46	34.57	1026.1	79.8	1.89	9.1	114.2	-	203.5	-	203.5	0.01	244.2	0.01
V23	0	16.16	33.11	1024.9	83.3	1.91	9.3	395.8	113.5	-	68.5	68.5	0.00	82.2	0.00
	60	16.16	33.11	1024.9	83.3	1.91	9.3	395.8	-	705.4	-	705.4	0.00	846.5	0.00

Table C2. Summary of Dilution Simulations for Dense Scenarios

Case ID	Nozzle angle (deg)	Effluent conditions			Port conditions				Impact dilution predictions			At impact (ZID)		AT BMZ	
		Flow (mgd)	Salinity (ppt)	Density (kg/m^3)	Flow (gpm)	Diam. (in.)	Velocity (ft/s)	Froude no.	Cederwall	Abessi & Roberts 2015a	UM3	Dilution	Salinity incr-ement (ppt)	Dilution	Salinity incr-ement (ppt)
V32	0	11.24	58.23	1045.2	63.3	1.78	8.2	26.5	15.4	-	16.1	15.4	1.61	18.5	1.34
	60	11.24	58.23	1045.2	63.3	1.78	8.2	26.5	-	47.2	-	47.2	0.53	56.6	0.44
V36	0	14.24	46.13	1035.5	72.7	1.84	8.8	38.8	18.1	-	19.0	18.1	0.71	21.7	0.59
	60	14.24	46.13	1035.5	72.7	1.84	8.8	38.8	-	69.1	-	69.1	0.19	82.9	0.15
AV10	0	17.24	38.24	1029.1	89.4	1.94	9.7	65.9	24.7	-	27.5	24.7	0.20	29.6	0.17
	60	17.24	38.24	1029.1	89.4	1.94	9.7	65.9	-	117.4	-	117.4	0.04	140.9	0.03
AV12	0	19.24	34.35	1025.9	98.4	1.99	10.2	132.4	42.2	-	37.4	37.4	0.03	44.9	0.02
	60	19.24	34.35	1025.9	98.4	1.99	10.2	132.4	-	235.9	-	235.9	0.00	283.1	0.00
V39	0	12.41	53.29	1041.2	61.5	1.76	8.1	29.5	16.2	-	17.0	16.2	1.23	19.5	1.02
	60	12.41	53.29	1041.2	61.5	1.76	8.1	29.5	-	52.6	-	52.6	0.38	63.1	0.32
V43	0	15.41	43.07	1033.0	80.0	1.89	9.2	45.6	19.6	-	20.2	19.6	0.50	23.5	0.41
	60	15.41	43.07	1033.0	80.0	1.89	9.2	45.6	-	81.2	-	81.2	0.12	97.5	0.10
V45	0	17.41	38.21	1029.0	90.3	1.95	9.7	66.0	24.7	-	18.4	18.4	0.26	22.1	0.22
	60	17.41	38.21	1029.0	90.3	1.95	9.7	66.0	-	117.7	-	117.7	0.04	141.2	0.03
AV19	0	19.41	34.36	1025.9	99.5	1.99	10.3	134.4	42.8	-	37.6	37.6	0.03	45.1	0.02
	60	19.41	34.36	1025.9	99.5	1.99	10.3	134.4	-	239.4	-	239.4	0.00	287.3	0.00

Table C3. Summary of Dilution Simulations for Buoyant Further Scenarios

Case ID	Season	Effluent conditions			Port conditions					UM3 simulations	
		Flow (mgd)	Salinity (ppt)	Density (kg/m^3)	Nozzle angle (deg)	Flow (gpm)	Diam. (inch)	Velocity (ft/s	Froude no.	Average dilution	Rise height (centerline) (ft)
New	Upwelling	18.99	27.99	1020.8	0	98.5	1.99	10.2	62.8	101	28
					60					82	34
	Davidson				0					145	55
					60					123	58
V25	Upwelling	21.16	25.48	1018.7	0	109.8	2.03	10.9	56.2	107	33
					60					91	39
	Davidson				0					159	65
					60					141	70
AV14	Upwelling	21.24	31.19	1023.4	0	114.9	2.06	11.1	96.5	88	20
					60					66	28
	Davidson				0					124	47
					60					94	49
AV21	Upwelling	21.41	31.22	1023.4	0	116.1	2.02	11.6	102.6	91	20
					60					68	30
	Davidson				0					126	64
					60					96	49
1	Upwelling	1.17	5.80	1002.6	0	6.8	0.71	5.5	26.6	499	29
					60					488	30
	Davidson				0					987	S
					60					949	S
5	Upwelling	1.57	4.53	1001.6	0	8.1	0.79	5.3	23.7	461	31
					60					447	32
	Davidson				0					853	50
					60					817	50
7	Upwelling	1.77	4.11	1001.3	0	9.3	0.85	5.3	22.6	443	32
					60					428	33
	Davidson				0					800	S
					60					768	S

Table C3. Summary of Dilution Simulations for Buoyant Further Scenarios

Case ID	Season	Effluent conditions			Port conditions					UM3 simulations	
		Flow (mgd)	Salinity (ppt)	Density (kg/m^3)	Nozzle angle (deg)	Flow (gpm)	Diam. (inch)	Velocity (ft/s	Froude no.	Average dilution	Rise height (centerline) (ft)
12	Upwelling	3.17	2.65	1000.2	0	16.5	1.11	5.5	20.1	359	36
					60					347	37
	Davidson				0					609	59
					60					586	59
16	Upwelling	5.17	1.93	999.7	0	26.9	1.35	6.0	19.9	300	51
					60					291	41
	Davidson				0					517	S
					60					507	S
17	Upwelling	5.67	1.83	999.6	0	29.6	1.40	6.2	19.9	290	S
					60					282	S
	Davidson				0					509	S
					60					504	S
18	Upwelling	6.17	1.75	999.5	0	32.3	1.44	6.4	20.2	282	S
					60					274	S
	Davidson				0					506	S
					60					510	S
32	Upwelling	24.57	1.04	999.0	0	128.0	2.10	11.9	30.9	175	S
					60					168	S
	Davidson				0					291	S
					60					276	S
New2	Upwelling	16.66	32.14	1024.1	0	86.1	1.92	9.5	103.5	92	18
					60					65	26
	Davidson				0					131	43
					60					95	46
New3	Upwelling	17.16	31.23	1023.4	0	89.0	1.94	9.7	87.0	91	20
					60					69	29
	Davidson				0					131	46
					60					102	48

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Appendix D:
Trussell Tech September 2017 Comparison of Dilution Results

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DRAFT COMMUNICATION

Comparison of Dilution Results

Draft Date: September 12, 2017
Final Date:

Author: Elaine Howe, P.E. (NM)
Brie Webber, P.E.

To: Denise Duffy (DDA)
Denise Conners (LWA)

Subject: Impact of larger RO concentrate discharge from 5 MGD AWPF on ocean dilution

---

The following communication documents the changes to the estimated minimum probable dilution (D_m) values determined during the various Ocean Plan compliance assessments that have been conducted for the GWR Project, MPWPSP, and Project Variant.

GWR Project

The original analysis documented in the February 2015 *Ocean Plan Compliance Assessment for the Pure Water Monterey Groundwater Replenishment Project* (Appendix U1 of the Final Consolidated EIR, January 2016) assumed there were 120 ports open along the diffuser. This analysis also used ambient ocean (receiving water) profile data from the Monterey Bay Aquarium Research Institute (MBARI) at station C1, which is approximately five miles northwest of MRWPCA's existing ocean outfall. Data examined from this site was collected between 2002 – 2012, and a single representative profile for each ocean condition (Davidson, Oceanic, Upwelling) was selected. The D_m values reported in Table 1 represent the lowest D_m values calculated for each discharge flow scenario, with the ambient ocean condition varying depending on which condition produced the lowest D_m. For additional information on modeling assumptions, refer to the FlowScience technical memoranda discussed in Appendix T of the Final Consolidated EIR for the Pure Water Monterey (PWM) Groundwater Replenishment Project (January 2016).

An addendum to the February 2015 Ocean Plan Compliance Assessment report was published in April 2015 (Appendix U2 of the PWM Final Consolidated EIR, January 2016) and included additional flow scenarios as well as modifications to the modeling assumptions. For the GWR Project, the model assumptions were updated to assume 130 open diffuser ports instead of 120 ports, which reflects current outfall conditions. This change increased the estimated minimum probable dilution. The most recent September 2017 modeling, done in relation to the larger 5

MGD AWPF, also considered 130 ports open (i.e., 129 existing ports plus the open end gate replaced with one diffuser port).

This most recent September 2017 GWR Project Ocean Plan Compliance Assessment for the larger, 5 MGD AWPF considered updated modeling assumptions as follows:

- The GWR RO concentrate flow was increased from 0.94 MGD to 1.17 MGD, in relation to increasing purified water production capacity from 4 MGD to 5 MGD.
- The open diffuser end gate was modeled with one 6-inch Tideflex valve
- The 0.1 MGD of blended hauled waste was not included in the analysis
- The ambient ocean profile data was updated using data collected between 2014 and 2017 in the vicinity of the outfall.

The original COP compliance analyses for the GWR Project (February 2015 and April 2015) modeled the end of the existing ocean outfall as an open pipe, which is the current configuration of the outfall. The September 2017 modeling work assumed that a 6-inch Tideflex valve was installed on the end of the outfall; this modification will occur prior to any discharge of RO concentrate.

The 0.1 MGD blended hauled waste, defined as up to 0.03 MGD of hauled waste mixed with secondary effluent (in a pond prior to discharge) for a maximum flow of 0.1 MGD, was not included in the updated analysis for simplicity. A sensitivity analysis was conducted to determine the impacts of hauled waste on the modeled D_m results. It was concluded that neither the flow nor TDS from the addition of hauled waste had a significant impact on the modeled D_m result, and was therefore excluded from the D_m calculation.

Starting in February of 2014, monthly conductivity-temperature-depth (CTD) water column profiles have been collected at four locations offshore of Marina, California adjacent to MRWPCA's ocean outfall. This work, funded by California American Water, has been done to establish a baseline ocean condition prior to changes in outfall discharge. Using this updated data, density profiles were averaged by season to obtain representative profiles for the dilution modeling included in the September 2017 COP compliance assessment report (Trussell Technologies, Inc.).

The previous dilution analysis conducted by FlowScience (November 2014 and April 2015) for the 2015 reports (included in the 2016 PWM Final Consolidated EIR) was performed using a semi-empirical model and the EPA's Visual Plumes method. The updated analysis (September 2017) used for the September 2017 report was performed by Dr. Philip Roberts (August 2017) using the same EPA Visual Plumes modeling suite.

Table 1 shows all of the modeled flow scenarios reported in all of the Ocean Plan compliance assessment technical memoranda. Footnotes document the relevant changes between each analysis effort.

Table 1: GWR Project Dilution Modeling Results Summary

No.	Flows (MGD)			D_m Values for the GWR Project		
	Secondary effluent	RO concentrate	Hauled Waste	COP Report February 2015 [1]	COP Addendum Report (4 MGD AWPF) April 2015 [2]	Larger GWR (5 MGD AWPF) September 2017 [2,3,4]
1	0	0.94	0.1	523	540	
	0	1.17	0			498
2	0.4	0.94	0.1	285	295	
	0.4	1.17	0			460
	0.6	1.17	0			442
3	0.8	1.17	0			
	2	1.17	0			358
4	3	0.94	0.1	201	208	
	4	1.17	0			299
	4.5	1.17	0			289
5	5	1.17	0			281
6	7	1.17	0			
7	8	0.94	0.1		228	
8	9	1.17	0			
9	21	1.17	0			
10	23.4	1.17	0			174
11	23.7	0.94	0.1	137	142	
12	24.7	0.94	0.1	150		

NOTES:
1 – 120 ports open
2 – 130 ports open
3 – End gate closed, modeled with UM3 of Visual Plumes Suite
4 – Updated ambient ocean data was used

The differences in D_m values between the 2015 4 MGD AWPF and the 2017 5 MGD AWPF is shown in Figure 1. Except for discharge scenarios with only RO concentrate (i.e., no Secondary Effluent), the larger AWPF allows for more dilution (i.e., higher D_m values). When there is no secondary effluent going to the outfall, less dilution in the ocean occurs for the larger GWR.

Differences in the D_m values are the result of both RO concentrate flow to the outfall and updated ambient ocean profiles.

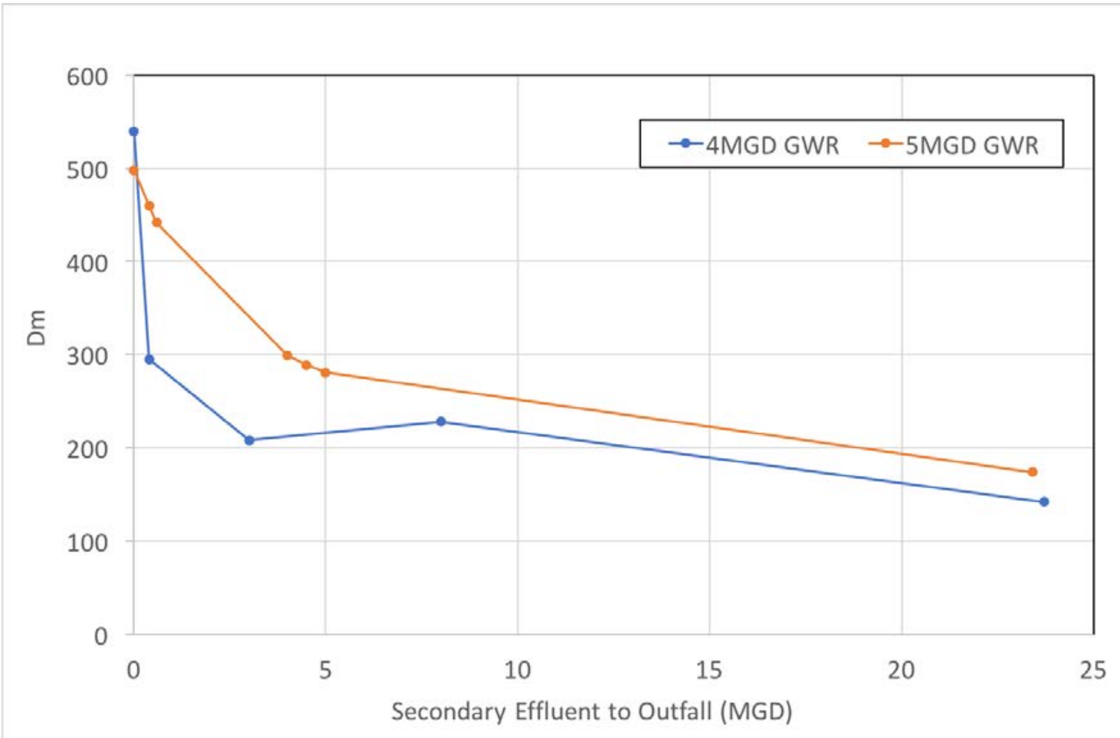

Figure 1. Comparison of D_ms for two size GWR Advanced Water Purification Facilities

MPWSP

All of the changes for the GWR Project documented above also occurred for analysis of the MPWSP when comparing the (1) MPWSP and Variant COP assessment published in March 2015, (2) Addendum report published in April 2015, and (3) MPWSP and Variant Updates published in July 2016 and September 2017. The one exception to this statement is that hauled waste was included in the calculated D_m values for the September 2017 analysis. (The March 2015 Ocean Plan Compliance Assessment report is included in Appendix V of the Final Consolidated EIR (January 2016), and the April 2015 Addendum report is included in Appendix U2 of the Final Consolidated EIR. The July 2016 Compliance Assessment report was included as Appendix D3 of CalAm's DEIR (January 2017).)

For the July 2016 and September 2017 reports, Dr. Phillip Roberts conducted the dilution modeling. Three methods were used when modeling ocean mixing: (1) the Cederwall formula (for neutral and negatively buoyant plumes only), (2) the mathematical model UM_3 in the United States Environmental Protection Agency's (EPA's) Visual Plume suite, and (3) the NRFIELD model (for positively buoyant plumes only) which is also from the EPA's Visual Plume suite. Table 2 shows all of the modeled flow scenarios reported in the Ocean Plan compliance assessment technical memoranda for the MPWSP.

Table 2: MPWSP Dilution Modeling Results Summary

No.	Flows (mgd)			D_m Values			
	Secondary effluent	Desal Brine	Hauled Waste	MPWSP & Variant March 2015 [1]	Addendum April 2015 [2,3]	MPWSP & Variant Update July 2016 [2,5]	MPWSP & Variant Update September 2017 [2,4,5]
1	0	13.98	0	16	17	14.6	14.4
2	1	13.98	0			15.2	
3	2	13.98	0	19		16.0	15.8
4	4	13.98	0.1				17.8
5	6	13.98	0.1				20.9
6	9	13.98	0		22	34.3	26.7
7	10	13.98	0.1				38.2
8	19.68	13.98	0	68			
9	19.78	13.98	0			153	98

NOTES:
1 – 120 ports open
2 – 130 ports open
3 – Addendum scenarios included 0.1 mgd hauled waste
4 – End gate closed, and 0.1 hauled waste *was* included
5 – Updated ambient ocean data was used, Dr. Phillip Roberts provided dilution calculations using Cederwall, UM3, and NRFIELD models

None of these dilution modeling results were affected by the increased capacity of the GWR project's AWPF since none of these flow scenarios include RO concentrate from the AWPF. Note, though, that the large difference between D_m values at the highest secondary effluent flow of 19.78 MGD is the result of different oceanic conditions—the 2016 D_m was for Davidson conditions while the 2017 D_m was for Upwelling conditions.

Variant Project

All changes for the MPWSP documented above also occurred for the analysis of the Variant Project. Table 3 shows all modeled flow scenarios reported in the Ocean Plan compliance assessment technical memoranda. Footnotes document the relevant changes between each analysis effort.

Table 3: Variant Project Dilution Modeling Results Summary

No.	Flows (mgd)				Dm Values			
	Secondary effluent	RO concentrate	Hauled Waste	Desal Brine	MPWSP & Variant March 2015 [1,3]	Addendum April 2015 [2,3]	MPWSP & Variant Update July 2016 [5]	MPWSP & Variant Update September 2017 [4,5]
1	0	0.94	0	8.99	17	18	15.6	15.3
2	0	1.17	0	8.99				15.5
3	1	0.94	0	8.99			16.4	16.1
4	1	1.17	0	8.99				16.4
5	2	1.17	0	8.99				17.7
6	3	0.94	0	8.99			20.3	19.6
7	3	1.17	0	8.99				20.1
8	4	1.17	0	8.99				23.8
9	5	1.17	0	8.99				30.7
10	5.3	0.94	0	8.99		24	54.4	31.6
11	5.3	1.17	0	8.99				33.3
12	6	1.17	0	8.99				67.5
13	7	1.17	0	8.99				90
14	11	1.17	0	8.99				106
15	15.92	0.94	0	8.99	82		194	114
16	15.92	1.17	0	8.99				114

NOTES:
1 – 120 ports open
2 – 130 ports open
3 – Scenarios included 0.1 mgd hauled waste
4 – End gate closed and 1.17 mgd RO concentrate
5 – Updated ambient ocean data was used

Figure 2 shows a comparison of the modeled D_m values for the Variant Projects with the 4 MGD GWR and the 5 MGD GWR. D_m values for the two projects are similar until approximately 8 MGD of secondary effluent in the discharge. Beyond 8 MGD secondary effluent, greater dilution in the ocean (higher D_m values) is seen for the Variant Project with the smaller GWR.

