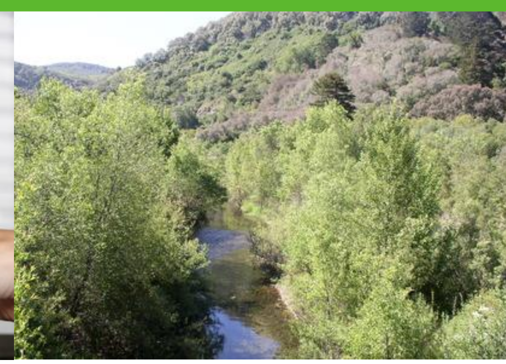
VOLUME IV: EIR CERTIFICATION AND PROJECT APPROVAL

CONSOLIDATED FINAL ENVIRONMENTAL IMPACT REPORT

FOR THE

PURE WATER MONTEREY GROUNDWATER REPLENISHMENT PROJECT



JANUARY 2016

Prepared for:

Monterey Regional Water Pollution Control Agency
in partnership with
Monterey Peninsula Water Management District

Prepared by:

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1. Notice of Public Hearing and Final EIR Availability and Distribution

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NOTICE OF PUBLIC HEARING TO CERTIFY THE FINAL EIR FOR THE PURE WATER MONTEREY GROUNDWATER REPLENISHMENT PROJECT, ADOPT FINDINGS AND A STATEMENT OF OVERRIDING CONSIDERATIONS, APPROVE A MITIGATION MONITORING AND REPORTING PROGRAM, AND APPROVE THE PROJECT OR AN ALTERNATIVE TO THE PROJECT

Notice is hereby given that, pursuant to requirements of the California Environmental Quality Act (CEQA), the Monterey Regional Water Pollution Control Agency (MRWPCA) has prepared a Final Environmental Impact Report (Final EIR) for the proposed Pure Water Monterey Groundwater Replenishment Project (GWR Project). The MRWPCA Board of Directors will conduct a public hearing to consider certification of the EIR, adoption of findings and a Statement of Overriding Considerations, approval of a Mitigation Monitoring and Reporting Program, and approval of the GWR Project or an Alternative to the GWR Project at a special meeting scheduled for Thursday, October 8, 2015 at 3:30 p.m. at the MRWPCA administration office at 5 Harris Court, Building D, Monterey, California.

Project Description: The proposed GWR Project would create a reliable source of water supply for northern Monterey County. The GWR Project would consist of two components: 1) purified water for recharge of the Seaside Groundwater Basin, and 2) recycled water to augment the existing Castroville Seawater Intrusion Project's agricultural irrigation supply. Water supplies proposed to be recycled and reused by the GWR Project include municipal wastewater, industrial wastewater, urban stormwater runoff, and surface water diversions. The GWR Project is being proposed by MRWPCA in partnership with the Monterey Peninsula Water Management District (Water Management District). The GWR Project would be located within northern Monterey County and would include new facilities located within unincorporated areas of the Salinas Valley and within the cities of Salinas, Marina, Seaside, Monterey, and Pacific Grove.

Final EIR: The Final EIR consists of the oral and written comments received on the Draft EIR, and presents responses to environmental issues raised in the comments. In addition to the responses to comments, the Final EIR contains revisions, updates, and clarifications in response to public comment on the Draft EIR. The Final EIR is available at the project website (www.purewatermonterey.org), the MRWPCA website (www.mrwpca.org), the MRWPCA administrative office at 5 Harris Court, Building D, Monterey, CA 93940, and the Water Management District administrative office at 5 Harris Court, Building G, Monterey, Ca 93940. The Final EIR is also available at the following libraries during normal business hours: Seaside Public Library, Marina Public Library, Salinas Public Libraries, Castroville Public Library, Monterey Public Library, Carmel Valley Public Library, and Harrison Memorial Library (Carmel).

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www.mrwpca.org/about_governance_public_meetings.php

For additional information regarding the GWR Project and Final EIR, you may contact: Bob Holden, Principal Engineer, MRWPCA, at gwr@mrwpca.com.

Subject: Proof of public notice for the Herald on September 25, 2015 for admin record

NOTICE OF PUBLIC HEARING TO CERTIFY THE FINAL EIR FOR THE PURE WATER MONTEREY GROUNDWATER REPLENISHMENT...

Source: Monterey Herald

Category: Legal & Public Notices

http://montereyherald.kaango.com/ads/viewad?adid=24204905

Ad Details:	
Ad ID:	24204905
Created:	Sep 25, 2015
Expires:	Sep 26, 2015

NOTICE OF PUBLIC HEARING TO CERTIFY THE FINAL EIR FOR THE PURE WATER MONTEREY GROUNDWATER REPLENISHMENT PROJECT, ADOPT FINDINGS AND A STATEMENT OF OVERRIDING CONSIDERATIONS, APPROVE A MITIGATION MONITORING AND REPORTING PROGRAM, AND APPROVE THE PROJECT OR AN ALTERNATIVE TO THE PROJECT Notice is hereby given that, pursuant to requirements of the California Environmental Quality Act (CEQA), the Monterey Regional Water Pollution Control Agency (MRWPCA) has prepared a Final Environmental Impact Report (Final EIR) for the proposed Pure Water Monterey Groundwater Replenishment Project (GWR Project). The MRWPCA Board of Directors will conduct a public hearing to consider certification of the EIR, adoption of findings and a Statement of Overriding Considerations, approval of a Mitigation Monitoring and Reporting Program, and approval of the GWR Project or an Alternative to the GWR Project at a special meeting scheduled for Thursday, October 8, 2015 at 3:30 p.m. at the MRWPCA administration office at 5 Harris Court, Building D, Monterey, California. Project Description: The proposed GWR Project would create a reliable source of water supply for northern Monterey County. The GWR Project would consist of two components: 1) purified water for recharge of the Seaside Groundwater Basin, and 2) recycled water to augment the existing Castroville Seawater Intrusion Project's agricultural irrigation supply. Water supplies proposed to be recycled and reused by the GWR Project include municipal wastewater, industrial wastewater, urban stormwater runoff, and surface water diversions. The GWR Project is being proposed by MRWPCA in partnership with the Monterey Peninsula Water Management District (Water Management District). The GWR Project would be located within northern Monterey County and would include new facilities located within unincorporated areas of the Salinas Valley and within the cities of Salinas, Marina, Seaside, Monterey, and Pacific Grove. Final EIR: The Final EIR consists of the oral and written comments received on the Draft EIR, and presents responses to environmental issues raised in the comments. In addition to the responses to comments, the Final EIR contains revisions, updates, and clarifications in response to public comment on the Draft EIR. The Final EIR is available at the project website (www.purewatermonterey.org), the MRWPCA website (www.mrwpca.org), the MRWPCA administrative office at 5 Harris Court, Building D, Monterey, CA 93940, and the Water Management District administrative office at 5 Harris Court, Building G, Monterey, Ca 93940. The Final EIR is also available at the following libraries during normal business hours: Seaside Public Library, Marina Public Library, Salinas Public Libraries, Castroville Public Library, Monterey Public Library, Carmel Valley Public Library, and Harrison Memorial Library (Carmel). Public Hearing: The MRWPCA Board of Directors will conduct a public hearing to consider certification of the EIR, adoption of findings and a Statement of Overriding Considerations, approval of a Mitigation Monitoring and Reporting Program, and approval of the GWR Project or an Alternative to the GWR Project at a special meeting to be held on Thursday, October 8, 2015 at 3:30 p.m. at the MRWPCA administrative office at 5 Harris Court, Building D, Monterey, CA. A copy of the meeting agenda can be found at the Board of Director's public meeting website at: www.mrwpca.org/about_governance_public_meetings.php For additional information regarding the GWR Project and Final EIR, you may contact: Bob Holden, Principal Engineer, MRWPCA, at gwr@mrwpca.com

Publish: Sept. 25, 2015.

The following e-mail was sent to the distribution list on the following pages on September 25, 2015.

From: GWR <gwr@mrwpca.com>
Sent: Friday, September 25, 2015 5:05 PM
To: Mike McCullough
Subject: Notice of Public Hearing: Pure Water Monterey Groundwater Replenishment Project

Monterey Regional Water Pollution Control Agency

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Mike McCullough

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2. MWRPCA October 8, 2015 Board Meeting Agenda and Staff Report for EIR Certification and Project Approval, including Errata to the Final EIR

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MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY

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SPECIAL MEETING NOTICE AND AGENDA

Thursday, October 8, 2015, 3:30 pm

BOARD OF DIRECTORS

[Note: MRWPCA Board Members are appointed from their respective Joint Powers Authority (JPA) jurisdictions.]

Gloria De La Rosa, Chair	Salinas
Rudy Fischer, Vice Chair	Pacific Grove
Linda Grier	Boronda County Sanitation District
Ron Stefani	Castroville Community Services District
John M. Phillips	County of Monterey
Dennis Allion	Del Rey Oaks
Peter Le	Marina Coast Water District
Libby Downey	Monterey
Tom Razzeca	Moss Landing County Sanitation District
Dave Pendergrass	Sand City
Ralph Rubio	Seaside
VACANT	United States Army - Ex-Officio

You are invited to visit our Website @ www.mrwpca.org to access a description of MRWPCA and its Mission Statement.

NOTE: All enclosures and staff materials regarding the following agenda items are available for public review on Monday, October 5, 2015 through Thursday, October 8, 2015, at the MRWPCA's Administrative Office in Monterey at Ryan Ranch, and at the public libraries located in Castroville, Marina, Monterey, Pacific Grove, Salinas, and Seaside. In compliance with the Americans with Disabilities Act, if you need special assistance to participate in this meeting, please contact the Board Clerk at (831) 645-4605. Notification 30 hours prior to the meeting will enable the Agency to make reasonable arrangements to ensure accessibility to this meeting. Later requests will be accommodated to the extent feasible.

1. CALL TO ORDER

2. ROLL CALL

3. PLEDGE OF ALLEGIANCE

4. PUBLIC COMMENTS

Anyone wishing to address the Board on matters not appearing on the Agenda may do so now for not more than three (3) minutes. Comments on any other matter listed on the Agenda are welcome at the time the matter is being considered by the Board.

5. PUBLIC HEARINGS

Public Hearing items consist of business which the underlying matter specifically requires input from the public prior to a vote by the Board. These items are acted upon in the following sequence: (1) Staff Reports; (2) Board Questions to Staff; (3) Public Comments; and, (4) Board Discussion and Action

A. PUBLIC HEARING FOR FINAL EIR FOR PURE WATER MONTEREY GROUNDWATER REPLENISHMENT PROJECT

1. Certify the Final EIR for the Pure Water Monterey Groundwater Replenishment Project
2. Adopt Findings and a Statement of Overriding Considerations
3. Approve a Mitigation Monitoring and Reporting Program
4. Approve the Project or an Alternative to the Project

Recommendation: That the Board approve Resolution 2015-24 to:

1) Certify the Final EIR for the Pure Water Monterey Groundwater Replenishment Project;
2) Adopt findings required by the California Environmental Quality Act;
3) Approve mitigation measures and a mitigation monitoring and reporting program;
4) Adopt a Statement of Overriding Considerations;
5) Approve the GWR Project, as modified by the Alternative Monterey Pipeline and select the RUWAP Alignment Option for the Product Water Conveyance pipeline and booster pump station; and
6) Authorize staff to proceed immediately with obtaining necessary agreements, permits, funding and financing, and approvals to construct and operate the Project components specified in Section III or RESOLUTION 2015-24.

6. ACTION ITEMS

Action Items consist of business which requires a vote by the Board. These items are acted upon in the following sequence: (1) Staff Reports; (2) Board Questions to Staff; (3) Public Comments; and, (4) Board Discussion and Action.

A. Amend Resolution 2015-19 and Resolution 2015-21 to reflect comments received from the State Water Resources Control Board; and, allow modifications to Resolution 2015-21 for minor changes pending the Agency and State Attorney's Final Review.

Recommendation: That the Board approve Amended Resolutions 2015-19 and 2015-21 to reflect the State Water Resources Board's comments; and allow staff to modify Resolution 2015-21 for minor changes pending the Agency and State Attorney's final review.

B. Approve Resolution 2015-25, Establishing an Enterprise Fund System of Accounting for the Pure Water Monterey Fund.

Recommendation: That the Board approve Resolution 2015-25, to establish an Enterprise Fund System of Accounting for the Pure Water Monterey Project.

C. Consider Establishing Rate Formula Factors for Primary and Secondary Treatment of Interruptible Source Waters

Recommendation: That the Board establish an Interruptible Rate following the description in the Interruptible Rate Qualifications and establish the three interruptible Rate Equation Factors listed in Table 1 of Staff Report for fiscal years 2015/16 and 2016/17.

7. STAFF REPORTS

Staff Reports include items for which verbal reports/presentations will be provided. If a specific presentation is planned, it will be listed and summary information may be included with the Agenda. Brief oral reports may be provided for items arising after Agenda preparation. The Board may wish to ask questions or discuss a staff report, but no action is appropriate other than referral to staff, or request that a matter be set as a future Agenda item.

A. General Manager/Assistant General Manager/Legal Counsel

8. BOARD MEMBER COMMENTS/REPORTS

Board Members may ask a question for clarification, make a brief announcement or make a brief comment or report on his or her own activities within the jurisdiction of the Agency. No discussion or action is appropriate other than referral to staff for consideration or setting a matter as a future agenda item.

9. ADJOURNMENT

Set next meeting(s)/location(s)/date(s)/time(s):

Regular and/or Special Meeting(s):

A. Location: MRWPCA Board Room - Ryan Ranch

Date(s)/Time(s):

WORKSHOP WITH MONTEREY COUNTY WATER RESOURCES AGENCY BOARD OF DIRECTORS

Thursday, October 8, 2015 at 4:30 pm

(but not before conclusion of the MRWPCA Special Board Meeting)

Date(s)/Time(s):

TOUR - DEMONSTRATION FACILITY FOR PURE WATER MONTEREY

Monday, October 26, 2015 at 5:00 pm

Date(s)/Time(s):

REGULARLY SCHEDULED BOARD MEETING:

Monday, October 26, 2015 at 6:00 pm

MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY

* * * AGENDA TRANSMITTAL FORM * * *

MEETING DATE:	OCTOBER 8, 2015
AGENDA ITEM:	5 – PUBLIC HEARING
AGENDA TITLE:	PUBLIC HEARING TO CERTIFY THE FINAL EIR FOR THE PURE WATER MONTEREY GROUNDWATER REPLENISHMENT PROJECT; ADOPT FINDINGS AND A STATEMENT OF OVERRIDING CONSIDERATIONS; APPROVE A MITIGATION MONITORING AND REPORTING PROGRAM, AND APPROVE THE PROJECT OR AN ALTERNATIVE TO THE PROJECT

Consent (   ) Action (X) Informational (   )

CONTACT:	BOB HOLDEN, PRINCIPAL ENGINEER
Phone:	372-3367

DEPARTMENT SUMMARY AND REQUESTED BOARD ACTION:

Background: MRWPCA is serving as Lead Agency for the CEQA process for the Pure Water Monterey Groundwater Replenishment Project (GWR Project). The Project is a water supply project that would serve northern Monterey County. The project would provide: (1) purified recycled water for recharge of a groundwater basin that serves as drinking water supply; and (2) recycled water to augment the existing Castroville Seawater Intrusion Project's agricultural irrigation supply.

The Draft Environmental Impact Report (Draft EIR) was circulated for the required 45-day public review period, between April 22 and June 5, 2015. The Final EIR was then prepared, and is required under CEQA to be distributed to all commenting agencies a minimum of 10 days before Lead Agency consideration of the EIR and action on the project; the Final EIR (http://purewatermonterey.org/wp/wp-content/uploads/PWM-FINAL-EIR.pdf) and Errata Sheet to the Final EIR (Attachment 1) was distributed on Friday, September 25, 2015, which meets the CEQA requirement. The Final EIR contains a list of comments submitted on the Draft EIR, copies of the comment letters, responses to the environmental points raised in those comments, and revisions to the Draft EIR made as a result of the public review process. The Final EIR, together with the Draft EIR, constitutes the Final EIR for the GWR Project. The MRWPCA Board is required to certify the EIR and approve the project before subsequent actions can be taken related to the project.

Requested Board Action: This item is being conducted as a public hearing. Staff recommends the Board open the public hearing and receive testimony. After testimony, the Board should move to close the public hearing. If, after deliberation, the Board finds that the Final EIR reflects the MRWPCA's independent judgment and has been prepared in accordance with CEQA and the CEQA Guidelines, it should move approval of Resolution No. 2015-24 to certify the Final EIR for the Pure Water Monterey Groundwater Replenishment Project, adopt findings and a statement of overriding considerations, approve a mitigation monitoring and reporting program, and approve the GWR Project.

In approving the overall GWR Project, staff recommends the Board also approve the Project as modified by the Alternative Monterey Pipeline, which eliminates the need for the proposed Transfer Pipeline to be built. Further, staff recommends that the Board select the Regional Urban Water Augmentation Project (RUWAP) alignment for the Product Water Conveyance pipeline and booster pump station.

RUWAP ALIGNMENT OPTION: The Draft EIR describes and evaluates two options for the Product Water Conveyance system, including two pipeline alignments and two associated locations for a booster pump station, called the RUWAP and Coastal Alignment Options. Only one of the two Product Water Conveyance pipeline alignments and booster pump stations would be constructed as part of the Project. A comparison of the severity of impacts between the two alternative Product Water Conveyance Systems shows that they are very similar. The primary difference in impacts is in construction and operational impacts to riparian habitat and federally protected wetlands as defined by Section 404 of the Clean Water Act or waters of the state; specifically, the impacts of the RUWAP Alignment Option would be less than significant, while the Coastal Alignment Option would be significant but reduced to less than significant with mitigation in the EIR. Either of the Product Water Conveyance options evaluated in the EIR would fully achieve the project objectives. The RUWAP Alignment Option would result in fewer adverse environmental impacts compared to the Coastal Alignment Option, and is expected to be less costly to construct than the Coastal Alignment Option. For these reasons, the staff recommends that the Board pursue the necessary permits and approvals to enable it to construct the RUWAP Alignment Option.

ALTERNATIVE MONTEREY PIPELINE: The Draft EIR describes and evaluates four options for the CalAm water system distribution improvements to deliver the extracted groundwater to CalAm customers: the Transfer Pipeline, the Alternative Transfer Pipeline, the Monterey Pipeline, and the Alternative Monterey Pipeline. The Alternative Monterey Pipeline is 6.5 miles long. The entire Alternative Monterey Pipeline is located outside of the Coastal Zone. If the Alternative Monterey Pipeline is selected for construction, neither the proposed Monterey Pipeline, proposed Transfer Pipeline, nor the Alternative Transfer

Pipeline would be built to deliver the required water quantities to meet CalAm customers' demands. The Alternative Monterey Pipeline would avoid and reduce significant impacts compared to the proposed Monterey Pipeline, and would avoid impacts of the Transfer Pipeline. The Alternative Monterey Pipeline would fully achieve the project objectives. Due to being located outside of the Coastal Zone and the elimination of the need for the Transfer Pipeline, the Alternative Monterey Pipeline would also have the potential to be implemented more expeditiously and thus would better meet the objective of being implemented in a timely manner. Because the Alternative Monterey Pipeline would substantially lessen the Project's adverse environmental impacts while also fully achieving the project objectives, the staff recommends that the Board support construction of the Alternative Monterey Pipeline, and select this alternative.

FINANCIAL IMPACT:	( ) Yes (X) No	
FUNDING SOURCE:	Capital Equipment Fund	
BUDGET RECAP:	Total Estimated Cost:	$0
	Amt Expended to Date:	$0
	Amt Budgeted FY 13/14:	$0
	New Funding Required:	$0
	New Revenue:	$0
	Revenue Impact:	$0
	New Personnel?	NO
	Change in Board Policy?	NO
PRIOR BOARD ACTIONS:		
ALTERNATIVES:	1) Continue the item to a subsequent Board meeting for further deliberation and action. 2) Approve an alternative to the Proposed Project. 3) Modify the Proposed Project, including any mitigation measures for the Proposed Project. 4) Deny approval of the Proposed Project and the Alternatives to the Proposed Project.	

MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY

* * * AGENDA TRANSMITTAL FORM * * *

COMMITTEE REVIEW AND ACTION:	N/A
MANAGER RECOMMENDATION:	Recommend approval
ATTACHMENTS:	1. Final EIR cover sheet and table of contents a) Errata Sheet to the Final EIR 2. RESOLUTION 2015-24, including Exhibits A and B a) Exhibit A: Summary of Impacts and Mitigation Measures for the Staff-Recommended Alternative b) Exhibit B: Mitigation Monitoring and Reporting Program for Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative
RECOMMENDED MOTION:	**That the Board approve RESOLUTION 2015-24 to:** **1) Certify the Final EIR for the Pure Water Monterey Groundwater Replenishment Project;** **2) Adopt findings required by the California Environmental Quality Act;** **3) Approve mitigation measures and a mitigation monitoring and reporting program;** **4) Adopt a Statement of Overriding Considerations;** **5) Approve the GWR Project, as modified by the Alternative Monterey Pipeline and select the RUWAP Alignment Option for the Product Water Conveyance pipeline and booster pump station; and** **6) Authorize staff to proceed immediately with obtaining necessary agreements, permits, funding and financing, and approvals to construct and operate the Project components specified in Section III of RESOLUTION 2015-24.**

Pure Water Monterey
A Groundwater Replenishment Project

FINAL ENVIRONMENTAL IMPACT REPORT
FOR THE
PURE WATER MONTEREY GROUNDWATER REPLENISHMENT PROJECT



September 2015

Download the entire Final EIR at: http://purewatermonterey.org/reports-docs/eir/

Prepared for:

Monterey Regional Water Pollution Control Agency
in partnership with
Monterey Peninsula Water Management District

Partners for Pure Water Solutions
MRWPCA
MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

Prepared by:

Denise Duffy & Associates, Inc.
Environmental Consultants Resource Planners
947 Cass Street, Suite 5
Monterey, CA 93940
(831) 373-4341

DD&A

FINAL

ENVIRONMENTAL IMPACT REPORT

for the

Pure Water Monterey Groundwater Replenishment Project

September 25, 2015

(SCH#2013051094)

Prepared for:
MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY

in partnership with:
Monterey Peninsula Water Management District

Prepared by:
DENISE DUFFY & ASSOCIATES, INC.
947 Cass Street, Suite 5
Monterey, CA 93940

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DRAFT

Errata Sheet to the Final EIR

for the Pure Water Monterey Groundwater Replenishment Project

Version date: 10/5/2015

The following Errata are provided to the Final EIR dated September 25, 2015 due to changes needed to the text of that document.

Errata #1: Additional Changes to the Draft EIR have been made in Chapter 5. Specifically, pages 5-82 is revised as follows and additional changes to Table 6-5Revised are shown in gray highlight:

Page 6-41 through 6-44	~~The row for Impacts BT-2 in~~ Table 6-5 has been changed as shown on the following pages and a footnote has been added on page 6-41 based on a biological survey of the Alternative Monterey Pipeline alignment by DD&A (DD&A, 2014) and review of the applicability of the mitigation measures to the Alternative Monterey Pipeline.

NOTE: In Table 6-5Revised on the following pages, changes to Draft EIR text are shown in ~~strikeout~~ for deleted text and underline for added text. Additional changes since Final EIR document completion are shown in highlighted and underlined (for added) or ~~striken~~ (for deleted) text.

Errata #2: Chapter 5, pages 5-11, Figure 2-32 Revised has been replaced with an updated version with the correct Area of Potential Effect boundary (red-dashed line) on the following page.

Table 6-5Revised

CalAm Distribution Pipeline Alignment Alternatives Overview

Impact Title (NOTE: Where the Proposed CalAm Distribution System would result in no impacts or less than significant impacts, such impacts have not been included in this table if they would be the same for the CalAm Distribution System: Monterey and Transfer Pipeline Alternatives.)	**PROPOSED CalAm Distribution System**			**ALTERNATIVES** **CalAm Distribution System: Transfer and Monterey Pipelines** Note: If Alternative Monterey Pipeline is implemented, neither the Proposed nor the Alternative Transfer Pipeline would be built and those impacts would be eliminated.			
	Transfer Pipeline	**Monterey Pipeline**	**Mitigation Measures**	**Alternative Transfer Pipeline**	**Change to impact significance and mitigation measures applicable**	**Alternative (GWR) Monterey Pipeline**	**Change to impact significance and mitigation measures applicable**
KEY TO ACRONYMS: **SU** = Significant Unavoidable Impact even with Mitigation; **LSM** = Significant Without Mitigation / Less-than-Significant with Mitigation; **LS** = Less-than-Significant Impact Comparison of impacts before mitigation: **"+"** Greater = Impact is greater compared to project impact. **"—"** Reduced = Impact is reduced compared to project impact. If neither **"—"** nor **"+"** is shown, the impact is the same or similar compared to the project impact.							
AE-2: Construction Impacts due to Temporary Light and Glare	NI	**LSM**	AE-2: Minimize Construction Nighttime Lighting. (Applies to the Monterey Pipeline)	NI	Same / No mitigation required	**LSM**	The Alternative Monterey Pipeline would not avoid or reduce the impact to a less-than-significant level compared to the Proposed Project because nighttime lighting would still be potentially used during construction of for the Alternative Monterey Pipeline. Mitigation would be required for the Proposed Project and Alternative Monterey Pipeline. Mitigation Measure AE-2 would be required for the Proposed Project and Alternative.
BT-1: Construction Impacts to Special-Status Species and Habitat	NI	**LSM**	BT-1a, BT-1b, BT-1c, BT-1d, BT-1e, BT-1g, BT-1h, BT-1k, BT-1l, BT-1m, BT-1n, and BT-1o. See complete text in Table S-1. (Applies to Monterey Pipeline, only)	NI	Same / No mitigation required	**LSM—**	The Alternative Monterey Pipeline would reduce the project impact to special status during construction to a less-than-significant level because the pipeline would be entirely with roadway rights of way; however, due to the potential for special status species to be located in proximity to the project construction site, the impact would be potentially significant. Mitigation would be required for the Proposed Project and the Alternative Monterey Pipeline. Mitigation Measures~~: None Required~~ BT-1a, BT-1k, and BT-1m would be required to reduce the impact to a less-than-significant level for the Alternative Monterey Pipeline.
BT-2: Construction Impacts to Sensitive Habitats, including Riparian, Federally Protected Wetlands as defined by Section 404 of the Clean Water Act, or Other Sensitive Natural Community.	NI	**LSM**	BT-2a: Avoidance and Minimization of Impacts to Riparian Habitat and Wetland Habitats. ~~Implement Construction Best Management Practices.~~ (Applies to both) BT-2b: Avoidance and Minimization of Impacts to Central Dune Scrub Habitat. (Applies to Monterey Pipeline, only)	NI		~~**LSM**~~ LS—	The Alternative Monterey Pipeline would reduce the project impact to sensitive habitats during construction to a less-than-significant level because the pipeline would be entirely with roadway rights of way. Mitigation Measures: None Required ~~The Alternative Monterey Pipeline would not avoid or reduce the impact to a less-than-significant level. Although the Alternative Monterey Pipeline would traverse different areas and different types of habitats than the Proposed Transfer and Monterey Pipeline, the construction-related impacts would be similar to those of the Proposed Transfer and Monterey Pipelines would have the same level of impact significance as the Proposed Project alignment; however, where different resources would be adversely affected, different mitigation measures would apply.~~ ~~Mitigation Measure BT-2a and BT-2b would be required for the Proposed and Alternative Monterey Pipeline, although a different Mitigation BT-2b would be required.~~[1]
BT-6: Operational Impacts to Sensitive Habitats, including Riparian, federally protected wetlands as defined by Section 404 of the Clean Water Act, or Other Sensitive Natural Community.	NI	LSM	BT-6: Implementation of Mitigation Measure BT-1a for Avoidance and Minimization of Operational Impacts to Sensitive Habitat (Applies to Monterey Pipeline, only)	NI	Same / No mitigation required	NI—	The Alternative Monterey Pipeline would avoid the significant impact on sensitive habitats (Coastal Dune Scrub and Monarch Butterflies). Mitigation Measures: None Required
CR-1: Construction Impacts on Historical Resources	NI	**LSM**	CR-1: Avoidance and Vibration Monitoring for Pipeline Installation in the Presidio of Monterey Historic District, and Downtown Monterey. (Applies to Monterey Pipeline, only)	NI	Same / No mitigation required	**LSM+**	Project impacts to historical resources would be similar with the Alternative Monterey Pipeline as with the Proposed Transfer and Monterey Pipeline. Construction of the Alternative Monterey Pipeline could impact the entrance monument at the Presidio of Monterey, a significant impact that would be reduced to less than significant with Mitigation Measure CR-1. The Alternative Monterey Pipeline would pass adjacent to the Spanish Royal Presidio and through the Monterey Old Town National Historic Landmark District, adjacent to the Stokes Adobe, the Gabriel de la Torre Adobe, the Fremont Adobe, Colton Hall, and Friendly Plaza. Although those potentially impacted resources would be different

[1] For the Alternative Monterey Pipeline, Mitigation Measures BT-2a and BT-2b are not applicable. See Denise Duffy & Associates, Inc. memorandum dated November 24, 2014 (DD&A, 2014).

	LSM	LSM					historical resources than the Proposed Monterey Pipeline would potentially impact, the severity of impacts on any one would be similar with implementation of the Proposed or Alternative Monterey Pipeline. The Alternative Monterey Pipeline would also extend through the Presidio of Monterey Historic District along Stillwell Avenue. Potential direct and indirect impacts on these historical resources would be significant, but reduced to less than significant with the mitigation measure listed below. Mitigation Measure CR-1 would be required for the Proposed Project and a revised version would be required for the Alternative Monterey Pipeline.
CR-2: Construction Impacts on Archaeological Resources or Unknown Human Remains	LSM	LSM	CR-2a: Archaeological Monitoring Plan. (Applies to Monterey Pipeline) CR-2b: Discovery of Archaeological Resources or Human Remains. (Applies to both) CR-2c: Native American Notification. (Applies to both)	LSM	Project impact would not be eliminated or reduced in significance with the Alternative Transfer Pipeline as construction would have the same potential to uncover unknown archaeological resources during construction. Mitigation Measure CR-2b and 2c required for the Proposed Project and Alternative.	LSM+	Project impact would not be avoided with Alternative Monterey Pipeline as its construction would result in the potential to uncover unknown archaeological resources during construction. The Alternative would be located adjacent to recorded prehistoric archaeological resources, which could increase the possibility for discovery during construction and result in a greater significant impact than with the Proposed Transfer and Monterey Pipelines. The potential inadvertent discovery of archaeological resources and human remains during construction of the Proposed Project Monterey Pipeline are considered significant impacts, but reduced to less than significant with mitigation measure listed below. Mitigation Measure CR-2a, 2b and 2c would be required for the Proposed Project and a revised version would be required for the Alternative Monterey Pipeline.
EN-1: Construction Impacts due to Temporary Energy Use	LSM	LSM	EN-1: Construction Equipment Efficiency Plan. (Applies to both)	LSM	Project impact would not be eliminated or reduced in significance with Alternative as construction of either the Proposed or Alternative Transfer Pipeline because they both would result in similar levels of energy consumption during construction. Mitigation Measure EN-1 required for the Proposed Project and Alternative.	LSM—	Project impact would be reduced in significance with Alternative Monterey Pipeline as its construction would result in less energy consumption during construction. Mitigation Measure EN-1 would be required for the Proposed Project and Alternative.
GS-1: Construction-Related Erosion or Loss of Topsoil	LS	LS	None required.	LS	Similar-Same / No mitigation required	LS—	Construction-related soil erosion would be reduced compared to that of the Proposed Monterey Pipeline because the Alternative Monterey Pipeline would be shorter than the combined Proposed (or Alternative) Transfer and Proposed Monterey Pipelines. The associated ground disturbance area would also be reduced. Like the Proposed Monterey Pipeline, the impact associated with increased soil erosion would be less than significant because construction activities would be conducted in accordance with requirements of the NPDES Construction General Permit and local grading and erosion control ordinances. Mitigation Measures: None Required.
GS-5: Operation - Exposure to Coastal Erosion and Sea Level Rise	NI	LSM	GS-5: Monterey Pipeline Deepening. (Applies to Monterey Pipeline only).	NI	Same / No mitigation required	NI	The Alternative Monterey Pipeline would avoid the impact related to coastal erosion and bluff retreat due to sea level rise because the alternative alignment is located outside of the 2030 to 2050 coastal erosion hazard zone. Therefore, no impact related to coastal erosion and bluff retreat would occur with the Alternative Monterey Pipeline. Mitigation Measure GS-5 would be required for Proposed Project, but not required for the Alternative Monterey Pipeline.
HH-2: Accidental Release of Hazardous Materials During Construction	LSM	LSM	HH-2a: Environmental Site Assessment. (Applies to both) HH-2b: Health and Safety Plan. (Applies to both) HH-2c: Materials and Dewatering Disposal Plan. (Applies to both)	LSM	Project impact would not be eliminated or reduced in significance with this Alternative as construction of either the Proposed or Alternative Transfer Pipeline would result in similar impact related to potential release of hazardous materials during construction. Mitigation Measure HH-2a, 2b and 2c would be required for the Proposed Project and Alternative.	LSM	Project impact would not be avoided or reduced in significance with Alternative Monterey Pipeline as construction of either the Proposed or Alternative Transfer and Proposed Monterey pipelines would result in similar impact related to potential release of hazardous materials during construction. Mitigation Measure HH-2a, 2b and 2c would be required for the Proposed Project and Alternative Monterey Pipeline.
LU-2: Operational Consistency	LSM	LSM	Mitigation Measures in Table 4.12-4.	LSM	Project impact would not be eliminated or reduced in significance with this Alternative	LSM	Project impact would not be avoided or reduced in significance with Alternative Monterey Pipeline as construction of

with Plans, Policies, Regulations					as construction of either the Proposed or Alternative Transfer Pipeline would result in similar impacts related to consistency with plans, policies and regulations. Mitigation Measures in Table 4.12-4		either the Proposed Project or Alternative would result in similar impact related to potential policy inconsistencies. Mitigation Measures would be required for the Proposed Monterey Pipeline and Alternative Monterey Pipeline.
NV-1: Construction Noise	LS	**SU**	NV-1b: Monterey Pipeline Noise Control Plan for Nighttime Pipeline Construction. (Applies to Monterey Pipeline) NV-1c: Neighborhood Notice. (Applies to Monterey Pipeline)	LS	Similar-Same / No mitigation required	**SU**	The Alternative Monterey Pipeline would not avoid or reduce the impact related to nighttime construction noise to a less-than-significant level because the Alternative would traverse residential neighborhoods similar to the Proposed Project alignment and may require nighttime construction. Mitigation Measure NV-1b and NV-1c would be required for the Proposed Project and Alternative, but would not reduce the impact to a less-than-significant level.
PS-3: Construction Solid Waste Policies and Regulations	**LSM**	**LSM**	PS-3: Construction Waste Reduction and Recycling Plan (Applies to both)	**LSM**	Project impact would not be avoided or reduced in significance with Alternative as construction of either the Proposed Project or Alternative would result in similar impact during construction. Mitigation Measure PS-3 would be required for the Proposed Project and Alternative.	**LSM**	Project impact would not be avoided or reduced in significance with Alternative as construction of either the Proposed Project or Alternative would result in similar impact during construction. Mitigation Measure PS-3 would be required for the Proposed Project and Alternative.
TR-2: Construction Traffic Delays, Safety and Access Limitations	**LSM**	**LSM**	TR-2: Traffic Control and Safety Assurance Plan (Applies to both)	**LSM**	Project impact would not be avoided or reduced in significance with Alternative as construction of either the Proposed Project or Alternative would result in similar traffic impact during construction. Mitigation Measure TR-2 would be required for the Proposed Project and Alternative.	**LSM**	Project impact would not be avoided or reduced in significance with Alternative, and would be approximately the same with the Alternative due to the same total length of pipeline, but potential hazards along the Monterey Peninsula Recreational Trail during construction would decrease compared to the Proposed Project. Mitigation Measure TR-2 would be required for the Proposed Project and Alternative.
TR-3: Construction-Related Road Deterioration	**LSM**	**LSM**	TR-3: Roadway Rehabilitation Program (Applies to both)	**LSM**	Project impact would not be avoided or reduced in significance with Alternative as construction of either the Proposed Project or Alternative would result in similar traffic impact during construction. Mitigation Measure TR-3 would be required for the Proposed Project and Alternative.	**LSM**	Project impact would not be avoided or reduced in significance with Alternative, and would be approximately the same with the Alternative due to the same total length of pipeline. Mitigation Measure TR-3 would be required for the Proposed Project and Alternative.
TR-4: Construction Parking Interference	**LSM**	**LSM**	TR-4: Construction Parking Requirements (Applies to both)	**LSM**	Project impact would not be avoided or reduced in significance with Alternative, and the Alternative's impact on parking during construction would be similar to the Proposed Project. Mitigation Measure TR-4 would be required for the Proposed Project and Alternative.	**LSM**	Project impact would not be avoided or reduced in significance with Alternative, and the Alternative's impact on parking during construction would be similar to the Proposed Project. Mitigation Measure TR-4 would be required for the Proposed Project and Alternative.