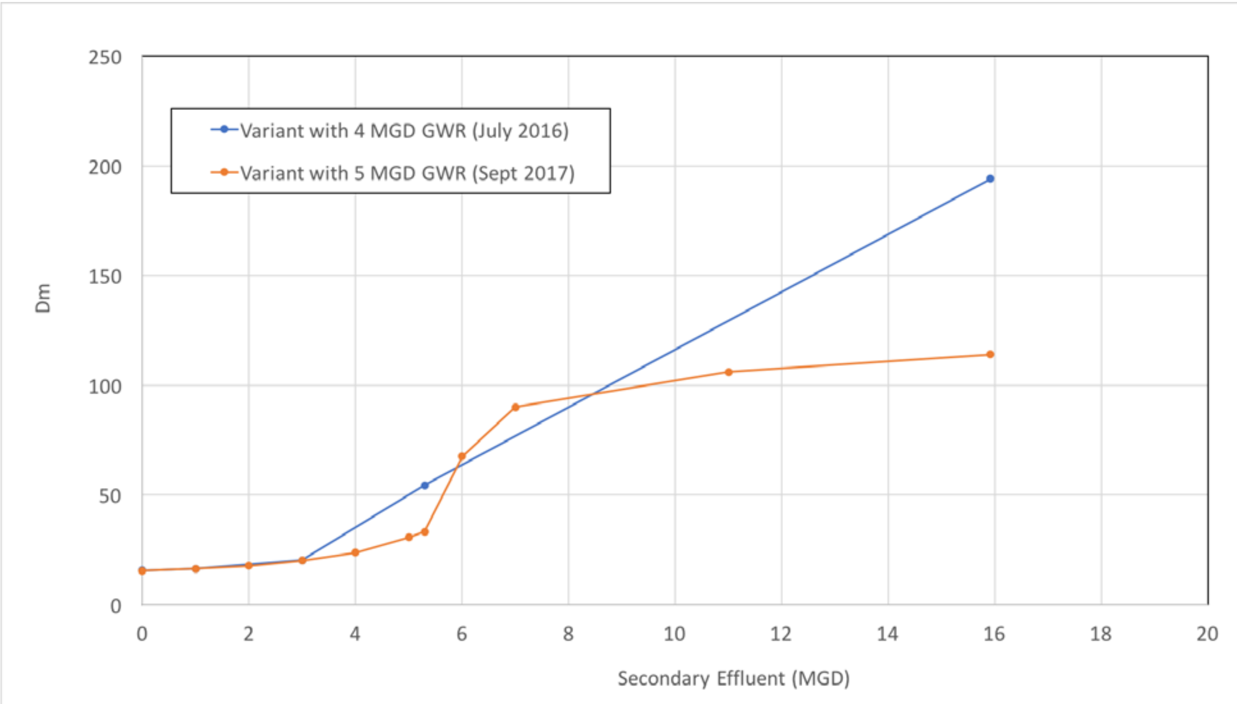

Figure 2. Comparison of D_ms for the Variant Project with two size GWR Advanced Water Purification Facilities

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Appendix E:
Trussell Tech September 2017 Revised Ocean Plan Compliance Assessment for MPWSP and Project Variant

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Revised Ocean Plan Compliance Assessment for the Monterey Peninsula Water Supply Project and Project Variant

Technical Memorandum

September 2017

Prepared for:

MRWPCA

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Revised Ocean Plan Compliance Assessment for the Monterey Peninsula Water Supply Project and Project Variant

Technical Memorandum

Pure Water Monterey
A Groundwater Replenishment Project

September 2017

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1 Executive Summary

In response to State Water Resources Control Board (SWRCB) Water Rights Orders WR 95-10, WR 2009-0060, and WR 2016-0016, two proposed projects are in development on the Monterey Peninsula to provide potable water to offset pending reductions of Carmel River water diversions: (1) a seawater desalination project known as the **Monterey Peninsula Water Supply Project** (MPWSP), and (2) a groundwater replenishment project known as the **Pure Water Monterey Groundwater Replenishment Project** (GWR Project). The capacity of the MPWSP is dependent on the construction of the GWR Project.

If the GWR Project is not constructed, the MPWSP would entail California American Water ("CalAm") building a seawater desalination facility capable of producing 9.6 million gallons per day (mgd) of drinking water. In the variation of the MPWSP where the GWR Project is constructed, known as the **Monterey Peninsula Water Supply Project Variant** ("Variant"), CalAm would build a smaller desalination facility capable of producing 6.4 mgd of drinking water, and a partnership between the Monterey Peninsula Water Management District (MPWMD) and the Monterey Regional Water Pollution Control Agency (MRWPCA) would build an advanced water treatment facility ("AWPF") as part of the GWR Project. This AWPF would be able to produce up to 4,300 acre-feet per year (AFY) (annual average of 3.8 mgd)[1] of highly purified recycled water to enable CalAm to extract 3,500 AFY (annual average of 3.1 mgd) from the Seaside Groundwater Basin for delivery to its customers.

Both the proposed desalination facility and the AWPF would employ reverse osmosis (RO) membranes to purify the waters, and as a result, both projects would produce RO concentrate waste streams that would be disposed through MRWPCA's existing ocean outfall: the brine concentrate from the desalination facility ("Desal Brine"), and the RO concentrate from the AWPF ("GWR Concentrate"). The goal of this technical memorandum (TM) is to analyze whether the discharges from the proposed projects through the existing ocean outfall would comply with the water quality objectives in the SWRCB 2015 Ocean Plan ("Ocean Plan") (SWRCB, 2015a).

The Ocean Plan sets forth numeric and narrative water quality objectives for the ocean with the intent of protecting the ocean's beneficial uses, which include recreation, aesthetics, navigation, fishing, mariculture, areas of special biological significance, rare and endangered species, habitat, fish migration, fish spawning, and shellfish harvesting. The Regional Water Quality Control Boards utilize these objectives to develop water quality-based effluent limitations for ocean dischargers that have a reasonable potential to exceed the water quality objectives.

When municipal wastewater flows are released from an outfall (typically using specially designed diffusers), the wastewater and ocean water undergo rapid mixing due to the momentum

[1] The AWPF would be capable of producing up to 5 mgd of highly purified recycled water on a daily basis, but production would fluctuate throughout the year, such that the average annual production would be 3.8 mgd (4,300 AFY) in a non-drought year, when adding to the drought reserve.

and buoyancy of the discharge.[2] The mixing that occurs in the rising plume is affected by the buoyancy and momentum of the discharge, a process referred to as initial dilution (NRC, 1993). For rising plumes, the Ocean Plan defines the initial dilution as complete when "the diluting wastewater ceases to rise in the water column and first begins to spread horizontally," (*i.e.*, when the momentum from the discharge has dissipated). For more saline discharges, a sinking plume forms when the discharge is denser than the ambient water (also known as a negatively buoyant plume). In the case of negatively buoyant plumes, the Ocean Plan defines the initial dilution as complete 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."

The numeric Ocean Plan objectives are to be met after the initial dilution of the discharge. The initial dilution occurs in an area known as the zone of initial dilution (ZID). The extent of dilution in the ZID is quantified and referred to as the minimum probable initial dilution (D_m). The water quality objectives established in the Ocean Plan are adjusted by the D_m to derive effluent limitations in the National Pollutant Discharge Elimination System (NPDES) permit that are applied to a wastewater discharge prior to ocean dilution.

The purpose of this analysis was to assess the ability of the MPWSP and Variant to comply with the Ocean Plan objectives. Trussell Tech used a conservative approach to estimate the water qualities of the secondary effluent, GWR Concentrate, Desal Brine and hauled waste for these projects. Dr. Philip Roberts, a Professor in the School of Civil and Environmental Engineering at the Georgia Institute of Technology, conducted modeling of the ocean discharge and estimated D_m values for scenarios involving different flow rates of the proposed projects and different ambient ocean conditions. These ocean modeling results were combined with projected discharge water quality to assess compliance with the Ocean Plan.

The estimates of minimum probable dilution (D_m) developed by Dr. Roberts for the MPWSP range from 14.4 to 98, and from 14.4 to 114 for the Variant. These D_m values are substantially lower than what is currently specified in the MRWPCA NPDES permit (145) and those estimated for the GWR Project, which range from 174 to 498 (see Appendix B). As a result of the reduced dilution, some contaminants, which have not traditionally been of concern for discharge through MRWPCA's ocean outfall, are estimated to potentially exceed the Ocean Plan objectives at the edge of the ZID. A summary of the constituents that show potential to exceed the Ocean Plan objectives is provided in Table ES-1 for the MPWSP, and Table ES-2 for the Variant. These constituents can be divided into three categories:

- **Category I -** Insufficient analytical sensitivity to determine compliance: The constituent was not detected above the method reporting limit (MRL) in any of the source waters, but the MRL is not sensitive enough to demonstrate compliance with the Ocean Plan objective.

[2] Municipal wastewater effluent, being low in salinity, is less dense than seawater and thus rises (due to buoyancy) while it mixes with ocean water. GWR Concentrate, whether by itself or mixed with municipal wastewater effluent, is less dense than seawater and also rises (due to buoyancy) while it mixes with ocean water. Desal Brine, depending on the ratio of dilution with GWR Concentrate and municipal wastewater effluent, may be more or less dense than seawater.

- **Category II -** Estimated to be close to exceeding the Ocean Plan objective: The constituent is estimated to be at a concentration between 80% and 100% of the Ocean Plan objective at the edge of the ZID.
- **Category III -** Estimated to exceed the Ocean Plan objective: The constituent is estimated to be at a concentration higher than the Ocean Plan objective at the edge of the ZID.

Table ES-1: Summary of Compliance Conclusions for the MPWSP

	Category I [a]	Category II [b]	Category III [c]	Worst Case Exceedance	
Constituent	Compliance Determination Not Possible	Estimated to be Close to Exceeding Objective	Estimated to Exceed Objective	Flow Scenario[f]	Estimated Percentage of Objective at edge of ZID
Cyanide [d]			✓	4	140%
Ammonia			✓	5	102%
Chlorinated Phenolics	✓			--	--
2,4-Dinitrophenol	✓			--	--
Tributyltin	✓			--	--
Acrylonitrile [e]	✓			--	--
Aldrin	✓			--	--
Benzidine	✓			--	--
Beryllium [e]	✓			--	--
Bis(2-chloroethyl)ether	✓			--	--
3,3-Dichlorobenzidine	✓			--	--
1,2-Diphenylhydrazine (azobenzene)	✓			--	--
Heptachlor	✓			--	--
TCDD Equivalents [e]	✓			--	--
2,4,6-Trichlorophenol	✓			--	--

Notes:
a: ND in all sources, but MRL higher than Ocean Plan objective and therefore unable to demonstrate compliance. Exceptions are: MRL for 2,4-dinitrophenol was less than objective in secondary effluent and MRL for heptachlor was less than objective in slant well.
b: Concentration of constituent at the edge of the ZID is estimated to be between 80% and 100% of the Ocean Plan objective for some scenarios
c: Concentration of constituent is estimated to be > 100% of the Ocean Plan objective for some scenarios at the edge of the ZID
d: Issues with approved analytical methods may have resulted in erroneously high cyanide quantification
e: Only a best-case scenario could be evaluated, where a value of 0 was assumed when the constituent was ND and the MRL was larger than the Ocean Plan objective
f: Flow scenarios are defined in Table 2 and Table 3

Table ES-2: Summary of Compliance Conclusions for the Variant

	Category I [a]	Category II [b]	Category III [c]	Worst Case Exceedance	
Constituent	Compliance Determination Not Possible	Estimated to be Close to Exceeding Objective	Estimated to Exceed Objective	Flow Scenario[f]	Estimated Percentage of Objective at edge of ZID
Cyanide [d]			✓	31	189%
Ammonia			✓	30	266%
Chlorinated Phenolics	✓			--	--
2,4-Dinitrophenol	✓			--	--
Tributyltin	✓			--	--
Acrylonitrile [e]		✓		30	94%
Aldrin	✓			--	--
Benzidine	✓			--	--
Beryllium [e]	✓			--	--
Bis(2-chloroethyl)ether	✓			--	--
Bis(2-ethyl-hexyl)phthalate		✓		30	84%
Chlordane			✓	30	199%
3,3-Dichlorobenzidine	✓			--	--
1,2-Diphenylhydrazine (azobenzene)	✓			--	--
Heptachlor	✓			--	--
PCBs			✓	30	169%
TCDD Equivalents [e]			✓	30	131%
Toxaphene			✓	30	126%
2,4,6-Trichlorophenol	✓			--	--

Notes:

a: ND in all sources, but MRL higher than Ocean Plan objective and therefore unable to demonstrate compliance. Exceptions are: MRL for 2,4-dinitrophenol was less than objective in secondary effluent and MRL for heptachlor was less than objective in slant well.

b: Concentration of constituent at the edge of the ZID is estimated to be between 80% and 100% of the Ocean Plan objective for some scenarios

c: Concentration of constituent is estimated to be > 100% of the Ocean Plan objective for some scenarios at the edge of the ZID

d: Issues with approved analytical methods may have resulted in erroneously high cyanide quantification

e: Only a best-case scenario could be evaluated, where a value of 0 was assumed when the constituent was ND and the MRL was larger than the Ocean Plan objective

f: Flow scenarios are defined in Table 2 and Table 3

Based on the data, assumptions, modeling, and analytical methodology presented in this TM, the MPWSP and Variant show a potential to exceed certain Ocean Plan objectives under specific discharge scenarios (see Tables ES-1 and ES-2). In particular, potential issues were identified for the MPWSP and Variant discharge scenarios involving low to moderate secondary effluent flows with Desal Brine: discharges are estimated to exceed or come close to exceeding multiple Ocean Plan objectives, specifically those for cyanide and ammonia for the MPWSP, and cyanide, ammonia, chlordane, PCBs, TCDD equivalents, and toxaphene for the Variant. Ammonia clearly exceeds the Ocean Plan objective and must be resolved for the MPWSP and Variant. When considering a best-case analysis for the Variant, acrylonitrile is estimated to come close to exceeding the Ocean Plan objective, and TCDD equivalents show a potential to exceed the objective. Additional analytical investigation regarding cyanide analysis is recommended to determine if the potential exceedances are representative of actual water quality conditions. Chlordane, PCBs and toxaphene, which were estimated to exceed the objectives for the Variant flow scenarios, were detected at concentrations that are orders of magnitude below detection limits of methods currently used for discharge compliance.

2 Introduction

In response to State Water Resources Control Board (SWRCB) Water Rights Orders WR 95-10, WR 2009-0060, and WR 2016-0016, two proposed projects are in development on the Monterey Peninsula to provide potable water to offset pending reductions of Carmel River water diversions: (1) a seawater desalination project known as the **Monterey Peninsula Water Supply Project** (MPWSP), and (2) a groundwater replenishment project known as the **Pure Water Monterey Groundwater Replenishment Project** (GWR Project). The capacity of the MPWSP is dependent on the construction of the GWR Project.[3]

If the GWR Project is constructed, the MPWSP would entail California American Water ("CalAm") building a seawater desalination facility capable of producing 9.6 million gallons per day (mgd) of drinking water. In the variation of the MPWSP where the GWR Project is constructed, known as the **Monterey Peninsula Water Supply Project Variant** ("Variant"), CalAm would build a smaller desalination facility capable of producing 6.4 mgd of drinking water, and a partnership between the Monterey Peninsula Water Management District (MPWMD) and the Monterey Regional Water Pollution Control Agency (MRWPCA) would build an advanced water treatment facility ("AWPF") as part of the GWR Project. This AWPF would be able to produce up to 4,300 acre-feet per year (AFY) (annual average of 3.8 mgd)[4] of highly purified recycled water to enable CalAm to extract 3,500 AFY (annual average of 3.1 mgd) from the Seaside Groundwater Basin for delivery to its customers.

The GWR Project involves treating secondary-treated wastewater (*i.e.*, secondary effluent) from MRWPCA's Regional Treatment Plant (RTP) through the proposed Advanced Water Purification Facility (AWPF) and then injecting up to 3,700 AFY of this highly purified recycled water into the Seaside Groundwater Basin, with subsequent withdrawal for use as a municipal water supply, and providing up to 600 AFY to Marina Coast Water District for urban landscape irrigation. The GWR Project will also provide additional tertiary recycled water for agricultural irrigation in the northern Salinas Valley as part of the Castroville Seawater Intrusion Project (CSIP). Both the proposed desalination facility and the AWPF would employ reverse osmosis (RO) membranes to purify the waters, and as a result, both projects would produce RO concentrate waste streams that would be disposed through MRWPCA's existing ocean outfall:

[3] Construction of the GWR Project is expected to begin in September 2018.

[4] The AWPF would be capable of producing up to 5 mgd of highly purified recycled water on a daily basis, but production would fluctuate throughout the year, such that the average annual production would be 3.8 mgd (4,300 AFY) in a non-drought year, when adding to the drought reserve.

the brine concentrate from the desalination facility ("Desal Brine"), and the RO concentrate from the AWPF ("GWR Concentrate").

The goal of this TM is to analyze whether the discharges from the proposed projects through the existing ocean outfall would comply with the numeric water quality objectives in the SWRCB 2015 Ocean Plan ("Ocean Plan") (SWRCB, 2015). A similar assessment of the GWR Project on its own was previously performed (Trussell Tech, 2017, see Appendix B), and so this document provides complementary information focused on the MPWSP and Variant projects.

The original version of this document (Trussell Tech, 2015a) and an addendum report to that document (Trussell Tech, 2015b) were included in both the GWR Project Consolidated Final Environmental Impact Report (CFEIR) and the MPWSP draft Environmental Impact Report (EIR). A second version of this document was updated to include new water quality data and flow scenarios for the MPWSP and Variant to address data gaps noted in the original analyses, and was included in the 2017 MPWSP draft EIR (Trussell Tech, 2016, see Appendix C). The following TM incorporates updates to the 2016 version, including additional water quality data and flow scenarios, and these revisions are discussed in more detail in the following sections.

2.1 Treatment through the Proposed CalAm Desalination Facility

This section describes the proposed treatment train for the MPWSP and Variant desalination facility. Seawater from the Monterey Bay would be extracted through subsurface slant wells beneath the ocean floor and piped to a new CalAm-owned desalination facility. This facility would consist of granular media pressure filters, cartridge filters, a two-pass RO membrane system, RO product-water stabilization (for corrosion control), and disinfection – (Figure 1). The RO process is expected to recover 42 percent of the influent seawater flow as product water, while the remainder of the concentrated influent water becomes the Desal Brine. The MPWSP and Variant product water (desalinated water) would be used for municipal drinking water, while the Desal Brine would be blended with (1) available RTP secondary effluent, (2) brine that is trucked and stored at the RTP, and (3) GWR Concentrate (for the Variant only), and discharged to the ocean through the existing MRWPCA ocean outfall. The volume of Desal Brine is dependent on the project size: 13.98 and 8.99 mgd for the MPWSP and Variant, respectively.

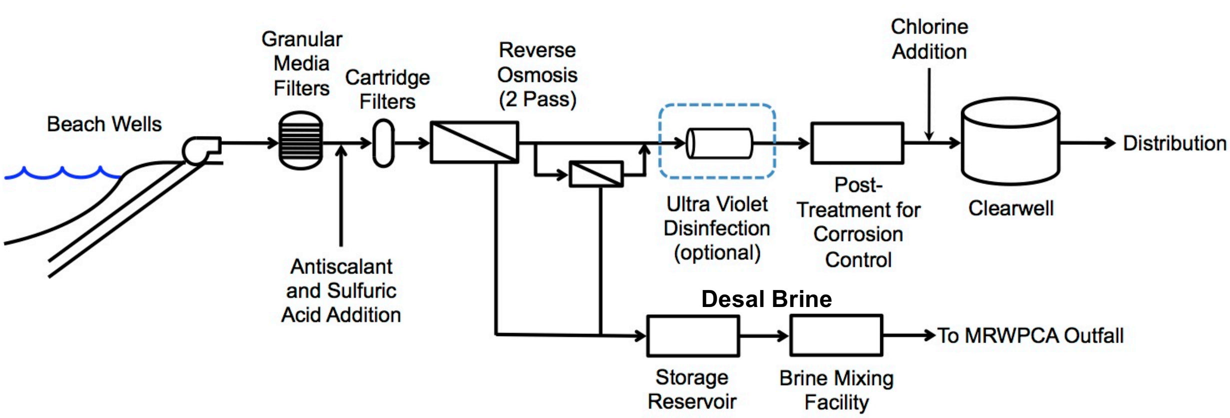

Figure 1 – Schematic of CalAm desalination facilities

2.2 Treatment through the RTP and Proposed AWT Facilities

The existing MRWPCA RTP treatment process includes screening, primary sedimentation, secondary biological treatment through trickling filters, followed by a solids contactor (*i.e.*, bio-flocculation), and clarification (Figure 2). Much of the secondary effluent undergoes tertiary treatment (coagulation, flocculation, granular media filtration, and disinfection) to produce recycled water used for agricultural irrigation. The unused secondary effluent is discharged to the Monterey Bay through the MRWPCA outfall. MRWPCA also accepts trucked brine waste for ocean disposal ("hauled waste"), which is stored in a pond and mixed with secondary effluent prior to being discharged.