KEY TO ACRONYMS: SU = Significant Unavoidable Impact even with Mitigation LSM = Significant Without Mitigation / Less-than-Significant with Mitigation LS = Less-than-Significant Impact

Comparison of impacts before mitigation "+" Greater = Impact is greater compared to project impact "—". Reduced = Impact is reduced compared to project impact. If neither "—" nor "+" is shown, the impact is the same or similar compared to the project impact

AE- Aesthetics, AQ- Air Quality/Greenhouse Gas, BF-Biological/Fisheries, BT- Biological/Terrestrial, CR- Cultural, EN-Energy Mineral Resources, GS-Geology/Soils, HH Hazards/ Hazardous Materials, GW-Hydrology/Water Quality: Groundwater, HS-Hydrology/Water Quality: Surface Water, LU-Land Use/Agriculture, MR-Marine Biological, NV-Noise/Vibration, PH-Population/Housing, PS-Public Services/Recreation/Utilities, TR-Traffic/Transportation, WW-Water Supply/Wastewater

RESOLUTION No. 2015-24

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY TO (1) CERTIFY THE FINAL EIR FOR THE PURE WATER MONTEREY GROUNDWATER REPLENISHMENT PROJECT, (2) ADOPT CALIFORNIA ENVIRONMENTAL QUALITY ACT FINDINGS, (3) APPROVE MITIGATION MEASURES AND A MITIGATION MONITORING AND REPORTING PROGRAM, (4) ADOPT A STATEMENT OF OVERRIDING CONSIDERATIONS, AND (5) APPROVE THE PROJECT AS MODIFIED

The Monterey Regional Water Pollution Control Agency ("MRWPCA"), as lead agency under the California Environmental Quality Act ("CEQA"), has completed the Final Environmental Impact Report ("Final EIR" or "EIR") for the Pure Water Monterey Groundwater Replenishment Project (the "Project"). The Project is being proposed by the MRWPCA in partnership with the Monterey Peninsula Water Management District ("MPWMD").

The Project is a water supply project that would serve northern Monterey County. The project would provide: (1) purified recycled water for recharge of a groundwater basin that serves as drinking water supply; and (2) recycled water to augment the existing Castroville Seawater Intrusion Project's agricultural irrigation supply:

- *Replenishment of the Seaside Groundwater Basin*. The Project would enable California American Water Company (CalAm) to reduce its diversions from the Carmel River system by up to 3,500 acre-feet per year by injecting the same amount of purified recycled water into the Seaside Basin. The purified recycled water would be produced at a new facility at the MRWPCA Regional Wastewater Treatment Plant (Regional Treatment Plant) and would be conveyed to and injected into the Seaside Groundwater Basin via a new pipeline and new well facilities. The injected water would then mix with the existing groundwater and be stored for future urban use by CalAm, thus enabling a reduction in Carmel River system diversions by the same amount.
- *Additional recycled water for agricultural irrigation in northern Salinas Valley*. An existing water recycling facility at the Regional Treatment Plant (the Salinas Valley Reclamation Plant) would be provided additional source waters in order to provide additional recycled water for use in the Castroville Seawater Intrusion Project's agricultural irrigation system. It is anticipated that in normal and wet years approximately 4,500 to 4,750 acre-feet per year of additional recycled water supply could be created for agricultural irrigation purposes.

The Project would also include a drought reserve component to support use of the new supply for crop irrigation during dry years. With the drought reserve component, the Project could provide up to 5,900 acre feet per year for crop irrigation in drought conditions. The Project components include: conveyance of five potential types of source water to the Regional Treatment Plant for treatment; a new Advanced Water Treatment (AWT) Facility and other improvements to the Regional Treatment Plant; treated water conveyance system, including pipelines and booster pump stations; groundwater injection wells; and potable water distribution system improvements.

The new source waters would supplement the existing incoming wastewater flows, and would include the following: 1) water from the City of Salinas agricultural wash water system, 2) stormwater flows from the southern part of Salinas and the Lake El Estero facility in Monterey, 3) surface water and agricultural tile drain water that is captured in the Reclamation Ditch and Tembladero Slough, and 4) surface water and agricultural tile drain water that flows in the Blanco Drain. The Project would require modifications to existing facilities and construction of new physical facilities, briefly listed below.

- *Source water diversion and storage*. New facilities would be required to divert and convey the new source waters through the existing municipal wastewater collection system and to the Regional Treatment Plant.
- *Treatment facilities at the Regional Treatment Plant*. A new AWT facility would be constructed at the Regional Treatment Plant site. This facility would include a state-of-the-art treatment system that uses multiple membrane barriers to purify the water, product water stabilization to prevent pipe corrosion due to water purity, a pump station, and a brine and wastewater mixing facility. There would also be modifications to the existing Salinas Valley Reclamation Plant to optimize and enhance the delivery of recycled water to growers.
- *Product water conveyance*. A new pipeline, a pump station and appurtenant facilities would be constructed to transport the purified recycled (product) water from the Regional Treatment Plant to the Seaside Groundwater Basin for injection.
- *Injection well facilities*. The injection facilities would include new wells (in the shallow and deep aquifers), back-flush facilities, pipelines, electricity/power distribution facilities, and electrical/motor control buildings.
- *Distribution of groundwater from Seaside Basin.* CalAm water distribution system improvements would deliver the extracted groundwater to CalAm customers.

As described below, the MRWPCA Board has determined to approve the Project as modified by the Alternative Monterey Pipeline, which eliminates the need for the proposed Transfer Pipeline to be built. Further, the MRWPCA Board has decided to select the Regional Urban Water Augmentation Project (RUWAP) alignment for the Product Water Conveyance pipeline and booster pump station.[1] Throughout the remainder of these findings, the term "Project" refers to the Proposed Project described in the EIR's Project Description chapter as modified by the Alternative Monterey Pipeline and the Board's selection of the RUWAP alignment for the Product Water Conveyance pipeline and booster pump station.

This resolution contains the MRWPCA's certification of the EIR, its CEQA findings, its adopted mitigation measures and mitigation monitoring and reporting program, its statement of

[1] The RUWAP alignment option was so named because it would follow a portion of the recycled water pipeline alignment of Marina Coast Water District's previously approved and partially-constructed RUWAP Recycled Water Project. The proposed new product water conveyance pipeline would be located primarily along paved roadway rights-of-way within urban areas. The Recycled Water Project was approved by the Marina Coast Water District in 2005; however, only portions of the recycled water distribution system have been built and no recycled water has been delivered to urban users.

overriding considerations supporting approval of the Project, and its Project approval. The State Clearinghouse number for the Project is SCH#2013051094.

A Draft Environmental Impact Report ("Draft EIR") was released for public and agency review on April 22, 2015. The Draft EIR assesses the potential environmental effects of implementation of the Project, identifies means to eliminate or reduce potential adverse impacts, and evaluates a reasonable range of alternatives to the Project.

The Final EIR is comprised of the Draft EIR together with one additional volume that includes the comments on the Draft EIR submitted by interested public agencies, organizations, and members of the public; written responses to the environmental issues raised in those comments; revisions to the text of the Draft EIR reflecting changes made in response to comments and other information; and other minor changes to the text of the Draft EIR. The Final EIR is hereby incorporated in this document by reference.

I. CERTIFICATION OF THE FINAL EIR

The MRWPCA Board (the "Board") certifies that it has been presented with the Final EIR and that it has reviewed and considered the information contained in the Final EIR prior to making the following findings and statement of overriding considerations in Section II, below.

Pursuant to CEQA Guidelines section 15090 (Title 14 of the California Code of Regulations, section 15090) the Board certifies that the Final EIR has been completed in compliance with CEQA and the CEQA Guidelines. The Board certifies the Final EIR for the Project as described above.

The Board further certifies that the Final EIR reflects its independent judgment and analysis.

II. FINDINGS

Having received, reviewed, and considered the Final EIR and other information in the record of proceedings, the Board hereby adopts the following findings in compliance with CEQA and the CEQA Guidelines:

Part A: Findings regarding the environmental review process and the contents of the Final EIR.

Part B: Findings regarding the significant environmental impacts of the Project and the mitigation measures for those impacts identified in the Final EIR and adopted as conditions of approval, as well as the reasons that some potential mitigation measures are rejected.

Part C: Findings regarding alternatives and the reasons that alternatives are rejected.

Part D: Statement of Overriding Considerations determining that the benefits of implementing the Project outweigh the significant unavoidable environmental impacts that will result and therefore justify approval of the Project despite such impacts.

The Board certifies that these findings are based on full appraisal of all viewpoints, including all comments received up to the date of adoption of these findings, concerning the environmental issues identified and discussed in the Final EIR. The Board adopts the findings and the statement in Parts A through D for Project.

In addition to the findings regarding environmental impacts, alternatives and overriding considerations, Part E, below, identifies the custodian and location of the record of proceedings, as required by CEQA.

Part F describes the Mitigation Monitoring and Reporting Program for the Project. As described in Part F, the Board hereby adopts the Mitigation Monitoring and Reporting Program as set forth in Exhibit B to these findings.

Part G, below, summarizes the findings and determinations regarding the Project.

A. <u>Environmental Review Process</u>

1. Notice of Preparation and Scoping Meeting

On May 30, 2013, the MRWPCA issued a Notice of Preparation announcing the intended preparation of the Draft EIR and describing its proposed scope. The NOP had a 30-day review period until July 2, 2013. A supplement to the NOP was prepared and circulated December 9, 2014 through January 8, 2015 to reflect updates to the Project that had occurred since the original NOP was issued. The MRWPCA received written responses to the NOPs from agencies, organizations and individuals.

The MRWPCA held a public scoping meeting on Thursday, June 18, 2013 from 6:00 to 8:00 PM at the Oldemeyer Center located at 986 Hilby Avenue, Seaside, CA 93955 to present the Project to the public and agencies and to solicit input as to the scope and content of the EIR. Public notices were placed in local newspapers informing the general public of the scoping meetings. The MRWPCA received oral comments at the public Scoping Meeting. Appendix A to the Draft EIR provides a summary of all written comments received in response to the initial and supplemental NOPs and oral comments received at the public Scoping Meeting.

2. Preparation of the EIR

The MRWPCA completed the Draft EIR for the Project and, beginning on April 22, 2015, the MRWPCA made the Draft EIR available for review and comment. A notice of availability and notice of completion of the Draft EIR was sent to the State Clearinghouse/ Governor's Office of Planning and Research. A notice of availability also was published in the *Monterey County Herald* and the *Salinas Californian*. A hard copy of the Draft EIR was made available for review during normal business hours at the MRWPCA Administrative Office, 5 Harris Court, Bldg. D, Monterey, CA 93940 and at the MPWMD Offices, 5 Harris Court, Bldg. G, Monterey, CA 93940. The Draft EIR was available online at the GWR Project website at: www.purewatermonterey.org. The Draft EIR was also available at the following libraries: Seaside Public Library, Marina Public Library, Salinas Public Libraries, Castroville Public Library, Monterey Public Library, Carmel Valley Public Library, and Harrison Memorial Library (Carmel).

The period for receipt of comments on the Draft EIR remained open until June 5, 2015. During the 45-day Draft EIR review period, the MRWPCA held two noticed public meetings to provide information and answer questions about the Project and the EIR. The first meeting was held on May 20, 2015 from 6:00 p.m. to 8:00 p.m. at the Oldemeyer Center (986 Hilby Avenue, Seaside, CA 93955). The second public meeting was held on May 21, 2015 from 4:00 p.m. to 6:00 p.m. at Hartnell College (411 Central Avenue, Salinas, CA 93901). Spanish translation was available, and both venues were accessible under the Americans with Disabilities Act (ADA). The notice of availability contained information about the meetings.

During the comment period, the MRWPCA received written comments from state and local agencies, organizations and individuals. A total of 26 comment letters were received on the Draft EIR during the public review process. Three letters from key agencies were received after the close of the review period and are included in the Final EIR.

The Final EIR was completed and made available to public agencies and members of the public on September 25, 2015.

The Final EIR contains all of the comments received during and immediately after the public comment period, together with written responses to significant environmental issues raised in those comments, which were prepared in accordance with CEQA and the CEQA Guidelines.

The Board finds and determines that the Final EIR provides adequate, good faith, and reasoned responses to all comments raising significant environmental issues.

3. Absence of Significant New Information

CEQA Guidelines Section 15088.5 requires a lead agency to recirculate an EIR for further review and comment when significant new information is added to the EIR after public notice is given of the availability of the draft EIR but before certification of the final EIR. New information added to an EIR is not "significant" unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect that the project proponent declines to implement. The Guidelines provide examples of significant new information under this standard. Recirculation is not required where the new information added to the EIR merely clarifies or amplifies or makes insignificant modifications in an adequate EIR.

The Board recognizes that the Final EIR incorporates information obtained by the MRWPCA since the Draft EIR was completed, and contains additions, clarifications, modifications, and other changes. With respect to this information, the Board finds as follows:

Changes to Mitigation Measures. As described in Chapter 5 of the Final EIR (Changes to the Draft EIR) and in the responses to comments, several mitigation measures have been modified, including Mitigation Measures AE-3, AE-4, AQ-1, BF-1a through BF-1c, BF-2a/Alternate BF-2a, BT-1a, BT-2c, HS-4, HS-C/MR-C, NV-1d, NV-2b, TR-2, and TR-3. Language within Mitigation Measures CR-1 and CR-2a has been modified, for consistency with the discussion in the Draft EIR on pages 6-41 and 6-42 regarding the applicability of Impacts CR-1 and CR-2 to the Alternative Monterey Pipeline. The Board finds that these changes to the mitigation measures in the Final EIR augment the mitigation measures as proposed in the Draft EIR, strengthen the effectiveness of the proposed mitigation measures, respond to agency input, and/or enhance their clarity, but do not cause any new or more severe environmental impacts. Therefore, in accordance with CEQA and the CEQA Guidelines, no recirculation of the EIR is necessary based on the changes and additions to the mitigation measures in the Final EIR.

***Other Changes*.** Various minor changes and edits have been made to the text and tables of the Draft EIR, as described in Chapter 5 of the Final EIR. These changes are generally of an administrative nature such as correcting typographical errors, making minor adjustments to the data, and adding or changing certain phrases to improve readability. The Board finds that these changes are of a minor, non-substantive nature and do not require recirculation of the EIR.

In addition to the changes and corrections described above, the Final EIR provides additional information in response to comments and questions from public agencies, private organizations, and individuals. The Board finds that this additional information does not constitute significant new information requiring recirculation, but rather that the additional information clarifies or amplifies an adequate EIR. The public has not been deprived of a meaningful opportunity to comment upon a substantial adverse environmental effect of the Project or a feasible project alternative or mitigation measure

Recirculation is required in four situations. Here, the Board finds that the additional information, including the changes described above, does not show that:

(1) A new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented.

(2) A substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted that reduce the impact to a level of insignificance.

(3) A feasible project alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the significant environmental impacts of the project, but the project's proponents decline to adopt it.

(4) The Draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

Based on the foregoing, and having reviewed the information contained in the Final EIR and in the record of the MRWPCA's proceedings, including the comments on the Draft EIR and the responses thereto, and the above-described information, the Board hereby finds that no significant new information has been added to the Final EIR since public notice was given of the availability of the Draft EIR that would require recirculation of the EIR. Therefore, in accordance with CEQA Guidelines Section 15088.5(b), no recirculation of the Draft EIR is required.

4. Differences of Opinion Regarding the Impacts of the Project

In making its determination to certify the Final EIR and to approve the Project, the Board recognizes that a range of technical and scientific opinion exists with respect to certain environmental issues. The Board has acquired an understanding of the range of this technical and scientific opinion by its review of the Draft EIR, the comments received on the Draft EIR and the responses to those comments in the Final EIR, as well as testimony, letters, and reports regarding the Final EIR and its own experience and expertise in these environmental issues. The Board has reviewed and considered, as a whole, the evidence and analysis presented in the Draft EIR, the evidence and analysis presented in the comments on the Draft EIR, the evidence and analysis presented in the Final EIR, the information submitted on the Final EIR, and the reports prepared by the experts who prepared the EIR, by the MRWPCA's consultants, and by staff, addressing those comments. The Board has gained a comprehensive and well-rounded understanding of the environmental issues presented by the Project. In turn, this understanding has enabled the Board to make its decisions after weighing and considering the various viewpoints on these important issues. The Board accordingly certifies that its findings are based on full appraisal of all of the evidence contained in the Final EIR, as well as the evidence and other information in the record addressing the Final EIR.

B. <u>Impacts and Mitigation Measures</u>

These findings provide the written analysis and conclusions of the Board regarding the environmental impacts of the Project and the mitigation measures identified by the Final EIR and adopted by the Board as conditions of approval for the Project.

In making these findings, the Board has considered the opinions of other agencies and members of the public, including opinions that disagree with some of the analysis and significance thresholds used in the EIR. The Board finds that the determination of significance thresholds is a judgment that is within the discretion of the Board; the significance thresholds used in the EIR are supported by substantial evidence in the record, including the expert opinion of the EIR preparers and MRWPCA staff; and the significance thresholds used in the EIR provide reasonable and appropriate means of assessing the significance of the adverse environmental effects of the Project.

In particular, the EIR relied on significance criteria for evaluating impacts that are tailored to this type of project. The criteria used in this EIR to determine whether an impact is or is not "significant" are based on (a) CEQA-stipulated "mandatory findings of significance" listed in CEQA Guidelines section 15065; (b) the relationship of the project effect to the adopted policies, ordinances and standards of the MRWPCA and of responsible agencies; and (c) commonly accepted practice and the professional judgment of the EIR authors and MRWPCA staff.

1. Findings on the Project's Environmental Impacts.

Exhibit A, Summary of Impacts and Mitigation Measures for the Staff Recommended Alternative, attached to these findings and incorporated herein by reference summarizes the environmental determinations of the Final EIR about the Project's significant impacts before and after mitigation. This exhibit does not attempt to describe the full analysis of each environmental impact contained in the Final EIR. Instead, Exhibit A provides a summary description of each significant impact, describes the applicable mitigation measures identified in the Final EIR and adopted by the Board where the measure is within the Board's jurisdiction to adopt, and states the Board's findings on the significance of each impact after imposition of the adopted mitigation measures. A full explanation of these environmental findings and conclusions can be found in the Final EIR, and these findings hereby incorporate by reference the discussion and analysis in the Final EIR supporting the Final EIR's determinations regarding the Project's impacts and mitigation measures designed to address those impacts. In making these findings, the Board ratifies, adopts, and incorporates the analysis and explanation in the Final EIR, and ratifies, adopts, and incorporates in these findings the determinations and conclusions of the Final EIR relating to environmental impacts and mitigation measures, except to the extent any such determinations and conclusions are specifically and expressly modified by these findings.

2. Adoption of Project Design Features and Mitigation Measures as Conditions of Approval.

The Board adopts, and incorporates as conditions of approval of the Project, the mitigation measures set forth in the Mitigation Monitoring and Reporting Program attached to these findings as Exhibit B to reduce or avoid the potentially significant and significant impacts of the Project. In adopting these mitigation measures, the Board intends to adopt each of the mitigation measures recommended for approval by the Final EIR that applies to a component of the Project that would be constructed by or funded by the Board. Accordingly, in the event an applicable mitigation measure recommended in the Final EIR has inadvertently been omitted from Exhibit B, such mitigation measure is hereby adopted and incorporated in the findings below by reference. In addition, in the event the language describing a mitigation measure set forth in Exhibit B fails to accurately reflect the mitigation measures in the Final EIR due to a clerical error, the language of the mitigation measure as set forth in the Final EIR shall control, unless the language of the mitigation measure has been specifically and expressly modified by these findings.

The Board hereby finds that the adopted mitigation measures are changes or alterations that have been required in, or incorporated into, the Project which mitigate or avoid significant effects on the environment.

- Some of the mitigation measures identified in the EIR cannot be fully implemented by the Board because the measures apply to a Project component that the Board does not control. The Alternative Monterey Pipeline would be implemented by CalAm and is not subject to regulatory approvals by MRWPCA. CalAm has confirmed that it would implement all of the mitigation measures that the EIR identifies for the Alternative Monterey Pipeline, including the following: AE-2; AQ-1; BT-1a; BT-1k; BT-1m; CR-1; CR-2(a); CR-2(b); CR-2(c); EN-1; HH-2(a); HH-2(b); HH-2(c); LU-2; NV-1(b); NV-1(c); PS-3; TR-2; TR-3; and TR-4.

The Board hereby finds that these mitigation measures are within the jurisdiction of other public agencies issuing regulatory approvals to CalAm, and can and should be approved by those other agencies.

3. Findings on Additional Suggested Mitigation Measures.

In several comments on the Draft EIR, various measures were suggested by commenters as proposed additional mitigation measures or modifications to the mitigation measures identified by the EIR. As described above, several of the EIR's mitigation measures were modified in response to such comments. Other comments requested minor modifications in mitigation measures identified in the Draft EIR, requested mitigation measures for impacts that were less than significant, or requested additional mitigation measures for impacts as to which the Draft EIR identified mitigation measures that would reduce the identified impact to a less than significant level; these requests are declined as unnecessary.

With respect to the additional measures suggested by commenters that were not added to the Final EIR, the Board hereby adopts and incorporates by reference the reasons set forth in the responses to comments contained in the Final EIR as its grounds for rejecting adoption of these mitigation measures.

C. Basis for the Board's Decision to Approve the Project (as Modified)

1. Summary of Discussion of Alternatives in the Final EIR

The Final EIR evaluates a number of potential alternatives to the Project. The EIR examines the environmental impacts of each alternative in comparison with the Project and the relative ability of each alternative to satisfy project objectives.

The EIR also describes the criteria used to identify a range of reasonable alternatives for review in the EIR and describes proposals that the MRWPCA concluded did not merit additional, more-detailed review because they did not present viable alternatives to the Project.

2. The Board's Findings Relating to Alternatives

In making these findings, the Board certifies that it has independently reviewed and considered the information on alternatives provided in the Final EIR, including the information provided in comments on the Draft EIR and the responses to those comments in the Final EIR. The Final EIR's discussion and analysis of these alternatives is not repeated in these findings, but the discussion and analysis of the alternatives in the Final EIR is incorporated in these findings by reference.

The Final EIR describes and evaluates in detail several alternatives to the Project. As set forth in section B above, the Board has adopted mitigation measures that mitigate the significant environmental effects of the Project. As explained in section D of these findings, while these mitigation measures will not mitigate all Project impacts to a less than significant level, they will mitigate those impacts to a level that the Board finds is acceptable. The Board finds that only the Project would satisfy all of the Project Objectives. The Board finds that the remaining alternatives are unable to satisfy the project objectives to the same degree as the Project. The

Board further finds that, on balance, none of the remaining alternatives has environmental advantages over the Project that are sufficiently great to justify approval of such an alternative instead of the Project, in light of each such alternative's inability to satisfy the project objectives to the same degree as the Project. Accordingly, the Board has determined to approve the Project instead of approving one of the remaining alternatives.

In making this determination, the Board finds that when compared to the other alternatives described and evaluated in the Final EIR, the Project, as mitigated, provides a reasonable balance between fully satisfying the project objectives and reducing potential environmental impacts to an acceptable level. The Board further finds and determines that the Project should be approved, rather than one of the other alternatives, for the reasons set forth below.

a. Description of Project Objectives

The primary objective of the Project is to replenish the Seaside Groundwater Basin with 3,500 AFY of purified recycled water to replace a portion of CalAm's water supply as required by state orders. To accomplish this primary objective, the Project would need to meet the following objectives:

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

Secondary objectives of the Project include the following:

- Provide additional water to the Regional Treatment Plant that could be used for crop irrigation through the Salinas Valley Reclamation Plant and Castroville Seawater Intrusion Project system;
- Develop a drought reserve to allow the increased use of Project source waters as crop irrigation within the area served by the Castroville Seawater Intrusion Project during dry years
- Assist in preventing seawater intrusion in the Seaside Groundwater Basin;
- Assist in diversifying Monterey County's water supply portfolio.

b. Discussion and Findings Relating to the Alternatives Evaluated in the Draft EIR

Chapter 6 of the Draft EIR provides a full discussion of the following alternatives, which are summarized below:

- No Project

- Alternatives to Project
  - Reduced Seaside Basin Replenishment Alternative
  - Component-by-component alternatives for Source Water Diversion and Use, for Product Water Conveyance, and for CalAm Distribution System Pipelines
  - Three overall alternatives to the Project were considered that combined component-by-component alternatives into overall alternatives:
    - Alternative A: Reduced Seaside Basin Replenishment and Alternative Monterey Pipeline
    - Alternative B: Reduced Source Water Alternative #2 (No Tembladero Slough) and Alternative Monterey Pipeline
    - Alternative C: Reduced Source Water Alternative #7 (Salinas Source Waters Only) and Alternative Monterey Pipeline

No Project Alternative.

Under CEQA, a "No-Project Alternative" compares the impacts of proceeding with a proposed project with the impacts of not proceeding with the proposed project. A No-Project Alternative describes the environmental conditions in existence at the time the Notice of Preparation was published, along with a discussion of what would be reasonably expected to occur in the foreseeable future, based on current plans and consistent with available infrastructure and community services.

Here, the No Project Alternative would not include construction of any of the Project components, which in turn would eliminate all construction and operational impacts at all of the Project component sites, avoiding all significant impacts identified for the Project. However, the beneficial impacts of the project with respect to the restoration of flows in the Carmel River would potentially be delayed or would not occur if the No Project Alternative was implemented. Benefits of the Project related to additional irrigation water for CSIP (and related to offset of groundwater pumping by delivering additional recycled water for crop irrigation) and potential improvements in seawater intrusion conditions would also not occur.

Under the No Project Alternative, none of the objectives of the Project would be met, and the benefits of the Project would not occur. The No Project Alternative would not enable CalAm to reduce its diversions from the Carmel River system by up to 3,500 AFY by injecting the same amount of purified recycled water into the Seaside Basin. This alternative also would not meet the project objective of providing additional water to the Regional Treatment Plant to be used for crop irrigation through the Salinas Valley Reclamation Plant and CSIP system, and there would be no drought reserve for crop irrigation within the CSIP area during dry years.

On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to provide the environmental benefits of the Project or to achieve the project objectives, and the Board rejects this alternative.

A commenter on the Draft EIR suggested that the larger desalination plant proposed by CalAm for the Monterey Peninsula Water Supply Project (MPSWP) would result from disapproval of the Proposed GWR Project. The MPSWP is an independent project undergoing its own CEQA process, and that project is not an approved plan, nor is it consistent with available infrastructure. Nevertheless, the EIR describes the relationship between the Project and the MPSWP, and discloses that if the Project is approved and implemented, the desalination plant that CalAm would pursue as part of the MPSWP would be the smaller, 6.4 million gallons per day (mpg) plant rather than the larger 9.6 mpg plant. The scenario under which the smaller desalination plant could be combined with the GWR Project is described in the MPSWP Draft EIR as the "MPSWP Variant" and the combined impacts of the two projects are described in the EIR for the GWR Project as potential cumulative impacts.

The Board finds that the potential effects of approval and denial of the GWR Project on the size of the desalination plant proposed by CalAm for the MPSWP have been adequately disclosed in the EIR for the Project.

Reduced Seaside Basin Replenishment Project Alternative.

This alternative would constitute a 3,000 AFY capacity project for water deliveries for the Project to the Seaside Basin, instead of 3,500 AFY. All of the Project facilities would be constructed, and the proposed additional recycled water for crop irrigation in the CSIP area (4,500 to 4,750 AFY) would be included. Under this alternative, the required diversions of source water would be reduced. To produce 3,000 AFY of water, approximately 3,703 AFY of new source waters would be required to be diverted to the AWT Facility. This compares to the 4,320 AFY needed to produce 3,500 AFY under the Project.

This alternative would result in nearly the same environmental impacts as the Project, since all diversion, conveyance, storage, treatment and injection facilities would need to be constructed under this alternative, even though there would be a reduction of product water provided to the Seaside Groundwater Basin. This alternative would partially meet the project objectives during normal and dry years, in that a reduced water supply would be produced and available to CalAm – 3,000 AFY instead of the proposed 3,500 AFY to replenish the Seaside Groundwater Basin. This alternative would fully meet the Crop Irrigation water supply project objectives.

On balance, the relatively small environmental benefits that might be achieved with this alternative are outweighed by its failure to fully provide the environmental benefits that would be achieved by replacement of 3,500 acre feet per year of CalAm's water supply as required by state orders. This alternative would not fully achieve the project objectives, and the Board rejects this alternative.

Alternatives to Source Water Diversions and Use.

The Draft EIR considered eight different Reduced Source Water Alternatives, in which one or more source water components would be eliminated:

Reduced Source Water Alternative #1 (No Lake El Estero)

In this alternative, the Lake El Estero source water diversion facilities would not be implemented. The construction of the new physical facilities at the Lake El Estero site would not occur, and no operational diversions of water from this water body to the wastewater collection system would occur.

Significant impacts related to biological resources (wetlands), construction and land use policy consistency would be eliminated at the Lake El Estero site. However, the alternative would not meet the project objectives to the extent that the Project would, including water demands for CalAm Monterey District of 3,500 AFY and for Crop Irrigation in the CSIP area of 4,500 – 4,750 AFY and up to 5,900 AFY in drought years. While the necessary amount of yield could be provided by the other proposed source waters without the Lake El Estero diversion, this component provides source water in certain drought years to more easily meet the project objectives and to provide more certainty that those objectives would be consistently achieved.

On balance, the relatively small environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Water Alternative #2 (No Tembladero Slough)

This alternative consists of a reduced source water diversion through elimination of the proposed diversion facilities at the Tembladero Slough Diversion site. Under this alternative, the construction of the new physical facilities at the Tembladero Slough Diversion site would not occur, and no operational diversions of water from this water body to the wastewater collection system would occur.

In comparison to the Project, elimination of this component would eliminate all of the significant impacts at the Tembladero Slough diversion, including the significant and unavailable noise impact. The alternative would meet the primary project objective of replenishment of the Seaside Basin but would not accomplish the project objectives to the extent that the Project would for CSIP irrigation in some drought years in comparison to the Project. During normal/wet years while building the drought reserve, the Tembladero Slough source water diversion would yield approximately 535 AFY. On average during such years, the Project would increase water supplied to the CSIP growers by approximately 5,456 AFY. If the Tembladero Slough diversion were eliminated from the Project, the Project would increase water supplied to the CSIP growers by 4,921 AFY (90% of the amount with Tembladero Slough).

During normal/wet years with a full drought reserve, water from the Tembladero Slough would not be needed if all other sources were available. The Tembladero Slough diversion would, however, provide a back-up source in the event other sources were not available.

Drought years when the drought reserve is used for the CSIP growers, the Tembladero Slough diversion would yield approximately 772 AFY. On average during such years, the Project would increase water supplied to the CSIP growers by approximately 5,728 AFY. If the Tembladero Slough diversion were eliminated from the Project, the Project would increase water supplied to the CSIP growers by 4,956 AFY (87% of the amount with Tembladero Slough).

On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Water Alternative #3 (No Tembladero Slough and No Lake El Estero)

In this alternative, there would be no source water diversion facilities constructed or operated at Tembladero Slough or at Lake El Estero. The construction of the new physical facilities at Tembladero Slough Diversion site at Lake El Estero would not occur, and no operational diversions of water from these water bodies to the wastewater collection system would occur.

Significant impacts related to noise, biological resources, cultural resources and land use policy consistency at the Lake El Estero and Tembladero sites would be eliminated. Additionally, impacts of public services, traffic, hazards and hazardous materials and energy would also be avoided at the Tembladero Slough and Lake El Estero sites due to the elimination of these diversion facilities. The significant and unavoidable noise impact at the Tembladero Slough diversion site also would be avoided.

This alternative would meet the primary project objective of replenishment of the Seaside Basin. However, elimination of the Tembladero Slough and Lake El Estero Diversions would not accomplish the Project objectives to the extent that the Project would because these source waters are needed to provide sufficient water supply during certain dry/drought year conditions, as explained under Reduced Source Water Alternatives 1 and 2, above. On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Alternatives #4 (No Blanco Drain Diversions)

Under this alternative, there would be no diversion of surface waters from the Blanco Drain and the construction of the new Blanco Drain pump station and pipeline (including the trenchless construction or directionally drilling activities to install the pipeline under the Salinas River) would not occur.

The impacts of eliminating the Blanco Drain Diversion component would reduce the physical changes to this site because no construction would occur to install the facilities needed to divert the surface water. In addition, the less-than-significant operational changes to flow and water levels and associated habitat and special status species impacts in the downstream reaches of the watershed (a short segment of the Blanco Drain, Salinas River and lagoon) would not occur. Biological, cultural, traffic, energy, land use, public services and noise impacts would also be reduced at the Blanco Drain site due to the elimination of these facilities.