The AWPF will include several advanced treatment technologies for purifying the secondary effluent: ozone (O_3), membrane filtration (MF), reverse osmosis (RO), an advanced oxidation process (AOP) using ultraviolet light (UV) and hydrogen peroxide, and finished water stabilization. The Project Partners conducted a pilot-scale study of the planned AWPF ozone, MF, and RO processes from December 2013 through July 2014, successfully demonstrating the ability of the various treatment processes to produce highly-purified recycled water that complies with the California Water Recycling Criteria for Indirect Potable Reuse: Groundwater Replenishment – Subsurface Application (Groundwater Replenishment Regulations) (SWRCB, 2015b) and Central Coast Water Quality Control Plan (Basin Plan) standards, objectives and guidelines for groundwater (CCRWQCB, 2011). After the pilot-scale study, an advanced water purification demonstration facility was built to gain additional experience operating ozone, MF, and RO processes. The new facility also included a UV/hydrogen peroxide AOP and stabilization treatment. The demonstration facility is operated and maintained by MRWPCA.

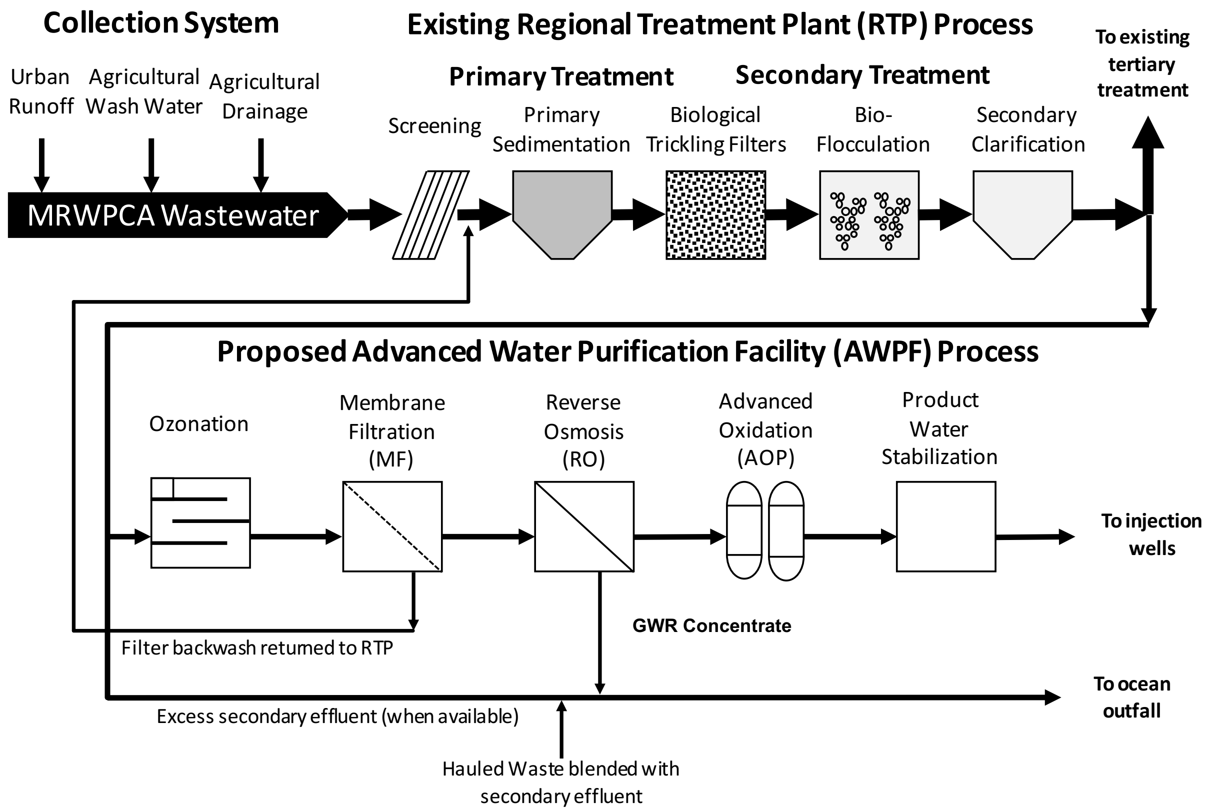

Figure 2 – Schematic of existing MRWPCA RTP and proposed AWPF treatment

2.3 California Ocean Plan

The Ocean Plan sets forth numeric and narrative water quality objectives for the ocean waters with the intent of protecting the ocean's beneficial uses, which include recreation, aesthetics, navigation, fishing, mariculture, areas of special biological significance, rare and endangered species, habitat, fish migration, fish spawning, and shellfish harvesting (SWRCB, 2015a). The Regional Water Quality Control Boards utilize these objectives to develop water quality-based effluent limitations for ocean dischargers that have a reasonable potential to exceed the water quality objectives.

When municipal wastewater flows are released from an outfall (typically using specially designed diffusers), the wastewater and ocean water undergo rapid mixing due to the momentum and buoyancy of the discharge.[5] The mixing that occurs in the rising plume is affected by the buoyancy and momentum of the discharge, a process referred to as initial dilution (NRC, 1993). For rising plumes, the Ocean Plan defines the initial dilution as complete when "the diluting wastewater ceases to rise in the water column and first begins to spread horizontally," (*i.e.*, when the momentum from the discharge has dissipated). For more saline discharges, a sinking plume forms when the discharge is denser than the ambient water (also known as a negatively buoyant

[5] Municipal wastewater effluent, being low in salinity, is less dense than seawater and thus rises (due to buoyancy) while it mixes with ocean water. GWR Concentrate, whether by itself or mixed with municipal wastewater effluent, is less dense than seawater and also rises (due to buoyancy) while it mixes with ocean water. Desal Brine, depending on the ratio of dilution with GWR Concentrate and municipal wastewater effluent, may be more or less dense than seawater.

plume). In the case of negatively buoyant plumes, the Ocean Plan defines the initial dilution as complete 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."

The numeric Ocean Plan objectives are to be met after the initial dilution of the discharge. The initial dilution occurs in an area known as the zone of initial dilution (ZID). The extent of dilution in the ZID is quantified and referred to as the minimum probable initial dilution (D_m). The water quality objectives established in the Ocean Plan are adjusted by the D_m to derive National Pollutant Discharge Elimination System (NPDES) permit limits that are applied to a wastewater discharge prior to ocean dilution.

The current MRWPCA wastewater discharge is governed by NPDES Permit No. CA0048551 (currently implemented as Order No. R3-2014-0013) issued by the Central Coast Regional Water Quality Control Board ("RWQCB") (CCRWQCB, 2014). Because the existing NPDES permit for the MRWPCA ocean outfall must be amended to discharge Desal Brine, comparing future discharge concentrations to the current NPDES permit limits (that will likely change when the permit is amended) would not be an appropriate metric or threshold for determining whether the proposed projects would have a significant impact on marine water quality. Instead, compliance with the Ocean Plan objectives was selected as an appropriate threshold for determining whether the proposed projects would result in a significant impact requiring mitigation.

Dr. Philip Roberts, a Professor in the School of Civil and Environmental Engineering at the Georgia Institute of Technology, conducted dilution modeling of the ocean discharge and estimated D_m values for scenarios involving different flow rates of the proposed projects and different ambient ocean conditions. These ocean modeling results were combined with projected discharge water quality to assess compliance with the Ocean Plan. Dr. Roberts' report is included as Appendix D.

2.4 Future Ocean Discharges

A summary schematic of the MPWSP and Variant is presented in Figure 3. For the MPWSP, 23.58 mgd of ocean water (design capacity) would be treated in the desalination facility; an RO recovery of 42% would lead to an MPWSP Desal Brine flow of 13.98 mgd that would be discharged through the outfall. Following periods of plant shutdown, the facility may produce 16.31 mgd of Desal Brine to temporarily boost plant production. Secondary effluent from the RTP would also be discharged through the outfall, although the flow would be variable depending on both the raw wastewater flow and the proportion being processed through the tertiary treatment system at the Salinas Valley Reclamation Plant (SVRP) to produce recycled water for agricultural irrigation. The third and final discharge component is hauled waste that is trucked to the RTP and blended with secondary effluent prior to discharge. The maximum anticipated flow of the hauled waste is 0.03 mgd, and is blended with secondary effluent for a total flow of 0.1 mgd. These three discharge components (Desal Brine, secondary effluent, and hauled waste) would be mixed at the proposed Brine Mixing Facility prior to ocean discharge.

For the Variant, 15.93 mgd of ocean water (design capacity) would be pumped to the desalination facility, and an RO recovery of 42% would result in a Variant Desal Brine flow of

8.99 mgd. Similar to the larger desalination facility, the plant may produce 11.24 mgd of Desal Brine for a short period of time to boost plant production. The Variant would include the GWR Project, which involves the addition of new source waters to the RTP that would alter the water quality of the secondary effluent produced by the RTP. The secondary effluent in the Variant is referred to as "Variant secondary effluent," and would be different in quality from the MPWSP secondary effluent. Under the GWR Project, a portion of the secondary effluent would be fed to the AWPF, and the resultant GWR Concentrate (maximum 1.17 mgd) would be discharged through the outfall. The hauled waste received at the RTP would continue to be mixed with secondary effluent prior to discharge, and so the quality of the blended brine and secondary effluent will change as a result of the change in secondary effluent quality. The hauled waste for the Variant is referred to as "Variant hauled waste." The discharge components for the MPWSP and Variant are summarized in Table 1.

Table 1 – Discharge waters Included in each analysis

Project	Desal Brine	Secondary Effluent	Variant Secondary Effluent	Hauled Waste	Variant Hauled Waste [a]	GWR Concentrate
MPWSP	✓ (13.98 mgd, 16.31 mgd periodically)	✓ (flow varies)		✓ (0.1 mgd)		
Variant	✓ (8.99 mgd, 11.24 mgd periodically)		✓ (flow varies)		✓ (0.1 mgd)	✓ (1.17 mgd)

[a] This is placed in a separate category because it contains Variant secondary effluent.

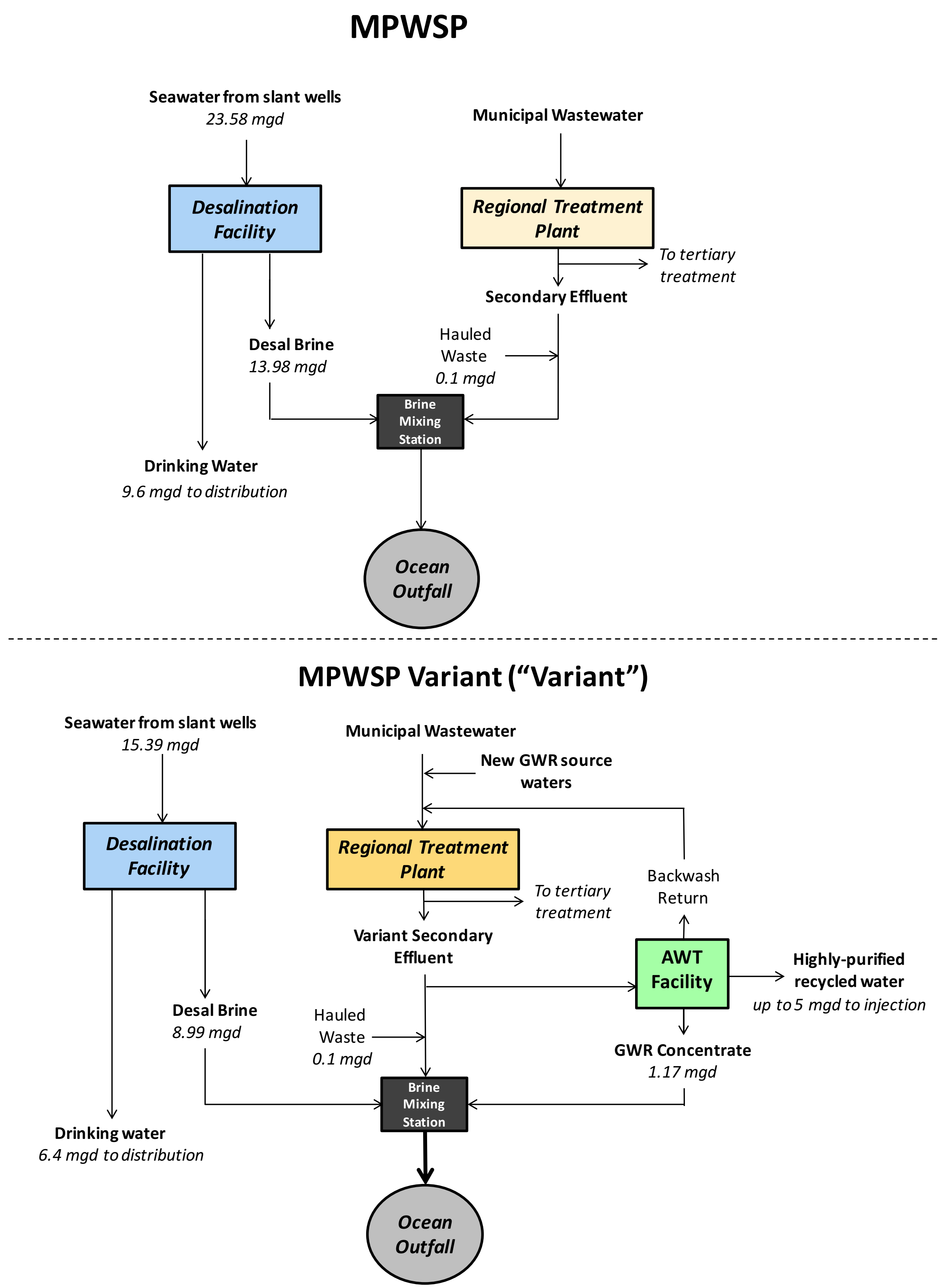

Figure 3 – Flow schematics for the MPWSP and Variant projects (specified flow rates are at design capacity)

2.5 Objective of Technical Memorandum

Trussell Technologies, Inc. ("Trussell Tech") estimated worst-case in-pipe water quality for the various ocean discharge scenarios (*i.e.*, prior to dilution through ocean mixing) for the proposed projects. Dr. Roberts' ocean discharge modeling and the results of the water quality analysis were then used to provide an assessment of whether the proposed projects would consistently meet Ocean Plan water quality objectives. The objective of this TM is to summarize the assumptions, methodology, results and conclusions of the Ocean Plan compliance assessment for the MPWSP and Variant.

3 Methodology for Ocean Plan Compliance Assessment

Water quality data from various sources for the different treatment process influent and waste streams were compiled. Trussell Tech combined these data for different flow scenarios and used ocean modeling results (*i.e.*, D_m values) to assess compliance of different discharge scenarios with the Ocean Plan objectives. This section documents the data sources and provides further detail on the methodology used to perform this analysis. A summary of the methodology is presented in Figure 4.

3.1 Methodology for Determination of Discharge Water Quality

The amounts and combinations of various wastewaters that would be disposed through the MRWPCA outfall will vary depending on the capacity, seasonal and daily flow characteristics, and extent and timing of implementation of the proposed projects.

Detailed discussions about the methods used to determine the discharge water qualities related to the GWR Project were previously discussed and can be found in Appendix B. This previous analysis included water quality estimates of the secondary effluent, Variant secondary effluent, hauled waste, Variant hauled waste, and the GWR Concentrate (*i.e.,* all of the discharges except for the Desal Brine). In the previous analysis, Trussell Tech assumed that the highest observed values for the various Ocean Plan constituents within each type of water flowing to and treated at the RTP, including the AWPF as applicable, to be the worst-case water quality.[6] These same data and assumptions were used in the analysis described in this memorandum. Use of these worst-case water quality concentrations ensures that the analysis in this memorandum is conservative related to the Ocean Plan compliance assessment (and thus, the impact analysis for the MPWSP environmental review processes).

To determine the impact of the MPWSP and Variant, the worst-case water quality of the Desal Brine was estimated using available data from CalAm's temporary test subsurface slant well on the CEMEX mine property in Marina, California. Long-term pumping and water quality sampling from this well began in April 2015.[7] As in the previous Ocean Plan compliance

[6] Except for copper, where instead the median was calculated from the data for each new source water because the maximum values detected seemed to be outliers, and the Ocean Plan objective for copper considered in this assessment is the 6-month median concentration.

[7] The well was shut down on June 5, 2015 to assess regional trends in aquifer water levels and resumed pumping October 27, 2015. The well was shut down again between March 4, 2016 and May 2, 2016 for discharge line repairs. No water quality data were collected during shutdown periods.

assessments, the highest observed concentrations in the slant well were used for this Ocean Plan compliance assessment.[8]

The methodology for determining the water quality of the Desal Brine and secondary effluent is further described in this section (the methodology for all other discharge waters can be found in Appendix B). A summary of which discharge waters are considered for both the MPWSP and Variant, and which data sources were used in the determination of the water quality for each discharge stream is shown in Figure 4.

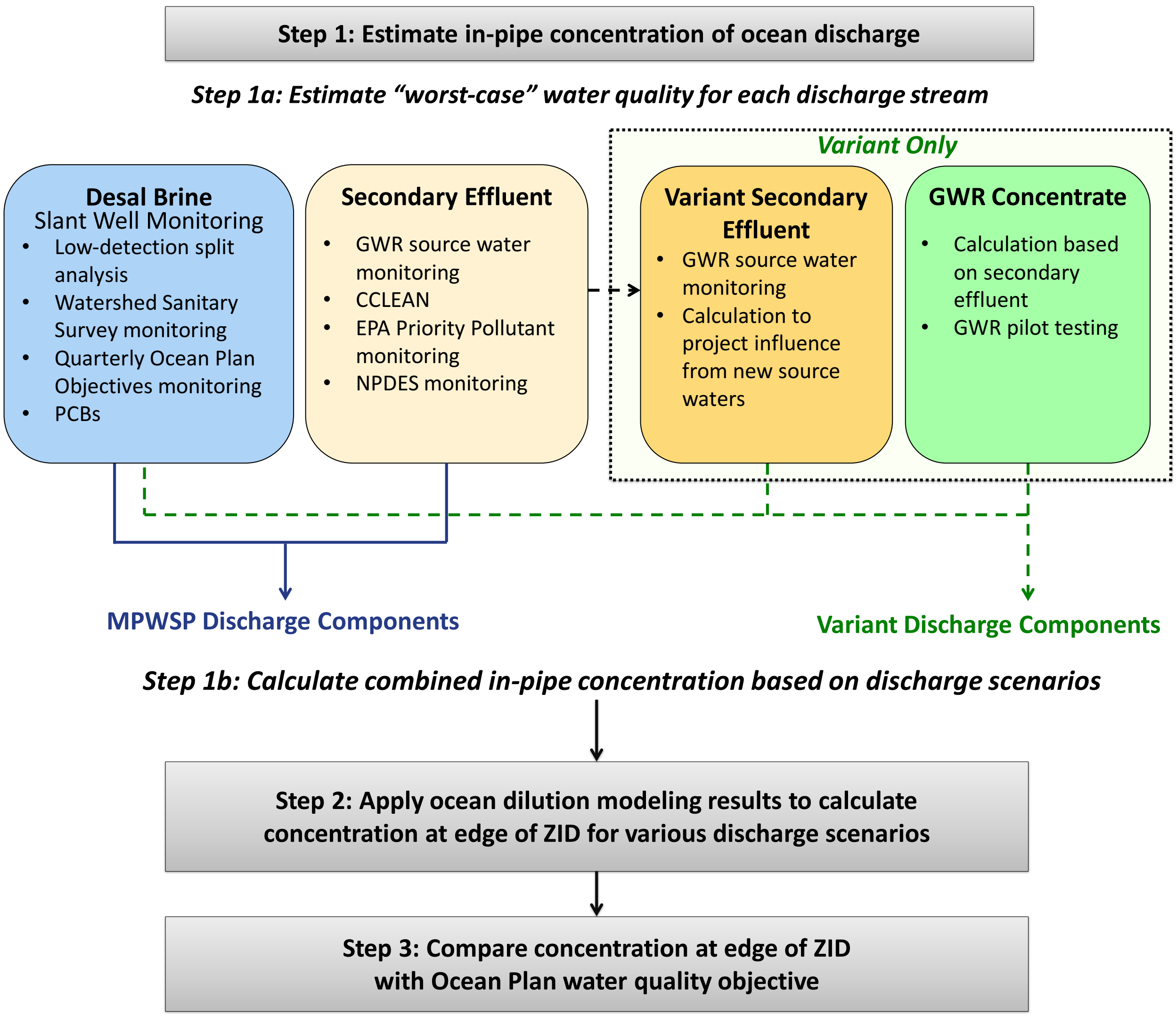

Figure 4 – Logic flow chart for determination of MPWSP and Variant compliance with Ocean Plan objectives.