The alternative would not fully accomplish the project objectives; in some drought years, the yield of the alternative would only provide from 2,800 to 4,300 AFY for the proposed Crop Irrigation component, as compared to up to 5,900 AFY under the Project. On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Alternatives #5 (No Reclamation Ditch and Tembladero Slough Diversions)

This alternative assumes no diversion from the source waters of the Reclamation Ditch or Tembladero Slough. No construction of physical facilities would be built at the Reclamation Ditch or Tembladero Slough Diversion sites, and no operational diversion of water and the resulting flow and water level changes to the existing surface water hydrology and habitat in the affected reaches (below the diversion points) would occur.

The impacts of eliminating these components would reduce the physical changes to these sites because no construction would occur to install the facilities needed to divert the surface water. In addition, the operational changes to flow and water levels in the downstream reaches of the watershed would not occur.

This alternative would not fully accomplish the project objectives; in some drought years, the yield of this alternative would be from 2,800 to 4,300 AFY for the proposed Crop Irrigation component, as compared to up to 5,900 AFY under the Project. On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Alternative #6 (No Surface Water Appropriative Permits)

Under this alternative, the following diversions would be eliminated from the Project: Reclamation Ditch, Tembladero Slough, and Blanco Drain. The impacts of eliminating these components would reduce the physical changes to these sites because no construction would occur to install the facilities needed to divert the surface water. In addition, the operational changes to flow and water levels in the downstream reaches of the watershed would not occur.

The alternative would not fully accomplish the project objectives; in some drought years, the yield of the alternative would only provide from 2,800 to 4,300 AFY for the proposed Crop Irrigation component, as compared to up to 5,900 AFY under the Project. On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Water Alternative #7 (City of Salinas Sources Only - No Source Water Diversions to Augment CSIP Deliveries)

This alternative assumes new source waters would be conveyed to the Regional Treatment Plant for project use from the City of Salinas sources only, and this alternative eliminates all diversions from surface waters including the Reclamation Ditch, Tembladero Slough, Blanco Drain, and the diversion facility at Lake El Estero. This alternative assumes that no additional waters would be diverted to provide augmentation of recycled water for CSIP area crop irrigation as proposed under the Project.

Elimination of all of the surface water diversion components would reduce the physical changes to those sites because no construction would occur to install the facilities need to divert the surface water. In addition, the operational changes to flow and water levels in the downstream reaches of the Reclamation Ditch watershed would not occur.

This alternative would produce 3,500 AFY of purified recycled water to replace a portion of CalAm's water supply to meet project objectives to replenish the Seaside Basin. However, irrigation waters for CSIP would not be augmented in comparison to the Project. This alternative would not fully meet the Crop Irrigation objectives.

On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Water Alternative #8 (No Agricultural Wash Water or South Salinas Stormwater)

Under this alternative, no physical changes would be made to the Salinas Pump Station source water diversion site, the Salinas Treatment Facility or the 33-inch wastewater pipeline to enable agricultural wash water and south Salinas stormwater to be stored and recovered for recycling and reuse. Construction and operational impacts related to biological (terrestrial and fisheries) resources, cultural resources, noise, energy, public services (waste disposal), and traffic impacts would be reduced under this alternative at the City of Salinas facilities due to the elimination of construction and operation of these facilities.

The alternative would not fully meet the project objective to provide additional agricultural irrigation water as the yield of the alternative would not provide the total Crop Irrigation yield of the Project, and in drought years would require the use of CSIP wells in the peak irrigation demand months.

On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Alternatives for Product Water Conveyance.

The Draft EIR describes two options for the Product Water Conveyance system, including two pipeline alignments and two associated locations for a booster pump station, called the RUWAP and Coastal Alignment Options. Only one of the two Product Water Conveyance pipeline alignments and booster pump stations would be constructed as part of the Project.

A comparison of the severity of impacts between the two alternative Product Water Conveyance Systems shows that they are very similar. The primary difference in impacts is in construction and operational impacts to riparian habitat and federally protected wetlands as defined by Section 404 of the Clean Water Act or waters of the state; specifically, the impacts of the RUWAP alignment option would be less than significant while the Coastal alignment option would be significant, but reduced to less than significant with mitigation in the EIR.

Either of the Product Water Conveyance options evaluated in the EIR would fully achieve the project objectives. The RUWAP Alignment Option would result in fewer adverse environmental impacts compared to the Coastal Alignment Option and is expected to be less costly to construct than the Coastal Alignment Option. For these reasons, the Board has determined that it will pursue the necessary permits and approvals to enable it to construct the RUWAP Alignment Option.

Alternatives to CalAm Distribution System Pipelines.

The CalAm Distribution System Transfer and Monterey Pipelines are proposed to be built by CalAm, and the Draft EIR considers alternative alignments for the proposed Transfer and Monterey Pipelines alignments. Importantly, if the Alternative Monterey Pipeline were constructed instead of the Proposed Project's alignment for the Monterey Pipeline, then the Transfer Pipeline would no longer be needed and the impacts associated with construction of the Transfer Pipeline would be eliminated.

Alternative Transfer Pipeline

Similar to the Project's alignment, the Alternative Transfer Pipeline would be 2.4 miles long. The level of significance and the severity of the impacts would be the same or similar for all impact topics if the Alternative Transfer Pipeline were constructed instead of the Proposed Transfer Pipeline, because both would be 2.4 miles long and both would be entirely within existing, paved, public roadways. The alternative would achieve the project objectives.

Because, as described below, the Board supports and selects the Alternative Monterey Pipeline, neither the proposed Transfer Pipeline nor the Alternative Transfer Pipeline is necessary for the Project to proceed, the Board rejects inclusion of either Transfer Pipeline alignment as part of the Project.

Alternative Monterey Pipeline

The Alternative Monterey Pipeline is 6.5 miles long. The entire Alternative Monterey Pipeline is located outside of the Coastal Zone. If the Alternative Monterey Pipeline is selected for construction, neither the proposed Monterey Pipeline, proposed Transfer Pipeline, nor the Alternative Transfer Pipeline would be built to deliver the required water quantities to meet CalAm customers' demands. The Alternative Monterey Pipeline would avoid and reduce significant impacts compared to the proposed Monterey Pipeline, and would avoid impacts of the Transfer Pipeline.

The Alternative Monterey Pipeline would fully achieve the project objectives. Due to being located outside of the Coastal Zone and the elimination of the need for the Transfer Pipeline, the Alternative Monterey Pipeline would also have the potential to be implemented more expeditiously and thus would better meet the objective of being implemented in a timely manner.

Because the Alternative Monterey Pipeline would substantially lessen the Project's adverse environmental impacts while also fully achieving the project objectives, the Board supports construction of the Alternative Monterey Pipeline, and hereby selects this alternative.

Overall Alternatives to the Project.

The Draft EIR also discusses several combinations of alternatives discussed above. These are called Alternative A, Alternative B, and Alternative C, and Table 6-6 in the Draft EIR provides an overview of the environmental impacts of each combined alternative compared to the Project.

Alternative A: Reduced Seaside Basin Replenishment and Alternative Monterey Pipeline

The Reduced Seaside Basin Replenishment Alternative would reduce the amount of water for Seaside Basin replenishment by 500 AFY compared to the Project (i.e., 3,000 AFY rather than 3,500 AFY of purified recycled water would be produced, conveyed to, and injected into the Seaside Basin, for later extraction by CalAm). The need to divert source waters would be reduced by approximately 600 AFY which could be achieved by eliminating one or more source water diversion sites, or by constructing and operating all of the source water diversions, but operating them with a lower total diversion amount.

If the Reduced Seaside Basin Replenishment Alternative were combined with the Alternative Monterey Pipeline (i.e., rather than the Proposed Transfer and Monterey Pipelines), numerous other significant construction impacts would be reduced due to reduced construction areas and activities, and the Project may be implemented more quickly, better meeting the project timeframe objective.

On balance, the relatively small environmental benefits that might be achieved by the Reduced Seaside Basin Replenishment component of this alternative are outweighed by the alternative’s failure to fully provide the environmental benefits that would be achieved by replacement of 3,500 acre feet per year of CalAm’s water supply as required by state orders. This alternative would not fully achieve the project objectives, and the Board rejects this alternative.

The Board selects the Alternative Monterey Pipeline.

Alternative B: Reduced Source Water Alternative # 2 (No Tembladero Slough) and Alternative Monterey Pipeline

Reduced Source Water Alternative # 2 would avoid the significant and unavoidable noise impact at the Tembladero Slough diversion due to exceedances of the MRWPCA’s noise level ordinance; however, the alternative would not meet the project objectives as fully as the Project. Specifically, the Reduced Source Water Alternative #2 would only provide up to 5,200 AFY for the proposed Crop Irrigation component in some drought years (compared to up to 5,900 AFY under the Project).

If the Reduced Source Water Alternative #2 was combined with the Alternative Monterey Pipeline (i.e., rather than the Proposed Transfer and Monterey Pipeline), numerous other significant construction impacts would be reduced due to reduced construction areas and activities. Because the Alternative Monterey Pipeline avoids the Coastal Zone, it may be implemented more quickly than the Proposed Monterey Pipeline, better meeting the project timeframe objective.

The EIR determined that other than the No Project Alternative, the Environmentally Superior Alternative would be the Reduced Source Water (No Tembladero Slough) Alternative combined with the Alternative Monterey Pipeline.

On balance, the environmental benefits that might be achieved by eliminating the Tembladero Slough diversion are outweighed by this alternative's failure to fully achieve the project objectives, and the Board rejects this alternative.

The Board selects the Alternative Monterey Pipeline.

Alternative C: Reduced Source Water Alternative # 7 (Salinas Source Waters Only) and Alternative Monterey Pipeline

Reduced Source Water Alternative #7 (Salinas Source Waters Only) was found to avoid the significant and unavoidable noise impact at the Tembladero Slough Diversion, in addition to reducing environmental impacts related to source water diversions from surface waters, such as changes in flow, induced water level changes, and direct and indirect impacts on biological resources (albeit the latter would be less-than-significant under the Project). The Reduced Source Water Alternative #7 would not meet the Crop Irrigation objective to the extent that the Project would; in fact it would provide very little or no augmentation of the existing supplies to the CSIP area.

If the Reduced Source Water Alternative #7 was combined with the Alternative Monterey Pipeline (i.e., rather than both the Proposed Transfer and Monterey Pipelines), numerous other significant construction impacts would be reduced due to reduced construction areas and activities. Because the Monterey Pipeline avoids the Coastal Zone, it may be implemented more quickly than the Project, better meeting the project timeframe objective.

On balance, the environmental benefits that might be achieved by eliminating all new source waters except for the Salinas source waters are outweighed by this alternative's failure to fully achieve the project objectives, and the Board rejects this alternative.

The Board selects the Alternative Monterey Pipeline.

Summary of Findings Regarding Alternatives. For all of the foregoing reasons, the Board has determined to approve the Project as modified by the Alternative Monterey Pipeline, instead of any of the other alternatives. As noted above, with the construction of the Alternative Monterey Pipeline, the Transfer Pipeline is no longer needed, and the impacts associated with construction of the Transfer Pipeline are eliminated. On balance, the Board finds that the Project as modified by the Alternative Monterey Pipeline best achieves the project objectives and environmental benefits.

c. Findings Regarding Suggestions for Modifying the Project, Variations on the Alternatives, and a Suggested Off-Site Alternative

Various modifications to the Project and variations on the alternatives were proposed in comments on the Draft EIR.

Certain commenters expressed their preference for an alternative to the Project or components thereof, and these are thoroughly discussed in Chapter 3 of the Final EIR (Master Responses to Comments on the Draft EIR), which is incorporated by reference into these findings. These proposed variations included a reduced Seaside Basin replenishment alternative, increased proposed project yield or AWT facility size alternatives, alternative water supply sources, a request for the Project to be considered an independent project, alternative pipeline alignments, and an additional no project alternative. The Final EIR determined that no additional alternatives were considered necessary to be added in the Final EIR because the alternatives suggested either would not reduce identified significant impacts, or would not feasibly meet most of the basic project objectives.

With respect to the additional alternatives suggested by commenters that were not added to the Final EIR, the Board hereby adopts and incorporates by reference the reasons set forth in the responses to comments contained in the Final EIR as its grounds for rejecting the addition of these alternatives.

Findings Regarding Adequacy of Range of Alternatives. The Board finds that the range of alternatives evaluated in the EIR reflects a reasonable attempt to identify and evaluate various types of alternatives that would potentially be capable of reducing the Project's environmental effects, while accomplishing most but not all of the project objectives. The Board finds that the alternatives analysis is sufficient to inform the Board and the public regarding the tradeoffs between the degree to which alternatives to the Project could reduce environmental impacts and the corresponding degree to which the alternatives would hinder the MRWPCA's ability to achieve the project objectives.

D. Statement of Overriding Considerations

1. Impacts That Remain Significant

As discussed in Exhibit A, the Board has found that the following impacts of the Project would or could remain significant following MRWPCA adoption of the mitigation measures described in the Final EIR:

- Impact NV-1: Construction Noise (Alternative Monterey Pipeline)
- Impact NV-2: Construction Noise That Exceeds or Violate Local Standards (Tembladero Slough)

2. Overriding Considerations Justifying Project Approval

In accordance with CEQA Guidelines Section 15093, the Board has, in determining whether or not to approve the Project, balanced the economic, social, technological, and other project benefits against the Project's unavoidable environmental risks, and finds that the benefits of the Project set forth below outweigh the significant adverse environmental effects that are not mitigated to less than significant levels. This statement of overriding considerations is based on the Board's review of the Final EIR and other information in the administrative record. The benefits identified below provide separate and independent bases for overriding the significant environmental effects of the Project.

- The Project would replace 3,500 AFY of unauthorized Carmel River diversions for municipal use with additional groundwater pumping enabled by recharge of purified recycled water;
- The Project would provide up to 4,500 – 4,750 AFY and up to 5,900 AFY in drought years of additional recycled water to Salinas Valley growers for crop irrigation;
- The Salinas Valley Groundwater Basin is in overdraft and the Project would reduce the volume of water pumped from Salinas Valley aquifers;
- The Project would increase water supply reliability and drought resistance;
- The Project would maximize the use of recycled water in compliance with the state Recycled Water Policy;
- The Project would reduce pollutant loads from agricultural areas to sensitive environmental areas including the Salinas River and Monterey Bay.

E. Record of Proceedings

Various documents and other materials constitute the record upon which the Board bases these findings and the approvals contained herein. The location and custodian of these documents and materials is: Mike McCullough, Governmental Affairs Administrator, Monterey Regional Water Pollution Control Agency, 5 Harris Court, Building D, Monterey, CA 93940.

F. Mitigation Monitoring and Reporting Program

In accordance with CEQA and the CEQA Guidelines, the Board must adopt a mitigation monitoring program to ensure that the mitigation measures adopted herein are implemented. The Board hereby adopts the Mitigation Monitoring and Reporting Program for the Project attached to these findings as Exhibit B.

G. Summary

1. Based on the foregoing findings and the information contained in the administrative record, the Board has made one or more of the following findings with respect to each of the significant environmental effects of the Project identified in the Final EIR:

a. Changes or alterations have been required in, or incorporated into, the Project which avoid or substantially lessen the significant environmental effects on the environment.

b. Those changes or alterations that are wholly or partially within the responsibility and jurisdiction of another public agency have been, or can and should be, adopted by that other public agency.

c. Specific economic, social, technological, or other considerations make infeasible the mitigation measures or alternatives identified in the Final EIR that would otherwise avoid or substantially lessen the identified significant environmental effects of the Project.

2. Based on the foregoing findings and information contained in the record, it is hereby determined that:

a. All significant effects on the environment due to approval of the Project have been eliminated or substantially lessened where feasible.

b. Any remaining significant effects on the environment found unavoidable are acceptable due to the factors described in the Statement of Overriding Considerations in Section II.D, above.

III. PROJECT APPROVAL

1. The Board hereby approves the Project as modified by the Alternative Monterey Pipeline, and the Board hereby selects the RUWAP Alignment Option for the Product Water Conveyance pipeline and booster pump station.

2. The Board hereby authorizes staff to proceed immediately with obtaining necessary agreements, permits, funding and financing, and approvals to construct and operate any or all of the following Project components, including applying to the State Water Resources Control Board for financing provided by the Clean Water State Revolving Fund Loan program or other grant and loan programs:

a. Diversion and use of the following Source Waters: unused treated wastewater from the MRWPCA Regional Treatment Plant; agricultural wash water from the Salinas Treatment Facility; Salinas Treatment Facility pond storage and recovery; City of Salinas urban runoff; Reclamation Ditch; Tembladero Slough; Blanco Drain; and Lake El Estero.[2]

b. Treatment Facilities at the Regional Treatment Plant including a new AWT Facility and Salinas Valley Reclamation Plant modifications.

c. Product Water Conveyance RUWAP Alignment Option including a pipeline and booster pump station.

d. Injection Well Facilities including injection wells, back-flush facilities, monitoring wells, and electrical power supply facilities, driveways, motor control and instrumentation buildings for the injection wells and back-flush operations .

[2] Although Tembladero Slough and Lake El Estero source water diversions are included as a component of the Project in this Project approval, the MRWPCA and their partner agency may not include these facilities in the initial phase of the Project, in particular they may not be included in permit applications, loan applications, and/or grant applications. There would be no effect on Project yields due to elimination of the Lake El Estero source water diversion due to the amount and timing of water available from this source. The effect of not implementing the Tembladero Slough diversion would be a reduction in the crop irrigation water yield for the Castroville Seawater Intrusion Project (CSIP) of approximately 500 to 750 acre feet per year (AFY) within some drought years. Based on source water analysis in the EIR, the Project would be expected to achieve a CSIP crop irrigation additional yield of 4,750 to 4,950 AFY and, although less frequently, up to 5,292 AFY in drought years.

e. All necessary infrastructure, construction equipment, construction staging and lay down areas, mitigation, and other activities needed to carry out the Project, with the exception of the Alternative Monterey Pipeline, which would be constructed by CalAm and is not within the control of the MRWPCA.

Exhibit A.
Summary of Impacts and Mitigation Measures for the Staff-Recommended Alternative DRAFT

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
KEY TO ACRONYMS: NI – No Impact; LS – Less than Significant; LSM – Less than Significant with Mitigation; SU – Significant and Unavoidable; BI- Beneficial Impact												
Aesthetics (AE)												
AE-1: Construction Impacts on Scenic Views, Scenic Resources and Visual Quality of the Surrounding Areas. Project construction would not result in substantial effects on scenic views, scenic resources or the visual character of the areas surrounding Project facilities.	LS	NI	LS	LS	NI	LS	NI	LS	LS	LS	**LS**	None required.
AE-2: Construction Impacts due to Temporary Light and Glare. Project construction could result in substantial, temporary sources of light or glare.	LS	NI	NI	NI	LS	LS	LS	NI	LSM	LSM	**LSM**	**Mitigation Measure AE-2**: Minimize Construction Nighttime Lighting. (Applies to the Injection Well Facilities Site and CalAm Distribution System: Alternative Monterey Pipeline). 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.
AE-3: Degradation of Visual Quality of Sites and Surrounding Areas. Project components would not result in a substantial degradation of the visual character of the project area and its surroundings.	LS	LS	LS	LS	LS	LS	LS	LS	LS	NI	**LS**	The following mitigation measure will be adopted by the MRWPCA due to City of Seaside comments on the Draft EIR and Notice of Preparation: **Mitigation Measure AE-3: Provide Aesthetic Screening for New Above-Ground Structures.** (Applies to the following project components: Product Water Conveyance: RUWAP Booster Pump Station and Injection Well Facilities). 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.
AE-4: Impacts due to Permanent Light and Glare during Operations. Operation of Project facilities may result in a substantial new source of light or glare that would adversely affect day or nighttime views in the area.	NI	NI	NI	NI	NI	NI	LS	LSM	LSM	NI	**LSM**	**Mitigation Measure AE-4**: Exterior Lighting Minimization. (Applies to the following project components: Product Water Conveyance: RUWAP Booster Pump Station and Injection Well Facilities) To prevent exterior lighting from affecting nighttime views, the design and operation of lighting at the Product Water Conveyance RUWAP 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.
Air Quality and Greenhouse Gas (AQ)												
AQ-1: Construction Criteria Pollutant Emissions. Construction of the Project would result in emissions of criteria pollutants, specifically PM_{10}, that may conflict with or obstruct implementation of the applicable air quality plan and may violate an air quality standard or contribute substantially to an existing or projected air quality violation in a region that is non-attainment under State ambient air quality standards.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LSM**[1]	**Mitigation Measure AQ-1**: Construction Fugitive Dust Control Plan. (Applies to all Project Component Sites where ground disturbance would occur.) 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 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

[1] Under Impact AQ-1, the implementation of each component when looked at individually would not a have a significant impact; it is only when all components are implemented together (with overlapping construction schedules) that a significant impact would occur triggering Mitigation Measures to reduce the impact to less than significant (LS).

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites						Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
	Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero						
KEY TO ACRONYMS: NI – No Impact; LS – Less than Significant; LSM – Less than Significant with Mitigation; SU – Significant and Unavoidable; BI- Beneficial Impact												
												and take corrective action within 48 hours. The phone number of the MBUAPCD shall also be visible to ensure compliance with MBUAPCD rules.
AQ-2: Construction Exposure of Sensitive Receptors to Pollutant Emissions. Construction of the Project would not expose sensitive receptors to substantial pollutant concentrations.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-3: Construction Odors. Construction of the Project would not create objectionable odors affecting a substantial number of people.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-4C: Construction Greenhouse Gas Emissions. Construction of the Project would generate greenhouse gas emissions, either directly or indirectly, but would not make a considerable contribution to significant cumulative impacts due to greenhouse gas emissions and the related global climate change impacts.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-5: Operational Air Quality Violation. Operation of the Project would result in criteria pollutant emissions, but would not violate air quality standards or contribute substantially to an existing or projected air quality violation.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-6: Operational Criteria Pollutant Emissions. Operation of the Project would result in a net increase of criteria pollutants in a region that is non-attainment under State ambient air quality standards, but the increase would not be cumulatively considerable.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-7: Operational Exposure of Sensitive Receptors to Pollutants. Operation of the Project would not expose sensitive receptors to substantial pollutant concentrations.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-8: Operational Odors. Operation of the Project would not create objectionable odors affecting a substantial number of people.	LS	LS	LS	LS	LS	NI	LS	NI	NI	NI	**LS**	None required.
AQ-9C: Operational Greenhouse Gas Emissions. Operation of the Project would generate greenhouse gas emissions, either directly or indirectly. These emissions would not exceed significance thresholds such that they would result in a considerable contribution to significant cumulative impacts of greenhouse gas emissions and the related global climate change impacts. In addition, the Project would not conflict with applicable plan, policy or regulation adopted for the purpose of reducing greenhouse gas emissions.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites						Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
	Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero						
KEY TO ACRONYMS: NI – No Impact; LS – Less than Significant; LSM – Less than Significant with Mitigation; SU – Significant and Unavoidable; BI- Beneficial Impact												
Biological Resources: Fisheries (BF)												
BF-1: Habitat Modification Due to Construction of Diversion Facilities. Construction of the proposed Reclamation Ditch and Tembladero Slough diversions could indirectly result in habitat modifications for endangered or threatened fish species as a result of construction activities and dewatering the construction sites.	NI	NI	LSM	LSM	LS	NI	NI	NI	NI	NI	**LSM**	**Mitigation Measure BT-1a** (see text after this table under Mitigation Measures for Impact BT-1: Construction Impacts to Special-Status Species and Habitat) **Mitigation Measure BF-1a**: Construction during Low Flow Season. (Applies to Blanco Drain[2], Reclamation Ditch and Tembladero Slough Diversions) 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. **Mitigation Measure BF-1b:** Relocation of Aquatic Species during Construction. (Applies to Reclamation Ditch and Tembladero Slough Diversions). 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. **Mitigation Measure BF-1c:** Tidewater Goby and Steelhead Impact Avoidance and Minimization. (Applies to Reclamation Ditch and Tembladero Slough Diversions) 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. • 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.
BF-2: Interference with Fish Migration. Operation of the Project would result in changes in stream flows that may interfere with fish migration in the Salinas River and Reclamation Ditch.	LS	LS	LSM	LS	LS	NI	NI	NI	NI	NI	**LSM**	**Mitigation Measure BF-2a:** Maintain Migration Flows. (Applies to the Reclamation Ditch Diversion) 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

[2] Although Impact BF-1 was found to be less than significant due to the construction of the Blanco Drain Source Water Diversion, this mitigation measure will be implemented for construction of the pipeline under Salinas River under the Blanco Drain component of the Project based on comments from the State Lands Commission (see comment and response to comment D-3 in Chapter 4 of the Final EIR document).

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Source Water Diversion and Storage Sites: Salinas Treatment Facility Storage and Recovery	Source Water Diversion and Storage Sites: Reclamation Ditch	Source Water Diversion and Storage Sites: Tembladero Slough	Source Water Diversion and Storage Sites: Blanco Drain (Pump Station and Pipeline)	Source Water Diversion and Storage Sites: Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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												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.* *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. (Applies to the Reclamation Ditch Diversion) 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.
BF-3: Reduction in Fish Habitat or Fish Populations Due to Project Operations. Operation of the Project diversions would not reduce the habitat of a fish species or substantially affect fish populations.	LS	LS	LS	LS	LS	NI	NI	NI	NI	NI	**LS**	None required.
Biological Resources: Terrestrial (BT)												
BT-1: Construction Impacts to Special-Status Species and Habitat. Project construction may adversely affect, either directly or through habitat modification, special-status plant and wildlife species and their habitat within the Project Study Area.	LSM	LSM	LSM	LSM	LSM	LSM	NI	LSM	LSM	LSM	**LSM**	See complete text of Mitigation Measures BT-1a through BT-1q and their applicability to each component in the text following this table.
BT-2: Construction Impacts to Sensitive Habitats. Project construction may adversely affect sensitive habitats (including riparian, wetlands, and/or other sensitive natural communities) within the Project Study Area.	NI	NI	LSM	LSM	LSM	NI	NI	LS	LS	LS	**LSM**	**Mitigation Measure BT-1a** (see text after this table under Mitigation Measures for Impact BT-1: Construction Impacts to Special-Status Species and Habitat) **Mitigation Measure BT-2a**: Avoidance and Minimization of Impacts to Riparian Habitat and Wetland Habitats. (Applies to Reclamation Ditch, Tembladero Slough Diversion, Blanco Drain Diversion) 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. **Mitigation Measure BT-2b:** Not required for Project Staff-Recommended Alternative (selection of RUWAP Alignment Option and Alternative Monterey Pipeline) **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

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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												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.
BT-3: Construction Impacts to Movement of Native Wildlife and Native Wildlife Nursery Sites. Project construction would not adversely affect native wildlife corridors and wildlife nursery sites.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
BT-4: Construction Conflicts with Local Policies, Ordinances, or Approved Habitat Conservation Plan. Project construction would potentially conflict with local policies or ordinances protecting biological resources. A conflict may occur if the HMP plant species within the Project component sites on the former Fort Ord that do not require a take authorization from the Service or CDFW are impacted, and seed salvage is not conducted. There are no approved HCPs applicable to the Project.	LS	LS	LS	LS	LS	LS	LS	LSM	LSM	LS	**LSM**	**Mitigation Measure BT-4**. HMP Plant Species Salvage. (Applies to Product Water Conveyance: RUWAP Alignment, and Injection Well Facilities site within the former Fort Ord only) 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.
BT-5: Operational Impacts to Special-Status Species. Project operations would not adversely affect, either directly or through habitat modification, special-status plant and wildlife species and their habitat.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
BT-6: Operational Impacts to Sensitive Habitats. Project operations may adversely affect sensitive habitats (including riparian, wetlands, and/or other sensitive natural communities) within and adjacent to the Project Study Area.	LS	LS	LS	LS	LS	LS	NI	LS	LS	LS	**LS**	None required.
BT-7: Operational Impacts to Movement of Native Wildlife and to Native Wildlife Nursery Sites. Project operations would not adversely affect native wildlife corridors and wildlife nursery sites.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
BT-8: Operational Conflicts with Local Policies, Ordinances, or approved Habitat Conservation Plan. Project operations would not conflict with local policies or ordinances protecting biological resources.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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Cultural and Paleontological Resources (CR)												
CR-1: Construction Impacts on Historic Resources. Project construction may result in a substantial adverse change in the significance of a known historic resource as defined in 15064.5 of the CEQA Guidelines or historic properties pursuant to 36 CFR 800.5.	NI	NI	NI	NI	NI	NI	NI	NI	NI	LSM	**LSM**	**Mitigation Measure CR-1**: 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)[3] 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 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.
CR-2: Construction Impacts on Archaeological Resources or Human Remains. Project construction may result in a substantial adverse change in the significance of one known archaeological resource and to unknown archaeological resources during construction and/or encounter unknown human remains.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	**Mitigation Measure CR-2a**: Archaeological Monitoring Plan. (Applies to the segment of the CalAm Distribution Pipeline through the Presidio of Monterey and along W. Franklin Street and to the Lake El Estero Diversion Site) 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.[4] 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 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.

[3] Note: The Staff-Recommendation Alternative of the GWR Project required that this mitigation measure be modified compared to the version in the Final EIR. Specifically, the text highlighted in gray has been added and the following text deleted: "W. Franklin Street in downtown Monterey." This change to the mitigation measure does not constitute significant new information.

[4] Note: The Staff-Recommendation Alternative of the GWR Project requires that this mitigation measure be modified compared to the version in the Final EIR. Specifically, the text highlighted in gray has been added and the following text deleted: "in downtown Monterey on W. Franklin Street between High and Figueroa Streets, and at potentially sensitive archaeological sites at Lake El Estero."

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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												Mitigation Measure CR-2b: Discovery of Archaeological Resources or Human Remains. (Applies to all Project components) 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. **Mitigation Measure CR-2c**: Native American Notification. (Applies to all Project components) 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.
CR-3: Construction Impacts on Unknown Paleontological Resources. Project construction would not result in damage to or destruction of unknown paleontological resources.	LS	LS	NI	NI	NI	NI	LS	NI	NI	LS	**LS**	None required.
Energy and Mineral Resources (EN)												
EN-1: Construction Impacts due to Temporary Energy Use. Project construction could result in wasteful or inefficient use of energy if construction equipment is not maintained or if haul trips are not planned efficiently. The Project would not conflict with existing energy standards.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	**Mitigation Measure EN-1**: Construction Equipment Efficiency Plan. (Applies to all Project components) 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.
EN-2: Operational Impacts due to Energy Use. Project operations would not result in the consumption of energy such that existing supplies would be substantially constrained nor would the Project result in the unnecessary, wasteful, or inefficient use of energy resources.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
EN-3: Operational Impacts on Mineral Resources. The Project would not result in a significant impact due to the loss of availability of known mineral resources of value to the region or to the state or to any locally-important mineral recovery site.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Geology, Soils, and Seismicity (GS)												
GS-1: Construction-Related Erosion or Loss of Topsoil. Construction of the Project would not result in substantial soil erosion or the loss of topsoil.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
GS-2: Construction-Related Soil Collapse and Soil Constraints during Pipeline Trenching. Construction of some Project pipeline components would be located on geologic units or soils that are unstable, or that may become unstable during project construction, and potentially result in soil instability or collapse; however, this exposure would not result in a substantial risk to people or structures.	LS	LS	NI	NI	LS	LS	NI	LS	LS	LS	**LS**	None required.
GS-3: Exposure to Fault Rupture. The Project would be located in a seismically active area, and portions of the Project may be affected by fault rupture from an earthquake on local faults; however, this exposure would not result in a substantial risk to people or structures.	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	**LS**	None required.
GS-4: Exposure to Seismic Ground Shaking and Liquefaction. The Project would be located in a seismically active area; however, Project operations would not expose people or structures to a substantial	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

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risk of loss, injury, or death involving exposure to seismic groundshaking and liquefaction.												
GS-5: Exposure to Coastal Erosion and Sea Level Rise. The Proposed CalAm Distribution System Monterey Pipeline would be exposed to substantial soil erosion as a result of sea level rise.	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	**NI**	None required. This impact would only be significant for the proposed Monterey Pipeline. Because the staff-recommended alternative includes the Alternative Monterey Pipeline and not the proposed Monterey Pipeline, this impact would not occur and no mitigation is required.
GS-6: Hydro-Collapse of Soils from Well Injection. Project operation would not create a substantial risk to life or property due to its facilities being located on a geologic unit or soils that are unstable, or that would become unstable as a result of hydro-collapse.	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	**LS**	None required.
GS-7: Exposure to Expansive and Corrosive Soils. The Project would not result in substantial risks to the public or other facilities due to location on expansive or corrosive soil types.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Hazards and Hazardous Materials (HH)												
HH-1: Use and Disposal of Hazardous Materials During Construction. Project construction would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HH-2: Accidental Release of Hazardous Materials During Construction. Project construction would potentially cause upset and accident conditions involving the release of hazardous materials into the environment.	LS	LS	LS	LS	LS	LSM	LS	LSM	LSM	LSM	**LSM**	**Mitigation Measure HH-2a**: Environmental Site Assessment. (Applies to the Lake El Estero Diversion, Product Water Conveyance: RUWAP Alignment, Injection Well Facilities and the CalAm Distribution System) 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. **Mitigation Measure HH-2b**: Health and Safety Plan. (Applies to the Lake El Estero Diversion, Product Water Conveyance RUWAP Alignment, the Injection Well Facilities, and the CalAm Distribution System) 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. **Mitigation Measure HH-2c**: Materials and Dewatering Disposal Plan. (Applies to the Lake El Estero Diversion, Product Water Conveyance System Options, the Injection Well Facilities, and the CalAm Distribution System) 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

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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												appropriate offsite disposal or discharge (see Section 4.11, Hydrology and Water Quality: Surface Water, for more information regarding this NPDES permit). 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.
HH-3: Construction of Facilities on Known Hazardous Materials Site. Project construction would occur on a known hazardous materials site pursuant to Government Code Section 65962.5; however, the Project would not result in a significant hazard to people or the environment.	NI	NI	NI	NI	NI	NI	NI	LS	LS	LS	**LS**	None required.
HH-4: Use of Hazardous Materials During Construction Within 0.25-Miles of Schools. Project construction would not result in nor create a significant hazard to the public or the environment due to handling of hazardous materials or hazardous emissions within 0.25 mile of a school during construction.	NI	NI	NI	NI	NI	NI	LS	LS	LS	NI	**LS**	None required.
HH-5: Wildland Fire Hazard during Construction. Project construction would not increase the risk of wildland fires in high fire hazard areas.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HH-6: Use and Disposal of Hazardous Materials During Operation. Project operations would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HH-7: Operation of Facilities on Known Hazardous Materials Site. Project facilities would be located on a known hazardous materials site; however, the Project would not result in a significant hazard to people or the environment.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Hydrology and Water Quality: Groundwater (GW)												
GW-1: Construction Groundwater Depletion, Levels, and Recharge. Construction of the Project components would not deplete groundwater supplies nor interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of local groundwater levels.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
GW-2: Construction Groundwater Quality. Project construction would not violate any water quality standards or otherwise degrade water quality.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
GW-3: Operational Groundwater Depletion and Levels: Salinas Valley Groundwater Basin. Operation of the Project would not deplete groundwater supplies in the Salinas Valley nor interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater levels in the Salinas Valley Groundwater Basin.	LS	LS	LS	LS	NI	NI	BI	NI	NI	NI	**BI**	None required.
GW-4: Operational Groundwater Depletion and Levels: Seaside Basin. Operation of the Project would not deplete groundwater supplies in the Seaside Basin nor interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater levels in the Seaside Basin.	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	**LS**	None required.