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8 Except for copper, where instead the median was calculated from data from the test slant well because the maximum values detected seemed to be outliers, and the Ocean Plan objective for copper considered in this assessment is the 6-month median concentration.

3.1.1 Secondary Effluent

For the MPWSP, the discharged secondary effluent would not be impacted by additional source waters that would be brought in for the Variant; therefore, the historical secondary effluent quality was used in the analysis. The following sources of data were considered for selecting a secondary effluent concentration for each constituent in the analysis:

- Secondary effluent water quality monitoring conducted for the GWR Project from July 2013 through June 2014.
- MRWPCA RTP historical NPDES compliance water quality data collected semi-annually by MRWPCA (2005- Spring 2017).
- Historical NPDES RTP Priority Pollutant data collected annually by MRWPCA (2004-2016).
- Water quality data collected semi-annually by the Central Coast Long-Term Environmental Assessment Network (CCLEAN) (2008-2016) (CCLEAN, 2014).

The secondary effluent concentration for each constituent selected for the analysis was the maximum reported value from the above sources. In some cases, constituents were not detected (ND); in these cases, the values are reported as ND (<MRL). In cases where the analysis of a constituent was detected but not quantified, the result is also reported as less than the Method Reporting Limit ND (<MRL).[9] Because the actual concentration could be any value equal to or less than the MRL, the conservative approach is to use the value of the MRL for the compliance analysis. For some ND constituents, the MRL exceeds the Ocean Plan objective, and thus no compliance determination can be made.[10] A detailed discussion of the cases where a constituent was reported as less than the MRL is included in the GWR Project TM in Appendix B (Trussell Technologies, 2017).

Cyanide has been detected in the RTP effluent at relatively high levels compared to the discharge requirements. The maximum detected value in the RTP effluent was 81 μg/L.

Several investigations have been conducted into the accuracy of sampling, preservation, and analytical methods for cyanide. These have shown that sample holding time and preservation have a significant impact on measured cyanide concentrations. Pandit et al. (2006) demonstrated that when sodium hydroxide was added to adjust the pH higher than 12, as specified in accepted methods for cyanide measurement in order to preserve the sample, the measured cyanide concentrations were consistently higher than those for samples preserved at pH 10 to 11. They also showed that cyanide levels increased within the recommended holding times of the approved cyanide methods (at pH 12).

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[9] The lowest amount of an analyte in a sample that can be quantitatively determined with stated, acceptable precision and accuracy under stated analytical conditions (*i.e.*, the lower limit of quantitation). Therefore, acceptable quality control and quality assurance procedures are calibrated to the MRL, or lower. To take into account day-to-day fluctuations in instrument sensitivity, analyst performance, and other factors, the MRL is established at three times the Method Detection Limit (or greater). The 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. (40 Code of Federal Regulations Section136 Appendix B).

[10] This phenomenon is common in the implementation of the Ocean Plan where for some constituents, suitable analytical methods are not capable of measuring low enough to quantify the minimum toxicologically relevant concentrations. For these constituents, a discharge is considered compliant if the monitoring results are less than the MRL.

In addition, the 2015 California Ocean Plan specifies the following:

If a discharger can demonstrate to the satisfaction of the Regional Water 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.

Based on the above information, it is recommended that additional cyanide sampling be conducted using different methods (*e.g.*, analysis within 15 minutes with no preservation) to determine if the laboratory method leads to inaccurately high cyanide values. It is also recommended to determine if a method can be performed that distinguishes between weakly and strongly complexed cyanide. Until this is completed, all cyanide concentrations presently available are used in this Ocean Plan compliance assessment.

3.1.2 Desalination Brine

Trussell Tech used the following four sources of data for the Desal Brine water quality assessment:

- A one-time 7-day composite sample from the test slant well with separate analysis of particulate and dissolved phase fractions of constituents using low-detection CCLEAN analysis techniques (February 18-25, 2016). The maximum total concentration was used in this analysis (*i.e.* the sum of the concentration in the particulate and dissolved phase fractions).[11] Of the constituents analyzed with this split phase method,[12] all were detected 100% in the dissolved phase, except PCBs, which were detected 99% in the dissolved phase.
- CalAm Watershed Sanitary Survey monitoring program monthly test slant well sampling water quality results (May 2015 – April 2017).[13]
- Quarterly sampling of the test slant well for constituents specified in the Ocean Plan (November 2015, February, June, and September 2016).
- Test slant well sampling by Geoscience Support Services, Inc. ("Geoscience") every other month for polychlorinated biphenyls (PCBs) (May 2015 – February 2016).[11]

The maximum value observed in any of the data sources was assumed to be the "worst-case" water quality for the raw seawater feeding the desalination facility. If a constituent was ND in all samples, and multiple analysis methods were used with varying MRL values, the highest MRL

[11] Only method detection limits were provided for these results. When a constituent was ND in this dataset, the method detection limit was used for analysis.

[12] Hexachlorobutadiene, hexachlorobenzene, HCH, heptachlor, aldrin, chlordane, DDT, heptachlor epoxide, dieldrin, Endrin, endosulfans, toxaphene, PCBs

[13] The well was shut down on June 5, 2015 to assess regional trends in aquifer water levels and resumed pumping October 27, 2015. The well was shut down again between March 4, 2016 and May 2, 2016 for discharge line repairs. No water quality data were collected during shutdown periods.

was assumed for compliance analysis; the exception to this statement is when data were available from the low detection limit 7-day composite sample. For these constituents,[14] the detected value from the low detection analysis was used, even if it was lower than the MRL provided by the standard analysis methods. If the sample results of a constituent reported the concentration as less than the MRL, the MRL was assumed for compliance analysis and the concentration is reported as ND (<MRL) in this TM. Equation 1 was used to calculate a conservative estimate of the Desal Brine concentration (C_{Brine}) for each constituent by using a concentration factor of 1.73, which was calculated assuming complete rejection of the constituent in the feed water (C_{Feed}) and a 42% recovery ($\%_R$) through the seawater RO membranes.

$$C_{Brine} = \frac{C_{Feed}}{1 - \%_R} \tag{1}$$

3.1.3 Combined Ocean Discharge Concentrations

Having estimated the worst-case concentrations for each of the discharge components, the combined concentration prior to discharge was determined as a flow-weighted average of the contributions of each of the discharge components appropriate for the MPWSP and Variant.

3.2 Ocean Modeling Methodology

In order to determine Ocean Plan compliance, Trussell Tech used the following information: (1) the in-pipe (*i.e.*, pre-ocean dilution) concentration of a constituent ($C_{in\text{-}pipe}$) that was developed as discussed in the previous section, (2) the minimum probable dilution for the ocean mixing (D_m) for the discharge flow scenarios that were modeled by Dr. Roberts[15] (Roberts, P. J. W, 2017), and (3) the background concentration of the constituent in the ocean ($C_{Background}$) that is specified in Table 3 of the Ocean Plan (SWRCB, 2015b). With this information, the concentration at the edge of the zone of initial dilution (C_{ZID}) was calculated using the following equation:

$$C_{ZID} = \frac{C_{In-pipe} + D_m * C_{Background}}{1 + D_m} \tag{2}$$

The C_{ZID} was then compared to the Ocean Plan water quality objectives[16] in Table 1 of the Ocean Plan (SWRCB, 2015). In this table, there are three categories of objectives: (1)

[14] Endrin, hexachlorocyclohexane, chlordane, DDT, dieldrin, heptachlor, heptachlor epoxide, hexachlorobutadiene, PCBs, toxaphene.

[15] The Ocean Plan defines dilution differently than Dr. Roberts. Dr. Roberts provided results defined as S = [total volume of a sample]/[volume of effluent contained in the sample]. The D_m referenced in Equation 1 of the California Ocean Plan is defined as $D_m = S – 1$. A value of 1 was subtracted from the dilution estimates provided by Dr. Roberts prior to using Ocean Plan Equation 1.

[16] Note that the Ocean Plan also defines effluent limitations for oil and grease, suspended solids, settleable solids, turbidity, and pH (see Ocean Plan Table 2). These parameters were not evaluated in this assessment. It is assumed that, if necessary, the pH of the water would be adjusted to be within acceptable limits prior to discharge. Oil and grease, suspended solids, settable solids, and turbidity in the GWR Concentrate and Desal Brine would be significantly lower than the secondary effluent. Prior to the AWPF RO treatment process, the process flow would be treated by MF, which will reduce these parameters, and the waste stream from the MF will be returned to RTP

Objectives for Protection of Marine Aquatic Life, (2) Objectives for Protection of Human Health – Non-Carcinogens, and (3) Objectives for Protection of Human Health – Carcinogens. There are also three objectives for each constituent included in the first category (for marine aquatic life): six-month median, daily maximum and instantaneous maximum concentration. For the other two categories, there is one objective: 30-day average concentration. When a constituent had three objectives, the lowest objective, the six-month median, was used to estimate compliance. This approach was taken because the discharge scenarios, discussed in further detail below, could be experienced for six months, and therefore the 6-month median objective would need to be met. For the ammonia objectives (specifically, the total ammonia concentration calculated as the sum of unionized ammonia (NH_3) and ionized ammonia (NH_4), expressed in μg/L as N) the daily maximum and 6-month median objectives were evaluated.

For each discharge scenario, if the C_{ZID} was below the Ocean Plan objective, then it was assumed that the discharge would comply with the Ocean Plan. However, if the C_{ZID} exceeds the Ocean Plan objective, then it was concluded that the discharge scenario could violate the Ocean Plan objective. Note that this approach could not be applied for some constituents, *viz.*, acute toxicity, chronic toxicity, and radioactivity. Calculating flow-weighted averages for toxicity (acute and chronic) and radioactivity (gross beta and gross alpha) is not appropriate based on the nature of the constituents. These constituents were measured individually for the secondary effluent and GWR Concentrate, and these individual concentrations would comply with the Ocean Plan objectives. Toxicity testing on the seawater was not included in the analysis for this TM; it will be evaluated by another method not discussed in this TM.

Dr. Roberts performed modeling of various discharge scenarios for the MPWSP and Variant that include combinations of Desal Brine, secondary effluent, GWR Concentrate, and hauled waste (Roberts, P. J. W, 2017). Forty-seven scenarios resulting in the worst-case dilution conditions will be presented in this TM. These scenarios assume the maximum flow rates for the GWR Concentrate, Desal Brine and hauled waste, which is a conservative assumption in terms of constituent loading and minimum dilution. Additional flow scenarios were modeled by Dr. Roberts, and can be found in his report (Appendix D).

3.2.1 Ocean Modeling Scenarios

The modeled scenarios are summarized in Tables 2 and 3 for the MPWSP and the Variant, respectively. The Variant discharge scenarios that have no Desal Brine (*i.e.*, Scenarios 21 through 29) have already been analyzed and found to comply with the Ocean Plan (Trussell Tech 2017, see Appendix B); these scenarios are shown in Table 3 for completeness, but for simplicity, the analysis of these scenarios is not repeated in Section 4.

The MPWSP flow scenarios included in this analysis cover the range of potential future discharge compositions, with various secondary effluent flows and Desal Brine flows included. The amount of secondary effluent being discharged is dependent on the demand for recycled water (highest demand, and lowest secondary effluent discharge is experienced during the

headworks. Prior to the Desalination Facility RO treatment process, the process flow would be treated by granular media filters and cartridge filters, which reduce these parameters. The waste stream from the granular media filter would be further treated in gravity thickening basins prior to any discharge of the decant through the ocean outfall. The cartridge filters will be disposed off-site and the solids will not be returned to the process.

summer months), and whether the SVRP is operational. Modeling the minimum secondary effluent flows (*i.e.*, no secondary effluent discharged) provides conditions where the influence of Desal Brine on the ocean discharge water quality is maximized and the discharge plumes are negatively buoyant. The moderate secondary effluent flow scenarios create conditions where the Desal Brine and the secondary effluent have similar levels of influence on the water quality of the ocean discharge, as well as neutrally buoyant discharge plumes. The high secondary effluent flow scenarios provide analysis of the highest expected flows that may be discharged, where the discharge is buoyant.

Table 2 - Modeled flow scenarios for the MPWSP

Flow Scenario No.	Discharge Flows (mgd)		
	Secondary Effluent [a]	Desal Brine	Hauled Waste
MPWSP with Normal Desal Brine Flow			
1	0	13.98	0.1
2	2	13.98	0.1
3	4	13.98	0.1
4	6	13.98	0.1
5	9	13.98	0.1
6	10	13.98	0.1
7	19.78	13.98	0.1
MPWSP with High Desal Brine Flow			
8	0	16.31	0.1
9	2	16.31	0.1
10	7	16.31	0.1
11	8	16.31	0.1
12	10	16.31	0.1
13	12	16.31	0.1
14	16	16.31	0.1

[a] Note that RTP wastewater flows have been declining in recent years as a result of water conservation; while 19.78 mgd is higher than current RTP wastewater flows, this is expected to be a conservative scenario with respect to ocean modeling, compared to using the current wastewater flows of 16 to 18 mgd.

Similar to the flow scenarios for the MPWSP, Variant flow scenarios were selected to cover the complete range of potential future discharge compositions. These scenarios encompass periods when the AWPF is offline, and/or the desalination plant is offline. They also cover short-term operations with higher Desal Brine discharges when the desalination plant is catching up on production after periods of being offline. All these potential operating conditions were considered with varying amounts of secondary effluent flow, as it is possible that any of these conditions may be experienced during future operations.

Table 3 – Modeled flow scenarios for the Variant

Flow Scenario No.	Discharge Flows (mgd)			
	Secondary Effluent [a]	Desal Brine	GWR Concentrate	Hauled Waste [b]
Variant with AWPF Offline				
15	0	8.99	0	0
16	2	8.99	0	0
17	4	8.99	0	0
18	5.8	8.99	0	0
19	14	8.99	0	0
20	19.78	8.99	0	0
Variant with Desalination Plant Offline				
21	0	0	1.17	0
22	0.4	0	1.17	0
23	0.8	0	1.17	0
24	3	0	1.17	0
25	5	0	1.17	0
26	7	0	1.17	0
27	9	0	1.17	0
28	21	0	1.17	0
29	23.4	0	1.17	0
Variant with Normal Flows				
30	0	8.99	1.17	0
31	2	8.99	1.17	0
32	4	8.99	1.17	0
33	6	8.99	1.17	0
34	11	8.99	1.17	0
35	15.92	8.99	1.17	0
Variant with High Desal Brine Flows and AWPF Offline				
36	0	11.24	0	0
37	3	11.24	0	0
38	5	11.24	0	0
39	9	11.24	0	0
40	12	11.24	0	0
41	16	11.24	0	0
Variant with High Desal Brine Flows				
42	0	11.24	1.17	0
43	1	11.24	1.17	0
44	4	11.24	1.17	0
45	9	11.24	1.17	0
46	12	11.24	1.17	0
47	16	11.24	1.17	0

[a] Note that RTP wastewater flows have been declining in recent years as a result of conservation; while 24.7 mgd is higher than current RTP wastewater flows, this is expected to be a conservative scenario with respect to ocean modeling, compared to using the current wastewater flows of 16 to 18 mgd.
[b] A sensitivity analysis was conducted to determine the impacts of hauled waste on the modeled D_m results. It was concluded that neither the flow nor TDS from the addition of hauled waste had a significant impact on the modeled D_m result, and was therefore excluded from the D_m calculation.

3.2.2 Ocean Modeling Assumptions

Dr. Roberts documented the modeling assumptions and results in a TM (Roberts, P. J. W., 2017, Appendix D). Changes incorporated into this modeling work compared to the work produced in 2016 included (a) modification to the outfall end gate to include one 6-inch Tideflex valve instead of an open end, (b) analysis of all worst-case ocean conditions, and (c) additional flow scenarios incorporating higher brine discharge flows. The modeling assumptions were specific to ambient ocean conditions: Davidson (November to March), Upwelling (April to August), and Oceanic (September to October).[17] In order to conservatively demonstrate Ocean Plan compliance, the lowest D_m from the applicable ocean conditions was used for each flow scenario. For all scenarios, the ocean modeling was performed assuming all 129 operational diffuser ports were open.

Three methods were used when modeling the ocean mixing: (1) the Cederwall formula (for neutral and negatively buoyant plumes only), (2) the mathematical model UM_3 in the United States Environmental Protection Agency's (EPA's) Visual Plume suite, and (3) the NRFIELD model (for positively buoyant plumes only), also from the EPA's Visual Plume suite (Roberts, P. J. W., 2017). When results were provided from both Cederwall and UM_3, the minimum estimated D_m value was used in this analysis; when results were provided from both UM_3 and NRFIELD, the D_m value estimated with the UM_3 model was selected for consistency, such that all dilution results for buoyant discharges used for this analysis were determined using the same model.

4 Ocean Plan Compliance Results

4.1 Water Quality of Combined Discharge

As described above, the first step in the Ocean Plan compliance analysis was to estimate the worst-case water quality for the future wastewater discharge components (*viz.,* Desal Brine, secondary effluent, hauled waste and GWR Concentrate). The estimated water quality for each type of discharge is provided in Table 4. Specific assumptions and data sources for each constituent are documented in the Table 4 footnotes.

Table 4 – Estimated worst-case water quality for the various discharge waters

Constituent	Units	Desal Brine	Secondary Effluent		Hauled Waste		GWR Concentrate	Footnotes
			MPWSP	*Variant*	*MPWSP*	*Variant*		
Ocean Plan water quality objectives for protection of marine aquatic life								
Arsenic	µg/L	17.2	45	45	45	45	12	2,6,16,21
Cadmium	µg/L	5.0	1	1.2	1	1.2	6.5	1,7,15,21
Chromium (Hexavalent)	µg/L	ND(<0.03)	ND(<2)	2.5	130	130	13	3,7,15,21

[17] Note that these ranges assign the transitional months to the ocean condition that is typically more restrictive at relevant discharge flows.

Constituent	Units	Desal Brine	Secondary Effluent		Hauled Waste		GWR Concentrate	Footnotes
			MPWSP	Variant	MPWSP	Variant		
Copper	µg/L	0.5	11	11	39	39	58	1,7,15,21,28
Lead	µg/L	ND(<0.5)	0.11	2.69	0.76	2.69	14.2	1,7,15,21
Mercury	µg/L	0.414	0.019	0.085	0.044	0.085	0.510	1,10,16,21
Nickel	µg/L	11.0	5.2	12.2	5.2	12.2	64	1,7,15,21
Selenium	µg/L	8.4	4	6.4	75	75	34	1,7,15,21
Silver	µg/L	0.50	0.14	0.77	0.14	0.77	4.05	1,10,15,21
Zinc	µg/L	9.5	20	57.5	170	170	303	1,7,15,21
Cyanide	µg/L	ND(<8.6)	81	89.7	81	89.7	143	1,7,16,17,21
Total Chlorine Residual	µg/L	--	ND(<200)	ND(<200)	ND(<200)	ND(<200)	ND(<200)	5
Ammonia (as N) 6-mo median	µg/L	143.1	42,900	42,900	42,900	42,900	225,789	1,6,15,21,27
Ammonia (as N) daily max	µg/L	143.1	49,000	49,000	49,000	49,000	257,895	1,6,15,21,27
Acute Toxicity	TUa	--	2.3	2.3	2.3	2.3	0.77	1,12,16,17,24
Chronic Toxicity	TUc	--	40	40	80	40	100	1,12,16,17,24
Phenolic Compounds (non-chlorinated)	µg/L	ND(<86.2)	69	69	69	69	363	1,6,14,15,23,2526
Chlorinated Phenolics	µg/L	ND(<34.5)	ND(<20)	ND(<20)	ND(<20)	ND(<20)	ND(<20)	3,9,18,23,25,26
Endosulfan	µg/L	ND(<3.4E-6)	0.015	0.046	0.015	0.046	0.24	1,10,14,15,22,25
Endrin	µg/L	ND(<1.6E-6)	0.000112	0.000112	0.000112	0.000112	0.00059	4,8,15,22
HCH (Hexachlorocyclohexane)	µg/L	0.000043	0.036	0.059	0.036	0.059	0.312	1,10,14,15,22, 25
Radioactivity (Gross Beta)	pCi/L	ND(<5.17)	32	32	307	307	34.8	1,6,12,16,17,23
Radioactivity (Gross Alpha)	pCi/L	22.4	18	18	457	457	14.4	1,6,12,16,17,23
Objectives for protection of human health - noncarcinogens								
Acrolein	µg/L	ND(<3.4)	ND(<5)	8.3	ND(<5)	8.3	44	3,7,15,23
Antimony	µg/L	0.21	0.65	0.78	0.65	0.78	4.1	1,7,15,21
Bis (2-chloroethoxy) methane	µg/L	ND(<16.7)	ND(<0.5)	ND(<4.0)	ND(<0.5)	ND(<4.0)	ND(<1)	3,9,18,23
Bis (2-chloroisopropyl) ether	µg/L	ND(<16.7)	ND(<0.5)	ND(<4.0)	ND(<0.5)	ND(<4.0)	ND(<1)	3,9,18,23
Chlorobenzene	µg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21
Chromium (III)	µg/L	17	3.0	6.9	87	87	36	2,7,15,21
Di-n-butyl phthalate	µg/L	ND(<16.7)	ND(<5)	ND(<7)	ND(<5)	ND(<7)	ND(<1)	3,9,18,23
Dichlorobenzenes	µg/L	ND(<0.9)	1.6	1.6	1.6	1.6	8.4	1,10,15,21
Diethyl phthalate	µg/L	ND(<0.9)	ND(<5)	ND(<5)	ND(<5)	ND(<5)	ND(<1)	3,9,18,23
Dimethyl phthalate	µg/L	ND(<0.9)	ND(<2)	ND(<2)	ND(<2)	ND(<2)	ND(<0.5)	3,9,18,23
4,6-dinitro-2-methylphenol	µg/L	ND(<84.5)	ND(<0.5)	ND(<19)	ND(<0.5)	ND(<19)	ND(<5)	3,9,18,23
2,4-dinitrophenol	µg/L	ND(<86.2)	ND(<0.5)	ND(<9)	ND(<0.5)	ND(<9)	ND(<5)	3,9,18,23
Ethylbenzene	µg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21
Fluoranthene	µg/L	ND(<0.2)	0.00684	0.00684	0.00684	0.00684	0.0360	4,8,15,23
Hexachlorocyclopentadiene	µg/L	ND(<0.09)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.05)	3,9,18,23
Nitrobenzene	µg/L	ND(<41.4)	ND(<0.5)	ND(<2.1)	ND(<0.5)	ND(<2.1)	ND(<1)	3,9,18,23
Thallium	µg/L	ND(<0.1)	ND(<0.5)	0.68	ND(<0.5)	0.68	3.6	3,7,15,21
Toluene	µg/L	ND(<0.9)	0.47	0.48	0.47	0.48	2.5	1,10,15,21
Tributyltin	µg/L	ND(<0.08)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.05)	ND(<0.02)	3,13,18,23
1,1,1-trichloroethane	µg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21
Objectives for protection of human health - carcinogens								
Acrylonitrile	µg/L	ND(<3.4)	ND(<2)	2.5	ND(<2)	2.5	13	3,7,15,23
Aldrin	µg/L	ND(<6.7E-5)	ND(<0.005)	ND(<0.007)	ND(<0.005)	ND(<0.007)	ND(<0.01)	3,9,18,23
Benzene	µg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21
Benzidine	µg/L	ND(<86.2)	ND(<0.5)	ND(<18.6)	ND(<0.5)	ND(<18.6)	ND(<0.05)	3,9,18,23
Beryllium	µg/L	ND(<0.9)	ND(<0.5)	ND(<0.68)	0.0052	0.0052	ND(<0.5)	3,9,17,18,21
Bis(2-chloroethyl)ether	µg/L	ND(<41.4)	ND(<0.5)	ND(<4.0)	ND(<0.5)	ND(<4.0)	ND(<1)	3,9,18,23
Bis(2-ethyl-hexyl)phthalate	µg/L	ND(<1.0)	78	78	78	78	411	2,6,15,23
Carbon tetrachloride	µg/L	ND(<0.9)	ND(<0.5)	0.50	ND(<0.5)	0.50	2.66	3,7,15,21
Chlordane	µg/L	1.45E-5	0.00122	0.00122	0.00122	0.00122	0.0064	4,8,14,15,22,25
Chlorodibromomethane	µg/L	ND(<0.9)	ND(<0.5)	2.2	ND(<0.5)	2.2	12	3,7,15,21
Chloroform	µg/L	ND(<0.9)	2	34	2	34	180	2,7,15,21
DDT	µg/L	1.7E-6	0.001	0.001	0.001	0.001	0.0003	4,7,14,19,22,25
1,4-dichlorobenzene	µg/L	ND(<0.9)	1.6	1.6	1.6	1.6	8.4	1,6,15,21
3,3-dichlorobenzidine	µg/L	ND(<86)	ND(<0.03)	ND(<18)	ND(<0.03)	ND(<18)	ND(<2)	3,9,18,23
1,2-dichloroethane	µg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21
1,1-dichloroethylene	µg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	0.5	0.5	ND(<0.5)	3,9,18,21
Dichlorobromomethane	µg/L	ND(<0.9)	ND(<0.5)	2.4	ND(<0.5)	2.4	12	3,7,15,21
Dichloromethane	µg/L	ND(<0.9)	0.88	0.88	0.88	0.88	4.6	1,7,15,21
1,3-dichloropropene	µg/L	ND(<0.9)	ND(<0.5)	0.56	ND(<0.5)	0.56	3.0	3,7,15,21

Constituent	Units	Desal Brine	Secondary Effluent		Hauled Waste		GWR Concentrate	Footnotes
			MPWSP	*Variant*	*MPWSP*	*Variant*		
Dieldrin	μg/L	4.7E-5	0.0007	0.0015	0.0007	0.0015	0.0001	4,7,19,22
2,4-dinitrotoluene	μg/L	ND(<0.2)	ND(<2)	ND(<2)	ND(<2)	ND(<2)	ND(<0.1)	3,9,18,23
1,2-diphenylhydrazine	μg/L	ND(<16.7)	ND(<0.5)	ND(<4)	ND(<0.5)	ND(<4)	ND(<1)	3,9,18,23
Halomethanes	μg/L	ND(<0.9)	0.54	1.3	0.73	1.3	6.9	2,7,14,15,21
Heptachlor	μg/L	ND(<6.9E-7)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	ND(<0.01)	2,9,18,22
Heptachlor epoxide	μg/L	ND(<1.6E-6)	0.000088	0.000088	0.000088	0.000088	0.000463	4,8,15,22
Hexachlorobenzene	μg/L	ND (<6.5E-5)	0.000078	0.000078	0.000078	0.000078	0.000411	4,8,15,22
Hexachlorobutadiene	μg/L	ND(<3.4E-7)	0.000009	0.000009	0.000009	0.000009	0.000047	4,8,15,22
Hexachloroethane	μg/L	ND(<16.7)	ND(<0.5)	ND(<2.1)	ND(<0.5)	ND(<2.1)	ND(<0.5)	3,9,18,23
Isophorone	μg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,23
N-Nitrosodimethylamine	μg/L	ND(<0.003)	0.017	0.086	0.017	0.086	0.150	2,7,16,17,23
N-Nitrosodi-N-Propylamine	μg/L	ND(<0.003)	0.076	0.076	0.076	0.076	0.019	2,6,16,17,23
N-Nitrosodiphenylamine	μg/L	ND(<16.7)	ND(<0.5)	ND(<2.1)	ND(<0.5)	ND(<2.1)	ND(<1)	3,9,18,23
PAHs	μg/L	2.2E-3	0.04	0.04	0.04	0.04	0.21	4,7,14,15,22,25
PCBs	μg/L	0.00013	0.00068	0.00068	0.00068	0.00068	0.00357	4,8,14,15,22,25
TCDD Equivalents	μg/L	ND (<2.5E-5)	1.37E-7	1.39E-7	1.37E-7	1.39E-7	7.29E-7	4,7,13,14,15,23, 25
1,1,2,2-tetrachloroethane	μg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21
Tetrachloroethylene	μg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21
Toxaphene	μg/L	3.97E-5	0.0071	0.0071	0.0071	0.0071	0.0373	4,8,15,22
Trichloroethylene	μg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21
1,1,2-trichloroethane	μg/L	ND(<0.9)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21
2,4,6-trichlorophenol	μg/L	ND(<16.7)	ND(<0.5)	ND(<2.1)	ND(<0.5)	ND(<2.1)	ND(<1)	3,9,18,23
Vinyl chloride	μg/L	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	ND(<0.5)	3,9,18,21

Table 4 Footnotes:

MPWSP Secondary Effluent and Hauled Waste

[1] The value reported is based on MRWPCA historical data.

[2] The value reported is based on secondary effluent data collected during the GWR Project source water monitoring programs (not impacted by the proposed new source waters), and are representative of future water quality under the MPWSP scenario.

[3] The MRL provided represents the Maximum Reported Value in Table F-3 of MRWPCA's current NPDES permit. There are two exceptions to this statement: (1) the maximum reported value for hexavalent chromium was disregarded as it was the concentration measured in the hauled waste, not the secondary effluent (2) chlorinated phenolics was not included in Table F-3, and so the MRL provided is the reported value from MRWPCA's priority pollutant monitoring.

Total Chlorine Residual

[5] For all waters, it is assumed that dechlorination will be provided such that the total chlorine residual will be below detection.

Variant Secondary Effluent and Hauled Waste

[6] Existing RTP effluent exceeds concentrations observed in other proposed source waters; the value reported is the existing secondary effluent value.

[7] The proposed new source waters may increase the secondary effluent concentration; the value reported is based on estimated source water blends.

[8] RTP effluent value is based on CCLEAN data; no other source waters were considered due to MRL differences.

[9] MRL provided represents the maximum flow-weighted MRL based on the blend of source waters.

[10] The only water with a detected concentration was the RTP effluent, however the flow-weighted concentration increases due to higher MRLs for the proposed new source waters.

[11] Additional source water data are not available; the reported value is for RTP effluent.

[12] Calculation of the flow-weighted concentration was not feasible due to constituent. The maximum observed value is reported.

[13] Agricultural Wash Water data are based on an aerated sample, instead of a raw water sample.

[14] This value in the Ocean Plan is an aggregate of several congeners or compounds. Per the approach described in the Ocean Plan, for cases where the individual congeners/compounds were less than the MRL, a value of 0 is assumed in calculating the aggregate value.

GWR Concentrate Data
[15] The value presented represents a calculated value assuming no removal prior to RO, complete rejection through RO membrane, and an 81% RO recovery.
[16] The value represents the maximum value observed during the pilot testing study.
[17] The calculated value for the AWPF data (described in note 15) was not used in the analysis because it was not considered representative. It is expected that the value would increase as a result of treatment through the AWPF (*e.g.* formation of N-Nitrosodimethylamine as a disinfection by-product), or that it will not concentrate linearly through the RO (*e.g.* toxicity and radioactivity).
[18] The MRL provided represents the limit from the source water and pilot testing monitoring programs.
[19] The value presented represents a calculated value assuming 93% and 84% removal through primary and secondary treatment for DDT and dieldrin, respectively, 36% and 44% removal through ozone for DDT and dieldrin, respectively, 92% and 97% removal through MF for DDT and dieldrin, respectively, recycling of the MF backwash to the RTP, complete rejection through the RO membrane, and an 81% RO recovery. The assumed removals are based on results from ozone bench-scale testing of Blanco Drain water blended with secondary effluent and low detection sampling through the RTP.
[20] Footnote not used

Desal Brine Data
[21] The value reported is based on test slant well data collected through the Watershed Sanitary Survey.
[22] The value reported is based on data from the one-time 7-day composite sample from the test slant well. If ND, the method detection limit was used for the analysis instead of the MRL. MRLs were not available for this data set.
[23] The value reported is based on data from the test slant well collected through the quarterly Ocean Plan constituents monitoring.
[24] Acute and chronic toxicity have not been measured or estimated
[25] This value in the Ocean Plan is an aggregate of several congeners or compounds. Per the approach described in the Ocean Plan, for cases where the individual congeners/compounds were less than the MRL, a value of 0 is assumed in calculating the aggregate value.
[26] Chlorinated phenolic compounds is the sum of the following: 4-chloro-3-methylphenol, 2-chlorophenol, pentachlorophenol, 2,4,5-trichlorophenol, and 2,4,6-trichlorophenol. Non-chlorinated phenolic compounds is the sum of the following: 2,4-dimethylphenol, 4,6-Dinitro-2-methylphenol, 2,4-dinitrophenol, 2-methylphenol, 4-methylphenol, 2-nitrophenol, 4-nitrophenol, and phenol.

General
[27] Ammonia (as N) represents the total ammonia concentration, *i.e.* the sum of unionized ammonia (NH_3) and ionized ammonia (NH_4).
[28] The value reported for the Variant secondary effluent was calculated using the median of the data collected for the new source waters and is an estimate of the potential increase in concentration of the secondary effluent based on estimated source water blends. The value reported for the Desal Brine was calculated with the median of the data collected from the test slant well and assuming a 42% recovery through the RO. The median values were used because the maximum values detected in both sources appear to be outliers, and because the Ocean Plan objective is a 6-month median concentration, it is reasonable to use the median value detected from these source waters.

4.2 Ocean Modeling Results

The resulting estimates of minimum probable dilution (D_m) for each discharge scenario are presented in Tables 5 and 6 (Roberts, P. J. W., 2017). For discharge scenarios that were modeled with more than one modeling method, the lowest D_m (*i.e.*, most conservative) is reported in the tables below. For the MPWSP, the flow scenarios in which little or no secondary effluent was discharged (Scenarios 1, 2, 8, and 9) resulted in the lowest D_m values as a result of the discharge plume being negatively buoyant. At higher secondary effluent flows, the discharge plume would be positively buoyant, resulting in an increased D_m, as evidenced in Scenarios 7 and 14. The same trend was observed for Variant scenarios.

The estimates of minimum probable dilution (D_m) for the MPWSP range from 14.4 to 98, and 14.4 to 114 for the Variant. These D_m values are substantially lower than what is currently specified in the MRWPCA NPDES permit (145) and those estimated for the GWR Project, which range from 174 to 498 (see Appendix B). As a result of the reduced dilution, some contaminants, which have not traditionally been of concern for discharge through MRWPCA's ocean outfall, are estimated to potentially exceed the Ocean Plan objectives at the edge of the ZID.

Table 5 – Flow scenarios and modeled D_m values used for Ocean Plan compliance analysis for MPWSP

Flow Scenario No.	Ocean Condition	Discharge flows (mgd)			D_m [b]
		Secondary Effluent [a]	Desal Brine	Hauled Waste	
MPWSP with Normal Desal Brine Flow					
1	Davidson	0	13.98	0.1	14.4
2	Davidson	2	13.98	0.1	15.8
3	Davidson	4	13.98	0.1	17.8
4	Davidson	6	13.98	0.1	20.9
5	Davidson	9	13.98	0.1	26.7
6	Upwelling	10	13.98	0.1	38.2
7	Upwelling	19.78	13.98	0.1	98
MPWSP with High Desal Brine Flow					
8	Davidson	0	16.31	0.1	14.5
9	Davidson	2	16.31	0.1	15.7
10	Davidson	7	16.31	0.1	21.8
11	Davidson	8	16.31	0.1	23.5
12	Davidson	10	16.31	0.1	29.2
13	Davidson	12	16.31	0.1	43.9
14	Oceanic	16	16.31	0.1	87

[a] Note that RTP wastewater flows have been declining in recent years as a result of conservation; while 19.68 mgd is higher than current RTP wastewater flows, this is expected to be a conservative scenario with respect to ocean modeling, compared to using the current wastewater flows of 16 to 18 mgd.
[b] Several models were used to estimate the minimal probable dilution value (UM_3, Cederwall for neutral and negatively buoyant plumes, and NRFIELD for buoyant plumes). Values included here are the model results (D_m values) that resulted in the lowest D_m. The Ocean Plan defines dilution differently than Dr. Roberts. Dr. Roberts provided results defined as S = [total volume of a sample]/[volume of effluent contained in the sample]. The D_m referenced in Equation 1 of the California Ocean Plan is defined as $D_m = S – 1$. A value of 1 was subtracted from the dilution estimates provided by Dr. Roberts prior to using Equation 1.

Table 6 – Flow scenarios and modeled D_m values used for Ocean Plan compliance analysis for Variant

Flow Scenario No.	Ocean Condition	Discharge flows (mgd)				D_m [c]
		Secondary Effluent [a]	Desal Brine	GWR Concentrate	Hauled Waste [b]	
Variant with AWPF Offline						
15	Davidson	0	8.99	0	0	15.7
16	Davidson	2	8.99	0	0	16.4
17	Davidson	4	8.99	0	0	19.9
18	Davidson	5.8	8.99	0	0	28.4
19	Upwelling	14	8.99	0	0	109.0
20	Upwelling	19.78	8.99	0	0	117.0
Variant with Normal Flows						
30	Davidson	0	8.99	1.17	0	15.5
31	Davidson	2	8.99	1.17	0	17.7
32	Davidson	4	8.99	1.17	0	23.8
33	Davidson	6	8.99	1.17	0	67.5
34	Upwelling	11	8.99	1.17	0	106.0
35	Upwelling	15.92	8.99	1.17	0	114.0
Variant with High Desal Brine Flows and AWPF Offline						
36	Davidson	0	11.24	0	0	14.4
37	Davidson	3	11.24	0	0	17.1
38	Davidson	5	11.24	0	0	20.5
39	Upwelling	9	11.24	0	0	90.0
40	Oceanic	12	11.24	0	0	94.0
41	Upwelling	16	11.24	0	0	102.0
Variant with High Desal Brine Flows						
42	Davidson	0	11.24	1.17	0	15.2
43	Davidson	1	11.24	1.17	0	16.0
44	Davidson	4	11.24	1.17	0	20.8
45	Upwelling	9	11.24	1.17	0	90.0
46	Upwelling	12	11.24	1.17	0	97.0
47	Upwelling	16	11.24	1.17	0	104

[a] Note that RTP wastewater flows have been declining in recent years as a result of conservation; while 19.68 mgd is higher than current RTP wastewater flows, this is expected to be a conservative scenario with respect to ocean modeling, compared to using the current wastewater flows of 16 to 18 mgd.