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GW-5: Operational Groundwater Quality: Salinas Valley. Operation of the Project would not degrade groundwater quality in the Salinas Valley.	BI	BI	LS	LS	LS	NI	BI	NI	NI	NI	**BI**	None required.
GW-6: Operational Groundwater Quality: Seaside Basin. Project operations would not degrade groundwater quality in the Seaside Basin, including due to injection of purified recycled water into the basin.	NI	NI	NI	NI	NI	NI	BI/ LS[4]	NI	BI/ LS[4]	NI	**BI/ LS[5]**	None required.
Hydrology and Water Quality: Surface Water (HS)												
HS-1: Construction Impacts to Surface Water Quality due to Discharges. Project construction involving well drilling and development, and dewatering of shallow groundwater during excavation would generate water requiring disposal. Compliance with existing regulatory requirements would ensure that water disposal during construction would not violate any water quality standards or waste discharge requirements, would not cause substantial erosion or siltation, and would not otherwise substantially degrade surface water quality.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HS-2: Construction Impacts to Surface Water Quality due to Earthmoving, Drainage Alterations, and Use of Hazardous Chemicals. Project construction would not violate any water quality standards or waste discharge requirements, would not cause substantial erosion or siltation, and would not otherwise substantially degrade surface water quality including marine water quality, due to earthmoving, drainage system alterations, and use of hazardous chemicals.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HS-3: Operational Impacts to Surface Water Quality due to Well Maintenance Discharges. Project operations would not violate any water quality standards or waste discharge requirements, would not cause substantial erosion or siltation, and would not otherwise substantially degrade surface water quality due to well maintenance discharges.	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	**LS**	None required.
HS-4: Operational Surface Water Quality Impacts due to Source Water Diversions. Project diversions would result in water quality benefits due to diversion and treatment of polluted waters; however, rapid water fluctuation from diversions at the Reclamation Ditch could induce erosion and sedimentation in downstream waters.	LS	LS	LSM	LS	LS	LS	NI	NI	NI	NI	**LSM**	**Mitigation Measure HS-4**: Management of Surface Water Diversion Operations (Applies to Reclamation Ditch Diversion, only) 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 are noted, the diversion structure shall be redesigned and the project proponents shall modify it in accordance with the new design.

[5] For concentrations of total dissolved solids and chloride, the impact would be beneficial; for all other water quality parameters, the impact would be less than significant.

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HS-5: Operational Marine Water Quality due to Ocean Discharges. Project operational discharges of reverse osmosis concentrate to the ocean through the MRWPCA outfall would not violate water quality standards or waste discharge requirements, or otherwise substantially degrade water quality.	BI	BI	BI	BI	BI	BI	LS	NI	NI	NI	**LS**	None required.
HS-6: Operational Drainage Pattern Alterations. The Project would alter existing drainage patterns of the component sites by increasing impervious surfaces, but would not substantially increase the rate or amount of runoff such that it would: (1) cause erosion or siltation on- or off-site, (2) cause flooding on- or offsite, or (3) exceed the existing storm drainage system capacity.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HS-7: Operational Carmel River Flows. Project operations would result in reduced pumping of the Carmel River alluvial aquifer resulting in increased flows in Carmel River that would benefit habitat for aquatic and terrestrial species.	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	**BI**	None required.
HS-8: Operational Risks due to Location within 100-Year Flood Area. Portions of the Project would be located within a 100-year flood hazard area but would not impede or redirect flood flows.	LS	LS	LS	LS	LS	LS	NI	LS	LS	NI	**LS**	None required.
HS-9: Operational Risks due to Flooding due to Levee/Dam Failure, or Coastal Inundation. During operations, some Project facilities may be exposed to flooding due to failure of a levee or dam, sea level rise, and storm surges/tides related to climate change, but this exposure would not pose a substantial nor significant risk of loss, injury, or death.	LS	LS	NI	LS	LS	LS	NI	NI	NI	LS	**LS**	None required.
HS-10: Operational Seiche, Tsunami, or Mudflow Risk. The Project operations would not expose people or structures to substantial risk from flooding due to a seiche, tsunami, or mudflow.	NI	NI	NI	LS	LS	LS	NI	NI	NI	LS	**LS**	None required.
Land Use, Agriculture, and Forest Resources (LU)												
LU-1: Temporary Farmland Conversion during Construction. The Project would result in a temporary disruption to agricultural production on designated prime, unique and statewide important farmlands during construction, but would not directly or indirectly convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to a non-agricultural use.	NI	LSM	NI	NI	LSM	NI	NI	LS	NI	NI	**LSM**	**Mitigation Measure LU-1**: Minimize Disturbance to Farmland. (Applies to the Salinas Treatment Facility and a portion of the Blanco Drain Diversion) 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.
LU-2: Operational Consistency with Plans, Policies, and Regulations. The Project would have one or more components that would potentially conflict, or be inconsistent with, applicable land use plans, policies, and regulations without implementation of mitigation measures identified in this EIR.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	See other applicable mitigation measures in this table by component. See also, Table 4.12-4 of the Draft EIR for a complete list of mitigation measures by policy and topic.
LU-3: Operational Indirect Farmland Conversion. The Project would not change the existing environment such that Prime Farmland, Unique Farmland, or Farmland of Statewide Importance is converted to non-	LS	LS	LS	LS	LS	LS	LS	NI	NI	NI	**LS**	None required.

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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agricultural use.												
Marine Biological Resources (MR)												
MR-1: Operational Impacts on Marine Biological Resources. Operation of the Project would not result in substantial adverse effects on candidate, sensitive, or special-status species and would not interfere substantially with the movement of any native resident or migratory fish or wildlife species.	BI	BI	BI	BI	BI	BI	LS	NI	NI	NI	**LS**	None required.
Noise and Vibration (NV)												
NV-1: Construction Noise. Construction activity would result in a temporary increase in ambient noise levels in the vicinity of all Project sites during construction that would not be substantial at most construction sites, except at the Injection Well Facilities and CalAm Distribution System: Improvements: Alternative Monterey Pipeline sites.	LS	LS	LS	LS	LS	LS	LS	LS	LSM	SU	**SU**	**Mitigation Measure NV-1a**: Drilling Contractor Noise Measures. (Applies to Injection Well Facilities) 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 at 50 feet. This would reduce the nighttime noise level to less than 60 dBA Leq 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. **Mitigation Measure NV-1b**: Monterey Pipeline Noise Control Plan for Nighttime Pipeline Construction. (Applies to CalAm Distribution System: Alternative Monterey Pipeline) 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. **Mitigation Measure NV-1c**: Neighborhood Notice. (Applies to Injection Well Facilities and CalAm Distribution System: Alternative Monterey Pipeline) 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. **Mitigation Measure NV-1d:** RUWAP Pipeline Construction Noise. (Applies to the RUWAP Alignment Option of the Product Water Conveyance) The following measures will be implemented by the project proponents in response to comments from the Marina Coast Water District if the RUWAP alignment option of the Product Water Conveyance Pipeline is selected for implementation. • 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.

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites						Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
	Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero						
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NV-2: Construction Noise That Exceeds or Violate Local Standards. Construction activity would result in a temporary increase that at some locations could generate noise levels in excess of standards established in the local general plans and/or could violate local regulations.	NI	NI	LSM	SU	LSM	NI	NI	LSM	NI	NI	**SU**	**Mitigation Measure NV-2a**: Construction Equipment. (Applies to Source Water Diversion and Storage Sites – Reclamation Ditch, Tembladero Slough and Blanco Drain, Product Water Conveyance Pipeline segments within the City of Marina and RUWAP Booster Station) 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, **Mitigation Measure NV-2b:** Construction Hours. (Applies to Product Water Conveyance Pipelines and Booster Pump Station in the City of Marina). 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.
NV-3: Construction Vibration. Construction of the Project would not expose sensitive receptors to excessive groundborne vibration.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
NV-4: Operational Noise. Operation of the Project facilities would potentially increase existing noise levels, but would not exceed noise level standards and/or result in nuisance impacts at sensitive receptors.	NI	LS	LS	LS	LS	LS	LS	LS	LS	NI	**LS**	None required.
Population and Housing (PH)												
PH-1: Construction-Related Growth Inducement. Project construction would result in temporary increases in construction employment, but would not induce substantial population growth.	-	-	-	-	-	-	-	-	-	-	**LS**	None required.
PH-2: Operations and Infrastructure-Related Growth Inducement. Operation of the Project would not directly result in population growth, and would not indirectly result in inducement of substantial population growth.	-	-	-	-	-	-	-	-	-	-	**LS**	None required.
Public Services, Utilities, and Recreation (PS)												
PS-1: Construction Public Services Demand. Construction of the Project would not result in public service demands for fire and police protection services, schools, or parks that would result in the need for new or physically altered facilities to maintain service capacity or performance objectives.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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PS-2: Construction Landfill Capacity. Construction of the Project would result in generation of solid waste; however, the solid waste would be disposed at a landfill with sufficient permitted daily and overall capacity to accommodate the project's solid waste disposal needs.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
PS-3: Construction Solid Waste Policies and Regulations. Construction of the Project would potentially conflict with state and local statutes, policies and regulations related to solid waste.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	**Mitigation Measure PS-3**: Construction Waste Reduction and Recycling Plan (relevant to all Project components). 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, MRWPCA and CalAm shall collect the receipts from the contractor(s) to document that the waste reduction, recycling, and diversion goals have been met.
PS-4: Public Services Demand During Operation. Operation of the Project would not result in public service demands for fire and police protection services, schools, or parks that would result in the need for new or physically altered facilities to maintain service capacity or performance objectives.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
PS-5: Landfill Capacity for Operations. Operation of the Project would not result in adverse effects on landfill capacity or be out of compliance with federal, state, and local statutes and regulations related to solid waste.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Traffic and Transportation (TR)												
TR-1: Construction Traffic. Project construction would result in a temporary increase in traffic volumes on regional and local roadways due to construction-related vehicle trips, which would not result in conflicts with any applicable plan, ordinance, or policy establishing measures of effectiveness for performance of the circulation system.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
TR-2: Construction-Related Traffic Delays, Safety and Access Limitations. Construction activities could result in temporary traffic delays, safety hazards, and/or disruption of access.	LS	LS	LS	LS	LS	NI	LS	LSM	NI	LSM	**LSM**	**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 (Alternative 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

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
KEY TO ACRONYMS: *NI – No Impact; LS – Less than Significant; LSM – Less than Significant with Mitigation; SU – Significant and Unavoidable; BI- Beneficial Impact*												
												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 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.
TR-3: Construction-Related Roadway Deterioration. Construction truck trips could result in increased wear-and-tear on the designated haul routes, which could result in temporary impacts to performance of the regional circulation system.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	**Mitigation Measure TR-3**: Roadway Rehabilitation Program (applies to all Project components) Prior to commencing project construction, MRWPCA (for all components other than the CalAm Distribution System Improvements) and CalAm (for CalAm Distribution System Improvements: Alternative Monterey Pipeline) 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.
TR-4: Construction Parking Interference. Construction activities may temporarily affect parking availability.	NI	NI	NI	NI	NI	LSM	NI	LSM	NI	LSM	**LSM**	**Mitigation Measure TR-4**: Construction Parking Requirements.(Applies to Product Water Conveyance: RUWAP Alignment in Marina and Seaside, and CalAm Distribution System: Alternative Monterey Pipeline). 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.
TR-5: Operational Traffic. Operation and maintenance of the Project would result in small traffic increases on regional and local roadways, but would not substantially affect the performance of the regional circulation system.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Water Supply and Wastewater Systems (WW)												
WW-1: Construction-Related Water Demand. The Project would result in a temporary increase in water use due to construction-related demands, but existing water supplies would be sufficient to serve construction-related demands and construction activities would not require new or expanded water supply resources or entitlements.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites						Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
	Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero						
KEY TO ACRONYMS: NI – No Impact; LS – Less than Significant; LSM – Less than Significant with Mitigation; SU – Significant and Unavoidable; BI- Beneficial Impact												
WW-2: Construction-Related Wastewater Generation. The Project would result in a temporary increase in wastewater generation due to demand from construction workers, but existing wastewater treatment facilities have sufficient capacity to serve construction-related demands.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
WW-3: Operational Water Supply and Entitlements. Sufficient water supplies are available for operation of the Project; prior to construction of each source water diversion component and prior to diversion of secondary treated effluent, the project proponents would obtain applicable water rights, permits, or agreements.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
WW-4: Operational Wastewater Treatment Capacity. Operation of the Project would not result in a determination by the wastewater treatment provider that would serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments.	LS	LS	LS	LS	LS	LS	LS	LS	LS	NI	**LS**	None required.

Mitigation Measures for Impact BT-1: Construction Impacts to Special-Status Species and Habitat

Mitigation Measure BT-1a: Implement Construction Best Management Practices. (Applies to All Project Components) 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 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.

Mitigation Measure BT-1b: Implement Construction-Phase Monitoring. (Applies to Salinas Pump Station, Salinas Treatment Facility, Blanco Drain Diversion, Project Water Conveyance: RUWAP Alignment Option, Injection Well Facilities) 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.

Mitigation Measure BT-1c: Implement Non-Native, Invasive Species Controls. (Applies to All Project Components, except Alternative Monterey Pipeline) 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.

Mitigation Measure BT-1d: Conduct Pre-Construction Surveys for California Legless Lizard. (Applies to the Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, and Injection Well Facilities) 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 pre-construction 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.

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. (Applies to Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, and Injection Well Facilities; does not apply to HMP species within the former Fort Ord) 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.

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. (Applies to non-HMP species at 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 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.

Mitigation Measure BT-1g: Conduct Pre-Construction Surveys for Special-Status Bats. (Applies to Salinas Pump Station, Salinas Treatment Facility, Blanco Drain Diversion, Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, and Injection Well Facilities) 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.

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. (Applies to Blanco Drain Diversion, Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, Injection Well Facilities) 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.

Mitigation Measure BT-1i: Conduct Pre-Construction Surveys for Monterey Dusky-Footed Woodrat. (Applies to Blanco Drain Diversion, Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, and Injection Well Facilities) 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.

Mitigation Measure BT-1j: Conduct Pre-Construction Surveys for American Badger. (Applies to Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station) 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 re-using 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.

Mitigation Measure BT-1k: Conduct Pre-Construction Surveys for Protected Avian Species, including, but not limited to, white-tailed kite and California horned lark. (Applies to All Components, except Alternative Monterey Pipeline) 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 pre-construction 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.

Mitigation Measure BT-1l: Conduct Pre-Construction Surveys for Burrowing Owl. (Applies to Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station) 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 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.

Mitigation Measure BT-1m: Minimize Effects of Nighttime Construction Lighting. (Applies to Injection Well Facilities and CalAm Distribution System: Alternative Monterey Pipeline) Nighttime construction lighting shall be focused and downward directed to preclude night illumination of the adjacent open space area.

*Because **Mitigation Measure BT-1n** (Mitigate Impacts to Smith's Blue Butterfly) was only applicable to the Product Water Conveyance: Coastal Alignment Option and the proposed CalAm Distribution System: Monterey Pipeline, and not the Alternative Monterey Pipeline; therefore, it is not required for the staff-recommended alternative.*

*Because **Mitigation Measure BT-1o** (Avoid and Minimize Impacts to Monarch Butterfly) was only applicable to the proposed CalAm Distribution System: Monterey Pipeline, and not the Alternative Monterey Pipeline; therefore, it is not required for the staff-recommended alternative.*

Mitigation Measure BT-1p: Avoid and Minimize Impacts to Western Pond Turtle. (Applies to Blanco Drain Diversion) 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.

Mitigation Measure BT-1q: Avoid and Minimize Impacts to California Red-Legged Frog. (Applies to Salinas Treatment Facility and Blanco Drain Diversion) 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 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 on-site 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.
- 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.

Exhibit A (continued)

Summary of Cumulative Impacts and Mitigation Measures – Staff-Recommended Alternative

#	Topical Section/ Cumulative Impact Issue		Determination of Significance and Discussion of Contribution of the Project to Cumulative Impacts (if applicable)	Mitigation Measures
4.2	Aesthetics		LS: There would be no significant cumulative construction or operational aesthetic impacts.	
4.3	Air Quality and Greenhouse Gas	Construction Greenhouse Gas Emissions	LS: The Project construction would not make a considerable contribution to significant cumulative impacts due to greenhouse gas emissions and the related global climate change impacts.	
		Overall Greenhouse Gas Emissions	LS: The Project would not make a considerable contribution to significant cumulative impacts of greenhouse gas emissions and the related global climate change impacts	
		Air Quality: Overall PM10	**LSM:** The Project would potentially make a considerable contribution to significant cumulative of regional emissions of PM_{10}; however, with implementation of Mitigation Measure AQ-1, the impact would be reduced to less than significant and the Project would not make a considerable contribution to a significant cumulative impact.	AQ-1 (see table above)
4.4	Biological Resources: Fisheries		LS: There would be no significant construction or operational cumulative impacts to biological resources: fisheries.	
4.5	Biological Resources: Terrestrial		LS: The Project would not make a considerable contribution to significant cumulative impacts to biological resources: terrestrial.	
4.6	Cultural and Paleontological Resources		LS: There would be no significant construction or operational cumulative impacts to cultural and paleontological resources.	
4.7	Energy and Mineral Resources	Energy	LS: The Project would not make a cumulatively considerable contribution to a significant cumulative energy impact.	
		Minerals	LS: There would be no significant construction or operational cumulative impacts to mineral resources.	
4.8	Geology, Soils, and Seismicity		LS: There would be no significant construction or operational cumulative geology, seismicity or soils impacts.	
4.9	Hazards and Hazardous Materials		LS: There would be no significant construction or operational cumulative impacts related to hazards or hazardous materials.	
4.10	Hydrology/Water Quality: Groundwater		LS: The Project would not contribute to significant cumulative impacts to groundwater levels, recharge, storage or quality in the Salinas Valley Groundwater Basin. There would be no significant construction or operational impact to groundwater levels, recharge or storage in the Seaside Groundwater Basin. The Project would not make a considerable contribution to cumulative impacts to groundwater quality in the Seaside Basin.	
4.11	Hydrology/Water Quality: Surface Water	Inland Surface Waters	LS: There would be no significant construction or operational cumulative impacts to hydrology and water quality of inland surface waters.	
		Marine Surface Waters	**LSM:** The Project would potentially make a considerable contribution to significant cumulative impacts to marine water quality due to the potential exceedance of the California Ocean Plan water quality objectives for several constituents; however, with implementation of Mitigation Measure HS-C, the impact would be reduced to less than significant and the Project would not make a considerable contribution to a significant cumulative impact.	HS-C (see full text following this table)
4.12	Land Use, Agriculture, and Forest Resources		LS: There would be no significant construction or operational cumulative land use impacts, and the Project would not make a considerable contribution to significant cumulative impacts related to conversion of agricultural lands within unincorporated Monterey County.	
4.13	Marine Biological Resources		LSM: The Project would potentially result in a considerable contribution to significant cumulative impacts on	MR-C

Exhibit A (continued)

Summary of Cumulative Impacts and Mitigation Measures – Staff-Recommended Alternative

#	Topical Section/ Cumulative Impact Issue		Determination of Significance and Discussion of Contribution of the Project to Cumulative Impacts (if applicable)	Mitigation Measures
			marine biological resources due to the potential exceedance of the Ocean Plan water quality objectives for several constituents; however, with implementation of Mitigation Measure MR-C, the impact would be reduced to less than significant and the Project would not make a considerable contribution to a significant cumulative impact.	(Implement HS-C, see full text following this table)
4.14	Noise and Vibration		LS: There would be no significant construction or operational cumulative noise and vibration impacts.	
4.15	Population and Housing		LS: The Project would not make a considerable contribution to significant cumulative impacts related to population and housing.	
4.16	Public Services, Recreation, and Utilities		LS: The Project would not contribute to cumulative impacts related to schools, parks, and recreational facilities. The Project would not make a considerable contribution to significant cumulative impacts to other public services and utilities (fire and police protection, solid waste).	
4.17	Traffic and Transportation		LS: There would be no significant cumulative construction-related traffic and transportation impacts. The Project would not make a considerable contribution to significant cumulative traffic and transportation impacts due to cumulative development.	
4.18	Water Supply and Wastewater Systems	Water Supply	LS: The Project would not make a considerable contribution to significant cumulative impacts to water supply.	
		Wastewater	LS: There would be no significant cumulative impacts on wastewater treatment capacity or ocean outfall disposal capacity.	

Exhibit A (continued)

Mitigation Measure HS-C/MR-C: Implement Measures to Avoid Exceedances over Water Quality Objectives at the Edge of the Zone of Initial Dilution

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:

a. **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.

b. **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.

c. **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 (see MPWSP DEIR Chapter 3, Project Description) 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.

d. **Biologically Active Filtration at the Regional Treatment Plant**: As part of the AWT Facilities 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 mgd desalination plant). 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 mgd desalination plant). This optional component of the Project is described in the Draft EIR in **Chapter 2, Project Description** (see **Section 2.8.1.3**), would become a required process if the MPWSP with 6.4 mgd desalination plant is in operation and the other components of the mitigation do not achieve Ocean Plan compliance. The impacts of implementation of this portion of the mitigation measure are discussed in Sections 4.2 through 4.18 as a component of the proposed AWT Facility (within the "Treatment Facilities at the Regional Treatment Plant" component of the Project).

EXHIBIT B

FINAL DRAFT

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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Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[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.	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.

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	• Wheel washers shall be installed and used by truck operators at the exits of the construction sites to the AWT Facility site, the 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	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]
	the species. • 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	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]
	protective fencing remains intact. 3. Protective fencing shall be placed prior to and during construction to keep construction equipment and personnel from impacting 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.	All except Alternative Monterey Pipeline	During project construction	Construction contactors	During project construction	MRWPCA qualified biologist and construction biological monitor

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	4. All non-native, invasive plant species shall be removed from disturbed areas prior to replanting.					
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	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]
	specifications, including, if appropriate, increased planting ratio to ensure the applicable success ratio. Specifically, seed shall be 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 Implemen-tation	Implemen-tation Responsi-bility[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.	Product Water Conveyance: RUWAP Pipeline Alignment	Prior to project construction	Construction contractor, MRWPCA, qualified	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]
	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 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.			biologist		
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	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

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	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. • 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 Implementation	Implementation Responsibility[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	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 Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	vibration to below the 0.12 inches per second (in/sec) peak particle velocity vibration PPV) threshold. If CalAm determines that the pipeline 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.	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]
	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 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	Lake El Estero Diversion, Product Water Conveyance RUWAP Pipeline	Prior to project construction	Construction contactors	During project construction	MRWPCA, CalAm, Monterey County Dept. of Environmental

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	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.	Alignment , the Injection Well Facilities, and the CalAm Distribution System: Alternative Monterey Pipeline				Health
	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	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]
	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). • ***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,	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	See other lines for responsibilities for each	See other rows for specific timing of	See other rows for responsibilities for each mitigation measure

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
Policies, and Regulations			measure	mitigation measure	each mitigation measure	
Cumulative impacts to marine biological resources	**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 (specifically, the MPWSP with 6.4 mgd desalination plant)	Prior to operation of 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)
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

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[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	All components	Prior to, during, and after project construction	MRWPCA and CalAm construction contractors	Upon project completion	MRWPCA and CalAm

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	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, 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	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 Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	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 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

3. Letters and emails received by the MRWPCA Board at the October 8, 2015 hearing

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Founded in 1997
LandWatch
monterey county

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Salinas, CA 93902-1876
831 759-2824
Website: www.landwatch.org
Email: landwatch@mclw.org
Fax: 831 759-2825

October 8, 2015

Gloria De La Rosa, Chair
Monterey Regional Water Pollution Control Agency
5 Harris Court, #D
Monterey, CA 93940

SUBJECT: PURE WATER MONTEREY PROJECT

Dear Chair La Rosa and Members of the Board of Directors:

LandWatch Monterey County urges you to approve the Pure Water Monterey project. LandWatch became an intervenor in the Cal-Am Water Supply Project primarily to support the groundwater replenishment project. We strongly support a variety of water supply sources including the use of reclaimed water.

The Pure Water Monterey project is an innovative project using many unused sources of water including vegetable wash water, storm water runoff and industrial drain water.
The water will be reclaimed to the highest standards and injected into the Seaside aquifer for later use. It will demonstrate to the State Water Resources Control Board that we are making progress towards significant reductions in pumping from the Carmel River.

The Monterey Regional Water Pollution Control Agency and Monterey Peninsula Water Management District are commended for having the foresight and leadership to develop a state-of-the-art water supply project. Once again, we urge your support for this water supply project.

Sincerely,

Amy L. White
Executive Director

THE LEAGUE
OF WOMEN VOTERS
of Monterey County

October 6, 2015

Gloria De La Rosa, Chair
Monterey Regional Water Pollution Control Agency
5 Harris Court, #D
Monterey, CA 93940

SUBJECT: PURE WATER MONTEREY PROJECT

Dear Chair La Rosa and Members of the Board of Directors:

The League of Women Voters of Monterey County urges you to approve the Pure Water Monterey project. The League studied water issues in 1982 and again in 1995. Among many positions based on these studies, we support a variety of water supply sources including the use of reclaimed water. Specifically, we have supported a portfolio approach to meet water supply requirements for the Monterey Peninsula and to address the State Water Resources Control Board's Cease and Desist Order since 2009. The League led efforts to develop the 2009 Hybrid Regional Plan which included the groundwater replenishment project. That plan was supported by the major environmental and land use policy groups in Monterey County and was later updated in 2012.

The Pure Water Monterey project is an innovative project which will utilize many unused sources of water including vegetable wash water, storm water runoff and industrial drain water. The water will be reclaimed to the highest standards and injected into the Seaside aquifer for later use. It will demonstrate to the State Water Resources Control Board that we are making progress towards significant reductions in pumping from the Carmel River.

The Monterey Regional Water Pollution Control Agency and Monterey Peninsula Water Management District are commended for having the foresight and leadership to develop a state-of-the-art water supply project. Once again, we urge your support for this water supply project.

Sincerely,

Janet Brennan

Janet Brennan
President

P.O. BOX 1995, MONTEREY, CALIFORNIA 93942 831•648•VOTE

MARINA COAST WATER DISTRICT

11 RESERVATION ROAD, MARINA, CA 93933-2099
Home Page: www.mcwd.org
TEL: (831) 384-6131 FAX: (831) 883-5995

October 8, 2015

Board of Directors
Monterey Regional Water Pollution Control Agency
5 Harris Court, Building D
Monterey, CA 93940

Re: Pure Water Monterey Groundwater Replenishment Project (SCH No. 2013051094)
Marina Coast Water District's Comments on Final Environmental Impact Report

Dear Board of Directors:

Marina Coast Water District ("MCWD") appreciates this opportunity to comment on the Final Environmental Impact Report ("FEIR") for the Pure Water Monterey Groundwater Replenishment Project ("GWR Project"), dated September 25, 2015. The District is responding as a responsible agency under the California Environmental Quality Act ("CEQA") (Public Resources Code § 21000 et seq.) and the CEQA Guidelines (Cal. Code Regs., titl.14, § 15000 et seq.) as it relates to any discretionary approvals the District may make relating to the Project. In this capacity, MCWD provides the following comments on the FEIR for the proposed GWR Project.

On June 4, 2015, we submitted a comment letter to inform the Monterey Regional Water Pollution Control Agency's ("MRWPCA") that clarifications to the Draft EIR ("DEIR") were required to ensure that it met the minimum standards of adequacy under the CEQA and the CEQA Guidelines. MRWPCA had a duty to provide a good-faith response to those comments in the FEIR. In a final EIR, the lead agency must evaluate and respond to all the environmental comments on the draft EIR it receives within the public review period. (Pub. Resources Code, § 21091, subd. (d)(2)(A); CEQA Guidelines, § 15088, subd. (a). The lead agency must provide draft responses to comments received from public agencies to those agencies at least 10 days before certifying the EIR. (Pub. Resources Code, § 21092.5, subd. (a); CEQA Guidelines, § 15088, subd. (b).) The written responses must describe the disposition of the "significant environmental issues" raised in the comments. (Pub. Resources Code, § 21091, subd. (d)(2)(B); CEQA Guidelines, § 15088, subd. (c).) The lead agency must specifically explain its reasons for rejecting suggestions received in comments and for proceeding with the project despite its environmental impacts. "There must be good faith, reasoned analysis in response. Conclusory statements unsupported by factual information will not suffice." (CEQA Guidelines, § 15088, subd. (c).)

The FEIR provides good faith reasoned responses to most of the MCWD's concerns relating to the GWR Project. While MCWD appreciates the additional information and clarifications provided in the Final EIR, the FEIR includes unsupported and inaccurate conclusions regarding MCWD's senior contractual rights to recycled water and MCWD's Regional Urban

Water Augmentation Project (RUWAP). Based on these statements, the FEIR concludes the GWR Project would not affect the District's ability to implement its RUWAP and supply the planned recycled water to the City of Marina and Ord Community. The FEIR's conclusions in this regard, however, are contingent on the Definitive Agreement that is currently being negotiated. If the Definitive Agreement does not adequately protect MCWD's senior contractual rights to recycled water and MCWD's Regional Urban Water Augmentation Project (RUWAP), the FEIR will need to be revised as explained below. Most, notably, the FEIR's conclusion that the GWR Project would not adversely affect the groundwater in the aquifers near the coast.

MCWD's Senior Contractual Rights to Recycled Water

As explained in our June 4, 2015 comment letter, MCWD supports MRWPCA's proposed use of agricultural wash water, Salinas City storm water, and surface water flows from the Reclamation Ditch, Blanco Drain, Tembladero Slough, and Lake El Estero as source waters for the GWR Project. MCWD also supports the use of "unused secondary treated effluent" as source water so long as MCWD's senior contractual rights to recycled water from MRWPCA are fully protected or a mutually beneficial resolution of those rights is achieved that allows MCWD to meet the present and planned future water supply needs of the City of Marina and Ord Community. The FEIR correctly acknowledges that MRWPCA is contractually obligated to deliver to MCWD for use within the Ord Community 950 AFY of recycled water during the critical irrigation period of April through September and an additional 477 AFY during the other months. Additional clarification are still necessary to ensure MCWD's senior contractual rights are fully protected.

First, FEIR Section 3.10.1, page 3-41, alleges that 650 AFY of the 950 AFY is dependent upon how the Third Amendment to the 1992 MCWRA-MRWPCA Agreement is renegotiated. This is not accurate. The 2009 MOU is a binding contractual obligation of MRWPCA to MCWD. Whatever happens to the Third Amendment, MRWPCA's contractual obligation to MCWD continues to exist.

FEIR Section 3.10.1, page 3-41, incorrectly alleges that the MCWD has not budgeted any part of the RUWAP Recycled Water Project for construction, has not funded any recycled water distribution system improvements, and no user agreements have been signed. In addition, based upon those incorrect allegations, the FEIR takes the position that the RUWAP Recycled Water Project will be treated as only a "reasonably foreseeable future project" for the cumulative impacts analysis.

MCWD includes RUWAP Recycled Water Project elements in its construction budget. For example, MCWD's Ord Community FY 2015-16 budget includes $750,000 for CIP RW-0156, Recycled Water Trunk Main. In addition, all new developments within MCWD's service areas are required to install recycled water distribution facilities and water customers within those developments are required to use recycled water when that water becomes available, whether it is tertiary or advanced treated water. Pursuant to Section 3.4 of that certain Land Transfer and Water Service Agreement between MCWD and the City of Seaside, "Seaside shall install, at Seaside's sole cost, any facilities needed to irrigate the [Bayonet and Black Horse] golf courses with recycled water when recycled water becomes available." Therefore, MCWD is budgeting for the construction of recycled water transmission pipelines, requiring developers to install recycled water distribution systems in new developments, and the City of Seaside's Bayonet and Black Horse golf courses are contractually obligated to use recycled water when it becomes available.

FEIR Section 3.10.1, page 3-42, states that the advanced treated water's reverse osmosis process results in 19% of the recycled water being lost. Consequently, MRWPCA's obligation to FORA to provide MCWD 1,427 AFY for the Ord Community is allegedly reduced to 1,157 AFY. Specifically, of the 1,427 AFY of RUWAP tertiary treated recycled water, up to 270 AFY would become reject water (including 180 AFY of the 950 AFY to be provided during the summer months). In other words, the FEIR is asserting that if MCWD and FORA accepts advanced treated water instead of tertiary treated water as allegedly provided in the 2009 RUWAP MOU, the 1,427 AFY tertiary treated water obligation would be reduced to 1,157 AFY of advanced treated water. As previously pointed out in MCWD DEIR comments, the FORA Board through Resolution 07-10 (May 2007) has already allocated the full 1,427 AFY to its land use member jurisdictions. MCWD will be discussing this issue with FORA.

The last sentence in the last paragraph of FEIR Section 3.10.1, page 3-42, states, "Alternatively, the parties may agree to commit additional secondary wastewater as influent to the AWT Facility to enable the AWT Facility to deliver up to the MCWD full allotment of planned recycled water demands (***and no more than the RTP receives as influent from MCWD***)." [Emphasis added.] MCWD agrees that pursuant to the 1989 and 1996 Annexation Agreements, MCWD is entitled to its full allotment of planned recycled water demands based upon the influent from MCWD's Central Marina and Ord Community service areas to the RTP, except that pursuant to the 2009 MOU, during May through August of each year, MCWD is entitled to 650 AFY for the Ord Community from MRWPCA's entitlements. In addition, MCWD has agreed to commit 300 AFY during April through September of each year for the Ord Community from MCWD's Central Marina influent.

Finally, MCWD continues to support exploring mutually beneficially uses of the Regional Urban Water Augmentation Project (RUWAP) pipeline alignment that can meet the present and planned future needs of MCWD, the Fort Ord Reuse Authority ("FORA"), and the GWR Project. As explained in our June 4, 2015 comment letter, the RUWAP alignment for the Product Water Conveyance would avoid impacts to riparian and wetland habitats from the Product Water Conveyance pipeline and therefore should be considered the environmentally superior alternative/option.

Resolution of the foregoing issues are critical to assessing the GWR's project potential impacts to groundwater. Unless a Definitive Agreement is reached that allows MCWD to meet the present and planned future water supply needs of the City of Marina and Ord Community and does not adversely impacts the District's ability to implement the RUWAP, the FEIR's analysis of the project's groundwater impacts is flawed.

MCWD's Comments Final EIR's Responses to Potential Groundwater Impacts

The FEIR continues to rely on outdated information to support its conclusion that the Project will result in beneficial impacts on groundwater in the coastal portion of Salinas Valley Groundwater Basin and on MCWD's water users. The FEIR retains a misleading description of the environmental setting within this coastal portion of the Salinas Valley Groundwater Basin and ignores the best available evidence regarding groundwater levels, groundwater quality, and water flows. The FEIR suggests this information is of little consequence "because groundwater interactions due to the Proposed Project do not adversely affect the water levels in the aquifers near the coast. In fact, the Proposed Project would result in a quantifiable benefit to the water levels and storage in the Salinas Valley Groundwater Basin, pressure subarea …." (FEIR, p. 4-124.) This premise, however, is based on the conclusion that MCWD will not be required to increase pumping in the Marina and Ord portions of the Salinas Valley Aquifer if the GWR Project is approved and implemented. Again, this conclusion cannot be supported unless and until a Definitive Agreement is reached.

The FEIR's suggestion that any effect of the GWR Project on the District's recycled water rights and RUWAP would not impact groundwater in coastal portion of Salinas Valley Groundwater Basin is fundamentally illogical. (See e.g., FEIR, p. 4-127 [even if RUWAP recycled water rights were not exercised, MCWD cannot increase pumping quantities of Salinas Valley Groundwater beyond its rights for future development.].) Again, the EIR avoided any analysis of cumulative groundwater impacts based on its conclusion that direct and indirect impacts of the GWR Project would be beneficial. (See DEIR, pp. 4.10-65 - 4.10-70 and FEIR, p. 4-124.) As explained above, MCWD has entered into agreements for this recycled water and is in the process of implementing the RUWAP. If MCWD's rights to recycled water are affected by the GWR Project, MCWD will be required to obtain water to meet its obligations and support planned growth in these areas. This in turn will likely require additional groundwater pumping in the Marina and Ord portions of the Salinas Valley Aquifer that is currently not anticipated. Thus, unless the Definitive Agreement, or other agreements between MCWD and MRWPCA, ensures MCWD's recycled water rights and RUWAP are not impacted by the GWR Project, neither the DEIR nor the FEIR provides the necessary evidence or analysis to support the EIR's conclusions that cumulative impacts to groundwater would be less than significant. In addition, the FEIR's determination that a discussion of alternatives and mitigation for these potentially significant groundwater impacts would also need to be revised.

MCWD hopes these comments assist MRWPCA in its evaluation of the EIR's compliance with CEQA. MCWD continues to look forward to working with MRWPCA to reach a Definitive Agreement and/or other agreements that protects MCWD's senior contractual rights to recycled water and the RUWAP, as well as advances regional goals through implementation of the GWR Project.

Sincerely,

Keith Van Der Maaten
General Manager

MEMORANDUM

To: Bob Holden, GWR Project Manager
Monterey Regional Water Pollution Control Agency (MRWPCA)

From: Alison Imamura and Denise Duffy, DD&A
Margaret Nellor, Nellor Environmental Services

Date: October 8, 2015

Subject: **Response to email from Steve Shimek dated October 7, 2015**

This memorandum is provided in response to the attached email from Mr. Steve Shimek, dated October 7, 2015 to MRWPCA staff as a follow up from a meeting on October 2, 2015. The research presentation and journal articles attached to the email are also attached herein.

These articles describe and analyze the various contributors to harmful algal blooms (also referred to as toxic algal blooms) and highlight anthropomorphic nutrient discharges as a contributor) in general, and they do not provide additional analysis specific to water quality impacts of the Pure Water Monterey Groundwater Replenishment Project (GWR Project). The research provided includes data and information regarding algal blooms in the marine environment, including in several cases, the Monterey Bay; however, these articles do not assess the GWR Project. Some of the papers pose the conclusion that the contribution from anthropogenic sources compared to natural sources (such as upwelling) may be greater than earlier papers; this data and information does not change the conclusions in the EIR.

The Master Response on Nutrients in Recycled Water and Ocean Outfall Discharge in the Final EIR (hereafter “Nutrient Master Response”, see Final EIR pages 3-20 through 3-27) clarifies the Draft EIR conclusions that the project would reduce the total amount of nitrogen-related nutrients that would flow to downstream water bodies including reduced total nitrate flux (loading) to Monterey Bay. Specifically, the GWR Project would divert and treat impaired (Clean Water Act, Section 303(d)) surface waters and would reduce the discharge of wastewater to the Monterey Bay. The GWR Project would discharge reverse osmosis concentrate (a by-product of the advanced water treatment facility), but the amount of nitrogen discharged to the ocean would be reduced. The GWR Project would result in beneficial water quality impacts related to the total nutrient and nitrate loadings to the Monterey Bay.

Based on the technical analysis by the CEQA team and MRWPCA’s experts in water quality, the project would meet Ocean Plan objectives that are established to protect human and ecological health and would assist the region in addressing requirements of the Regional Water Quality Control Board (RWQCB) related to Clean Water Act (CWA) compliance (i.e., reducing pollutant loads in water bodies listed as impaired under CWA 303(d)). In addition, MRWPCA is also subject to statutory and regulatory requirements under the Federal Clean Water Act, the California Ocean Plan, the Porter-Cologne Water Quality Control Act, and the Central Coastal Water Quality Control Plan. Specifically, MRPWCA has been and will continue to comply with relevant permits under these regulatory programs established to protect water quality, including the following:

- NPDES permit for the MRWPCA Regional Treatment Plant regulates the treated wastewater discharge from the Regional Treatment Plant that flows into Monterey Bay through the MRWPCA outfall (RWQCB, Order No R3-2014-0013 NPDES NO. CA0048551 *Waste Discharge Requirements for the Monterey Regional Water Pollution Control Agency Regional Treatment Plant,* 2014.)

- Recycled water use on agricultural land would comply with statutory and regulatory requirements for the production and use of recycled water per California Water Code Sections 13500 – 13577 and California Code of Regulations, Title 22, Sections 60301 – 60357 and the RWQCB Order 94-82 that includes provisions for recycled water application: (1) not to exceed vegetative demand and soil moisture holding conditions; (2) prevent spray nozzle logging, over watering, and ponding; and (3) minimize runoff.

The master response acknowledges anthropogenic contributors on page 3-23, but concludes that the project would not add any nutrients to the environment beyond the existing conditions, in fact would result in a net reduction in nutrient loading to the environment.

Also, attached to this memorandum is additional document review notes by Nellor Environmental Associates regarding the applicability of the information presented to the GWR Project.

Because none of the information in the research papers allows you to draw specific conclusions about the Proposed Project, the applicability of the research does not add significant new information to the record for the GWR Project.

In the **National Coastal Condition Report IV** on the site link provided by Mr. Shimek's email (http://www2.epa.gov/national-aquatic-resource-surveys/national-coastal-condition-report-iv-factsheet), a map is provided that shows California has an overall condition is good (the highest rating). The ratings are based on five indices of ecological condition: water quality index (including dissolved oxygen, chlorophyll a, nitrogen, phosphorus, and water clarity), sediment quality index (including sediment toxicity, sediment contaminants, and sediment total organic carbon [TOC]), benthic index, coastal habitat index, and a fish tissue contaminants index. This demonstrates that the conditions of the Monterey Bay are not indicative of poor background water quality.

Based on review of those journals by the CEQA Team and MRWPCA staff and technical consultants, no new significant impacts and no increase in severity of impacts would result from implementation of the GWR Project.

See also:

Attachment 1. Response to Comments from Nellor Environmental Associates regarding review of Algal Bloom Papers

Response to Steve Shimek October 7, 2015 Email
October 8, 2015

Attachment 1. Response to Comments from Nellor Environmental Associates regarding review of Algal Bloom Papers

Armstrong, M.D., W.P. Howard, Cochlan, N.L., Kudela, R.M. Nitrogenous preference of toxigenic Pseudo-nitzschia australis (Bacillariophyceae) from field and laboratory experiments, Science Direct, Harmful Algae 6 (2007) 206–217.

- Collected water samples from San Francisco Bay and from a high nutrient (not defined or specified the location) low chlorophyll (HNLC) coastal region was apparently not contaminated by iron, at 4 m to 14 m depth a surface mixed layer, temperature of 12.5 8 C and a practical salinity of 31.5.

- They used P. australis was isolated from Monterey Bay, California (isolate AU221-a), and grown as batch cultures in filter-sterilized (0.2 mm), nutrient-enriched artificial seawater.

- The ambient nitrogen concentration of the seawater collected for the experiment was 6.6 m M nitrate, 1.76 m M ammonium, and 0.9 m M urea. Three separate nutrient treatments were conducted where 42.4 m Mnitrate (as KNO3) was added to the first carboy (total nitrate 49 m M), 10 m Mammonium(asNH4 Cl) was added to the second carboy (total ammonium 11.76 m M), and 20 m Murea was added to the third carboy (total urea 20.9 m M).

- The mean growth rates from the field data during the exponential phase were statistically indistinguishable across all nitrogen-substrate treatments, using either chlorophyll a concentrations or the P. australis cell abundance.

- Bates et al. (1993) showed that cultures grown at less than 110 m M of nitrate and ammonium had equivalent growth rates and that there was no inhibition of nitrate uptake due to ammonium. [Note: this is 15.4 mg/L NO3 as N – Gordon needs to check my conversion)

- This increase in P. australis across all treatments suggests that specific conditions such as stratification of the water column (alleviation of light limitation) can increase the growth of P. australis when nitrogen is available. (so light alleviation is important in preventing growth)

- The implications of these results are that elevated concentrations of urea from anthropogenic sources such as agricultural and urban runoff, or sewage discharge, could be a significant source of nitrogen for toxic bloom development or sustenance of P. australis .

Comments:

- The study didn't define a concentration of nitrate that was key to algal bloom growth, just that they saw growth.
- If the 42.4 uM of nitrate was key in this study, it converts to 5.9 mg/L NO3-N. This concentration is not feasible given the concentration in the oufall, 145:1 dilution (which does not include current effects), and current effects.
- Also the depth precludes light. So suggests that site specific conditions of wastewater discharge should be a factor in making conclusions.
- Research papers that addressed other regions, such as southern California that show high percentage

contributions of anthropogenic nitrogen. These studies do not apply to Monterey Bay that has a fraction of the population and associated municipal wastewater discharge and Monterey Bay also has a much ~~lower~~ higher upwelling rate.

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October 8, 2015

Monterey Regional Water Pollution Control Agency
Administration Office
ATTN: Bob Holden, Principal Engineer
5 Harris Ct., Bldg D
Monterey, CA 93940

Dear Mr. Holden and Pure Water Monterey Responsible Parties:

The Otter Project / Monterey Coastkeeper provided timely comments on the Draft EIR for the Pure Water Monterey Groundwater Replenishment Project. Those comments were dated 6/5/2015 and are included in the FINAL EIR and identified as comment "X".

In our letter we prefaced our support with the comment: "The Otter Project supports the proposed project with modifications to remove nutrients from all product waters (both GWR and CSIP) and from the ocean disposal waste stream." It should come as no surprise, at this late date, that we cannot support this project if nutrients are not removed from the entire waste stream.

The FINAL EIR, relying on old and outdated evidence, incorrectly states:

> "Along the California coast (including Monterey Bay), the dynamics of harmful algal blooms appear to be dominated by oceanic forces, such as occurrence during upwelling currents, but this does not rule out that anthropomorphic nutrient sources could exacerbate an algal bloom (Anderson et al. 2008; Caron et al., 2010; Horner et al., 1997)."

This statement incorrectly summarizes the state of research at this time. While it is true that harmful algal blooms (HABs) can be triggered by upwelling events and have occurred for many years, probably decades, the current balance of evidence supports the statement from Dr. Clarissa Anderson that was included in our letter:

> "We have seen a 30- to 100-fold increase in domoic acid in water samples in the last decade or so. We think that the toxicity of these blooms is related to agricultural runoff."

Included with this letter are printed copies of the following research. Electronic copies are available by contacting Steve Shimek at The Otter Project.

- Howard, M, et. al. 2014. Anthropogenic nutrient sources rival natural sources on small scales in the coastal waters of the Southern California Bight. Limnol. Oceanogr., 59(1), 2014, 285–297.
- Howard, M. et. al. 2007. Nitrogenous preference of toxigenic Pseudo-nitzschia australis (Bacillariophyceae) from field and laboratory experiments. Harmful Algae 6 (2007) 206–217.
- Kudela, R. et. al. 2008. The potential role of anthropogenically derived nitrogen in the growth of harmful algae in California, USA. Harmful Algae 8 (2008) 103–110
- Lane, J. et. al. 2009. Development of a logistic regression model for the prediction of toxigenic Pseudo-nitzschia blooms in Monterey Bay, California. Mar Ecol Prog Ser 383: 37–51, 2009.
- Lane, J. et. al. 2011. Assessment of river discharge as a source of nitrate-1 nitrogen to Monterey Bay, California. Submitted but unpublished.

- Anderson, C.R., Edwards, C.A., Goebel, N.L., Kudela, R.M., 2013. Forecasting the terrestrial influence on domoic acid production: a mechanistic approach. In: 7th Symposium on Harmful Algae in the US. (Full presentation is attached. The abstract is available at: http://www.whoi.edu/fileserver.do?id=208984&pt=2&p=28786 .

The discharge of a nutrient enriched waste stream into the near ocean environment should be avoided and not permitted.

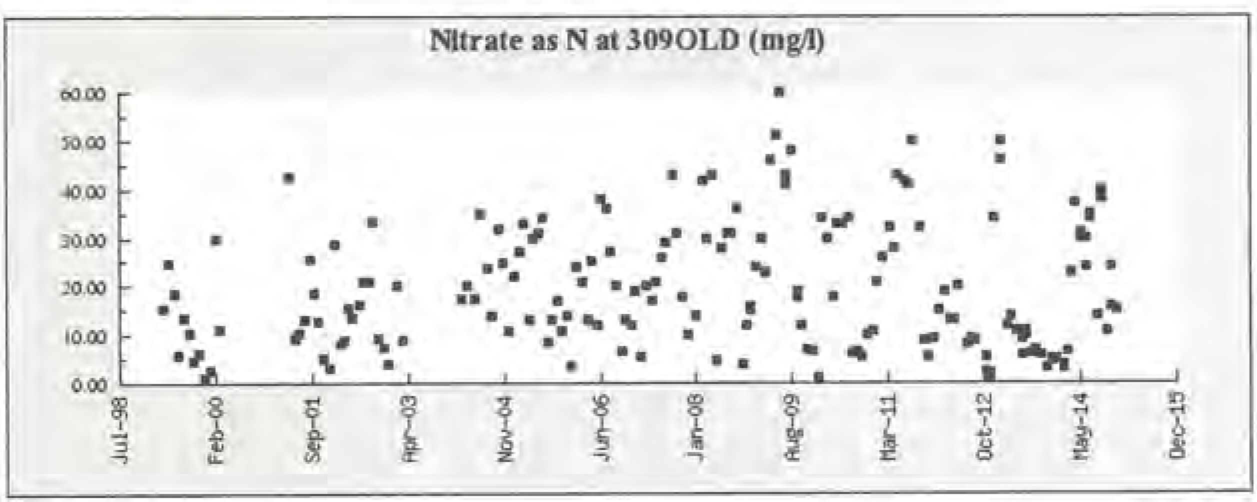
The FINAL EIR relies on the following statement to conclude that the net loading of nutrients (both nitrogen and phosphorous) will be substantially decreased:

> "Further, while the concentrations of nitrogen and phosphorus in the MRWPCA ocean discharge would increase, it is important to note that the net nutrient loading to the ocean from the region would decrease due to the Proposed Project, taking into account the diversion of the agricultural drainage waters and the reduction of agricultural fertilizer use (as described in Section 3.6.4 of this master response)."

The premise of Section 3.6.4 is summarized by the key statement:

> "Because growers incur substantial cost to purchase and apply fertilizers, it is reasonable to presume based on economics, that growers would reduce the use of fertilizers if irrigation water provided a significant portion of the required macro-nutrients for optimal plant growth."

While the above statement is intuitively correct, very unfortunately there is no evidence that it is correct in practice. If growers we properly accounting for the nitrogen in the in their supply water, their surface water discharge should be relatively depleted of nitrogen and this is simply not the case. The following graph of 196 samples taken at the Old Salinas River Channel at Monterey Dunes Way (the heart of the CSIP area) is taken from the Central Coast RWQCB CCAMP database:



The drinking water standard for this measure is 10 mg/l and many samples measured four to six times the MCL. No evidence is provided that fertilizer applications have been reduced and the water quality evidence shows that the drainage water is highly contaminated, far from depleted, and statistical analysis in fact indicates that conditions are worsening.

In conclusion:

- The FINAL EIR mischaracterizes the current weight of scientific evidence for HABs. Current research indicates that anthropogenic discharges of nutrients do in fact trigger harmful algal blooms. A condition of this project must be that nutrients will be removed from the entire waste stream, including the ocean outfall.

- The characterization that growers will reduce their fertilizer use and instead rely on at least some of the nutrients available in the recycled water is unsubstantiated. In fact, there is evidence to the contrary and conditions appear to be worsening.

Thank you for the opportunity to review both the draft and FINAL EIRs. The Otter Project / Monterey Coastkeeper supports the proposed project only if modifications are made to remove nutrients from all product waters (both GWR and CSIP) and from the ocean disposal waste stream.

Sincerely,

Steve Shimek

Attachments:
Research papers and presentations bulleted above

Limnol. Oceanogr., 59(1), 2014, 285–297

doi:10.4319/lo.2014.59.1.0285

Anthropogenic nutrient sources rival natural sources on small scales in the coastal waters of the Southern California Bight

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Abstract

Anthropogenic nutrients have been shown to provide significant sources of nitrogen (N) that have been linked to increased primary production and harmful algal blooms worldwide. There is a general perception that in upwelling regions, the flux of anthropogenic nutrient inputs is small relative to upwelling flux, and therefore anthropogenic inputs have relatively little effect on the productivity of coastal waters. To test the hypothesis that natural sources (e.g., upwelling) greatly exceed anthropogenic nutrient sources to the Southern California Bight (SCB), this study compared the source contributions of N from four major nutrient sources: (1) upwelling, (2) treated wastewater effluent discharged to ocean outfalls, (3) riverine runoff, and (4) atmospheric deposition. This comparison was made using large regional data sets combined with modeling on both regional and local scales. At the regional bight-wide spatial scale, upwelling was the largest source of N by an order of magnitude to effluent and two orders of magnitude to riverine runoff. However, at smaller spatial scales, more relevant to algal bloom development, natural and anthropogenic contributions were equivalent. In particular, wastewater effluent and upwelling contributed the same quantity of N in several subregions of the SCB. These findings contradict the currently held perception that in upwelling-dominated regions anthropogenic nutrient inputs are negligible, and suggest that anthropogenic nutrients, mainly wastewater effluent, can provide a significant source of nitrogen for nearshore productivity in Southern California coastal waters.

Eutrophication of coastal waters has greatly increased in the last several decades throughout the world, with demonstrated linkages to anthropogenic nutrient loads (*see* reviews Howarth 2008; Paerl and Piehler 2008). Human population growth, development of coastal watersheds, agricultural and aquaculture runoff into the coastal oceans, and burning of fossil fuels are among the many factors contributing to increased eutrophication of coastal waters (Anderson et al. 2002; Howarth 2008). Anthropogenic inputs of agricultural runoff, wastewater and sewage discharge, and groundwater discharge have all been shown to provide significant sources of nitrogen (N) that have been linked to increased primary and macroalgal production (Lapointe et al. 2004, 2005) and harmful algal blooms (HABs) (Anderson et al. 2002; Glibert et al. 2005; Heisler et al. 2008). Anthropogenic nutrient inputs are considered the most significant factor contributing to the global increase in the frequency and intensity of HABs (Hallegraeff 2004; Glibert et al. 2005). Although many studies have focused on agricultural runoff, wastewater has also been found to promote HABs and increase primary productivity (Jaubert et al. 2003); in some regions, wastewater has been shown to be more important than upwelling as a N source (Chisholm et al. 1997; Thompson and Waite 2003; Lapointe et al. 2005).

Nitrogen has been the focus of most coastal eutrophication studies because it has been shown to be the primary limiting macronutrient for algae in coastal waters (Dugdale 1967; Ryther and Dunstan 1971) including California (Eppley et al. 1979). However, previous research has shown that the N form, not just quantity, is important for HABs and algal blooms (Glibert et al. 2006), particularly in California coastal waters (Howard et al. 2007; Cochlan et al. 2008; Kudela et al. 2008).

Recent studies within the Southern California Bight (SCB) have documented chronic algal bloom hot spots that coincide with areas that have potentially significant anthropogenic nutrient inputs (Nezlin et al. 2012). Before 2000, toxic outbreaks of *Pseudo-nitzschia* (an algal diatom that produces domoic acid) were considered rare (Lange et al. 1994); however, in recent years, frequent occurrences (Seubert et al. 2013) and high concentrations of this toxin have been documented in the SCB (Trainer et al. 2000; Schnetzer et al. 2007; Caron et al. 2010) and have been attributed to upwelling (Lewitus et al. 2012; Schnetzer et al. 2013). Increased awareness of toxic HAB events served as the primary motivation for establishment of the Harmful Algae and Red Tide Regional Monitoring Program by the Southern California Coastal Ocean Observing System (SCCOOS). This ongoing program collects weekly HAB species and toxin information from five pier locations in Southern California (SC; data available online, http://www.sccoos.org/data/habs/index.php).

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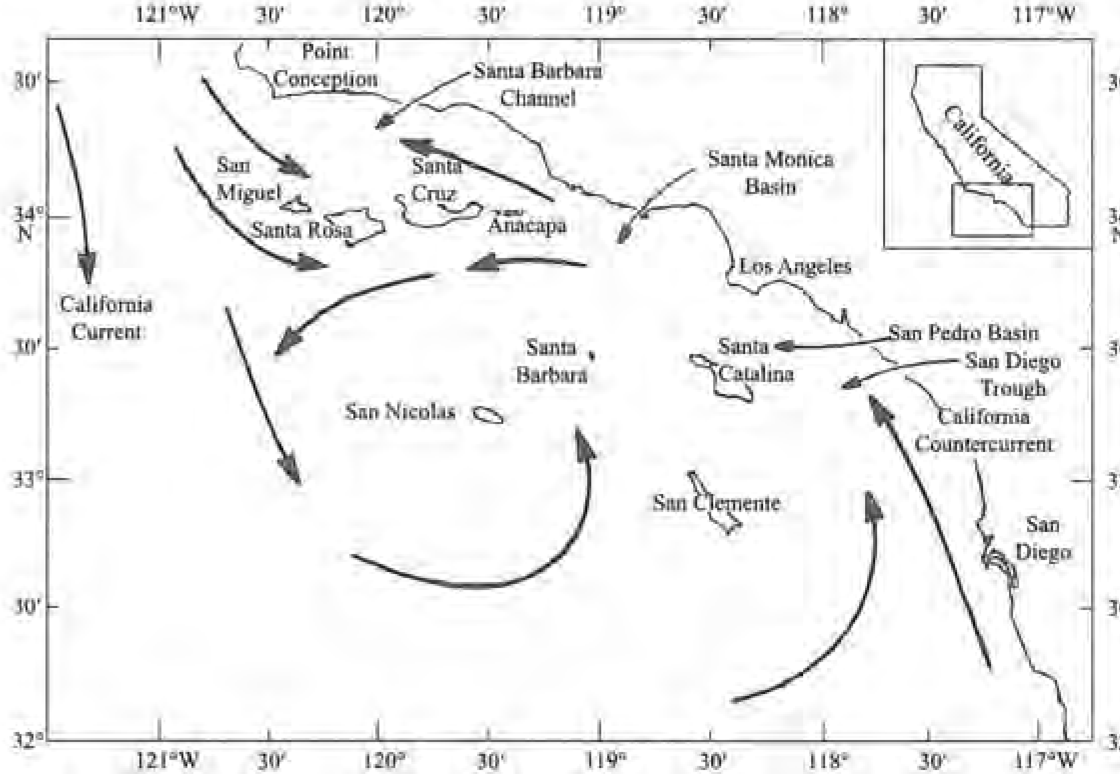

Fig. 1. The circulation patterns in the SCB (adapted from Hickey 1992).

There is a general perception that in upwelling regions, such as coastal California, the flux of anthropogenic nutrient inputs is insignificant relative to upwelling flux, and therefore anthropogenic inputs have relatively little effect on the productivity of coastal waters. Upwelling is the process by which vertical currents transport deep nutrient-rich water to the surface, displacing nutrient-depleted surface water. No studies to date have quantified and compared the natural and anthropogenic inputs on regional and local scales in the SCB to verify the accuracy of this perception. However, a growing number of studies have suggested a linkage between anthropogenic N sources and algal blooms (including HABs) in California (Kudela and Cochlan 2000; Beman et al. 2005; Kudela et al. 2008). Additionally, physiological studies have shown that several common California HAB species are capable of utilizing anthropogenic N forms, such as urea (Cochlan et al. 2008; Kudela et al. 2008), for growth, and toxin production can be increased under these conditions (Howard et al. 2007).

To test the hypothesis that natural sources (e.g., upwelling) greatly exceed anthropogenic nutrient sources to the SCB, this study compared the contributions of N from four major nutrient sources, (1) upwelling, (2) treated wastewater effluent discharged to ocean outfalls, (3) riverine runoff, and (4) atmospheric deposition. This comparison was made using large regional empirical data sets combined with modeling on both regional (SCB-wide) and subregional scales. This is the first study to make this comparison on the U.S. West Coast.

Methods

Study area and circulation patterns—The SCB lies along the southern part of the Pacific coast of the continental United States. The continental coastline generally runs along a north–south gradient beginning at Cape Flattery, Washington (~48°23′N), until Cape Mendocino in northern California (~40°15′N), then turns toward a south–southeast direction. Figure 1 shows the generalized circulation patterns in the SCB. The continuum is broken by a bend or curvature in the coastline between Point Conception (~34°34′N) and the Mexico international border (~32°32′N). The SCB includes an ocean area of 78,000 km² (Dailey et al. 1993) and numerous islands offshore. The bottom topography consists of submarine mountains and valleys, neither of which could be considered a classical continental shelf nor a classical continental slope.

A ring of coastal mountain ranges defines SC and shelters the coastal area from dominating northwesterly winds, which create a "coastal basin" where cool, dense air is trapped, resulting in much weaker wind and sea patterns than over the open ocean (Dorman and Winant 1995). SC's climate exhibits relatively dry summer and wet winter seasons. During the dry season a semipermanent eastern Pacific high-pressure area dominates SC. The marine layer is a prominent feature from late spring through early fall. Beginning late fall to early spring (October through March) the high-pressure ridge is displaced and the southern margin of the polar jet stream affects SC. Over 90% of the precipitation generally occurs during this time period.

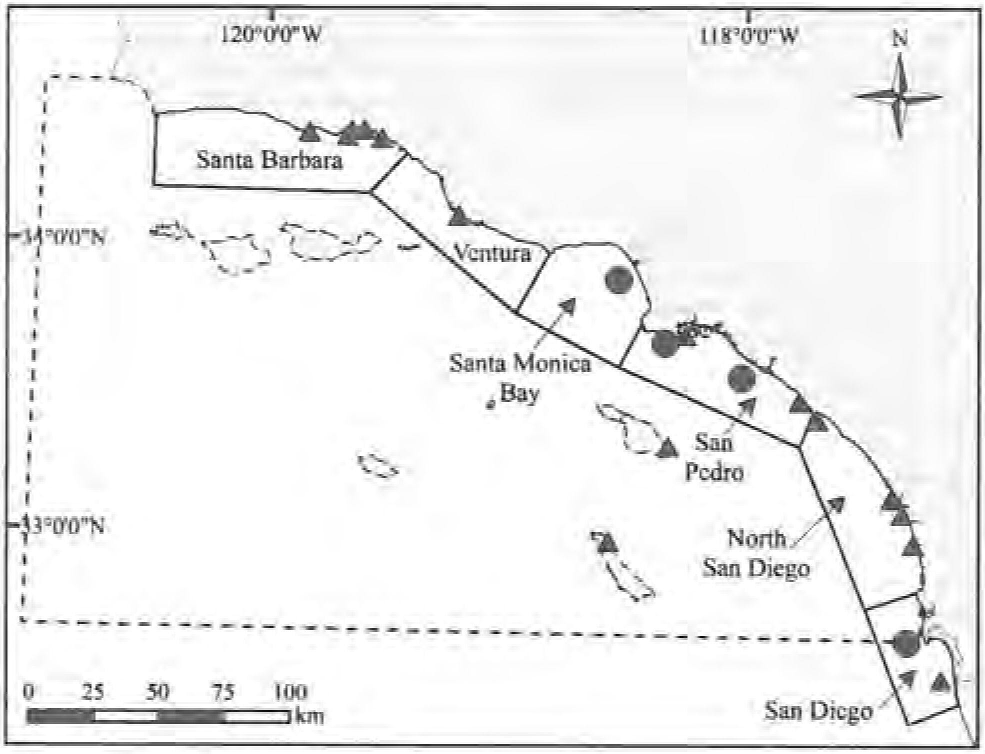

Fig. 2. Regional and subregional SCB boundaries used to calculate fluxes of each of the four major sources. The area used for regional estimates is outlined in a dashed black line; subregions are labeled and outlined in a solid black line. The POTW outfalls that discharge wastewater effluent are represented by black circles for large (> 100 MGD) and black triangles for small (< 25 MGD).

The migratory nature of the region's storm fronts causes alternating periods of dry and wet weather during the rainy season.

The ocean region within the SCB is dominated by the equatorward California Current (CC). The CC is a typical broad eastern boundary current (Hickey 1979) that transports cold subarctic water from north to south throughout the year along a typically narrow (3 to 6 km) coastal continental shelf (Fig. 1). The CC is not steady but migrates seasonally onshore and offshore, producing a rich eddy field (Burkov and Pavlova 1980). As the CC passes Point Conception, it turns south-southeast along SC's outer continental slope, then a portion branches (~32°N) eastward to northward along the coast (Hickey 1992), forming a large gyre known as the Southern California Eddy (Fig. 1). The poleward current along the coast is called the Southern California Countercurrent (SCC) (Sverdrup and Fleming 1941). It transports warm southern water into Santa Monica Bay and the Santa Barbara Channel.

Surface current flows may not reflect subpycnocline currents (Hamilton et al. 2006). During spring, the intensity of the equatorward CC increases compared with the poleward SCC. The CC jet migrates onshore, and the eastward branches penetrate into the SCB through the Santa Barbara Channel and onward south of the Channel Islands (Hickey 1979). The islands act as barriers to deflect surface currents in different directions. Near shore, over the continental shelf and borderland slope, the near-surface flow is commonly equatorward, whereas the California Undercurrent is poleward (Hickey 1992).

Estimation and comparison of nutrient sources—The N fluxes into the SCB from four potential sources were estimated: (1) upwelling, (2) wastewater effluent discharge, (3) riverine runoff, and (4) atmospheric deposition. A combination of field measurements and modeling over a 1-yr period (January–December 2010) was used to estimate the contribution of each nutrient source on a bight-wide scale (51,686 km^2) as well as for six smaller subregional areas (Fig. 2) including: Santa Barbara (2405 km^2), Ventura (1449 km^2), Santa Monica Bay (1571 km^2), San Pedro (1641 km^2), North San Diego (1837 km^2), and San Diego (1020 km^2). The combined area of all of the subregions makes up 20% of the total bight-wide area of the SCB. Nutrient inputs were estimated as annual loads for the bight-wide scale (reported in kg N yr^{-1}) as well as annual fluxes for the six subregional areas (reported as kg N km^{-2} yr^{-1}).

Modeling to estimate upwelling—The upwelling contribution of N was estimated using the regional oceanic modeling system (ROMS), a three-dimensional ocean circulation model for the U.S. West Coast (Marchesiello et al. 2003), coupled with an nutrient–phytoplankton–zooplankton–detritus (NPZD)-type ecosystem–biogeochemistry model (Gruber et al. 2006) to generate a reanalysis of the ocean environment from January to December 2010. This model integration resulted in highly time-resolved output of the three-dimensional physical and biogeochemical parameters. The ROMS model saves output of the daily averages of all advection terms in Eq. 1 (Gruber et al. 2006) and the output was integrated over time and space.

$$\frac{\partial B}{\partial t} = \nabla \cdot K \nabla B - \vec{u} \cdot \nabla_h B - \left(w + w^{sink}\right) \frac{\partial B}{\partial z} + J(B) \qquad (1)$$

where K is the eddy kinematic diffusivity tensor, and where ∇ and ∇_h are the three-dimensional (3-D) and horizontal gradient operators, respectively. The horizontal and vertical velocities of the fluid are represented by $\vec{u}$ and w, respectively. The w^{sink} represents the vertical sinking rate of the biogeochemical components and $J(B)$ represents the source minus sink term. All of these terms are described in detail in Gruber et al. (2006). From this detailed output, periods of upwelling were determined using vertical velocity, lateral advection, and temperature fields, and then the net mass of nitrate (NO_3) and ammonium (NH_4) from lateral and vertical fluxes to the euphotic zone was calculated. The total vertical flux assimilated by the model includes advection and diffusion, whereas the total lateral flux was assimilated for advection only. Daily estimates were summed to provide an annual estimate. The total flux of N (NO_3 and NH_4) estimates were made over a range of spatial scales, from a bight-wide scale (Fig. 2 black dotted line) to smaller subregional scales (Fig. 2 black solid line).

Model description—ROMS is a free-surface, hydrostatic, 3-D primitive equation regional ocean model (Marchesiello et al. 2003; Shchepetkin and McWilliams 2005). A description and validation of the ROMS model at the 15-km spatial scale has been published (Gruber et al. 2006). This ROMS 3-D model provided both 6 hourly "nowcasts" obtained via assimilation of satellite sea-surface temperature, high-frequency radar surface current velocity, subsurface temperatures, and salinities profiled from Argo floats and gliders as well as daily 72-h forecasts. The ROMS output (for the physics-only model runs) was provided at both the Jet Propulsion Laboratory ROMS web site (http://ourocean.jpl.nasa.gov/SCB) and the SCCOOS web site (www.sccoos.org/data/roms).