[b] Hauled waste was not included in the modeling of MPWSP flow scenarios; however, the change in both flow and TDS from the addition of hauled waste is less than 1% and thus is expected to have a negligible impact on the modeled D_m.

[c] Several models were used to estimate the minimal probable dilution value (UM_3, Cederwall for neutral and negatively buoyant plumes, and NRFIELD for buoyant plumes). Values included here are the model results (D_m values) that resulted in the lowest D_m. The Ocean Plan defines dilution differently than Dr. Roberts. Dr. Roberts provided results defined as S = [total volume of a sample]/[volume of effluent contained in the sample]. The D_m referenced in Equation 1 of the California Ocean Plan is defined as $D_m = S – 1$. A value of 1 was subtracted from the dilution estimates provided by Dr. Roberts prior to using Equation 1.

4.3 Ocean Plan Compliance Results

The flow-weighted in-pipe concentration for each constituent was calculated for each modeled discharge scenario using the water quality presented in Table 4 and the discharge flows presented in Tables 2 and 3. The in-pipe concentration was then used to calculate the concentration at the edge of the ZID using the D_m values presented in Tables 5 and 6. The resulting concentrations for each constituent in each scenario were compared to the Ocean Plan objectives to assess compliance. The estimated concentrations for the 47 flow scenarios (14 for the MPWSP and 33 for the Variant) for all constituents are presented as concentrations at the edge of the ZID (Appendix A, Table A1 and A3) and as a percentage of the Ocean Plan objective (Appendix A, Table A2 and A4).

Some constituents were estimated to potentially exceed or come close to exceeding the Ocean Plan water quality objectives for the MPWSP and Variant; however, some of these constituents were never detected above the MRL in any of the source waters, but the MRLs are higher than the Ocean Plan objective. Due to this insufficient analytical sensitivity, no compliance conclusion can be drawn for these constituents. This is a common occurrence for ocean discharges since the MRL of the approved compliance analysis method is higher than the Ocean Plan objective for certain constituents.

Of the constituents detected in the source waters, two (cyanide and ammonia) were identified as having potential to exceed the Ocean Plan objective in the MPWSP, and eight (cyanide, ammonia, acrylonitrile, beryllium, chlordane, PCBs, TCDD equivalents, and toxaphene) were identified as having potential to exceed the Ocean Plan objective in the Variant. Within this Variant subset of eight constituents, acrylonitrile, beryllium and TCDD equivalents were detected in some of the source waters, but not in the others. For these analyses, the MRLs themselves were above the Ocean Plan objective. To assess the blended concentrations for these constituents, a value of zero was assumed for any sources when the concentration was below the MRL.[18] This approach is a "best-case" scenario because it assumes the lowest possible concentration—namely, a value of zero—for any constituent below the reporting limit. This approach is still useful, however, to bracket the analysis and assess the potential for Ocean Plan compliance issues under best-case conditions. Through this method, TCDD equivalents continues to show potential to exceed the Ocean Plan objective for the Variant. The estimated concentration of acrylonitrile[19] and beryllium at the edge of the ZID is less than the Ocean Plan objective and therefore did not show exceedances through this "best-case" analysis. However, because this is only a partial analysis (a special case), it is not possible to draw conclusions on whether acrylonitrile and beryllium will comply with the Ocean Plan during actual conditions.

The constituents that may exceed the Ocean Plan objective, or come close to exceeding the objective, are shown at their estimated concentration at the edge of the ZID in Table 7 for the MPWSP and Table 8 for the Variant, and as the concentration at the edge of the ZID as a

[18] Additionally, the Ocean Plan states that for constituents that are made up of an aggregate of constituents, a concentration of 0 can be assumed for the individual constituents that are not detected above the MRL, such as TCDD equivalents.

[19] Acrylonitrile was only detected in one potential source water for the Variant. It was not detected in any potential source waters for the MPWSP Project; therefore, a compliance determination cannot be made for the MPWSP Project and only partial determination can be made for the Variant.

percentage of the Ocean Plan objective in Table 9 and 10 for the MPWSP and Variant, respectively. The "best-case" scenario compliance assessment results for acrylonitrile and TCDD equivalents are also included in these tables.

Table 7 – Estimated concentrations at the edge of the ZID for Ocean Plan constituents of concern in the MPWSP [a]

Constituent	Units	Ocean Plan Objective	Estimated Concentration at Edge of ZID by Flow Scenario													
			MPWSP							MPWSP with High Desal Brine Flows						
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
***Objectives for protection of marine aquatic life* - 6-month median limit**																
Cyanide	µg/L	1	0.6	1.1	1.3	1.4	1.3	1.0	0.5	0.6	1.0	1.3	1.3	1.2	0.9	0.5
Ammonia (as N) – 6-mo median [b]	µg/L	600	29	341	523	600	614	461	255	26	301	575	585	546	409	243
***Objectives for protection of human health - carcinogens* - 30-day average limit [c d]**																
Acrylonitrile [c d]	µg/L	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethyl-hexyl)phthalate	µg/L	4	0.1	0.7	1.0	1.1	1.1	0.8	0.5	0.1	0.6	1.1	1.1	1.0	0.8	0.4
Chlordane	µg/L	2.3E-05	1.5E-06	1.0E-05	1.5E-05	1.7E-05	1.8E-05	1.3E-05	7.3E-06	1.4E-06	9.1E-06	1.7E-05	1.7E-05	1.6E-05	1.2E-05	6.9E-06
PCBs	µg/L	1.9E-05	8.9E-06	1.2E-05	1.4E-05	1.4E-05	1.3E-05	9.2E-06	4.6E-06	8.8E-06	1.2E-05	1.3E-05	1.3E-05	1.1E-05	8.1E-06	4.6E-06
TCDD Equivalents [d]	µg/L	3.9E-09	6.3E-11	1.1E-09	1.7E-09	1.9E-09	1.9E-09	1.5E-09	8.1E-10	5.4E-11	9.4E-10	1.8E-09	1.9E-09	1.7E-09	1.3E-09	7.7E-10
Toxaphene [e]	µg/L	2.1E-04	5.8E-06	5.7E-05	8.7E-05	1.0E-04	1.0E-04	7.6E-05	4.2E-05	5.3E-06	5.1E-05	9.6E-05	9.7E-05	9.1E-05	6.8E-05	4.0E-05

a: Shading indicates constituent is expected to be greater than 80 percent (orange shading) or exceed (red shading) the ocean plan objective for that discharge scenario.
b: Ammonia (as N) represents the total ammonia concentration, *i.e.* the sum of unionized ammonia (NH_3) and ionized ammonia (NH_4).
c: Acrylonitrile was only detected in one potential source water for the Variant Project. It was not detected in any potential source waters for the MPWSP Project; therefore, a compliance determination cannot be made for the MPWSP Project and only partial determination can be made for the Variant Project.
d: Acrylonitrile, beryllium and TCDD equivalents represent a special case; they were detected in some source waters, but were also not detected above the MRL in others, and the MRL values are above the Ocean Plan objectives. For these constituents, a value of 0 was assumed when it was not detected in a source water and the MRL was above the Ocean Plan objective. This assumption was made to show there is potential for the constituent to exceed the Ocean Plan objective in some flow scenarios, but there is not enough information to provide a complete compliance determination at this time. When only the detected values were considered, beryllium did not exceed the Ocean Plan objective and therefore was not included in Tables 7 through 10.
e: Toxaphene was only detected using the low-detection techniques of the CCLEAN program. It was detected once (09/2011) out of 12 samples collected from the secondary effluent from 2010 through 2015, and during the 7-day composite sample from the test slant well.

Table 8 – Estimated concentrations at the edge of the ZID for Ocean Plan constituents of concern in the Variant [a]

Constituent	Units	Ocean Plan Objective	Estimated Concentration at Edge of ZID by Flow Scenario																							
			Variant with GWR Offline						Variant with Normal Flows						Variant with High Desal Brine Flows and GWR Offline						Variant with High Desal Brine Flows					
			15	16	17	18	19	20	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Objectives for protection of marine aquatic life **- 6-month median limit**																										
Cyanide	µg/L	1	0.6	1.4	1.6	1.4	0.5	0.5	1.5	1.9	1.7	0.7	0.5	0.6	0.6	1.4	1.6	0.5	0.5	0.5	1.3	1.6	1.8	0.6	0.6	0.6
Ammonia (as N) – 6-mo median [b]	µg/L	600	39	474	648	581	239	251	1593	1551	1248	473	326	316	34	519	627	212	235	246	1333	1363	1227	335	327	320
Objectives for protection of human health - carcinogens **- 30-day average limit [c d]**																										
Acrylonitrile [c d]	µg/L	0.1	0.002	0.03	0.04	0.03	0.01	0.01	0.1	0.1	0.1	0.03	0.02	0.02	0.001	0.03	0.04	0.01	0.01	0.01	0.1	0.1	0.1	0.02	0.02	0.02
Bis(2-ethyl-hexyl)phthalate	µg/L	4	0.1	0.9	1.2	1.1	0.4	0.5	2.9	2.9	2.3	0.9	0.6	0.6	0.1	1.0	1.2	0.4	0.4	0.5	2.5	2.5	2.3	0.6	0.6	0.6
Chlordane	µg/L	2.3E-05	2E-06	1E-05	2E-05	2E-05	7E-06	7E-06	5E-05	4E-05	4E-05	1E-05	9E-06	9E-06	2E-06	2E-05	2E-05	6E-06	7E-06	7E-06	4E-05	4E-05	4E-05	1E-05	9E-06	9E-06
PCBs	µg/L	1.9E-05	9E-06	1E-05	1E-05	1E-05	4E-06	4E-06	3E-05	3E-05	2E-05	9E-06	6E-06	5E-06	9E-06	1E-05	1E-05	4E-06	4E-06	4E-06	3E-05	3E-05	2E-05	6E-06	6E-06	6E-06
TCDD Equivalents [d]	µg/L	3.9E-09	1E-10	2E-09	2E-09	2E-09	8E-10	8E-10	5E-09	5E-09	4E-09	2E-09	1E-09	1E-09	8E-11	2E-09	2E-09	7E-10	8E-10	8E-10	4E-09	4E-09	4E-09	1E-09	1E-09	1E-09
Toxaphene [e]	µg/L	2.1E-04	7E-06	8E-05	1E-04	1E-04	4E-05	4E-05	3E-04	3E-04	2E-04	8E-05	5E-05	5E-05	7E-06	9E-05	1E-04	4E-05	4E-05	4E-05	2E-04	2E-04	2E-04	6E-05	5E-05	5E-05

a: Shading indicates constituent is expected to be greater than 80 percent (orange shading) or exceed (red shading) the ocean plan objective for that discharge scenario.
b: Ammonia (as N) represents the total ammonia concentration, *i.e.* the sum of unionized ammonia (NH_3) and ionized ammonia (NH_4).
c: Acrylonitrile was only detected in one potential source water for the Variant Project. It was not detected in any potential source waters for the MPWSP Project; therefore, a compliance determination cannot be made for the MPWSP Project and only partial determination can be made for the Variant Project.
d: Acrylonitrile, beryllium and TCDD equivalents represent a special case; they were detected in some source waters, but were also not detected above the MRL in others, and the MRL values are above the Ocean Plan objectives. For these constituents, a value of 0 was assumed when it was not detected in a source water and the MRL was above the Ocean Plan objective. This assumption was made to show there is potential for the constituent to exceed the Ocean Plan objective in some flow scenarios, but there is not enough information to provide a complete compliance determination at this time. When only the detected values were considered, beryllium did not exceed the Ocean Plan objective and therefore was not included in Tables 7 through 10.
e: Toxaphene was only detected using the low-detection techniques of the CCLEAN program. It was detected once (09/2011) out of 12 samples collected from the secondary effluent from 2010 through 2015, and during the 7-day composite sample from the test slant well.

Table 9 – Estimated concentrations at the edge of the ZID expressed as percentage of Ocean Plan Objective for constituents of in the MPWSP [a]

Constituent	Units	Ocean Plan Objective	Est. Percentage of Ocean Plan objective at Edge of ZID by Flow Scenario													
			MPWSP							MPWSP with High Desal Brine Flows						
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
***Objectives for protection of marine aquatic life* - 6-month median limit**																
Cyanide	µg/L	1	59%	108%	133%	140%	134%	99%	52%	58%	101%	134%	133%	120%	88%	51%
Ammonia (as N) – 6-mo median [b]	µg/L	600	5%	57%	87%	100%	102%	77%	43%	4%	50%	96%	97%	91%	68%	40%
***Objectives for protection of human health - carcinogens* - 30-day average limit [c d]**																
Acrylonitrile [c d]	µg/L	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethyl-hexyl)phthalate	µg/L	4	3%	19%	28%	32%	32%	24%	13%	3%	17%	31%	31%	29%	22%	13%
Chlordane	µg/L	2.3E-05	6%	44%	66%	75%	77%	57%	32%	6%	39%	72%	73%	68%	51%	30%
PCBs	µg/L	1.9E-05	47%	64%	72%	72%	66%	49%	24%	46%	61%	69%	67%	60%	43%	24%
TCDD Equivalents [d]	µg/L	3.9E-09	2%	27%	42%	49%	50%	38%	21%	1%	24%	47%	48%	44%	33%	20%
Toxaphene [e]	µg/L	2.1E-04	3%	27%	42%	47%	48%	36%	20%	3%	24%	45%	46%	43%	32%	19%

a: Shading indicates constituent is expected to be greater than 80 percent (orange shading) or exceed (red shading) the ocean plan objective for that discharge scenario.
b: Ammonia (as N) represents the total ammonia concentration, *i.e.* the sum of unionized ammonia (NH_3) and ionized ammonia (NH_4).
c: Acrylonitrile was only detected in one potential source water for the Variant Project. It was not detected in any potential source waters for the MPWSP Project; therefore, a compliance determination cannot be made for the MPWSP Project and only partial determination can be made for the Variant Project.
d: Acrylonitrile, beryllium and TCDD equivalents represent a special case; they were detected in some source waters, but were also not detected above the MRL in others, and the MRL values are above the Ocean Plan objectives. For these constituents, a value of 0 was assumed when it was not detected in a source water and the MRL was above the Ocean Plan objective. This assumption was made to show there is potential for the constituent to exceed the Ocean Plan objective in some flow scenarios, but there is not enough information to provide a complete compliance determination at this time. When only the detected values were considered, beryllium did not exceed the Ocean Plan objective and therefore was not included in Tables 7 through 10.
e: Toxaphene was only detected using the low-detection techniques of the CCLEAN program. It was detected once (09/2011) out of 12 samples collected from the secondary effluent from 2010 through 2015, and during the 7-day composite sample from the test slant well.

Table 10 – Estimated concentrations at the edge of the ZID expressed as percentage of Ocean Plan Objective for constituents of in the Variant [a]

Constituent	Units	Ocean Plan Objective	Est. Percentage of Ocean Plan objective at Edge of ZID by Flow Scenario																							
			Variant with GWR Offline						Variant with Normal Flows						Variant with High Desal Brine Flows and GWR Offline						Variant with High Desal Brine Flows					
			15	16	17	18	19	20	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
***Objectives for protection of marine aquatic life* - 6-month median limit**																										
Cyanide	µg/L	1	61%	138%	163%	139%	53%	55%	150%	189%	173%	71%	55%	56%	61%	144%	158%	49%	53%	55%	135%	158%	176%	55%	56%	57%
Ammonia (as N) – 6-mo median [b]	µg/L	600	7%	79%	108%	97%	40%	42%	266%	258%	208%	79%	54%	53%	6%	86%	105%	35%	39%	41%	222%	227%	205%	56%	54%	53%
***Objectives for protection of human health - carcinogens* - 30-day average limit [c d]**																										
Acrylonitrile [c d]	µg/L	0.1	2%	28%	38%	34%	14%	14%	94%	92%	74%	28%	19%	19%	1%	30%	37%	13%	14%	15%	79%	81%	73%	20%	19%	19%
Bis(2-ethyl-hexyl)phthalate	µg/L	4	3%	26%	34%	31%	12%	13%	84%	81%	65%	25%	17%	17%	3%	28%	33%	11%	12%	13%	70%	72%	64%	18%	17%	17%
Chlordane	µg/L	2.3E-05	8%	60%	81%	72%	30%	31%	199%	193%	155%	59%	40%	39%	7%	66%	79%	26%	29%	30%	167%	170%	153%	42%	40%	40%
PCBs	µg/L	1.9E-05	47%	71%	77%	63%	22%	23%	169%	156%	121%	45%	30%	28%	47%	73%	74%	22%	23%	23%	149%	147%	124%	32%	30%	29%
TCDD Equivalents [d]	µg/L	3.9E-09	2%	39%	53%	48%	20%	21%	131%	128%	103%	39%	27%	26%	2%	42%	52%	17%	19%	20%	110%	112%	101%	28%	27%	26%
Toxaphene [e]	µg/L	2.1E-04	4%	38%	51%	46%	19%	20%	126%	122%	98%	37%	26%	25%	3%	41%	50%	17%	19%	19%	105%	108%	97%	26%	26%	25%

a: Shading indicates constituent is expected to be greater than 80 percent (orange shading) or exceed (red shading) the ocean plan objective for that discharge scenario.
b: Ammonia (as N) represents the total ammonia concentration, *i.e.* the sum of unionized ammonia (NH_3) and ionized ammonia (NH_4).
c: Acrylonitrile was only detected in one potential source water for the Variant Project. It was not detected in any potential source waters for the MPWSP Project; therefore, a compliance determination cannot be made for the MPWSP Project and only partial determination can be made for the Variant Project.
d: Acrylonitrile, beryllium and TCDD equivalents represent a special case; they were detected in some source waters, but were also not detected above the MRL in others, and the MRL values are above the Ocean Plan objectives. For these constituents, a value of 0 was assumed when it was not detected in a source water and the MRL was above the Ocean Plan objective. This assumption was made to show there is potential for the constituent to exceed the Ocean Plan objective in some flow scenarios, but there is not enough information to provide a complete compliance determination at this time. When only the detected values were considered, beryllium did not exceed the Ocean Plan objective and therefore was not included in Tables 7 through 10.
e: Toxaphene was only detected using the low-detection techniques of the CCLEAN program. It was detected once (09/2011) out of 12 samples collected from the secondary effluent from 2010 through 2015, and during the 7-day composite sample from the test slant well.

Potential issues for cyanide and ammonia compliance were identified to occur when there is no, or relatively low secondary effluent flow mixed with hauled waste and Desal Brine, as in MPWSP Scenarios 2-6 and 9-13. Potential issues were also identified to occur when there is little or no secondary effluent flow discharged for the Variant Project, as in Variant Scenarios 16-18, 30-32, 37, 38, and 42-44. The constituents of interest related to these scenarios are cyanide, ammonia, acrylonitrile, bis(2-ethyl-hexyl)phthalate, chlordane, PCBs, TCDD equivalents, and toxaphene. Ammonia is expected to be the constituent with the highest exceedance, being 2.66 times the Ocean Plan objective in flow scenario 30 (0 mgd secondary effluent with hauled waste, 1.17 mgd GWR Concentrate and 8.99 mgd Desal Brine). This scenario is problematic because constituents that have relatively high loadings in the secondary effluent are concentrated in the GWR Concentrate. This scenario assumes the GWR Concentrate flow is much smaller than the Desal Brine flow, such that the resulting discharge plume is negatively buoyant and achieves poor ocean dilution.

Chlordane, PCBs, and toxaphene were only detected when analyzed with low-detection methods, which have far greater sensitivity than standard methods. These results were used to investigate potential to exceed Ocean Plan objectives because these objectives are orders of magnitude below detection limits of methods currently used for discharge compliance.

5 Conclusions

The purpose of this analysis was to assess the ability of the MPWSP and Variant to comply with the Ocean Plan objectives. Trussell Tech used a conservative approach to estimate the water qualities of the secondary effluent, GWR Concentrate, Desal Brine and hauled waste for these projects. These water quality data were then combined for various discharge scenarios, and a concentration at the edge of the ZID was calculated for each constituent and scenario. A summary of the constituents that show potential to exceed the Ocean Plan objectives is provided in Table 11 for the MPWSP and Table 12 for the Variant. These constituents can be divided into three categories:

- **Category I -** Insufficient analytical sensitivity to determine compliance: The constituent was not detected above the MRL in any of the source waters, but the MRL is not sensitive enough to demonstrate compliance with the Ocean Plan objective.
- **Category II -** Estimated to be close to exceeding the Ocean Plan objective: The constituent is estimated to be at a concentration between 80% and 100% of the Ocean Plan objective at the edge of the ZID.
- **Category III -** Estimated to exceed the Ocean Plan objective: The constituent is estimated to be at a concentration higher than the Ocean Plan objective at the edge of the ZID.

Table 11: Summary of Compliance Conclusions for the MPWSP

	Category I [a]	Category II [b]	Category III [c]	Worst Case Exceedance	
Constituent	Compliance Determination Not Possible	Estimated to be Close to Exceeding Objective	Estimated to Exceed Objective	Flow Scenario	Estimated Percentage of Objective at edge of ZID
Cyanide [d]			✓	4	140%
Ammonia			✓	5	102%
Chlorinated Phenolics	✓			--	--
2,4-Dinitrophenol	✓			--	--
Tributyltin	✓			--	--
Acrylonitrile [e]	✓			--	--
Aldrin	✓			--	--
Benzidine	✓			--	--
Beryllium [e]	✓			--	--
Bis(2-chloroethyl)ether	✓			--	--
3,3-Dichlorobenzidine	✓			--	--
1,2-Diphenylhydrazine (azobenzene)	✓			--	--
Heptachlor	✓			--	--
TCDD Equivalents [e]	✓			--	--
2,4,6-Trichlorophenol	✓			--	--

Notes:

a: ND in all sources, but MRL higher than Ocean Plan objective and therefore unable to demonstrate compliance. Exceptions are: MRL for 2,4-dinitrophenol was less than objective in secondary effluent and MRL for heptachlor was less than objective in slant well.

b: Concentration of constituent at the edge of the ZID is estimated to be between 80% and 100% of the Ocean Plan objective for some scenarios

c: Concentration of constituent is estimated to be > 100% of the Ocean Plan objective for some scenarios at the edge of the ZID

d: Issues with approved analytical methods may have resulted in erroneously high cyanide quantification

e: Only a best-case scenario could be evaluated, where a value of 0 was assumed when the constituent was ND and the MRL was larger than the Ocean Plan objective

Table 12: Summary of Compliance Conclusions for the Variant

	Category I [a]	Category II [b]	Category III [c]	Worst Case Exceedance	
Constituent	Compliance Determination Not Possible	Estimated to be Close to Exceeding Objective	Estimated to Exceed Objective	Flow Scenario	Estimated Percentage of Objective at edge of ZID
Cyanide [d]			✓	31	189%
Ammonia			✓	30	266%
Chlorinated Phenolics	✓			--	--
2,4-Dinitrophenol	✓			--	--
Tributyltin	✓			--	--
Acrylonitrile [e]		✓		30	94%
Aldrin	✓			--	--
Benzidine	✓			--	--
Beryllium [e]	✓			--	--
Bis(2-chloroethyl)ether	✓			--	--
Bis(2-ethyl-hexyl)phthalate		✓		30	84%
Chlordane			✓	30	199%
3,3-Dichlorobenzidine	✓			--	--
1,2-Diphenylhydrazine (azobenzene)	✓			--	--
Heptachlor	✓			--	--
PCBs			✓	30	169%
TCDD Equivalents [e]			✓	30	131%
Toxaphene			✓	30	126%
2,4,6-Trichlorophenol	✓			--	--

Notes:
a: ND in all sources, but MRL higher than Ocean Plan objective and therefore unable to demonstrate compliance. Exceptions are: MRL for 2,4-dinitrophenol was less than objective in secondary effluent and MRL for heptachlor was less than objective in slant well.
b: Concentration of constituent at the edge of the ZID is estimated to be between 80% and 100% of the Ocean Plan objective for some scenarios
c: Concentration of constituent is estimated to be > 100% of the Ocean Plan objective for some scenarios at the edge of the ZID
d: Issues with approved analytical methods may have resulted in erroneously high cyanide quantification
e: Only a best-case scenario could be evaluated, where a value of 0 was assumed when the constituent was ND and the MRL was larger than the Ocean Plan objective

Based on the data, assumptions, modeling, and analytical methodology presented in this TM, the MPWSP and Variant show a potential to exceed certain Ocean Plan objectives under specific discharge scenarios (see Tables 11 and 12). In particular, potential issues were identified for the MPWSP and Variant flow scenarios involving low to moderate secondary effluent flows with Desal Brine. Under these conditions, discharges are estimated to exceed or come close to exceeding multiple Ocean Plan objectives, specifically those for cyanide and ammonia for the MPWSP, and cyanide, ammonia, chlordane, PCBs, TCDD equivalents, and toxaphene for the

Variant. Ammonia clearly exceeds the Ocean Plan objective and must be resolved for the MPWSP and Variant. When considering a best-case analysis for the Variant, acrylonitrile comes close to exceeding the Ocean Plan objective, and TCDD equivalents show a potential to exceed the objective. Additional analytical investigation regarding cyanide analysis is recommended to determine if the potential exceedances are representative of actual water quality conditions. Chlordane, PCBs and toxaphene, which were estimated to exceed the objectives for Variant flow scenarios, were detected at concentrations that are orders of magnitude below detection limits of methods currently used for discharge compliance.

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Appendix F:
Future RUWAP Urban Recycled Water Irrigation Water Use and Implications for CSIP Yields

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MEMORANDUM

TO: Bob Holden, MRWPCA
Denise Duffy, DD&A

DATE: October 23, 2017

FROM: Andrew Sterbenz, PE

JOB #: MRWP.01.14

SUBJECT: 600 AFY RUWAP Recycled Water Urban Irrigation Use and Implications for CSIP Yields

The purpose of this memorandum is to provide an additional scenario for the future Regional Urban Water Augmentation Project (RUWAP) Recycled Water Project for urban irrigation and its effects on Castroville Seawater Intrusion Project (CSIP) water supplies, with and without the Pure Water Monterey Groundwater Replenishment Project (Proposed Project). Our previous memorandum, Future RUWAP Recycled Water Urban Irrigation Use and Implications for CSIP Yields, dated 9/16/2015 and included as Appendix BB of the Final EIR for the Proposed Project, presented several scenarios for providing water for the RUWAP. This added scenario analysis was requested to reflect the currently proposed initial RUWAP demand of 600 AFY, which differs from the previously analyzed initial demand estimate of 540 AFY.

The new scenario is described as follows:

600 AFY AWT Demand (600 AFY-AWT) Scenario: In this scenario, MCWD and MRWPCA agree to share a pipeline as described in the original memorandum, and an initial 600 AFY of recycled water would be produced for existing MCWD customers along the proposed Product Water Pipeline alignment (i.e., the RUWAP pipeline option). Approximately 741 AFY of AWT Influent would be required to produce this water, accounting for the 19% loss of RO concentrate as ocean discharge. The Revised Table 2, below, adds a row reflecting the average monthly influent that would be required at the AWT Facility to produce a net 600 AFY for delivery.

Revised Table 2: RUWAP Urban Recycled Water Use by Treatment and Delivery Scenario (AFY)

Scenario	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
RW [1]	81	74	81	156	161	156	161	161	156	81	79	81	**1,427**
AWT Product[2]	100	91	100	192	199	192	199	199	192	100	97	100	**1,761**
AWT Influent[1]	66	60	66	126	130	126	130	130	126	66	64	66	**1,156**
Init-RW [1]	31	28	31	59	61	59	61	61	59	31	30	31	**540**
Init-AWT[2]	38	35	38	73	75	73	75	75	73	38	37	38	**666**
600 AFY-RW[1]	34	31	34	65	68	65	68	68	65	34	33	34	**600**
600 AFY-AWT[2]	42	38	42	81	84	81	84	84	81	42	41	42	**741**

NOTES:
1. Values reflect urban recycled water deliveries.
2. Values reflect influent supply to the AWT Facility

The 600 AFY scenario was modeled using the same assumptions as in the previous analysis[1]. The resulting project yields under a normal water year building a drought reserve, under a normal water year with a full drought reserve and under a drought year starting with a full reserve are presented in Tables 8A, 8B and 8C, respectively (attached). Table 3 was then modified (below) to present the results of the additional scenario in the same context as the earlier analysis. As can be seen, the Proposed Project in conjunction with the RUWAP use provides a smaller benefit to the Castroville Seawater Intrusion Project (CSIP) than the Proposed Project without the RUWAP demand. However, both scenarios with the Proposed Project provide a significant increase in recycled water for the CSIP compared to the current condition.

Modified Table 3. Estimated Annual Recycled Water Yields Under Various Scenarios of MCWD Demand and Pipelines[2]

	Existing	Proposed Project with No MCWD Use			Shared Pipeline Scenario 600 AFY MCWD Use	
Year Type	SVRP to CSIP	AWT to SGB (injection amount)	MCWD	SVRP to CSIP	AWT to MCWD	SVRP to CSIP
April to September						
Normal/wet building reserve	10,310	1,755	0	14,160	399	13,670
Normal/wet reserve full		1,755	0	13,620	399	13,140
Drought year use reserve for CSIP	10,460	855	0	14,560	399	14,060
Total Annual						
Normal/wet building reserve	13,000	3,700	0	18,410	600	17,930
Normal/wet reserve full		3,500	0	17,880	600	17,390
Drought year use reserve for CSIP	15,470	2,500	0	21,200	600	20,620

[1] The previous analysis in 2015 assumed the surface water diversions (Blanco Drain, Reclamation Ditch and Tembladero Slough) were available at the volumes in the diversion permit applications.

[2] Updating the analysis to reflect the final water rights permits (Blanco Drain and Reclamation Ditch, with Tembladero Slough not issued) and more current municipal wastewater inflow data, the annual flow totals to CSIP become:

Year Type	Proposed Project without MCWD	Proposed Project with MCWD
Normal/wet building reserve	16,516	15,936
Normal/wet reserve full	16,156	15,936
Drought year using reserve	17,694	17,030

References:

Memorandum: Future RUWAP Recycled Water Urban Irrigation Use and Implications for CSIP Yields, dated 9/16/2015, prepared by Schaaf & Wheeler

Attachments:

Table 8A, Source Water Analysis, Diversion Pattern for a Normal Year Building a Drought Reserve, 600 AFY RUWAP Demand as AWT Product
Table 8B, Source Water Analysis, Diversion Pattern for a Normal Year with a Full Reserve, 600 AFY RUWAP Demand as AWT Product
Table 8C, Source Water Analysis, Diversion Pattern for a Drought Year starting with a Full Reserve, 600 AFY RUWAP Demand as AWT Product

Table 8A: Source Water Analysis for the Pure Water Monterey Groundwater Replenishment Project

Diversion Pattern for a Normal Water Year Building a Drought Reserve, 600 AFY RUWAP Demand as AWT Product

All facilities built [1] - average water year conditions - all flows in acre-feet 10/3/2017

SOURCES	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Existing RTP Inflows (Average 2009 to 2013)	**1,798**	**1,678**	**1,867**	**1,796**	**1,850**	**1,799**	**1,893**	**1,888**	**1,813**	**1,844**	**1,762**	**1,776**	**21,764**
New Source Water													
City of Salinas													
1 Salinas Agricultural Wash Water [2]	156	158	201	307	311	391	435	444	367	410	329	223	3,732
Agricultural Wash Water (AWW) to Ponds [3]	*156*	*158*	*201*	*0*	*0*	*0*	*0*	*0*	*0*	*410*	*329*	*223*	*1,477*
AWW directly to RTP	*0*	*0*	*0*	*307*	*311*	*391*	*435*	*444*	*367*	*0*	*0*	*0*	*2,255*
2 Salinas Urban Storm Water Runoff [4]	52	41	34	16	2	0	0	0	2	8	23	47	225
Urban runoff to ponds	*52*	*41*	*34*	*0*	*0*	*0*	*0*	*0*	*0*	*8*	*23*	*47*	*205*
Urban runoff to RTP	*0*	*0*	*0*	*16*	*2*	*0*	*0*	*0*	*2*	*0*	*0*	*0*	*20*
3 Rainfall (on SIWTF, 121 acre pond area) [5]	26	24	21	11	3	1	0	0	2	6	14	24	132
4 Evaporation (from SIWTF, 121 acre pond area) [6]	(12)	(16)	(29)	(41)	(46)	(52)				(28)	(15)	(12)	(251)
5 Percolation [7]	(143)	(129)	(143)	(138)	(143)	(138)				(143)	(138)	(143)	(1,257)
6 SIWTF pond storage balance [8]	684	763	847	647	362	0	0	0	0	253	466	605	
7 Recovery of flow from SIWTF storage ponds to RTP	0	0	0	32	100	172	0	0	0	0	0	0	304
8 AWW and Salinas Runoff to RTP	0	0	0	355	413	563	435	444	369	0	0	0	2,579
Water Rights Applications to SWRCB													
9 Blanco Drain [9]	0	0	0	252	225	274	277	244	184	0	0	0	1,456
10 Reclamation Ditch at Davis Road [10]	0	0	0	162	97	132	129	121	80	0	0	0	721
11 Tembladero Slough at Castroville [11]	0	0	0	154	145	67	66	62	41	0	0	0	535
12 City of Monterey - Diversion at Lake El Estero	0	0	0	0	0	0	0	0	0	0	0	0	0
13 **Subtotal New Waters Available**	**0**	**0**	**0**	**923**	**880**	**1,036**	**907**	**871**	**674**	**0**	**0**	**0**	**5,291**
Total Projected Water Supply	**1,798**	**1,678**	**1,867**	**2,719**	**2,730**	**2,835**	**2,800**	**2,759**	**2,487**	**1,844**	**1,762**	**1,776**	**27,055**
DEMANDS	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Average SVRP deliveries to CSIP (2009-2013)	13	459	726	1,376	1,763	1,750	1,866	1,854	1,698	984	448	18	12,955
14 FIVE YEAR AVERAGE CSIP AREA WELL WATER USE (2009-2013)	448	195	304	412	324	606	519	504	300	75	233	352	4,272
TOTAL CSIP Demand	**461**	**654**	**1,030**	**1,788**	**2,087**	**2,356**	**2,385**	**2,358**	**1,998**	**1,059**	**681**	**370**	**17,227**
15 FEEDWATER AMOUNT AT RTP TO GWR PROJECT AWTF	367	331	367	355	367	355	367	367	355	367	355	367	4,320
16 FEEDWATER TO ESTABLISH CSIP AREA DROUGHT RESERVE (200 AFY AWTF PRODUCT WATER) [14]	42	38	42							42	41	42	248
17 FEEDWATER TO AWT FOR MCWD RUWAP [18]	42	38	42	81	84	81	84	84	81	42	41	42	741
18 **TOTAL TO GWR ADVANCED WATER TREATMENT FACILITY**	**451**	**407**	**451**	**436**	**451**	**436**	**451**	**451**	**436**	**451**	**437**	**451**	**5,309**
Total Projected Water Demand	**912**	**1,062**	**1,481**	**2,224**	**2,537**	**2,792**	**2,836**	**2,808**	**2,434**	**1,510**	**1,118**	**821**	**22,536**
Use of Source Water	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
19 Secondary effluent to SVRP for CSIP [12]	461	654	1,030	1,715	1,767	1,718	1,810	1,804	1,732	1,059	681	370	14,801
20 New sources available to CSIP [13]	0	0	0	568	513	681	540	504	319	0	0	0	3,125
21 **Total Supply to CSIP**	**461**	**654**	**1,030**	**2,283**	**2,280**	**2,399**	**2,350**	**2,308**	**2,051**	**1,059**	**681**	**370**	**17,926**
Net CSIP Increase													**4,971**
22 Surface waters at RTP to AWT	0	0	0	0	0	0	0	0	0	0	0	0	0
23 Secondary effluent to AWT	409	369	409	0	0	0	0	0	0	409	396	409	2,401
24 AWW and Salinas urban runoff to AWT	0	0	0	355	367	355	367	367	355	0	0	0	2,166
25 Secondary effluent to AWT for MCWD RUWAP	42	38	42	81	84	81	84	84	81	42	41	42	741
26 **Feedwater to AWT**	**451**	**407**	**451**	**436**	**451**	**436**	**451**	**451**	**436**	**451**	**437**	**451**	**5,308**
Subtotal- all waters (including secondary effluent)	**912**	**1,062**	**1,481**	**2,719**	**2,730**	**2,835**	**2,800**	**2,759**	**2,487**	**1,510**	**1,118**	**821**	**23,234**
27 FIVE YEAR AVERAGE WASTE WATER EFFLUENT TO OCEAN OUTFALL (2009-2013) [15]	1,785	1,219	1,141	420	88	49	27	34	114	859	1,314	1,759	8,809
28 WASTE WATER EFFLUENT TO OCEAN OUTFALL WITH PROPOSED DIVERSIONS TO CSIP/AWT/RUWAP [16]	885	616	386	0	0	0	0	0	0	333	645	955	3,821
29 NEW SUPPLIES IN EXCESS OF AWT DEMANDS FOR GWR [17]	(409)	(369)	(409)	568	513	681	540	504	319	(409)	(396)	(409)	724
30 AWT BRINE TO OCEAN OUTFALL	86	77	86	83	86	83	86	86	83	86	83	86	1,009

Notes

1 Presumes all facilities associated with diversions are completed.

2 Table 2-1, p. 5, Schaaf & Wheeler Consulting Engineers. Revised Draft, Groundwater Replenishment Project, Salinas River Inflow Impacts, Prepared for Denise Duffy & Associates, February 2015.

3 Volume of effluent from City of Salinas agricultural wash water to be directed into ponds 1,2,3, and the aeration pond for storage.

4 Average monthly flow from Revised Draft, Groundwater Replenishment Project, Salinas River Inflow Impacts, Prepared for Denise Duffy & Associates, February 2015.

5 Rainfall from Revised Draft, Groundwater Replenishment Project, Salinas River Inflow Impacts, Prepared for Denise Duffy & Associates, February 2015. Pond area presumed to be Ponds 1,2, 3 + Aeration lagoon. No rainfall/evaporation or storage assigned to drying beds.

6 Table 3, Todd Groundwater, Draft Memorandum, Pure Water Monterey Groundwater Replenishment Project: Impacts of Changes in Percolation at the Salinas Industrial Wastewater Treatment Facility on Groundwater and the Salinas River, February 11, 2015.

7 Table 4, Ibid.

8 Ponds 1,2,3 and aeration basin hold up to 1,065 acre-feet (one foot of freeboard). If flow to ponds would exceed the maximum volume, it is presumed that excess flow can be diverted to the RIBs or drying beds or flow can be diverted to the RTP. Presume that pond storage goes to zero sometime during the year (shown here starting in July).

9 Table 4, Ibid. Also confirmed in MPWMD Industrial Ponds Percolation and Evaporation Technical Memorandum 2015-01, July 2015.

10 Max. diversion = 6 cfs. See REVISED DRAFT RECLAMATION DITCH YIELD STUDY, Schaaf and Wheeler, March 2015. Note that flow figures shown here are a combination of flow estimates in the S&W analysis made for the 2 cfs instream requirement Jan-May and 1 cfs instream requirement for June-Dec.