The ROMS configuration consisted of a single domain covering the SC coastal ocean from Santa Barbara to San Diego at a resolution of 1 km. The vertical discretization used a stretched terrain-following coordinate (S-coordinate) on a staggered grid over variable topography (Song and Haidvogel 1994). The stretched coordinate allowed increased resolution in areas of interest, such as the thermocline and bottom boundary layers. ROMS used a sigma-type vertical coordinate in which coordinate surfaces followed the bottom topography. In the SCB configuration, there were 40 unevenly spaced sigma surfaces used, with the majority of these clustered near the surface to better resolve processes in the mixed layer. The horizontal discretization used a boundary-fitted, orthogonal curvilinear formulation. Coastal boundaries were specified as a finite-discretized grid via land and sea masking. The SCB configuration of ROMS has been tested and used extensively (Dong et al. 2009).

Boundary conditions for the SCB domain were provided from a separate data-assimilating ROMS domain that covered the entire coast of California and northern Baja California at a resolution of 3 km. The tidal forcing was added through lateral boundary conditions that were obtained from a topography experiment–Poseidon (TOPEX POSEIDON) global barotropic tidal model (TOPEX POSEIDON global barotropic tidal model.6; Egbert et al. 1994), which had a horizontal resolution of 0.25° and used an inverse modeling technique to assimilate satellite altimetry crossover observations. There were eight major tide constituents used at the diurnal and semidiurnal frequencies (M2, K1, O1, S2, N2, P1, K2, and Q1). The atmospheric forcing required by the ROMS model was derived from hourly output from forecasts performed with a regional atmospheric model, the Weather Research and Forecasting System (WRF). This model has been used in the SCB region (Conil and Hall 2006). The horizontal resolution was 4 km and the lateral boundary forcing and initial conditions were derived from the National Centers for Environmental Prediction 12-km North American model daily Greenwich mean time forecasts. The surface latent and sensible heat fluxes, as well as surface evaporation rates, were derived from WRF surface air temperatures, surface relative humidity, 10-m winds, solar and terrestrial radiation, and ROMS sea-surface temperatures, using the bulk formula proposed by Kondo (1975). The freshwater flux was computed as the calculated evaporation rate minus the WRF precipitation rate (evaporation − precipitation). The wind stress was derived from the 10-m winds using the formula of Large and Pond (1981). The variables used for computing the ocean-model forcing have been evaluated against buoy data. The surface winds were accurate, with root mean square errors of 2–3 m s^{-1} in speed and 30° in direction. Comparison of modeled vs. measured surface air temperatures and relative humidity showed good accuracy with errors of 1–2°C and 5–10%.

The biogeochemical model that was used in this ROMS configuration was an NPZD model based on Fasham et al. (1990). The model was optimized and validated for the U.S. West Coast coastal upwelling region by Gruber et al. (2006). This model has been validated and gave good results in the upwelling-dominated coastal zone, but it failed to reproduce observations farther offshore in more nutrient-depleted areas (Gruber et al. 2006). A full description of the model can be found in Gruber et al. (2006), but is described briefly here.

The NPZD model included a single limiting nutrient (N) and a diatom-like single phytoplankton class. Although the model output was only used to calculate NO_3 and NH_4 lateral and vertical fluxes, a total of 12 state variables is tracked including: NO_3, NH_4, phytoplankton, zooplankton, small and large detritus (both N and carbon [C] concentrations due to varying C : N ratios), oxygen, dissolved inorganic carbon, calcium carbonate, and total alkalinity.

In the absence of a larger domain model with the same NPZD biogeochemical model characteristics, biogeochemical boundary conditions were based on the physical

Table 1. List of polynomial (polyn.) parameters for the biogeochemical boundary conditions in ascending order, e.g., $NO_3(\sigma_\theta > 26.8) = -20{,}258 + 1484.7\sigma_\theta - 27.1422\sigma^2$. Chlorophyll *a* (Chl *a*), not applicable (na).

Variable	σ_θ range 1	Polyn. 1	σ_θ range 2	Polyn. 2	σ_θ range 3	Polyn. 3
Nitrate	Up to 24.99	−48.0343, 1.9910	25.0–26.79	−371.8125, 11.3264, 0.1449	Over 26.8	−20258, 1484.7, −27.1422
Chl *a* (top 50 m)	All values	−547.1559, 42.7240, −0.8334	na	na	na	na
Chl *a* (>50 m)	All values	17.4953, −0.7332	na	na	na	na
Ammonium	Up to 24.82	−1.9986, 0.0866	24.82–26.42	−265.6287, 20.7761, −0.4056	26.42–27.2	170.3260, −12.5235, 0.2302

boundary conditions, modeled at daily time steps, and the relationship between physical quantities (either temperature or potential density) and nutrients were used to derive initial and boundary conditions for NO_3 and NH_4, as summarized in Table 1. There were not enough organic N or urea data to estimate the contribution of this form from upwelling. Therefore the total dissolved nitrogen (TN) flux for upwelling excludes organic N sources. Initial and boundary conditions for NO_3 concentrations were determined with a polynomial regression that describes the relationship between NO_3 and density (σ_θ), defined for the SCB from temperature, salinity, and NO_3 data from the World Ocean Atlas 2005 (Garcia et al. 2006; Fig. 3).

Climatological biogeochemical boundary and initial conditions were used to determine a relationship between potential density and NH_4 because there were no observed data available for NH_4. The scatter is much larger for this relationship than for NO_3 (Fig. 3).

Wastewater effluent discharge—Nutrient loads from wastewater effluent discharged from outfalls to the SCB were estimated for both large (> 100 million gallons a day [MGD]) and small (< 25 MGD) publicly owned treatment works (POTWs) in each subregion (Table 2), where large POTWs contribute 90% of total discharges to SCB. Large POTW nutrient loads were determined for January–December 2010 by measuring effluent nutrient concentrations quarterly from December 2008 through December 2009; these quarterly concentrations were combined with monthly discharge flows from 2010 National Pollutant Discharge Elimination System (NPDES) monitoring reports from the Hyperion Treatment Plant (HTP) operated by City of Los Angeles (LA), the Joint Water Pollution Control Plant (JWPCP) operated by LA County Sanitation District, the Treatment Plant No. 2 operated by Orange County Sanitation District, and the Point Loma Wastewater Treatment Plant operated by City of San Diego. Samples were analyzed for TN following Environmental Protection Agency (EPA) method SM4500-N, nitrate plus nitrite (herein referred to as NO_3) following EPA 300.0 and SM4500, ammonia (NH_3) following method EPA 350.1 and SM4500, and urea using Goeyens et al. (1998). Organic nitrogen (ON) was not measured for the large POTWs, only urea, which is a component of ON. An interlaboratory comparison was conducted for these analytes and the variability was determined to be negligible.

Effluent nutrient concentration data for small POTWs were determined using available data published for 2005 from NPDES monitoring reports (Lyon and Stein 2008). Small POTW effluent concentration data were available for NO_3, NH_3, and TN; ON was reported from one POTW in Ventura. Details on methods were reported in Lyon and Stein (2008).

POTW N load (bight-wide) was estimated by multiplying nutrient concentrations (mg L^{-1}) with annual flow volume (L) and POTW N fluxes for each subregion were estimated by dividing the N load by the area (km^{-2}).

The error associated with the N loads was determined by multiplying the standard deviation (SD) of nutrient concentrations by the total annual discharge. Total error was calculated as the square root of the squared sums of each of the individual estimates for each watershed.

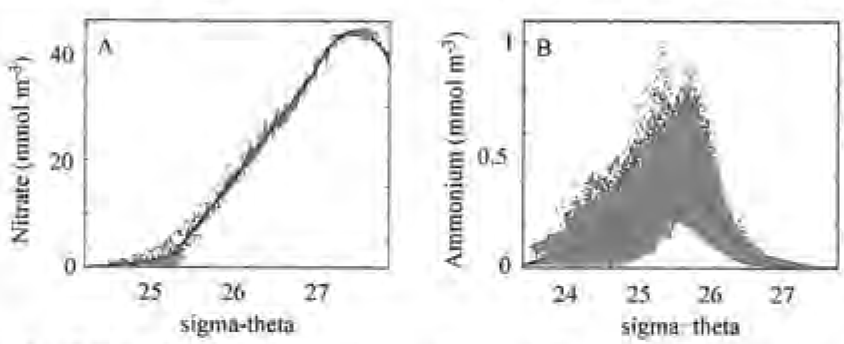

Fig. 3. Relationship between potential density (σ_θ) and (A) nitrate and (B) ammonium in the SCB. Nitrate and ammonium data (gray dots) are derived from the World Ocean Atlas (2005) and ROMS tests run with climatological boundary conditions, respectively. Black lines designate the stepwise polynomial fits.

Table 2. Location and relative size of POTWs used for effluent discharge load estimates by subregion. S, small; L, large; WWTP, wastewater treatment plant.

Subregion	POTW name	Size
Santa Barbara	Goleta WWTP	S
	El Estero WWTP	S
	Montecito WWTP	S
	Summerland WWTP	S
	Carpinteria WWTP	S
Ventura	Oxnard WWTP	S
Santa Monica Bay	HTP	L
San Pedro	JWPCP	L
	Treatment Plant No. 2	L
	Terminal Island WWTP	S
	Aliso Creek Ocean Outfall	S
North San Diego	San Juan Creek Ocean Outfall	S
	Oceanside WWTP	S
	Camp Pendleton WWTP	S
	Fallbrook Public Utility District WWTP	S
	Encina Ocean Outfall	S
	San Elijo Water Pollution Control Facility	S
San Diego	Point Loma Wastewater Treatment Plant	L
	Hale Ave. Resource Recovery Facility	S
	South Bay Water Reclamation Plant	S
	International Wastewater Treatment Plant	S

$$\text{Total load SD} = \left(\sum_{1}^{10} [C_e Q]^2\right)^{1/2} \tag{2}$$

where C_e is the standard deviation in nutrient concentration for each large POTW effluent. Q is the total annual discharge.

Riverine loads—Riverine nutrient loads to the SCB were estimated using empirical wet-weather and dry-weather data for monitored watersheds in combination with modeled wet-weather loads for unmonitored watersheds for the period of October 2008–October 2010.

Discharge and nutrient samples were collected at 34 wet-weather and 57 dry-weather mass emission stations by Ventura, Los Angeles, Orange, and San Diego counties under their NPDES permits or by SCB Regional Monitoring Program partners during the period of October 2008–October 2010. Howard et al. (2012) provides methodological details including summary of the wet- and dry-weather monitoring and the 91 mass loading stations utilized for the study.

A spreadsheet model based on the rational method (O'Loughlin et al. 1996) was used to generate freshwater runoff Q (m^3 d^{-1}) and the N loads associated with wet-weather events. Modeled storm discharge (Q) was calculated as a function of drainage area (A, km^2), mean rainfall intensity (I, mm d^{-1}), hydraulic runoff coefficient (C), and conversion constant (k).

$$Q = AICk \tag{3}$$

Hydraulic runoff coefficient (C) varied as a function of land use and cover type (Howard et al. 2012). The Ackerman and Schiff model (2003) was improved by refining land use-specific runoff concentrations for NO_3 (excluding nitrite) and NH_4, on the basis of published values from previously published studies (Stein et al. 2007) and TN runoff concentrations were derived from empirical data for this study (Howard et al. 2012).

Within each watershed, Q was then calculated as the sum of discharge associated with six land-use categories: agriculture, commercial, industrial, open space (natural), residential, and other urban. The daily nutrient loads were estimated as the sum of the product of the runoff concentration (c) and Q for each land use, using Eq. 3.

The error associated with the N loads was determined by multiplying the standard deviation of nutrient concentrations by the total discharge (wet- or dry-weather discharge, respectively, for the watershed). Total error was calculated as the square root of the squared sums of each of the individual estimates for each watershed, as given in Eq. 3.

The drainage area was delineated for each watershed on the basis of hydraulic unit code boundaries. The model domain included all SC coastal watersheds in San Diego, Orange, Riverside, Los Angeles, San Bernardino, Ventura, and Santa Barbara counties with an initial total watershed area of 27,380 km^2. Watershed areas larger than 52 km^2 upstream of dams were excluded in the model domain, to mimic the retention of water by dams (Ackerman and Schiff 2003). The final model domain was comprised of 98 watersheds with a total area of 14,652 km^2. Each of the watersheds was populated with land-cover data from Stein et al. (2007), and aggregated into the six land-use categories.

Daily precipitation data for approximately 200 rain gauge stations were obtained from the National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data and Information Service, National Climatic Data Center, and Climate Data Online database. Data were transformed to estimate mean precipitation over the 98 watersheds relevant to the study. Precipitation data were interpolated within each watershed on a regular grid using a biharmonic spline interpolation method (Sandwell 1987).

A model scenario was run to estimate the anthropogenic influence on nutrient fluxes to the SCB using 100% open-space land use for the entire Bight, representing a "preurbanization" baseline. The model domain was expanded to include areas above existing dams because there were no dams withholding potential runoff in the modeled preurbanized state. Rainfall data were not available for the period representing the preurbanized state; therefore, current rainfall data (2008–2009) were used to estimate loads. This enabled a comparison of pre- and posturbanization loads without any bias due to differences in precipitation (Howard et al. 2012).

Atmospheric deposition—Atmospheric deposition rates were estimated for both wet-weather and dry-weather deposition. The wet deposition rates were calculated from the average annual rates for 2009 and 2010 at two National

Atmospheric Deposition Program sites: Site 42, Los Angeles County (Tanbark Flat, 34.2071, −117.7618) and Site 94, San Bernardino County (Converse Flats, 34.1938, −116.9131). Wet deposition rates for NO_3 and NH_4 from these two sites were averaged across sites and years (kg km^{-2} d^{-1}), then applied to the total number of wet days for the January–December 2010 study year.

Sampling for dry deposition was conducted three times over a 6-month period at rooftop location at the HTP and the City of Oceanside Library. Techniques using surrogate surfaces for estimating N dry deposition in semiarid environments, including a water surface sampler and filter samplers, were used (Moumen et al. 2004; Raymond et al. 2004). Both of these techniques use aerodynamic discs, are of short duration (2 to 4 d), and produce reproducible results when evaluated against the atmospheric concentrations and each other. Samplers were deployed in duplicate for the water collector and in triplicate for the filter collectors. Filter samplers and water surface samplers were analyzed for NH_4 and NO_3. Concentrations were converted to deposition rates by incorporating the surface area of the sampler and the duration of the sampling event (kg km^{-2} d^{-1}). The average deposition rate for the three sampling events was multiplied by the number of dry-weather days during the January–December 2010 study year for a bight-wide estimation of dry deposition. Results from the HTP site were applied to the Santa Monica Bay and San Pedro Bay subregions, and results from the Oceanside sampler were applied to all other subregions.

Estimates of contribution of anthropogenic activities to SCB nutrient loads—The contribution of anthropogenic activities to SCB nutrient loads was calculated from the total flux of N from natural sources (upwelling, atmospheric deposition, and preurbanization rivers) compared with the TN flux of all nutrient sources (upwelling, atmospheric deposition, posturbanization rivers, and wastewater effluent discharge).

Results

Bight-wide regional nitrogen loads—Summed across the entire SCB scale, TN loads differed by an order of magnitude, with upwelling contributing the largest load and riverine runoff the smallest (Fig. 4, Table 3). Upwelling consisted almost entirely of NO_3 (98.7%), and little NH_4 (1.3%), whereas effluent loads consisted mostly of NH_4 (92%) with minor percentages of NO_3 (7.0%) and ON (1.0%). The riverine runoff was comprised mostly of ON (60%) and NO_3 (35%), with a smaller contribution from NH_4 (6.0%). The NO_3 loads from riverine runoff and effluent were equivalent (3.5×10^6 and 3.4×10^6 kg N yr^{-1}, respectively), even though NO_3 comprised only 7.0% of the TN from effluent. The error analysis of TN loads for the riverine runoff and effluent ranged from 3.3% to 17.6% for effluent and 2.4% to 37.8% for riverine runoff (Table 4).

Subregional nitrogen fluxes—TN for each source varied by subregion. Effluent and upwelling had similar annual TN fluxes for the three subregions with large POTW outfall discharges (Santa Monica Bay, San Pedro, and San Diego; Fig. 5, Table 5). These were 9.9×10^3 and 1.0×10^4 kg N km^{-2} yr^{-1}, respectively, for Santa Monica Bay, 1.2×10^4 and 2.3×10^4 kg N km^{-2} yr^{-1}, respectively, for San Pedro Bay, and 7.4×10^3 and 2.4×10^3 kg N km^{-2} yr^{-1} for San Diego subregion. Note that the upwelling flux estimated for San Diego is at the edge of the model boundary; therefore, it has a large amount of uncertainty. For these three regions, riverine runoff and atmospheric deposition were one to two orders of magnitude less than upwelling and effluent, respectively, with annual fluxes ranging from 7.0×10^1 to 6.0×10^3 kg N km^{-2} yr^{-1} for riverine runoff and 4.3×10^2 to 8.7×10^2 kg N km^{-2} yr^{-1} for atmospheric deposition.

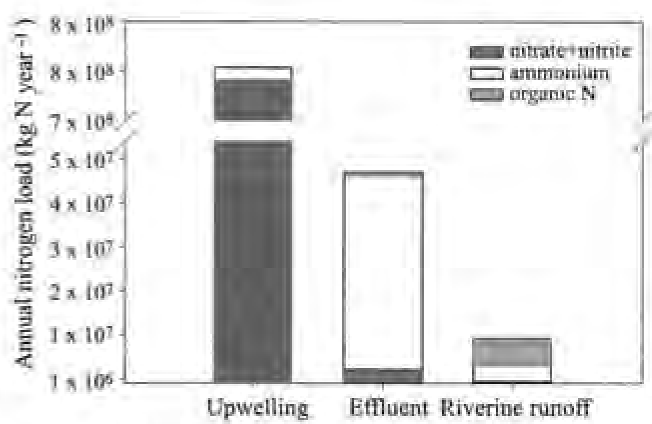

Fig. 4. Annual total nitrogen loads (in kg N yr^{-1}) to the SCB for each nutrient source, with total nitrogen components separated into nitrate plus nitrite shown by the black bars, ammonium shown by the white bars, and organic nitrogen shown by the gray bars.

The Santa Barbara and Ventura subregions both had net annual downwelling rather than net upwelling, ranging from 2.1×10^4 to 1.0×10^5 kg N km^{-2} yr^{-1}, respectively. In these subregions, the dominant sources varied from effluent and atmospheric deposition in Santa Barbara (1.6×10^2 and 4.3×10^2 kg N km^{-2} yr^{-1}, respectively) to roughly equivalent fluxes of effluent, riverine runoff, and atmospheric deposition in Ventura (5.1×10^2, 4.1×10^2 and 8.7×10^2 kg N km^{-2} yr^{-1}, respectively). Only in North San Diego County was upwelling (3.6×10^4 kg N km^{-2} yr^{-1}) dominant by an order of magnitude over effluent (1.4×10^3 kg N km^{-2} yr^{-1}) and by two orders of magnitude over riverine runoff (6.0×10^2 kg N km^{-2} yr^{-1}) and atmospheric deposition (4.7×10^2 kg N km^{-2} yr^{-1}).

Table 3. Annual nitrogen loads for each nutrient source and constituent. All loads are 10^6 kg N yr^{-1}. The form of nitrogen expressed as a percentage of total nitrogen for each source is given in parentheses.

	Total N	Nitrate + nitrite	Ammonium	Organic N
Upwelling	750	740 (98.7)	10 (1.3)	na*
Effluent	48	3.4 (7.0)	44 (92.0)	0.5 (1.0)
Riverine runoff†	10	3.5 (34.0)	0.6 (6.0)	6.2 (60.0)

* na, not analyzed for this source.
† Data for January through October 2010.

Table 4. Summary of the standard error calculated for nitrogen components of riverine runoff and effluent. Absolute and standard error are reported as 10^4 kg N yr^{-1}.

	Riverine runoff				Effluent	
	Wet weather		Dry weather			
Component	Absolute error	% error	Absolute error	% error	Standard error	% error
Total N	22	8.8	3.0	2.4	200	4.6
Nitrate	8.4	7.5	2.7	3.6	55	17.6
Ammonium	9.4	37.8	0.8	11.6	130	3.3

The flux of individual forms of nitrogen (NO_3 and NH_4) were estimated for each source in every subregion, whereas ON was estimated when data were available (Table 6). In the Santa Barbara subregion, the largest source of NO_3 is from atmospheric deposition (2.1×10^2 kg N km^{-2} yr^{-1}), whereas effluent and atmospheric deposition deliver equivalent amounts of NH_4 (1.6×10^2 and 2.1×10^2 kg N km^{-2} yr^{-1}, respectively). Riverine runoff and atmospheric deposition deliver the largest fluxes of NO_3 (3.5×10^2 and 2.1×10^2 kg N km^{-2} yr^{-1}, respectively) in Ventura, whereas NH_4 fluxes were dominated by effluent and atmospheric deposition (4.0×10^2 and 2.1×10^2 kg N km^{-2} yr^{-1}, respectively). The highly urbanized areas of Santa Monica Bay and San Pedro exhibited similar flux patterns, with upwelling providing the highest flux of NO_3 (9.3×10^3 and 2.2×10^4 kg N km^{-2} yr^{-1}, respectively), effluent providing the highest flux of NH_4 (8.4×10^3 and 1.2×10^4 kg N km^{-2} yr^{-1}, respectively), and riverine runoff providing the highest flux of ON (1.3×10^2 and 5.0×10^2 kg N km^{-2} yr^{-1}, respectively). The North San Diego subregion had an NO_3 flux from upwelling that was two to four orders of magnitude higher than any other source, whereas upwelling and effluent contributed most of the NH_4 flux (3.1×10^3 and 1.4×10^3 kg N km^{-2} yr^{-1}, respectively). In the San Diego subregion, upwelling and riverine runoff provided the highest flux of NO_3 (1.7×10^3 and 1.5×10^3 kg N km^{-2} yr^{-1}, respectively), whereas effluent provided most of the NH_4 flux (7.3×10^3 kg N km^{-2} yr^{-1}) and ON was mostly provided by riverine runoff (4.2×10^3 kg N km^{-2} yr^{-1}).

Estimates of contribution of anthropogenic activities to SCB nutrient loads—The contribution of anthropogenic activities to SCB nutrient loads was estimated from the TN flux from natural sources (upwelling, atmospheric deposition, and preurbanization rivers) compared with the TN flux of all nutrient sources (upwelling, atmospheric deposition, posturbanization rivers, and wastewater effluent discharge). The increase in TN due to anthropogenic sources was largest for the more heavily urbanized areas of Santa Monica Bay

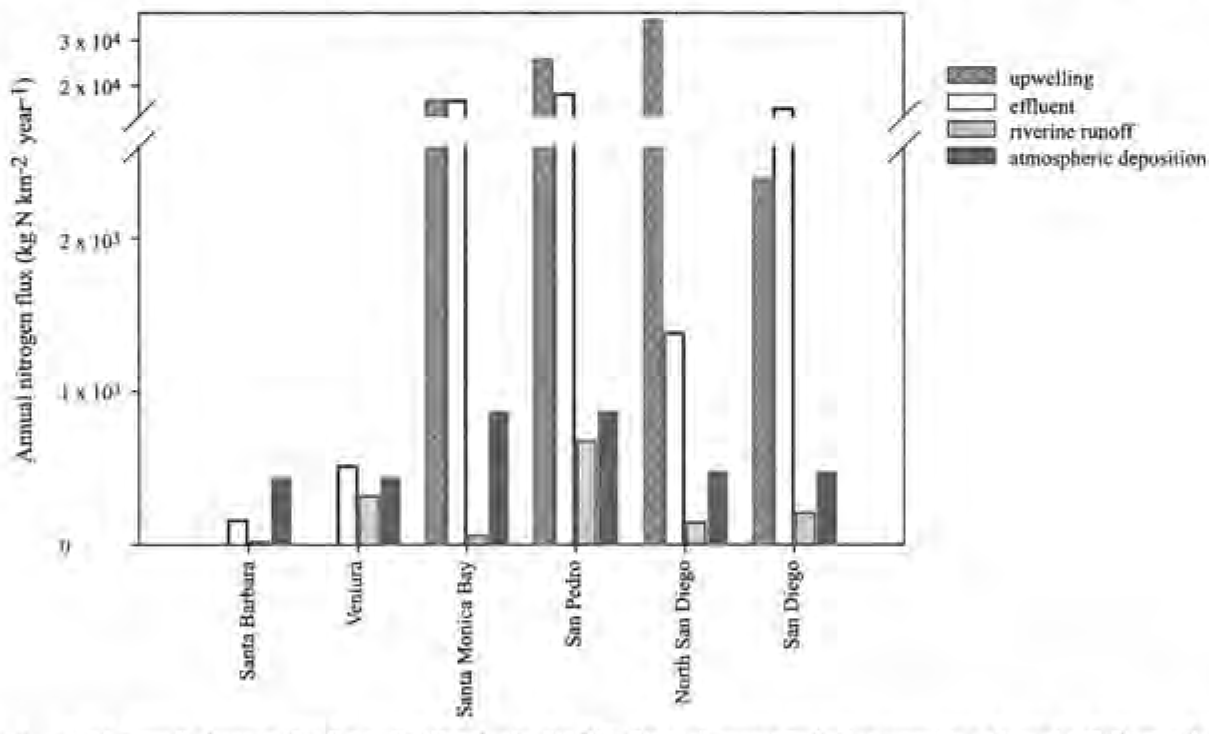

Fig. 5. Total annual nitrogen flux for each subregion in the SCB for each source including upwelling shown by dark gray bars with lines, effluent shown by white bars, riverine runoff shown by light gray bars, and atmospheric deposition shown by black bars.

Table 5. Annual total nitrogen flux for each subregion (10^2 kg N km^{-2} yr^{-1}).

Source	Santa Barbara	Ventura	Santa Monica Bay	San Pedro	North San Diego	San Diego
Upwelling	−210	−1071	102	238	367	24
Effluent	1.6	5.1	99	121	14	74
Riverine runoff*	0.7	4.1	1.4	12	6	60
Atmospheric deposition	4.3	4.3	8.7	8.7	4.7	4.7
Total N	−203	−1057	211	380	392	163

* Data for January through October 2010.

and San Pedro subregions, with increases of 2- and 1.5-fold (110% and 52%), respectively. The less urbanized subregions of Santa Barbara, Ventura, and North San Diego only had slight changes of 5% or less (Table 7).

Discussion

Regional nitrogen loads and subregional nitrogen fluxes—At the scale of the entire SCB region, the results of this study support the hypothesis that natural N sources (i.e., upwelling) dominated anthropogenic sources of N by an order of magnitude (Table 3, Fig. 4). However, at a subregional scale and proximal to the coastline (~20 km), anthropogenic N sources, particularly wastewater effluent discharged through ocean outfalls, were equivalent to natural N sources in five of the six subregions (Table 5, Fig. 5). In the highly urbanized subregions of Santa Monica Bay and San Pedro, anthropogenic N inputs (mainly wastewater effluent) doubled the amount of TN flux in these subregions. The upwelling and effluent sources combined comprised 95% of the TN load in these subregions. The Santa Monica Bay subregion had equivalent contributions from upwelling and wastewater effluent to the TN flux (each was 47% to the TN flux). In San Pedro, the TN contribution from upwelling was the same order of magnitude as wastewater effluent, but the actual upwelling flux comprised 60% of the TN, whereas the

Table 6. Flux of each nitrogen form in each subregion of the SCB (10^2 kg N km^{-2} yr^{-1}).

	Total N	Nitrate + nitrite	Ammonium	Organic N (urea only)
Santa Barbara				
Upwelling	−210	−198	−11	na
Effluent	1.6	na	1.6	na
Riverine runoff	0.7	0.1	0.04	0.6
Atmospheric deposition	4.3	2.1	2.1	na
Ventura				
Upwelling	−1071	−995	−75	na
Effluent	5.1	0.4	4.0	0.7
Riverine runoff	4.1	3.5	0.1	0.4
Atmospheric deposition	4.3	2.1	2.1	na
Santa Monica Bay				
Upwelling	102	93	8.6	na
Effluent	99	13	84	(0.9)
Riverine runoff	1.4	0.001	0.1	1.3
Atmospheric deposition	8.7	6.1	2.4	na
San Pedro				
Upwelling	238	220	18	na
Effluent	121	5.8	121	1.0
Riverine runoff	12	6.3	1.0	5.0
Atmospheric deposition	8.7	6.1	2.4	na
North San Diego				
Upwelling	367	336	31	na
Effluent	14	0.06	14	na
Riverine runoff	6.0	2.2	0.35	3.4
Atmospheric deposition	4.7	2.1	2.1	na
San Diego				
Upwelling	24	17	6.5	na
Effluent	74	2.1	71	(0.6)
Riverine runoff	60	15	3.1	42
Atmospheric deposition	4.7	2.1	2.1	na

na, not analyzed for this source.

Table 7. The total nitrogen flux (10^2 kg N km^{-2} yr^{-1}) for natural nutrient sources (upwelling, atmospheric deposition, and preurbanization riverine runoff) and for natural and anthropogenic sources (upwelling, atmospheric deposition, posturbanization riverine runoff, and wastewater effluent discharge) to the SCB.

	Natural sources	Natural and anthropogenic sources	% change
Santa Barbara	−200	−203	1
Ventura	−990	−1057	7
Santa Monica Bay	100	211	110
San Pedro	250	380	52
North San Diego	370	392	6
San Diego	30	163	nd

nd, not determined due to subregional area at the edge of the ROMS model boundary.

POTW effluent was 33% of TN contribution (Table 5, Fig. 5). The TN flux from riverine runoff and atmospheric deposition was one to two orders of magnitude less than upwelling and effluent in both of these subregions (Table 5, Fig. 5). There are POTWs in these subregions that discharge directly into the major rivers and those discharges were included in the riverine runoff component, thereby making the total contribution of effluent slightly underestimated. In contrast, the North San Diego subregion had least amount of anthropogenic N inputs and the upwelling flux had the highest contribution to TN by two to four orders of magnitude compared with effluent, riverine runoff, and atmospheric deposition (Table 5, Fig. 5). The TN flux in Santa Barbara and Ventura was mostly driven by downwelling, as the TN flux from other sources differed by two to three orders of magnitude. In Santa Barbara, the riverine inputs were relatively insignificant compared with the other sources (Table 5, Fig. 5). In Ventura, effluent, riverine runoff, and atmospheric deposition contributions to TN were an equivalent order of magnitude and differed by three orders of magnitude from downwelling (Table 5, Fig. 5). The San Diego subregion had a large contribution of TN from effluent and riverine runoff; the upwelling is at the edge of the model boundary and is likely underestimated.

The absolute and standard error estimates were calculated to determine the amount of uncertainty in the nutrient source loads and fluxes (Table 4). The standard error determined for riverine runoff and effluent loads was less than 20% with one exception, the riverine runoff (wet weather) NH_4 loads (37.8%). Effluent loads from POTWs are monitored on a monthly basis and have been tracked over the last 30 yr with a high level of quality assurance (Lyon and Stein 2008). There were insufficient data to calculate the error for the atmospheric deposition estimates, but this appears to be a very small source at the subregional scale. The coupled ROMS and NPZD model has been validated at the 15-km resolution for the entire U.S. West Coast by comparing model results with either remote-sensing observations (from advanced very-high-resolution radiometer, sea-viewing wide field-of-view sensor) or in situ measurements from the California Cooperative Oceanic Fisheries Investigations Program (Gruber et al. 2006). Although we have a high level of confidence in our results at an annual and bight-wide scale, the 1-km ROMS model and NPZD used for the subregional scales has not yet been fully validated; therefore it is not possible at this time to calculate the error associated with the upwelling estimates from this study.

The two most urbanized subregions, Santa Monica Bay and San Pedro, had the largest percent change in TN flux due to anthropogenic sources (110% and 52%, respectively), whereas the less urbanized regions of Santa Barbara, Ventura, and North San Diego had much smaller changes in TN flux (1%, 1%, and 5%, respectively) due to anthropogenic inputs (Table 7). These findings contradict the current perception that anthropogenic nutrient inputs are negligible in upwelling-dominated regions. Other studies in Central California have focused on terrestrial runoff as the main source of anthropogenic nutrients (Kudela and Cochlan 2000; Kudela et al. 2008), but the results from this study show that wastewater inputs comprise a much higher contribution to the overall TN fluxes in the SCB, whereas the riverine contributions were relatively insignificant.

The importance of nutrient forms and ratios—Nitrogen is considered to be the primary limiting macronutrient for the growth of algae in many coastal ecosystems (Dugdale 1967; Ryther and Dunstan 1971), including California (Eppley et al. 1979). Previous studies have shown that the form of N, not just the quantity, is important for algal community composition, giving rise to algal blooms and HABs in particular (Howard et al. 2007; Cochlan et al. 2008; Kudela et al. 2008). The sources of N to the SCB are comprised of different forms of N, mainly NO_3, NH_4, and ON, which includes urea. When we examined the forms of N that comprised each of the sources examined in this study on a bight-wide scale, upwelling was mostly comprised of NO_3 (98.7% of TN), effluent was mostly comprised of NH_4 (92% of TN), and riverine runoff was comprised of a mixture of inorganic and organic N forms (34% and 60%, respectively; Table 3). ON was mostly derived from riverine runoff (60% on a bight-wide scale). NO_3 comprised only 7% of the TN load for effluent on a bight-wide scale (Table 3). However, examination of the forms of N from each source on a subregional scale provided surprising results (Table 6). In the heavily urbanized areas of Santa Monica Bay and San Pedro, effluent actually contributed a larger or equivalent NO_3 flux than riverine runoff or atmospheric deposition (Table 6, Fig. 5). These findings contradict the perception that the contribution of effluent NO_3 is insignificant, and show that effluent does provide an equivalent or larger contribution of NO_3 compared with riverine and atmospheric deposition sources. Upwelling was one to two orders of magnitude larger than all of the sources and thus clearly provided the largest contribution of NO_3 to the SCB (Table 6).

Urea, an organic form of N used as an indicator of coastal runoff in agricultural regions (Kudela and Cochlan 2000), has been found to sustain HABs in Central and Southern California (Kudela and Cochlan 2000; Kudela et al. 2008), and California HAB species have been shown to utilize urea for growth (McCarthy 1972; Howard et al.

2007). Despite these studies, urea concentrations in California's coastal waters and the importance of urea as an N source for algal growth is often overlooked and understudied. The main source of urea to the SCB was determined to be riverine runoff. Although it was a measurable source of N in the SCB, it was a minor component of the TN load (Tables 3, 6; Figs. 4, 5).

The nutrient fluxes estimated for the four major sources in this study were calculated at annual timescales. However, it is important to recognize that nutrient delivery to the coastal ocean on short, daily to weekly timescales is more ecologically relevant for primary productivity and HAB development. The timing of these nutrient inputs should be considered as some sources are chronic (daily wastewater effluent discharge into oceans and into rivers), whereas other sources are seasonal or episodic (riverine runoff and upwelling). Therefore, seasonal differences exist in both the TN flux as well as the proportion of N forms from each source. Riverine runoff is generally prevalent in the winter; upwelling occurs primarily in the spring and early summer; and effluent is chronic. Therefore, although upwelling clearly provided the largest source of NO_3 (Table 6, Fig. 5), effluent probably provided most of the NO_3 during nonupwelling and low riverine flow time periods. Other studies in SC have shown that stormwater runoff has at times been the dominant source of N inputs during nonupwelling periods and that those processes provided different proportions of N forms than upwelling (Warrick et al. 2005; McPhee-Shaw et al. 2007). In Monterey Bay, a more extensive study of this dynamic has shown similar results where riverine inputs of NO_3 exceeded upwelling inputs across short, daily to weekly, timescales (but not monthly or annual scales), as often as 28% of the year (Quay 2011).

Another aspect to consider from this study is the importance of N : P ratios. Although the conventional Redfield ratio of N : P is 16 : 1, the effluent sources in this study have disproportionate N : P ratios that widely varied by POTW. The two large POTWs located in the San Pedro subregion have the highest N : P ratios of 60 : 1 (JWPCP) and 21 : 1 (Treatment Plant No. 2). Given the large contribution of effluent to the TN flux in this subregion (Table 6, Fig. 5), these ratios suggest that effluent provides a disproportionate amount of N relative to P compared with natural sources.

Implications for primary production and algal blooms—Nitrogen is the primary limiting macronutrient in the coastal waters in the SCB (Eppley et al. 1979); consequently, any N inputs to the coastal oceans will likely increase biological productivity. The results from the subregional spatial scale of this study are more ecologically relevant to the development of algal blooms, and show that anthropogenic nutrients can provide a significant source of N for algal blooms, including HABs (Table 6, Fig. 5). Recent studies have identified chronic algal bloom hot spots that coincide with areas in the SCB that have major anthropogenic sources of nutrients (Nezlin et al. 2012), suggesting that at local spatial scales, anthropogenic nutrients may provide favorable growth conditions for algal bloom development. On a more refined spatial scale, terrestrial freshwater discharge and wastewater effluent discharges via ocean outfalls have been shown to increase phytoplankton biomass and affect patterns of phytoplankton productivity and community composition (Corcoran et al. 2010; Reifel et al. 2013). A 2006 study in Santa Monica Bay documented an effluent plume and urban riverine runoff that stimulated an algal bloom for which several HAB species dominated the community composition (Reifel et al. 2013). Other SCB studies in Santa Monica Bay and San Diego have been unable to attribute chlorophyll variability in the nearshore environment with upwelling and have concluded that nearshore productivity and chlorophyll are not always driven by classical coastal upwelling (Kim et al. 2009; Corcoran et al. 2010; Nezlin et al. 2012). The Scripps Pier time series in La Jolla, California (San Diego subregion) documented increased annual mean chlorophyll over the last 18 yr, but there was no obvious simultaneous increase in upwelling (Kim et al. 2009). Although anthropogenic nutrient sources (especially wastewater effluent) have traditionally been ignored as a significant source of N when evaluating algal biomass and community composition in the nearshore environment, the results from this study show that effluent contributes a significant portion of the TN flux, and therefore could explain nearshore chlorophyll variability that is not correlated to natural oceanographic conditions.

In summary, the results from this study contradict the currently held perception that anthropogenic nutrient inputs are negligible in upwelling-dominated regions and are consistent with a growing number of studies that suggest a linkage between anthropogenic N sources and HABs in California nearshore waters (Kudela and Cochlan 2000; Beman et al. 2005; Kudela et al. 2008). Although this study was designed to be a first-order estimation of nutrient sources, the results suggest that anthropogenic nutrients are not negligible compared with natural nutrients and can have ecological effects at local spatial scales. In the urbanized SCB, treated effluent has altered the quantity and composition of the N pool, which may have ecological consequences reflected in changes in algal community composition and has likely increased nearshore primary productivity and the duration of algal blooms. Although there are global examples of increased primary productivity with increased N inputs, quantification of such increases due to anthropogenic sources and determination of the spatial scale for which anthropogenic sources remain a significant component of overall TN in the SCB will be important to evaluate further in future research. The combination of physical and biogeochemical models will provide an important next step toward addressing these aspects of the effects of anthropogenic nutrients in the coastal waters of the SCB. Given that the forms of N can be biologically transformed, an important aspect of future studies should be to determine rates of nitrification and the timescales by which effluent NH_4 is transformed into NO_3, as these processes will alter the forms of N present. Future studies should also include a multiyear source analysis to determine the interannual variability for each source.

Acknowledgments

We express our gratitude to Becky Schaffner for assistance with map preparation. We thank the two anonymous reviewers as our manuscript was greatly improved from their suggestions and feedback.

This research was supported by funding provided by the California Ocean Protection Council (Grant Agreement 08-095), the State Water Resources Control Board (Agreement 08-060-250), and NOAA Monitoring and Event Response for HABs (NA05NO54781228).

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Associate editor: Mary I. Scranton

Received: 02 March 2013
Accepted: 03 September 2013
Amended: 02 November 2013

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Available online at www.sciencedirect.com

ScienceDirect

Harmful Algae 6 (2007) 206–217

HARMFUL ALGAE

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Nitrogenous preference of toxigenic *Pseudo-nitzschia australis* (Bacillariophyceae) from field and laboratory experiments

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Received 12 July 2005; received in revised form 19 June 2006; accepted 29 June 2006

Abstract

Field and laboratory experiments were designed to determine the differential growth and toxin response to inorganic and organic nitrogen additions in *Pseudo-nitzschia* spp. Nitrogen enrichments of 50 μM nitrate (KNO_3), 10 μM ammonium (NH_4Cl), 20 μM urea and a control (no addition) were carried out in separate carboys with seawater collected from the mouth of the San Francisco Bay (Bolinas Bay), an area characterized by high concentrations of macronutrients and iron. All treatments showed significant increases in biomass, with chlorophyll *a* peaking on days 4–5 for all treatments except urea, which maintained exponential growth through the termination of the experiment. *Pseudo-nitzschia australis* Frenguelli abundance was 10^3 cells l^{-1} at the start of the experiment and increased by an order of magnitude by day 2. Particulate domoic acid (pDA) was initially low but detectable (0.15 μg l^{-1}), and increased throughout exponential and stationary phases across all treatments. At the termination of the experiment, the urea treatment produced more than double the amount of pDA (9.39 μg l^{-1}) than that produced by the nitrate treatment (4.26 μg l^{-1}) and triple that of the control and ammonium treatments (1.36 μg l^{-1} and 2.64 μg l^{-1}, respectively). The mean specific growth rates, calculated from increases in chlorophyll *a* and from cellular abundance of *P. australis*, were statistically similar across all treatments.

These field results confirmed laboratory experiments conducted with a *P. australis* strain isolated from Monterey Bay, CA (isolate AU221-a) grown in artificial seawater enriched with 50 μM nitrate, 50 μM ammonium or 25 μM of urea as the sole nitrogen source. The exponential growth rate of *P. australis* was significantly slower for cells grown on urea (*ca.* 0.5 day^{-1}) compared to the cells grown on either nitrate or ammonium (*ca.* 0.9 day^{-1}). However the urea-grown cells produced more particulate and dissolved domoic acid (DA) than the ammonium- or nitrate-grown cells. The field and laboratory experiments demonstrate that *P. australis* is able to grow effectively on urea as the primary source of nitrogen and produced more pDA when grown on urea in both natural assemblages and unialgal cultures. These results suggest that the influence of urea from coastal runoff may prove to be more important in the development or maintenance of toxic blooms than previously thought, and that the source of nitrogen may be a determining factor in the relative toxicity of west coast blooms of *P. australis*.

Keywords: Domoic acid; Harmful algae; Nitrogen; *Pseudo-nitzschia australis*; Urea

1. Introduction

The occurrence of harmful algal blooms (HABs) appears to be increasing in both frequency and intensity in recent years (e.g., see reviews by Hallegraeff, 1993;

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doi:10.1016/j.hal.2006.06.003

Anderson et al., 2002; Glibert et al., 2005a). This is especially evident along the central California coast where amnesic shellfish poisoning (ASP) events caused by toxic blooms of the diatom *Pseudo-nitzschia* spp. have increased dramatically over the last decade (Buck et al., 1992; Scholin et al., 2000; Trainer et al., 2000). The first major ASP event identified in North America occurred in 1987 in eastern Prince Edward Island, Canada, where a toxic bloom of *Pseudo-nitzschia multiseries* Hasle (Bates et al., 1989) resulted in 107 illnesses and the deaths of three people after ingesting contaminated blue mussels (*Mytilus edulis*) (Perl et al., 1990). Blooms of *Pseudo-nitzschia australis* in Monterey Bay, California were first recorded during the fall months of 1989, 1990 and 1991 as well as the spring of 1990 and summer of 1991 (Buck et al., 1992). In September 1991, the first confirmed report of domoic acid poisoning on the U.S. west coast resulted in the mortality of more than 100 brown pelicans (*Pelecanus occidentalis*) and Brandt's cormorants (*Phalacrocorax penicillatus*) (Fritz et al., 1992; Work et al., 1993). In 1998 another bloom, which spanned the central California coast, resulted in the deaths of over 400 sea lions (*Zalophus californianus*) due to consumption of contaminated northern anchovies (*Engraulis mordax*) (Scholin et al., 2000; Trainer et al., 2000).

As a result of these events, a number of laboratory studies on *Pseudo-nitzschia* were initiated, which identified macronutrient limitation as an important factor affecting cellular toxicity (Pan et al., 1996a,b,c; Bates, 1998). Although initial studies focused on macronutrients, iron and copper limitation, as well as elevated copper conditions, have been shown in laboratory studies to induce toxin production in both *P. multiseries* and *P. australis* (Maldonado et al., 2002; Ladizinsky and Smith, 2003; Wells et al., 2005). Domoic acid (DA) has been shown to form chelates with both of these trace metals, potentially increasing the biological availability of iron and/or decreasing the toxicity of copper (Ladizinsky and Smith, 2000; Rue and Bruland, 2001). However, Bates et al. (2000) reported DA levels were 10 times lower in iron-stressed cultures relative to iron-replete cultures of *P. multiseries*.

Substantial variability in growth and toxicity has been shown among different *Pseudo-nitzschia* species as well as isolates of the same species in culture from the same geographical area (Bates, 1998; Kudela et al., 2003a). Macronutrient limitation (silicate and phosphate, but not nitrogen) is known to induce toxin production in *P. multiseries* (Pan et al., 1996a,b; Bates, 1998). Pan et al. (1996a,b) proposed two different stages in the production of DA under silicate limitation. The first occurs during the late exponential phase, characterized by slower growth rates and moderate DA production. The second stage occurs during stationary phase and is distinguished by the depletion of silicate and a significant increase in toxin production per cell (an order of magnitude higher in batch culture). Similar results were found under phosphate limitation. Pan et al. (1996c) showed an increase in the production of domoic acid in *P. multiseries*, in both steady-state continuous culture and batch cultures, when phosphate concentrations were limiting and alkaline phosphatase activity was high. There have been fewer laboratory studies using strains of *P. australis*. Garrison et al. (1992) isolated *P. australis* from the Monterey Bay bloom in 1991, and conducted batch culture experiments with two strains that confirmed DA production by this species with maximum particulate DA concentrations of 37 pg cell^{-1} and 12 pg cell^{-1}.

Despite the many studies on toxin production and nutrient limitation, very few studies have evaluated the nutritional preference of *Pseudo-nitzschia* spp., particularly in terms of nitrogen sources. In laboratory experiments, Bates et al. (1993) grew cultures of *P. multiseries* with varying concentrations of ammonium and nitrogen, ranging from 55 μM to 880 μM, and found that at less than 110 μM N the growth of the cells and the production of DA were the same for nitrate- and ammonium-grown cultures. Hillebrand and Sommer (1996) also evaluated the nitrogenous preference of *P. multiseries* by using nitrate, ammonium and urea in batch cultures. In a batch culture with initial concentrations of 40 μM ammonium, the growth rate increased with increasing concentration of nitrate added to the culture, which the authors interpreted as an alleviation of ammonium inhibition of nitrate uptake, whereas at growth-saturating nitrate concentrations, ammonium additions decreased the growth rate of *P. multiseries*.

While there have been numerous laboratory studies using isolates of *P. multiseries*, this is the first study to examine the nitrogenous nutrition (including urea) of *P. australis*, the predominant DA producer in California waters. In contrast to previous nitrogen-based studies, the field and laboratory experiments reported here were designed to identify differential responses to ammonium, nitrate and urea enrichment using ecologically relevant nitrogen concentrations.

2. Materials and methods

2.1. Field experiment

Nutrient addition experiments were conducted aboard the R/V *Point Sur* during February 2003. Seawater was collected in the vicinity of the San Francisco Bay (Bolinas Bay, 37°51.30′N, 122°39.13′W). At the time of collection, there was a broad chlorophyll maximum that ranged from 4 m to 14 m depth, a surface mixed layer temperature of 12.5 °C and a practical salinity of 31.5. Ten-liter PVC Niskin bottles (refitted with silicone rubber band springs) mounted on an instrumented rosette were used to collect seawater from 4 m depth. Although water was not collected using strict trace metal clean protocols, reasonable care was taken to reduce the risk of metal contamination. On the same cruise, water collected in the same fashion, but from a high nutrient low chlorophyll (HNLC) coastal region was apparently not contaminated by iron, as evidenced by the lack of enhanced phytoplankton growth under multi-day, deck incubation conditions (data not shown).

Four 9-liter acid-cleaned polycarbonate (Nalgene) carboys were rinsed three times and filled with seawater using multiple Niskin bottles. Carboys were then either unenriched (control) or enriched with nitrogen and placed in a deckboard incubator maintained at the ambient surface temperature (with running seawater) and *ca.* 50% surface irradiance (using neutral density screening). The ambient nitrogen concentration of the seawater collected for the experiment was 6.6 μM nitrate, 1.76 μM ammonium, and 0.9 μM urea. Three separate nutrient treatments were conducted where 42.4 μM nitrate (as KNO_3) was added to the first carboy (total nitrate 49 μM), 10 μM ammonium (as NH_4Cl) was added to the second carboy (total ammonium 11.76 μM) and 20 μM urea was added to the third carboy (total urea 20.9 μM). There was also a control (no addition). Reagent grade stocks and Milli-Q® water were used to prepare all nutrient enrichments. Incubations were maintained for 3 days at sea in a deckboard incubator (mean daily irradiance *ca.* 350 μmol photons $m^{-2} s^{-1}$), and subsequently transferred to a walk-in environmental chamber (15 °C and *ca.* 100 μmol photons $m^{-2} s^{-1}$ irradiance using "cool-white" fluorescent lamps and a 12:12 light:dark cycle) at the University of California Santa Cruz (due to termination of the cruise) for the remainder of the experiment.

2.1.1. Analytical methods

Samples for chlorophyll *a* were collected daily in triplicate and filtered onto uncombusted glass-fiber filters (Whatman GF/F; nominal pore size 0.7 μm); separate samples for size fractionated chlorophyll *a* were determined using 1-μm and 5-μm polycarbonate filters (Poretics), frozen in liquid nitrogen and processed using the non-acidification method (Welschmeyer, 1994). Macronutrients (nitrate plus nitrite [hereafter referred to as nitrate], silicate and *ortho*-phosphate) were sampled daily, stored frozen, and later analyzed with a Lachat Quick Chem 8000 Flow Injection Analysis system using standard colorimetric techniques (Knepel and Bogren, 2001; Smith and Bogren, 2001a,b). Ammonium and urea samples were collected using 60 ml low-density polyethylene (LDPE) centrifuge tubes (Corning®). Ammonium samples were stored refrigerated after the addition of the phenolic reagent; the addition of the phenolic reagent binds ammonium and eliminates the need to freeze samples (Degobbis, 1973). The remaining reagents were added within 120 h, and the samples were manually analyzed using a spectrophotometer equipped with a 10-cm cell (Solorzano, 1969). Urea samples were frozen at −20 °C, and subsequently thawed ashore at room temperature before manual analysis using the diacetyl monoxime thiosemicarbizide technique (Price and Harrison, 1987), modified to account for a longer time period (72 h) and lower digestion temperature (22 °C). Particulate domoic acid (pDA) samples were filtered onto uncombusted Whatman GF/F filters and processed according to the method of Pocklington et al. (1990), using high performance liquid chromatography with fluorescence detection. At two time points, *P. australis* was identified using large subunit rRNA-targeted fluorescent probes (whole cell) as described by Miller and Scholin (1998). The samples were also probed for *P. multiseries* but this species was not present. Samples (10 ml) from each treatment were collected in triplicate, on days 0 and 2, filtered and immediately preserved in saline ethanol for later microscopic analysis in the laboratory. Because rRNA probes were not available for the remaining sample points, whole-water samples were collected on all days, to be preserved with acidified Lugol's solution; however, after inspecting the samples, it was apparent that 1% non-acidic Lugol's solution was erroneously used. Therefore, it was not possible to use these samples for phytoplankton floristic analysis. Visual examination of the positive whole-cell probe samples (which probes all phytoplankton) provided a record of dominant groups.

2.2. Laboratory experiments

P. australis was isolated from Monterey Bay, California (isolate AU221-a), and grown as batch cultures in filter-sterilized (0.2 μm), nutrient-enriched artificial seawater (modified ESAW; Harrison et al., 1980) at the Romberg Tiburon Center; modifications to this artificial seawater included reducing the nitrogen enrichment to 50 μM nitrate, 50 μM ammonium and 25 μM urea, respectively, for each treatment. Other modifications are described in detail by Berges et al. (2003). Cultures were maintained at 15 (±0.3) °C with irradiance levels at 100 μmol photons m^{-2} s^{-1} for a 12:12 light:dark cycle. Cell samples were fixed in 1% acidic Lugol's solution and counted using a Palmer-Maloney nanoplankton counter at 100× using a phase contrast microscope (Eclipse E4000, Nikon®). Chlorophyll *a* samples were collected during the late exponential phase; 20 ml of each treatment was filtered onto uncombusted Whatman GF/F filters, extracted in 90% acetone and analyzed as described for the field experiment. Particulate and dissolved DA samples were also taken towards the end (late exponential phase) of the experiment and analyzed using the ELISA method (Garthwaite et al., 2001). For particulate determinations, cells were filtered onto 0.2-μm pore-sized polycarbonate filters (Nuclepore) that were placed in 4-ml vials containing 2-ml deionized water (Millipore). They were cycled through four freeze–thaw sequences using liquid nitrogen and boiling water to liberate the water-soluble DA molecule from the cellular matrix. After the samples were refiltered through a 0.2-μm acrodisc syringe filter, aliquots of the supernatant were analyzed with appropriate dilutions. The 0.2-μm filtrate was collected for measurement of dissolved DA and analyzed directly without dilution. *In vivo* chlorophyll *a* and the ratio of variable (F_v) to maximum (F_m) fluorescence measured during the dark cycle using DCMU (Cullen and Renger, 1979) were determined daily on a Turner Designs 10-AU fluorometer. All experiments were conducted in triplicate for each nitrogen source.

3. Results

3.1. Field experiment

Seawater was collected during a period of minimal prior rainfall, low ambient nutrient levels, and a relatively homogenous water column to 50 m depth. Total biomass (as chlorophyll *a*) in the carboys was initially moderate (4.03 μg l^{-1} on day 0) and increased significantly with the addition of each nitrogen substrate as well as in the control (Fig. 1A). The maximum chlorophyll values were recorded on day 4 for the nitrate addition and the control (29.33 μg l^{-1} and 19.9 μg l^{-1}, respectively) and on day 5 for the ammonium addition (28.48 μg l^{-1}). The urea addition was still in exponential growth on day 7 (30.40 μg l^{-1}) (Fig. 1B). Size fractionated chlorophyll indicated that most of the biomass was greater than 1.0 μm.

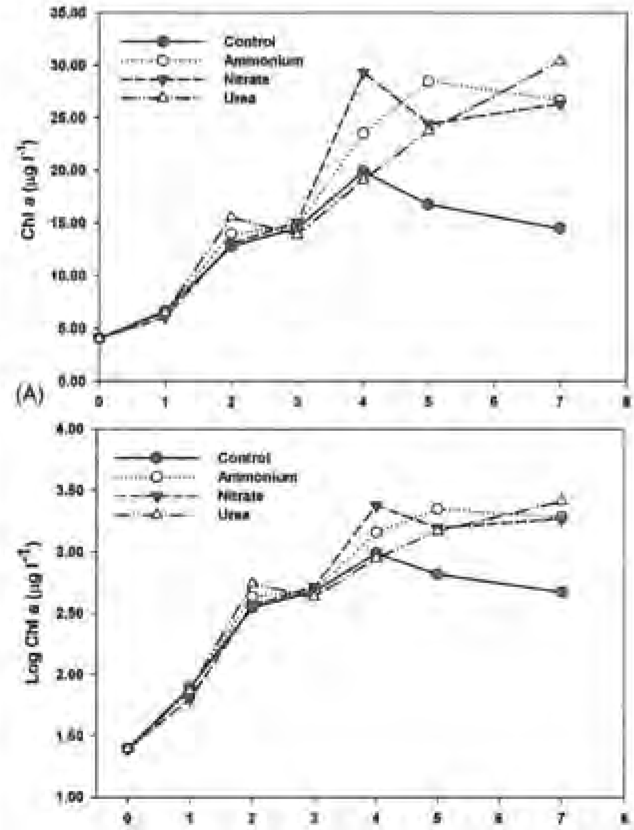

Fig. 1. (A) Total phytoplankton community chlorophyll *a* measured daily from the field experiment and (B) semi-log plot of growth of the same samples for each nitrogen treatment: control (●), ammonium (○), nitrate (▼) and urea (▽). Samples were not taken on day 6 of the experiment. Values are the mean of triplicate samples.

3.1.1. Domoic acid

Initially, particulate domoic acid (pDA) was low but easily detectable, 0.15 μg l^{-1} on day 0 (Fig. 2). However, by day 4 during exponential growth, the pDA of the community increased to the following: nitrate addition, 0.41 μg l^{-1}; ammonium addition (the highest on day 4), 1.50 μg l^{-1}; urea addition, 1.04 μg l^{-1}; the control, 0.46 μg l^{-1}. By the end of the experiment (day 7), the urea treatment produced significantly more pDA (9.39 μg l^{-1}) and was still in exponential growth, while the control was still the lowest at 1.36 μg l^{-1} and it had entered stationary phase. Both the nitrate and ammonium additions were in stationary phase on day 7, when pDA increased to 4.26 μg l^{-1} and 2.64 μg l^{-1}, respectively. Using the days 0 and 2 *P. australis* specific cell counts, per-cell toxicity was 43 pg $cell^{-1}$ on day 0. We do not have simultaneous whole-cell probe data and toxin data for other days; however, using chlorophyll as a proxy, pDA chl^{-1} was 38.7 ng pDA chl^{-1} on day 0. By day 4, the control and nitrate addition decreased to

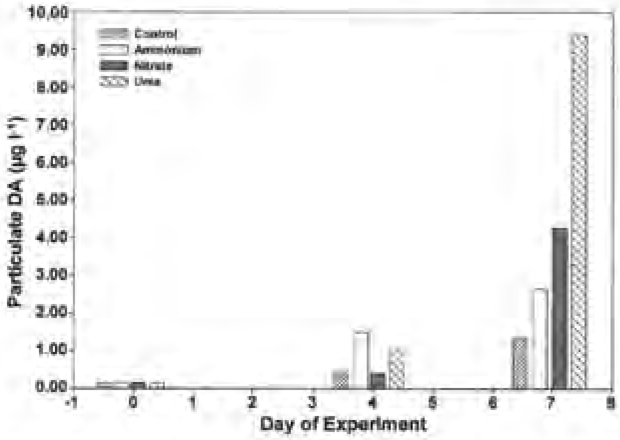

Fig. 2. Particulate domoic acid ($\mu g\ l^{-1}$) sampled on days 0, 4, and 7 of the field experiment for each nitrogen treatment: control (lined bar), ammonium (white bar), nitrate (solid black bar), and urea (hatch bar).

23.5 ng pDA chl^{-1} and 14.0 ng pDA chl^{-1}, respectively, while the ammonium and urea treatments increased to 64.0 ng pDA chl^{-1} and 54.7 ng pDA chl^{-1}. Concentrations increased for all carboys by day 7 to 162.0 ng pDA chl^{-1} in the nitrate addition, 99.3 ng pDA chl^{-1} in the ammonium addition, 309.1 ng pDA chl^{-1} in the urea addition and 94.3 ng pDA chl^{-1} in the control carboy.

3.1.2. Inorganic and organic nitrogen

The ambient nitrogen concentration of the seawater used in the incubation experiments was 6.6 µM nitrate, 1.7 µM ammonium and 0.9 µM urea. An additional 42.4 µM N was added for the nitrate addition treatment, 10 µM N for the ammonium treatment, and 20 µM urea for the urea addition. For the ammonium treatment, the ammonium concentration was half of its initial value by day 2 and was depleted by day 5 (Fig. 3A).

The initial urea concentration did not change significantly in the nitrate (Fig. 3B) ammonium and control treatments (Fig. 3C), but decreased ~50% by day 5 in the urea treatment (Fig. 3D) which also corresponded to the time point at which nitrate was depleted. At the termination of the experiment there was still 6.6 µM urea in the urea treatment.

Macronutrient depletion rates were calculated from a least-squares linear regression analysis of the exponential growth phase and an analysis of variance (ANOVA) determined from semi-log plots of nutrient concentration versus time (Guillard, 1973). The depletion of total nitrogen in each treatment was highest in the control treatment (Table 1) and lowest in the nitrate treatment. Because of the large amount of nitrate added (relative to the depletion rate) and due to issues associated with the

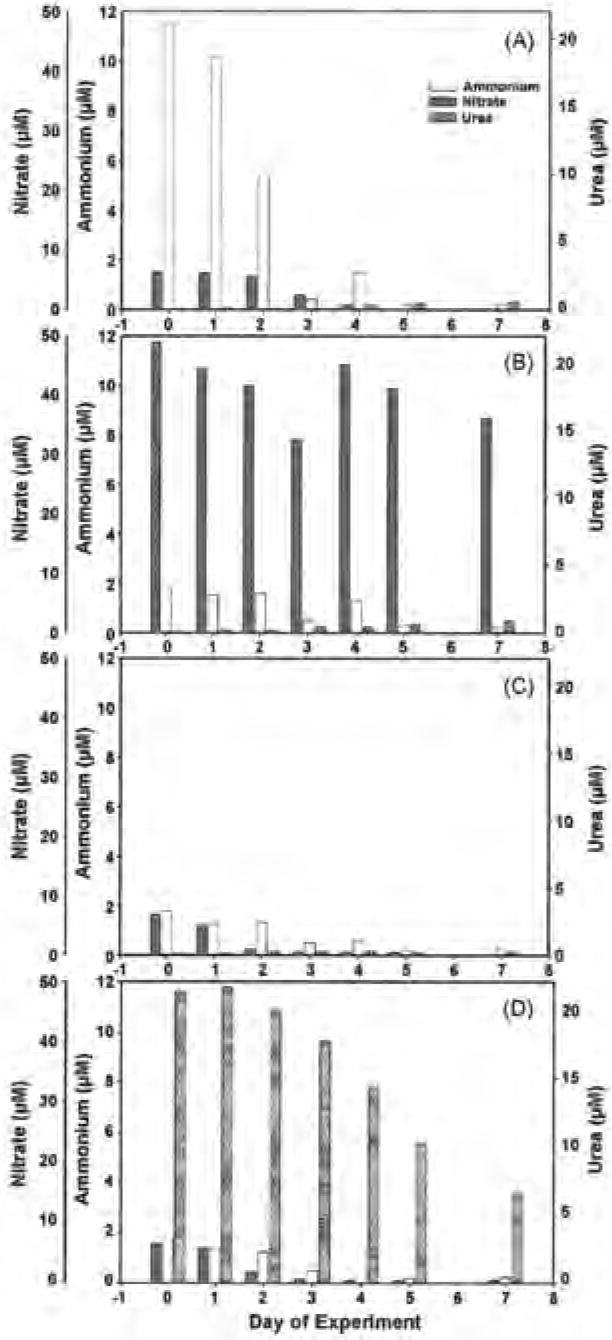

Fig. 3. Nitrate, ammonium and urea concentrations (in µM) measured daily in the field experiment for each nitrogen treatment: (A) ammonium; (B) nitrate; (C) control; (D) urea. Nitrate concentration (solid black bar) on the far left axis, ammonium concentration (white bar) on the left axis and urea concentration (crosshatch bar) on the right axis. Samples were not taken on day 6 of the experiment.

analysis of these high values on the autoanalyzer, the analytical error associated with the estimate of nitrate drawdown precludes accurate estimation of nitrate depletion rates to compare with the drawdown of ammonium and urea. As a result, the depletion rates

Table 1
Net nitrogen depletion rates for all treatments during the field experiment

Treatment	Depletion rates (day^{-1}) from days 0 to 3 (S.E.; n; r^2)											
	Nitrate			Ammonium			Urea			Total nitrogen		
Nitrate		0.13			0.35			−0.47			0.13	
	0.06	4	0.95	0.38	4	0.82	0.31	4	0.92	0.06	4	0.95
Ammonium		0.30			1.47			0.13			0.58	
	0.30	4	0.83	0.88	4	0.88	0.61	4	0.34	0.45	4	0.89
Urea		0.77			0.38			0.06			0.15	
	0.35	4	0.96	0.28	4	0.90	0.05	4	0.89	0.07	4	0.96
Control		0.87			0.36			−0.48			0.62	
	0.36	4	0.96	0.31	4	0.88	0.39	4	0.88	0.16	4	0.98

Standard error (S.E.), number of days included in the rate calculation (n) and r-squared values (r^2) are included in the table.

calculated for the nitrate treatment (total nitrogen and nitrate) do not accurately reflect the utilization of total nitrogen, as evidenced by the growth rates which are statistically indistinguishable across treatments. The highest net nitrate depletion rate (excluding the nitrate treatment) was in the control treatment and the lowest was in the ammonium treatment. For ammonium-based depletion rates, the ammonium treatment had the highest rate of depletion and the nitrate treatment was lowest. The ammonium-based depletion rates for the nitrate, urea and control treatments were not statistically indistinguishable ($p < 0.05$). For urea depletion rates, the highest rates were observed in the ammonium treatment and lowest in the urea treatment, while the nitrate treatment and the control had positive depletion rates for urea, meaning there was an increase in urea with time, probably due to grazers.

3.1.3. Other nutrients

The silicate concentration was initially 23 μM and decreased to 2.7–3.5 μM in the nitrogen additions and to 8.7 μM in the control by the end of the 7-day experiment. Silicate decreased to half of the initial concentration in the nitrate and ammonium treatments by day 3, and in the urea and control treatments, by day 4. The concentration of phosphate was initially 0.8 μM and by day 3 was half of this concentration across all treatments. Phosphate was depleted by day 4 in the nitrogen additions but not until day 7 in the control treatment.

3.1.4. Growth rate

Growth rates for the whole phytoplankton community were calculated from a linear regression analysis of the exponential growth phase and ANOVA determined from semi-log plots of chlorophyll *a* versus time (Guillard, 1973). Growth rates were statistically indistinguishable across all treatments ($p > 0.05$): nitrate 0.48 day^{-1} (calculated over 5 days, days 0–4); ammonium, 0.39 day^{-1} (days 0–5); urea, 0.34 day^{-1} (days 0–5); control, 0.40 day^{-1} (days 0–4). Qualitative indicators of growth of *P. australis* were calculated over 2 days from enumeration of the whole cell probes taken on days 0 and 2. The ammonium treatment was the highest (1.19 day^{-1}), followed by urea (1.16 day^{-1}), then the control (1.08 day^{-1}), and the lowest was the nitrate treatment (0.95 day^{-1}) (Table 2). The growth rates of for *P. australis* were substantially higher than those calculated from the entire assemblage.

3.1.5. Community composition

The phytoplankton assemblage was initially diatom-dominated, with *ca.* 76% centric and 24% pennate

Table 2
Calculated growth rates based on the increase in phytoplankton community chlorophyll *a* (during exponential growth) and *Pseudo-nitzschia australis* cell abundance (days 0–2) during the field experiment off San Francisco Bay

Treatment	Chlorophyll growth rates (day^{-1}) (S.D.; n; r^2)			Growth rate of *P. australis* (day^{-1})
Nitrate		0.48		0.95
	0.14	5	0.97	
Ammonium		0.39		1.19
	0.19	6	0.94	
Urea		0.34		1.16
	0.26	6	0.88	
Control		0.40		1.08
	0.16	5	0.94	

Standard deviation (S.D.), number of days included in the rate calculation (n) and r-squared values (r^2) are included in the table for chlorophyll-based rates.

forms (by number). Dominant genera included *Asterionellopsis*, *Chaetoceros*, and *Thalassiosira* spp.; other genera included *Skeletonema* and *Stephanopyxis* and, to a lesser extent, *Coscinodiscus* and *Eucampia*; dinoflagellates were negligible.

Despite the elevated growth rate for *P. australis* calculated from direct cell counts, there was a reduction from days 0 to 2 in pennate abundance (*ca.* 5–6.5% by number versus *ca.* 91–94% centrics and 0.5–2.1% dinoflagellates).

Although only two time points were available for *P. australis* enumeration (whole cell probe), *P. australis* was present in all samples. *P. australis* cell concentration was initially 3.60×10^3 cells l^{-1} and by day 2 had increased by an order of magnitude in all treatments to the following: nitrate addition, 2.77×10^4 cells l^{-1}; ammonium addition, 4.62×10^4 cell l^{-1}; urea addition, 4.32×10^4 cells l^{-1}; the control, 3.64×10^4 cells l^{-1}. At the start of the experiment, *P. australis* comprised 72% of all pennates and 17% of the whole phytoplankton community. By day 2, *P. australis* accounted for 41% of the pennates in the nitrate treatment, 86% in the ammonium treatment, 55% in the urea treatment and 69% in the control, but only 2.3–5.5% of the entire assemblage.

3.2. Laboratory experiment

3.2.1. Growth rate

Specific growth rates during the exponential growth phase were determined from linear regressions of the natural log of cell abundance versus time (Fig. 4A and B). Comparisons of the mean (±1S.D.) growth rates, using ANOVA (using post-hoc Tukey's test), indicate that the cells maintained on urea grew slower (0.52 ± 0.09 day^{-1}) than the cells grown on either nitrate (0.89 ± 0.08 day^{-1}) or ammonium (0.93 ± 0.001 day^{-1}), which both maintained significantly greater growth rates ($p < 0.01$), but were indistinguishable from each other ($p > 0.05$).