11 Max. diversion = 3 cfs. See REVISED DRAFT RECLAMATION DITCH YIELD STUDY, Schaaf and Wheeler, March 2015. Figures shown here are the difference between the combined Davis Road/TS diversion with Seasonal Bypass. This presumes the preference is to remove flow at Davis Road first, rather than bypass flow to Tembaldero Slough.

12 Includes secondary effluent wastewater currently used to produce recycled water at the Salinas Valley Reclamation Project (SVRP), and additional amounts which may be used during periods of low demand (<5 mgd) with the proposed improvements to the SVRP.

13 New source waters not used by AWT will be available to SVRP for CSIP.

14 A drought reserve of up to 1,000 AF would be created over five years by producing 200 AFY additional product water from the GWR Project AWTF during winter months and storing the water in the Seaside Basin. This would establish a "water bank" that the CSIP can draw on in droughts. The drought reserve would allow flow at the RTP for the GWR Project to be temporarily reduced during critically dry periods, thus freeing up more of the newly available inflows to the RTP to be sent to the CSIP area. Extraction from the Seaside Basin would continue at the average rate to supply the Monterey Peninsula.

15 Average monthly RTP discharge, 2009-2013 (reported by MRWPCA).

16 Secondary treated municpal effluent not used for SVRP or the AWT.

17 Excess is calculated as Line 13 minus Lines 15 & 16

18 RUWAP supply comes from existing RTP inflows, demands reflect existing urban irrigation customers along trunk main.

Table 8B: Source Water Analysis for the Pure Water Monterey Groundwater Replenishment Project

Diversion Pattern for a Normal Water Year with a Full Reserve, 600 AFY RUWAP Demand as AWT Product

All facilities built [1] - average water year conditions - all flows in acre-feet 10/3/2017

	SOURCES	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
	Existing RTP Inflows (Average 2009 to 2013)	**1,798**	**1,678**	**1,867**	**1,796**	**1,850**	**1,799**	**1,893**	**1,888**	**1,813**	**1,844**	**1,762**	**1,776**	**21,764**
	New Source Water													
	City of Salinas													
1	Salinas Agricultural Wash Water [2]	156	158	201	307	311	391	435	444	367	410	329	223	3,732
	Agricultural Wash Water (AWW) to Ponds [3]	*156*	*158*	*201*	*0*	*0*	*0*	*0*	*0*	*0*	*410*	*329*	*223*	*1,477*
	AWW directly to RTP	*0*	*0*	*0*	*307*	*311*	*391*	*435*	*444*	*367*	*0*	*0*	*0*	*2,255*
2	Salinas Urban Storm Water Runoff [4]	52	41	34	16	2	0	0	0	2	8	23	47	225
	Urban runoff to ponds	*52*	*41*	*34*	*0*	*0*	*0*	*0*	*0*	*0*	*8*	*23*	*47*	*205*
	Urban runoff to RTP	*0*	*0*	*0*	*16*	*2*	*0*	*0*	*0*	*2*	*0*	*0*	*0*	*20*
3	Rainfall (on SIWTF, 121 acre pond area) [5]	26	24	21	11	3	1	0	0	2	6	14	24	132
4	Evaporation (from SIWTF, 121 acre pond area) [6]	(12)	(16)	(29)	(41)	(46)	(52)				(28)	(15)	(12)	(251)
5	Percolation [7]	(143)	(129)	(143)	(138)	(143)	(138)				(143)	(138)	(143)	(1,257)
6	SIWTF pond storage balance [8]	684	763	847	647	362	0	0	0	0	253	466	605	
7	Recovery of flow from SIWTF storage ponds to RTP	0	0	0	32	100	172	0	0	0	0	0	0	304
8	AWW and Salinas Runoff to RTP	0	0	0	355	413	563	435	444	369	0	0	0	2,579
	Water Rights Applications to SWRCB													
9	Blanco Drain [9]	0	0	0	252	225	274	277	244	184	0	0	0	1,456
10	Reclamation Ditch at Davis Road [10]	0	0	0	162	97	132	129	121	80	0	0	0	721
11	Tembladero Slough at Castroville [11]	0	0	0	0	0	0	0	0	0	0	0	0	0
12	City of Monterey - Diversion at Lake El Estero	0	0	0	0	0	0	0	0	0	0	0	0	0
13	**Subtotal New Waters Available**	**0**	**0**	**0**	**769**	**735**	**969**	**841**	**809**	**633**	**0**	**0**	**0**	**4,756**
	Total Projected Water Supply	**1,798**	**1,678**	**1,867**	**2,565**	**2,585**	**2,768**	**2,734**	**2,697**	**2,446**	**1,844**	**1,762**	**1,776**	**26,520**

	DEMANDS	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
	Average SVRP deliveries to CSIP (2009-2013)	13	459	726	1,376	1,763	1,750	1,866	1,854	1,698	984	448	18	12,955
14	FIVE YEAR AVERAGE CSIP AREA WELL WATER USE (2009-2013)	448	195	304	412	324	606	519	504	300	75	233	352	4,272
	TOTAL CSIP Demand	**461**	**654**	**1,030**	**1,788**	**2,087**	**2,356**	**2,385**	**2,358**	**1,998**	**1,059**	**681**	**370**	**17,227**
15	FEEDWATER AMOUNT AT RTP TO GWR PROJECT AWTF	367	331	367	355	367	355	367	367	355	367	355	367	4,320
16	FEEDWATER TO ESTABLISH CSIP AREA DROUGHT RESERVE (200 AFY AWTF PRODUCT WATER) [14]	0	0	0							0	0	0	0
17	FEEDWATER TO AWT FOR MCWD RUWAP[18]	42	38	42	81	84	81	84	84	81	42	41	42	741
18	**TOTAL TO GWR ADVANCED WATER TREATMENT FACILITY**	**409**	**369**	**409**	**436**	**451**	**436**	**451**	**451**	**436**	**409**	**396**	**409**	**5,061**
	Total Projected Water Demand	**870**	**1,024**	**1,439**	**2,224**	**2,537**	**2,792**	**2,836**	**2,808**	**2,434**	**1,468**	**1,077**	**779**	**22,288**

	Use of Source Water	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
19	Secondary effluent to SVRP for CSIP [12]	461	654	1,030	1,715	1,767	1,718	1,810	1,804	1,732	1,059	681	370	14,801
20	New sources available to CSIP [13]	0	0	0	414	368	614	474	442	278	0	0	0	2,590
21	**Total Supply to CSIP**	**461**	**654**	**1,030**	**2,129**	**2,135**	**2,332**	**2,284**	**2,246**	**2,010**	**1,059**	**681**	**370**	**17,391**
	Net CSIP Increase													**4,436**
22	Surface waters at RTP to AWT	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Secondary effluent to AWT	367	331	367	0	0	0	0	0	0	367	355	367	2,154
24	AWW and Salinas urban runoff to AWT	0	0	0	355	367	355	367	367	355	0	0	0	2,166
25	Secondary effluent to AWT for MCWD RUWAP	42	38	42	81	84	81	84	84	81	42	41	42	741
26	**Feedwater to AWT**	**409**	**369**	**409**	**436**	**451**	**436**	**451**	**451**	**436**	**409**	**396**	**409**	**5,061**
	Subtotal- all waters (including secondary effluent)	**870**	**1,024**	**1,439**	**2,565**	**2,585**	**2,768**	**2,734**	**2,697**	**2,446**	**1,468**	**1,077**	**779**	**22,452**

		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
27	FIVE YEAR AVERAGE WASTE WATER EFFLUENT TO OCEAN OUTFALL (2009-2013)[15]	1,785	1,219	1,141	420	88	49	27	34	114	859	1,314	1,759	8,809
28	WASTE WATER EFFLUENT TO OCEAN OUTFALL WITH PROPOSED DIVERSIONS TO CSIP/AWT/RUWAP [16]	928	654	428	0	0	0	0	0	0	375	685	998	4,068
29	NEW SUPPLIES IN EXCESS OF AWT DEMANDS FOR GWR [17]	(367)	(331)	(367)	414	368	614	474	442	278	(367)	(355)	(367)	436
30	AWT BRINE TO OCEAN OUTFALL	78	70	78	83	86	83	86	86	83	78	75	78	962

Notes

1 Presumes all facilities associated with diversions are completed.

2 Table 2-1, p. 5, Schaaf & Wheeler Consulting Engineers. Revised Draft, Groundwater Replenishment Project, Salinas River Inflow Impacts, Prepared for Denise Duffy & Associates, February 2015.

3 Volume of effluent from City of Salinas agricultural wash water to be directed into ponds 1,2,3, and the aeration pond for storage.

4 Average monthly flow from Revised Draft, Groundwater Replenishment Project, Salinas River Inflow Impacts, Prepared for Denise Duffy & Associates, February 2015.

5 Rainfall from Revised Draft, Groundwater Replenishment Project, Salinas River Inflow Impacts, Prepared for Denise Duffy & Associates, February 2015. Pond area presumed to be Ponds 1,2, 3 + Aeration lagoon. No rainfall/evaporation or storage assigned to drying beds.

6 Table 3, Todd Groundwater, Draft Memorandum, Pure Water Monterey Groundwater Replenishment Project: Impacts of Changes in Percolation at the Salinas Industrial Wastewater Treatment Facility on Groundwater and the Salinas River, February 11, 2015.

7 Table 4, Ibid.

8 Ponds 1,2,3 and aeration basin hold up to 1,065 acre-feet (one foot of freeboard). If flow to ponds would exceed the maximum volume, it is presumed that excess flow can be diverted to the RIBs or drying beds or flow can be diverted to the RTP. Presume that pond storage goes to zero sometime during the year (shown here starting in July).

9 Table 4, Ibid. Also confirmed in MPWMD Industrial Ponds Percolation and Evaporation Technical Memorandum 2015-01, July 2015.

10 Max. diversion = 6 cfs. See REVISED DRAFT RECLAMATION DITCH YIELD STUDY, Schaaf and Wheeler, March 2015. Note that flow figures shown here are a combination of flow estimates in the S&W analysis made for the 2 cfs instream requirement Jan-May and 1 cfs instream requirement for June-Dec.

11 Max. diversion = 3 cfs. See REVISED DRAFT RECLAMATION DITCH YIELD STUDY, Schaaf and Wheeler, March 2015. Figures shown here are the difference between the combined Davis Road/TS diversion with Seasonal Bypass. This presumes the preference is to remove flow at Davis Road first, rather than bypass flow to Tembaldero Slough.

12 Includes secondary effluent wastewater currently used to produce recycled water at the Salinas Valley Reclamation Project (SVRP), and additional amounts which may be used during periods of low demand (<5 mgd) with the proposed improvements to the SVRP.

13 New source waters not used by AWT will be available to SVRP for CSIP.

14 A drought reserve of up to 1,000 AF would be created over five years by producing 200 AFY additional product water from the GWR Project AWTF during winter months and storing the water in the Seaside Basin. This would establish a "water bank" that the CSIP can draw on in droughts. The drought reserve would allow flow at the RTP for the GWR Project to be temporarily reduced during critically dry periods, thus freeing up more of the newly available inflows to the RTP to be sent to the CSIP area. Extraction from the Seaside Basin would continue at the average rate to supply the Monterey Peninsula.

15 Average monthly RTP discharge, 2009-2013 (reported by MRWPCA).

16 Secondary treated municpal effluent not used for SVRP or the AWT.

17 Excess is calculated as Line 13 minus Lines 15 & 16

18 RUWAP supply comes from existing RTP inflows, demands reflect existing urban irrigation customers along trunk main.

Table 8C: Source Water Analysis for the Pure Water Monterey Groundwater Replenishment Project

Diversion Pattern for a Drought Year, Starting with a Full Drought Reserve, 600 AFY RUWAP Demand as AWT Product

All facilities built [1] - average water year conditions - all flows in acre-feet 10/3/2017

	SOURCES	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
	Minimum Year RTP Inflows (2013)	*1,725*	*1,494*	*1,645*	*1,657*	*1,722*	*1,675*	*1,748*	*1,773*	*1,715*	*1,690*	*1,634*	*1,612*	**20,090**
	New Source Water													
	City of Salinas													
1	Salinas Agricultural Wash Water [2]	156	158	201	307	311	391	435	444	367	410	329	223	3,732
	Agricultural Wash Water (AWW) to Ponds [3]	*156*	*158*	*201*	*0*	*0*	*0*	*0*	*0*	*0*	*410*	*329*	*223*	*1,477*
	AWW directly to RTP	*0*	*0*	*0*	*307*	*311*	*391*	*435*	*444*	*367*	*0*	*0*	*0*	*2,255*
2	Salinas Urban Storm Water Runoff [4]	17	14	11	5	1	0	0	0	1	3	8	16	76
	Urban runoff to ponds	*17*	*14*	*11*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*8*	*16*	*69*
	Urban runoff to RTP	*0*	*0*	*0*	*5*	*1*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*7*
3	Rainfall (on SIWTF, 121 acre pond area) [5]	11	6	4	3	0	0	0	0	1	2	5	4	36
4	Evaporation (from SIWTF, 121 acre pond area) [6]	(12)	(16)	(29)	(41)	(46)	(52)				(28)	(15)	(12)	(251)
5	Percolation [7]	(143)	(129)	(143)	(138)	(143)	(138)				(143)	(138)	(143)	(1,257)
6	SIWTF pond storage balance [8]	550	584	628	452	163	(27)	0	0	0	245	433	521	
7	Recovery of flow from SIWTF storage ponds to RTP	0	0	0	0	100	0	0	0	0	0	0	0	100
8	AWW and Salinas Runoff to RTP	0	0	0	312	412	391	435	444	368	0	0	0	2,362
	Water Rights Applications to SWRCB													
9	Blanco Drain [9]	0	0	246	252	225	274	277	244	184	168	133	0	2,003
10	Reclamation Ditch at Davis Road [10]	0	0	165	162	97	132	129	121	80	87	98	0	1,071
11	Tembladero Slough at Castroville [11]	0	0	142	154	145	67	66	62	41	45	50	0	772
12	City of Monterey - Diversion at Lake El Estero	0	0	0	0	0	0	0	0	0	0	0	0	0
13	**Subtotal New Waters Available**	**0**	**0**	**553**	**880**	**879**	**864**	**907**	**871**	**673**	**300**	**281**	**0**	**6,208**
	Total Projected Water Supply	**1,725**	**1,494**	**2,198**	**2,537**	**2,601**	**2,539**	**2,655**	**2,644**	**2,388**	**1,990**	**1,915**	**1,612**	**26,297**

	DEMANDS	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
	Max Year SVRP deliveries to CSIP (2013)	*0*	*692*	*1,558*	*1,669*	*1,799*	*1,675*	*1,786*	*1,803*	*1,725*	*1,548*	*1,127*	*88*	15,469
14	PEAK CSIP AREA WELL WATER USE (10/2013-09/2014)	*509*	*9*	*221*	*242*	*1,197*	*1,261*	*1,303*	*1,025*	*453*	*165*	*35*	*730*	7,150
	TOTAL CSIP Demand	**509**	**701**	**1,779**	**1,911**	**2,996**	**2,936**	**3,089**	**2,828**	**2,178**	**1,713**	**1,162**	**818**	**22,619**
15	FEEDWATER AMOUNT AT RTP TO GWR PROJECT AWTF	367	331	367	**133**	**137**	**133**	**137**	**137**	**133**	367	355	367	2,963
16	FEEDWATER TO ESTABLISH CSIP AREA DROUGHT RESERVE (200 AFY AWTF PRODUCT WATER) [14]	0	0	0							0	0	0	0
17	FEEDWATER TO AWT FOR MCWD RUWAP[18]	42	38	42	81	84	81	84	84	81	42	41	42	741
18	**TOTAL TO GWR ADVANCED WATER TREATMENT FACILITY**	**409**	**369**	**409**	**213**	**221**	**213**	**221**	**221**	**213**	**409**	**396**	**409**	**3,704**
	Total Projected Water Demand	**918**	**1,070**	**2,188**	**2,124**	**3,217**	**3,150**	**3,309**	**3,049**	**2,392**	**2,122**	**1,558**	**1,227**	**26,324**

	Use of Source Water	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
19	Secondary effluent to SVRP for CSIP [12]	509	701	1,603	1,576	1,638	1,594	1,665	1,690	1,634	1,580	1,162	818	16,170
20	New sources available to CSIP [13]	0	0	186	747	742	731	770	734	540	0	0	0	4,451
21	**Total Supply to CSIP**	**509**	**701**	**1,789**	**2,323**	**2,380**	**2,326**	**2,435**	**2,424**	**2,175**	**1,580**	**1,162**	**818**	**20,620**
	Net CSIP Increase													**5,151**
22	Surface waters at RTP to AWT	0	0	367	0	0	0	0	0	0	300	281	0	948
23	Secondary effluent to AWT	367	331	0	0	0	0	0	0	0	67	74	367	1,206
24	AWW and Salinas urban runoff to AWT	0	0	0	133	137	133	137	137	133	0	0	0	809
25	Secondary effluent to AWT for MCWD RUWAP	42	38	42	81	84	81	84	84	81	42	41	42	741
26	**Feedwater to AWT**	**409**	**369**	**409**	**213**	**221**	**213**	**221**	**221**	**213**	**409**	**396**	**409**	**3,704**
	Subtotal- all waters (including secondary effluent)	**918**	**1,070**	**2,198**	**2,537**	**2,601**	**2,539**	**2,655**	**2,644**	**2,388**	**1,990**	**1,558**	**1,227**	**24,324**

		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
27	*DRY YEAR WASTEWATER EFFLUENT TO OCEAN OUTFALL (2013) [15]*	*1,725*	*802*	*87*	*0*	*0*	*0*	*0*	*0*	*0*	*142*	*507*	*1,607*	4,870
28	WASTE WATER EFFLUENT TO OCEAN OUTFALL WITH PROPOSED DIVERSIONS TO CSIP/AWT/RUWAP [16]	807	424	(0)	0	0	0	0	0	0	(0)	357	385	1,973
29	NEW SUPPLIES IN EXCESS OF AWT DEMANDS FOR GWR [17]	(367)	(331)	186	747	742	731	770	734	540	(67)	(74)	(367)	3,244
30	AWT BRINE TO OCEAN OUTFALL	78	70	78	41	42	41	42	42	41	78	75	78	704

Notes

1 Presumes all facilities associated with diversions are completed.

2 Table 2-1, p. 5, Schaaf & Wheeler Consulting Engineers. Revised Draft, Groundwater Replenishment Project, Salinas River Inflow Impacts, Prepared for Denise Duffy & Associates, February 2015.

3 Volume of effluent from City of Salinas agricultural wash water to be directed into ponds 1,2,3, and the aeration pond for storage.

4 Assume dry year at 1/3 the average monthly values from Revised Draft, Groundwater Replenishment Project, Salinas River Inflow Impacts, Prepared for Denise Duffy & Associates, February 2015.

5 Rainfall from Revised Draft, Groundwater Replenishment Project, Salinas River Inflow Impacts, Prepared for Denise Duffy & Associates, February 2015. Pond area presumed to be Ponds 1,2, 3 + Aeration lagoon. No rainfall/evaporation or storage assigned to drying beds.

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8 Ponds 1,2,3 and aeration basin hold up to 1,065 acre-feet (one foot of freeboard). If flow to ponds would exceed the maximum volume, it is presumed that excess flow can be diverted to the RIBs or drying beds or flow can be diverted to the RTP. Presume that pond storage goes to zero sometime during the year (shown here starting in July).

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12 Includes secondary effluent wastewater currently used to produce recycled water at the Salinas Valley Reclamation Project (SVRP), and additional amounts which may be used during periods of low demand (<5 mgd) with the proposed improvements to the SVRP.

13 New source waters not used by AWT will be available to SVRP for CSIP.

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15 Monthly RTP discharge during critically dry year (2013), reported by MRWPCA

16 Secondary treated municpal effluent not used for SVRP or the AWT.

17 Excess is calculated as Line 13 minus Lines 15 & 16

18 RUWAP supply comes from existing RTP inflows, demands reflect existing urban irrigation customers along trunk main.