3.2.2. Chlorophyll *a* and cellular fluorescence capacity

Chlorophyll *a* samples were collected during late exponential phase and the chlorophyll *a* per cell was statistically indistinguishable ($p > 0.05$) for the nitrate and ammonium treatments (2.44 ± 0.55 pg cell^{-1} and 2.37 ± 0.48 pg cell^{-1}, respectively). However, the urea treatment exhibited a significantly lower ($p < 0.05$) mean cellular chlorophyll *a* concentration of 0.99 ± 0.43 pg cell^{-1}. The cellular fluorescence capacity for all nitrogen-substrate treatments, determined using DCMU, was indistinguishable from one another during exponential growth; F_v/F_m averaged 0.62 ± 0.05 ($n = 16$). The F_v/F_m values did not decrease during the late exponential phase when samples were collected for chlorophyll *a* and DA.

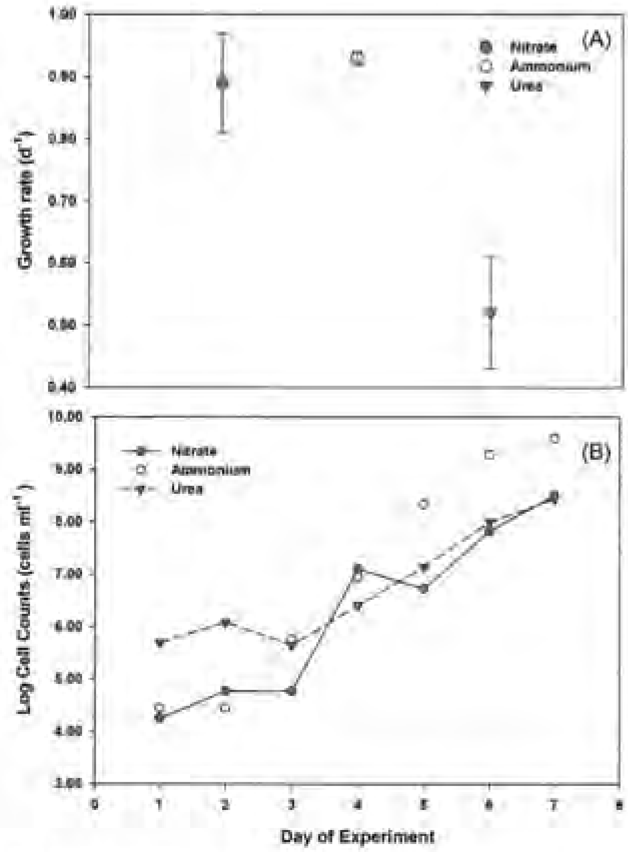

Fig. 4. (A) Growth rates derived from cell count measurements during exponential growth phase; (B) semi-log plot of cell counts measured daily from the laboratory experiment for each nitrogen treatment: (●), nitrate (○), ammonium (▼) and urea. Values are the mean of triplicate samples and error bars on the growth rate plot denote range of replicates.

3.2.3. Domoic acid

Particulate DA was collected during late exponential growth for each culture and normalized to cell abundance; the mean (±1S.D.) pDA per cell for each nitrogen treatment is presented here and graphically (Fig. 5A). The urea treatment had substantially greater pDA per cell, 1.37 ± 0.97 fg cell^{-1}, whereas the nitrate and ammonium treatments were lower, 0.48 ± 0.14 fg cell^{-1} and 0.26 ± 0.098 fg cell^{-1}, respectively. Overall, strain Au221-a was generally less toxic than the natural assemblages, which is consistent with previous laboratory experiments that demonstrate substantial strain-specific variability as well as a gradual loss of toxicity with time (e.g. Villac et al., 1993; Kudela et al., 2003b).

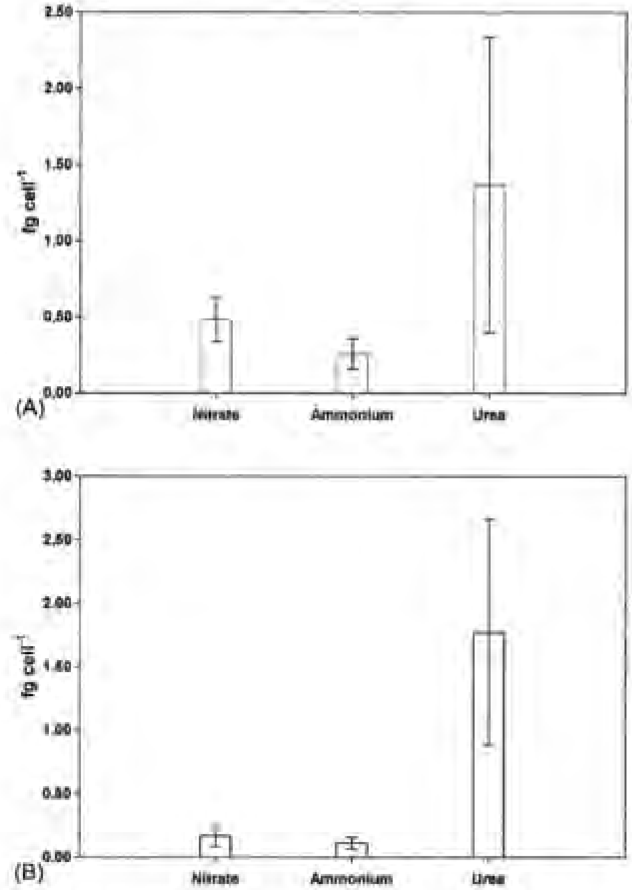

Fig. 5. Particulate (A) and dissolved (B) domoic acid per cell in the laboratory experiment. Values are means ($n = 3$) of domoic acid concentrations normalized to cellular abundance. Error bars represent $\pm$1S.D.

Dissolved domoic acid (dDA), expressed either volumetrically (per ml of culture filtrate) or normalized to cellular abundance (Fig. 5B), was significantly greater ($p < 0.05$) in the urea treatment (5.42 ± 2.24 pg ml^{-1}; 1.77 ± 0.89 fg cell^{-1}), compared to either the nitrate treatment (0.80 ± 0.34 pg ml^{-1}; 0.165 ± 0.082 fg cell^{-1}), or the ammonium treatment (1.51 ± 0.74 pg ml^{-1}; 0.112 ± 0.045 fg cell^{-1}).

4. Discussion

4.1. Field experiment

The central California coast consists of a wide continental shelf characterized by seasonally high concentrations of upwelled macronutrients as well as the micronutrient iron. The supply of fine-grained sediment from river input, combined with upwelling occurring over the shelf, creates an iron-replete region ideal for diatom blooms (Bruland et al., 2001). The phytoplankton assemblage in this region has previously been reported to be largely nitrogen and light limited during the winter (Kudela and Dugdale, 2000; Olivieri and Chavez, 2000). The oceanic conditions experienced during this experiment were typical of the winter season in central California (Wilkerson et al., 2000). Although the elevated ammonium and urea concentrations suggest the influence of San Francisco Bay outflow, Si:N ratios were relatively low (~4:1), substantially lower than reported during high-flow periods (Wilkerson et al., 2000). Consistent with these past observations, biomass (chlorophyll *a*) increased in all the field grow-out treatments, including the control, which suggests that the growth of the phytoplankton community was primarily limited by light availability and not initially limited by nitrogen.

The mean growth rates from our field data during the exponential phase were statistically indistinguishable across all nitrogen-substrate treatments, using either chlorophyll *a* concentrations or the *P. australis* cell abundance. It appears that *P. australis* does not exhibit a strong preference for any particular nitrogen source and can grow equally well on the organic substrate, urea. *P. australis*, initially present at a cell concentration of 10^3 cells l^{-1}, increased by an order of magnitude in all treatments to 10^4 cells l^{-1}, which is considered "bloom" conditions by monitoring agencies. At this cell concentration threshold, increased testing for domoic acid in coastal waters ensues (M. Silver, pers. commun.). This increase in *P. australis* across all treatments suggests that specific conditions such as stratification of the water column (alleviation of light limitation) can increase the growth of *P. australis* when nitrogen is available.

4.1.1. Domoic acid

There is a wide reported range of DA concentrations for central California (Table 3). Buck et al. (1992) reported pDA concentrations in Monterey Bay of 1.1–2.4 μg l^{-1} in October 1991 and 0.1–6.7 μg l^{-1} in November 1991. *P. australis* abundances were (6.5–20) × 10^4 cells l^{-1} and (0.8–67) × 10^4 cells l^{-1}, respectively. Scholin et al. (2000) reported a range of 7.2–31.2 pg DA per *P. australis* cell in Monterey Bay during the 1998 bloom. The calculated pDA in Monterey Bay on 20 May 1998, was 0.36–9.75 μg l^{-1}. Scholin et al. (2000) suggested that the increase in abundance of *P. australis* in the first half of May was a response to increased silicate concentrations, possibly in response to enhanced coastal runoff. El Niño conditions reduced the upwelling intensity signal along the California coast and record levels of rainfall were recorded in 1998 (Trainer

Table 3
Highest concentrations of particulate domoic acid reported in field observations for central California from 1991 to 2003 where *P. australis* was the dominant recorded organism

Location	DA (μg l^{-1})	Date	Reference
Monterey Bay	1.1–2.4	October 1991	Buck et al. (1992)
Monterey Bay	0.1–6.7	November 1991	Buck et al. (1992)
Monterey Bay	9.75	May 1998	Scholin et al. (2000)
Santa Cruz Wharf	2.5	May 1998	Scholin et al. (2000)
Monterey Bay	0.36	May 1998	Scholin et al. (2000)
Point Lobos	0.18–0.27	June 1998	Trainer et al. (2000)
Morro Bay	1.3–3.8	June 1998	Trainer et al. (2000)
Point Arguello and Point Conception	2.2–7.3	June 1998	Trainer et al. (2000)
Santa Barbara	0.5–1.2	June 1998	Trainer et al. (2000)
Mouth of San Francisco Bay	0.13	June 1998	Trainer et al. (2000)
Above Point Ano Nuevo	0.44	June 1998	Trainer et al. (2000)
Monterey Bay and Point Lobos	0.38	June 1998	Trainer et al. (2000)
Bolinas Bay	0.15–9.39	February 2003	This study

Note that the values from Trainer et al. (2000) are whole water samples (particulate and dissolved domoic acid).

et al., 2000). However, even in May and June during the 1998 bloom, temperature and salinity measurements indicated oceanic conditions. Trainer et al. (2000) suggested upwelling, not enhanced river flow, as the source of nutrients that sustained the bloom. Concentrations of whole water DA on 3–5 June ranged from 1.3 to 3.8 μg l^{-1} in Morro Bay and 2.2 to 6.3 μg l^{-1} in Point Conception where *P. australis* was the dominant species, at abundances of 4.9×10^4 cells l^{-1} and 2.3×10^5 cells l^{-1}, respectively. The highest whole water DA concentrations (7.3 μg l^{-1}) were recorded in southern California, at Point Arguello (Trainer et al., 2000).

Results from this experiment (0.15–9.39 μg pDA l^{-1}) fall within the reported range for pDA values, with initial concentrations on the low end, increased concentrations across all treatments by day 4 and the highest levels achieved near the maximum pDA concentrations of 9.75 μg l^{-1} reported by others (Scholin et al., 2000). All but the urea treatment entered stationary growth phase by the end of the experiment (day 7). The results of the urea treatment are especially significant since it produced the highest pDA on day 7, which was double the amount produced by the nitrate treatment and three times more than that of the control and ammonium treatments. The initial (days 0–2) quantitative indicators of growth of *P. australis* were similar in all of the treatments, and the mean specific growth rates calculated from community chlorophyll concentrations were also statistically indistinguishable from each other. Therefore, the large increase in pDA production cannot be explained simply by higher biomass or lower growth rates in the urea treatment. This suggests that the per-cell production of pDA was substantially greater when grown on urea. Since the cells in the urea treatment were still growing exponentially when pDA was measured, and previous laboratory experiments have shown that the major increase in production of pDA is in stationary phase (at least for *P. multiseries*; Pan et al., 1996a,b; Bates, 1998), one might expect pDA values to be conservative. The implications of these results are that elevated concentrations of urea from anthropogenic sources such as agricultural and urban runoff, or sewage discharge, could be a significant source of nitrogen for toxic bloom development or sustenance of *P. australis*.

4.1.2. Utilization of more than one nitrogen source

The depletion of half of the initial concentration of ammonium and approximately 10% of the concentration of nitrate in the ammonium treatment by day 2, as well as the depletion of both nitrogen sources by day 5, demonstrates simultaneous utilization of more than one nitrogen source. In addition, there was no indication of any inhibitory effects of ammonium on nitrate uptake. Bates et al. (1993) showed that cultures grown at less than 110 μM of nitrate and ammonium had equivalent growth rates and that there was no inhibition of nitrate uptake due to ammonium. As might be expected, ammonium addition stimulated ammonium depletion rates, whereas ammonium depletion rates were similar in the other treatments. Since these experiments utilized mixed phytoplankton assemblages, it is not possible to attribute these nitrogen uptake characteristics to *Pseudo-nitzschia* specifically, but *P. australis* remained the dominant pennate diatom (86%) in the ammonium treatment and accounted for 41% in the nitrate treatment.

In the urea treatment, the depletion of 6 μM of the initial nitrate but only 2 μM of the initial urea by day 2 indicates a slight preference for nitrate over urea. However, the depletion of nitrate by day 5 and the subsequent drawdown of urea indicate the sustained growth capabilities of the assemblage, including *P. australis*, when urea is the sole nitrogen source, particularly since this treatment was still growing exponentially on day 7. The lower depletion rates for urea across all treatments were expected since elevated ammonium concentrations (>1 μM) have been shown to suppress the uptake mechanism for urea in unialgal cultures (e.g. Molloy and Syrett, 1988; Cochlan and Harrison, 1991). In addition, an increase in urea in the carboys can be attributed to grazers. Growth rates were not statistically different across treatments, but based on the growth and nitrogen depletion rates (Tables 1 and 2), there appears to be a slight preference for nitrate and ammonium relative to urea.

Although limitation by other macro- or micronutrients was not directly assessed, ambient silicate and phosphate conditions during the experiment suggest that these nutrients were not limiting (they were not completely depleted for most treatments). Iron limitation and copper toxicity were also not directly addressed; however, initial iron concentrations were elevated, as expected over this shallow shelf region (Bruland, pers. commun.). Copper concentrations can be expected to be similar across nutrient additions, so any changes in growth rate or toxin production are not directly attributable to changes in copper toxicity.

4.2. Laboratory experiment

4.2.1. Growth rates and chlorophyll a

Laboratory experiments indicated that the concentration of chlorophyll *a* per cell was two- to three-fold less in the urea treatment compared to the nitrate and ammonium treatments. The low chlorophyll *a* per cell in the urea treatment could indicate possible nutrient stress, but the cellular fluorescence capacity for each nitrogen treatment did not differ (mean $F_v/F_m = 0.62$, and did not decline with time), suggesting that the physiological status was unaffected by the nitrogen source supporting growth. However, the exponential growth rate (determined using cell abundance) of *P. australis* was significantly slower for cells grown on urea compared to those grown on nitrate and ammonium, which both maintained similar growth rates. These laboratory results demonstrate the capability of this diatom to grow equally well on oxidized and reduced forms of nitrogen, and that *P. australis* is capable of using urea as the sole nitrogen source for growth, albeit at a somewhat slower rate than cultures grown on either nitrate or ammonium.

4.2.2. Domoic acid

The highest level of particulate domoic acid (pDA) per cell occurred in the urea treatment. As with the urea-amended field experiment, cells from the laboratory cultures were harvested in late logarithmic phase for particulate and dissolved domoic acid (dDA) analysis, and it is possible that urea-grown cells could potentially produce higher pDA $cell^{-1}$ once the cells enter stationary phase. In addition, the dDA (normalized to cell abundance) was ∼140% of the pDA in the urea treatment whereas in the ammonium and nitrate treatments dDA/pDA only averaged 40–50%. This ratio of dDA/pDA is unusually high for cells harvested in late logarithmic phase. However, there are no other published results at this concentration of ammonium. The results for the laboratory experiment were similar to those of the field experiment in that DA production as a function of nitrogen source was greatest when nitrogen was derived solely from urea, followed by nitrate and ammonium, which were statistically indistinguishable. Assuming that DA production would continue to increase as cells entered stationary phase, and that a considerable fraction of DA is dissolved, our estimates of enhanced toxicity when grown on urea are likely conservative.

5. Conclusions

In California coastal waters, *Pseudo-nitzschia* spp. represent only a minor constituent of the total phytoplankton assemblage during most of the year. Previous authors have suggested a number of potential environmental factors such as coastal runoff (Scholin et al., 2000), metal stress (Rue and Bruland, 2001; Maldonado et al., 2002; Ladizinsky and Smith, 2003; Wells et al., 2005) or macronutrient limitation (Pan et al., 1996a,b,c) that may trigger toxin production in *Pseudo-nitzschia* blooms. In the San Francisco Bay experiment, no conspicuous "triggers" of DA production, such as silicate or phosphate limitation, were observed. The phytoplankton assemblage, which included a large proportion of *P. australis*, did not exhibit a preference for any particular nitrogen substrate, and both inorganic and organic nitrogen sources could support the growth of this assemblage, while the unialgal cultures definitively show that *P. australis* can grow on all nitrogen substrates tested. Both the field and laboratory experiments demonstrate that urea-grown cells were more toxic than cells utilizing either nitrate or ammonium. Given that this diatom blooms during both upwelling and non-upwelling conditions off the west coast of the U.S. (Buck et al., 1992; Fryxell et al., 1997; Trainer et al., 2000), substantial differences in the nitrogenous nutrition of *P. australis* can be expected, and anthropogenic inputs of reduced nitrogen substrates, such as urea, may be more important in harmful algal bloom development than previously thought, as suggested in a recent analysis by Glibert et al. (2005b). We conclude that *P. australis* is capable of using both inorganic and organic nitrogen sources and that nitrogenous source can influence toxin production in this species in central California.

Acknowledgements

This work was supported by the NOAA-ECOHAB grant NA96OP0475 awarded to RMK and WPC, and additional grants awarded to RMK and MDA, including C7-94085 (NOAA), OCE-138544 (NSF), and those from Dr. Earl H. and Ethyl M. Meyers Trust, Ida Benson Lynn Fellowship, the University of California, Santa Cruz Women's Club, and the Ocean Science Department. Ship time for the field component was made available by Dr. Kenneth W. Bruland, funded by NSF grant OCE-0238347. The authors thank Dr. Peter E. Miller, Dr. Chris Scholin, Mr. Rob Franks, Dr. Mary Silver, Mr. Julian Herndon and the captain and crew of the R/V *Point Sur*. In particular, we acknowledge the time and effort of Ms. Margaret P. Hughes and Dr. Mark L. Wells for their culturing assistance, domoic acid analyses, and for supplying the initial cultures. We also thank two anonymous reviewers and Dr. Ted Smayda who provided useful commentary on an earlier version of the manuscript.[TS]

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Harmful Algae 8 (2008) 103–110

Contents lists available at ScienceDirect

Harmful Algae

journal homepage: www.elsevier.com/locate/hal

The potential role of anthropogenically derived nitrogen in the growth of harmful algae in California, USA

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ARTICLE INFO

Article history:
Received 30 April 2007
Received in revised form 22 July 2007
Accepted 1 August 2008

Keywords:
Ammonium
Eutrophication
Nitrate
Nitrogen uptake kinetics
Urea

ABSTRACT

Cultural eutrophication is frequently invoked as one factor in the global increase in harmful algal blooms, but is difficult to definitively prove due to the myriad of factors influencing coastal phytoplankton bloom development. To assess whether eutrophication could be a factor in the development of harmful algal blooms in California (USA), we review the ecophysiological potential for urea uptake by *Pseudo-nitzschia australis* (Bacillariophyceae), *Heterosigma akashiwo* (Raphidophyceae), and *Lingulodinium polyedrum* (Dinophyceae), all of which have been found at bloom concentrations and/or exhibited noxious effects in recent years in California coastal waters. We include new measurements from a large (Chlorophyll $a > 500$ mg m^{-3}) red tide event dominated by *Akashiwo sanguinea* (Dinophyceae) in Monterey Bay, CA during September 2006. All of these phytoplankton are capable of using nitrate, ammonium, and urea, although their preference for these nitrogenous substrates varies. Using published data and recent coastal time series measurements conducted in Monterey Bay and San Francisco Bay, CA, we show that urea, presumably from coastal eutrophication, was present in California waters at measurable concentrations during past harmful algal bloom events. Based on these observations, we suggest that urea uptake could potentially sustain these harmful algae, and that urea, which is seldom measured as part of coastal monitoring programs, may be associated with these harmful algal events in California.

1. Introduction

The apparent worldwide increase in the occurrence and impact of harmful algal bloom (HAB) events (e.g., Anderson et al., 2002) has frequently been attributed to, either directly or indirectly, increased cultural eutrophication (Glibert et al., 2005, 2006; GEOHAB, 2006). Despite this link, there is a general perception that coastal California is relatively less impacted by cultural eutrophication, because of the dominance of upwelling and the relatively minor contribution of terrestrial runoff (Otero and Siegel, 2004). Coastal California has also historically been classified as being primarily nitrogen-limited (e.g., Eppley et al., 1979; Kudela and Dugdale, 2000), suggesting that phytoplankton (including potential harmful algal species) in California coastal waters would respond positively to increased nitrogen loading. However, there is only limited regional evidence to support this assertion, with increased phytoplankton biomass directly attributed to runoff in the Gulf of California, Baja Mexico (Beman et al., 2005), Southern California (Kudela and Cochlan, 2000) and central California (Kudela and Chavez, 2004), while the importance of runoff as a potential nutrient source has been suggested by numerous investigators (e.g. Eppley et al., 1979; Warrick et al., 2005).

To assess the role of runoff and cultural eutrophication in California, several approaches could be taken. The most direct would be to assess the temporal trend of harmful algal events with nutrient concentration and rates of nutrient use by HAB species; unfortunately, the long-term records of ambient nutrient concentrations and harmful algae in California are not necessarily coincident, and there are relatively few time series of land-derived nutrient loads. As an alternative, we present data on the physiological capacity for several HAB species from coastal California to respond to nutrient enrichment on short time scales. We focus on urea, both because of its accelerated global use (Glibert et al., 2006) and because elevated urea concentrations in the coastal ocean are generally indicative of eutrophication, while elevated concentrations of other nutrients such as nitrate and phosphate are more difficult to attribute directly to eutrophication in upwelling-dominated systems such as California.

We present data from several HAB and potentially harmful species, including the pennate diatom genus *Pseudo-nitzschia*, the dinoflagellates *Akashiwo sanguinea*, *Lingulodinium polyedrum*, and *Cochlodinium* spp., and the raphidophyte *Heterosigma akashiwo*,

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doi:10.1016/j.hal.2008.08.019

using nitrogen uptake kinetics as a metric for the potential of these organisms to respond to urea and ammonium, proxies for eutrophication. All of these N uptake kinetics have been measured by our laboratories using either natural assemblages or culture isolates from U.S. west coast waters.

2. Methods

We primarily focus on a review of nitrogen uptake and ecophysiological data for HAB species from coastal waters of California, and refer the reader to the referenced literature for the details of specific sampling and experimental protocols. New N kinetic results are presented for the dinoflagellate *Akashiwo sanguinea* from a nearly mono-specific bloom event in Monterey Bay during September 9–14, 2006, and are described in more detail. Unless otherwise stated, similar methods were employed for the other phytoplankton species, as documented in the respective publications.

To assess the role of anthropogenic loading, time-series measurements were conducted in Monterey Bay and San Francisco Bay. In Monterey Bay, ambient concentrations of nitrate, ammonium, urea, and *P. australis* abundance were measured from Santa Cruz Municipal Wharf (36°57.48′N, 122°1.02′W) for March 2006–May 2007, and in San Francisco Bay, ambient concentrations of nitrate, ammonium, and urea were measured for May–September, 2005 from the northeastern (Paradise Cay: 37°N, 122°28.5′W) and southwestern (Richardson Bay: 37°53′N, 122°30.2′W) sides of the Tiburon Peninsula both within 10 km from the Golden Gate entrance to the open ocean.

2.1. Field experiments

Water was collected at two separate locations during a large red tide event, dominated by the dinoflagellate *Akashiwo sanguinea*, from the R/V John H. Martin, on September 7 and 8, 2006. At the time of collection, *A. sanguinea* was concentrated in a near-surface red tide, with chlorophyll *a* (Chl *a*) concentrations within the red tide in excess of 500 mg Chl *a* m^{-3} at some locations (Table 1). Either 10-l. PVC Niskin bottles (refitted with silicone rubber band springs) mounted on an instrumented rosette or a clean polyethylene bucket was used to collect seawater from 2 m and 0–1 m depth, respectively. Nine-liter, acid-cleaned polycarbonate (Nalgene) carboys were rinsed three times and filled with seawater using multiple Niskin bottles or the homogenized bucket sample. The water was maintained at sea in a deckboard incubator cooled with flowing surface seawater to maintain ambient temperature of collection and darkened to avoid light shock during transport back to shore. For the first experiment, samples collected on 7 September were transferred to an environmental chamber (15.5 °C, 180 μmol photons m^{-2} s^{-1}) ashore and assayed for nutrient kinetics within 3 h of collection. On 8 September, 2 m samples were transferred to a walk-in environmental chamber (15–16 °C and ca. 100–250 μmol photons m^{-2} s^{-1} irradiance using "cool-white" fluorescent lamps and a 14:10 light:dark cycle) at the University of California Santa Cruz. Kinetics experiments were performed within 12 h of water collection, after maintenance of the whole water under simulated *in situ* conditions. Field concentrations of 300 mg Chl *a* m^{-3} in surface waters would result in approximately 10% surface irradiance at 2 m depth, or approximately 100–200 μmol photons m^{-2} s^{-1}. Additional nutrient samples were taken to coincide with the kinetics experiments, and were within the sampling error of the N concentrations reported in Table 1.

2.2. Analytical methods

Samples for Chl *a* were collected in triplicate and filtered onto uncombusted glass-fiber filters (Whatman GF/F; nominal pore size 0.7 μm) and processed using the non-acidification method (Welschmeyer, 1994). Macronutrients (nitrate plus nitrite [hereafter referred to as nitrate], silicate and ortho-phosphate) were stored frozen, and later analyzed with a Lachat Quick Chem 8000 Flow Injection Analysis system using standard colorimetric techniques (Knepel and Bogren, 2001; Smith and Bogren, 2001a,b). Ammonium and urea samples were collected using 50 mL low-density polyethylene (LDPE) centrifuge tubes (Corning®); previous tests have confirmed that these tubes are contaminant free for both urea and ammonium. Ammonium samples were stored refrigerated and were manually analyzed using the fluorescence method of Holmes et al. (1999). Urea samples were frozen at −20 °C, and subsequently thawed at room temperature before manual analysis using the diacetyl monoxime thiosemicarbizide technique (Price and Harrison, 1987), modified to account for a longer time period (72 h) and lower digestion temperature (22 °C) as suggested by Goeyens et al. (1998). The time-series measurements of ambient N concentrations from San Francisco Bay were measured similarly, except for ammonium which was measured using the phenol hypochlorite technique (Solorzano, 1969) with a spectrophotometer equipped with a 10-cm cell.

2.3. Kinetics methods

Three nitrogen substrates (nitrate, ammonium, urea) were used to determine the uptake response kinetics. In the laboratory, water was dispensed into pre-cleaned, 70 mL polycarbonate flasks at the same time that nutrient and pigment samples were collected, and inoculated with either ^{15}N-ammonium chloride, (99 atom%; Cambridge Isotopes), ^{15}N-sodium nitrate (99 atom%) or ^{13}C-^{15}N-urea (99.0 and 98.2 atom%) at a range of initial substrate concentrations. For the first experiment (7 September) 10 substrate levels were used, with duplicate measurements at the lowest concentrations; initial concentrations were 0.14, 0.29, 0.43, 0.58, 0.72, 1.01, 1.16, 1.45, 7.24, and 14.49 μg-at N L^{-1} for ammonium and nitrate, 2× those concentrations for urea. The second experiment (8 September) used 0.20, 0.30, 0.40, 0.60, 0.80, 1.01, 2.02, 5.05, 10.10 and 20.20 μg-at N L^{-1} (2× these concentrations for urea, except for 40.40, which was lost) with three replicates at 0.30 (0.60) μg-at N L^{-1}. For both experiments, after inoculation the flasks were transferred to an environmental chamber maintained at the temperature of sample collection (15–16 °C), and incubated under 180–240 μmol photons m^{-2} s^{-1} irradiance using standard (GE "soft white") fluorescence

Table 1
Ambient conditions at the time of collection for the two sampling events in Monterey Bay, CA during 2006

Date	Urea	Ammonium	Nitrate (μg-at N L^{-1})	Phosphate (μM)	Silicate (μM)	Temperature (°C)	Salinity	Chl *a* (μg L^{-1})	*A. sanguinea* (cells L^{-1})
7 September	0.25	0.03	0.02	3.56	16.99	15.59	33.53	370.05	6.41×10^{9}
8 September	n.d.	n.d.	0.35	0.41	19.48	15.10	33.60	573.66	9.88×10^{9}

Water was collected from 0 and 2 m on 7 and 8 September, respectively.
n.d., not determined.

illumination. Incubations were terminated after 30 min by filtration (<100 mm Hg) onto precombusted GF/F filters, immediately dried at 50 °C, and subsequently analyzed for total particulate nitrogen and isotopic enrichment using a Finnigan Delta XP mass spectrometer.

Particulate nitrogen specific uptake rates (V, h^{-1}) were estimated from the accumulation of ^{15}N in the particulate material, and calculated as described in Dugdale and Wilkerson (1986). Rates were not corrected for the effects of isotopic dilution (Glibert et al., 1982) due to the short (30 min) incubation periods. Curve fitting was carried out using an iterative, non-linear least-squares technique (Kaleidagraph; Abelbeck Software), which utilizes the Levenberg-Marquardt algorithm (Press et al., 1992), to determine the half-saturation (K_s, μg-at N L^{-1}) and maximum uptake (V_{max}, h^{-1}) parameters of a Michaelis–Menten curve for nitrogen kinetics. The substrate affinity constant at low concentrations (i.e., ambient nutrients $<K_s$) was determined from the initial slope (α) of the Michaelis–Menten plot; calculated as $\alpha = V_{max}/K_s$.

2.4. Species enumeration

Ashore, freshly preserved (1% paraformaldehyde or acidic Lugol's solution) whole water samples were qualitatively inspected for species dominance and abundance using with a Fluid Imaging Technologies FlowCAM. Preserved samples were subsequently settled and enumerated on a Zeiss Axiovert microscope using the Utermöhl technique. For the time-series of *Pseudo-nitzschia* abundance presented in Fig. 2, weekly whole-water samples were collected and enumerated using a DNA-specific whole cell probe method as described by Miller and Scholin (1998) for *P. australis* and *P. multiseries*. During this time interval, *P. multiseries* was always absent or a very small fraction (<1%) of the total *Pseudo-nitzschia* abundance. Therefore, Fig. 2B only presents *P. australis* abundance, expressed as log-transformed cell counts [log(cells L^{-1})]. Particulate domoic acid concentrations were also measured for the April–May 2007 bloom event, following the methods described by Schnetzer et al. (2007).

3. Results

To assess the nutrient utilization capability of *Akashiwo sanguinea* found off California, we conducted nutrient uptake kinetics experiments during September 2006 using natural assemblages where *A. sanguinea* was the dominant organism. The ambient nitrogen concentrations of nitrate, ammonium, and urea of the seawater collected for these experiments were low to undetectable, while phosphate and silicate concentrations were still measurable (Table 1). Because we assessed N uptake kinetics on natural field assemblages, we cannot attribute our uptake rates and estimated kinetic parameters solely to *Akashiwo*; however, since it was dominant, we have assumed that the reported values are indicative of *Akashiwo sanguinea*. For both samples, *A. sanguinea* was found at concentrations in excess of 8×10^6 cells L^{-1} (Table 1) and represented >86% and >88% numerically (7 and 8 September, respectively), and >90–95% by biomass (estimated from cell size), of the algal cells present; a near mono-culture of this dinoflagellate in the surface waters of the red tide blooms.

All three nitrogen substrates exhibited reasonable Michaelis–Menten responses (Fig. 1, Table 2), although the nitrate kinetics for 7 September were linear or nearly linear at substrate concentrations greater than 2 μg-at N L^{-1}. This does not affect the determination of α, the initial slope, but it precludes a true estimate of V_{max}. We therefore report the highest measured value for nitrate uptake as a conservative V_{max} estimate. There was variability in kinetics responses between the two sampling events. Although these differences are relatively minor for the estimated maximal uptake rates of nitrate and urea, the affinity coefficients differed substantially between dates. However for ammonium, whereas the V_{max} ammonium differed by almost twofold, the α values were similar.

At elevated nutrient concentrations, ammonium uptake is between two- and threefold higher than urea and nitrate uptake, respectively (Table 2). At low ($<K_s$) concentrations, urea exhibits a much greater range of uptake affinities (α: the initial slope of the uptake curve), with between two- and threefold higher affinities than nitrate or ammonium, while nitrate and ammonium are essentially equivalent when the kinetics parameters from the same experiment are compared for the respective nitrogen substrates.

Substrate preference is often assessed by comparing maximum uptake rates (V_{max}) for one nitrogen source in the absence of other N substrates (e.g. Dortch, 1990). Based on these single substrate experiments, the N preference of *Akashiwo sanguinea* follows the order: ammonium ≫ urea > nitrate during high ambient N conditions. However using the half-saturation constants, which are generally thought to be indicative of substrate utilization under nutrient-limited conditions, the order is urea > nitrate > ammonium, and while using the initial slope (α), *A. sanguinea* affinity order is urea ≫ ammonium > nitrate. The inherent variability in the nutrient kinetics parameters demonstrates the difficulty of assessing N preference from natural assemblages; regardless of how nutrient preference is assessed, however, it is clear that *A. sanguinea* is capable of utilizing all three forms of nitrogen measured in this

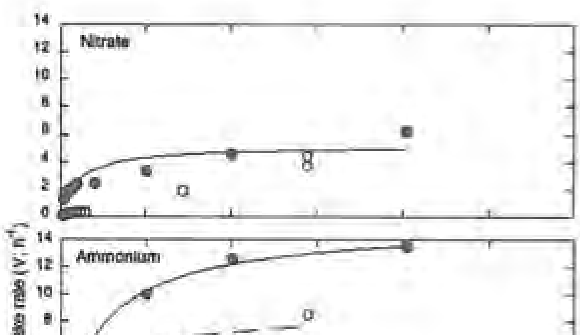

Fig. 1. Particulate N-specific uptake rates (V, h^{-1}) for nitrate (top), ammonium (middle), and urea (bottom) for natural assemblages dominated by *Akashiwo sanguinea* collected from Monterey Bay, California on 7 September (open circles), and 8 September (closed circles) plotted versus substrate concentrations (μg-at N L^{-1}). Two replicates for nitrate and ammonium were conducted at the highest substrate concentration on 7 September, while three replicates were conducted at 0.3 μg-at N L^{-1} on 8 September, and are presented as individual symbols (symbols are overlapping for ammonium and urea); replicates were not measured for other concentrations. The curves represent Michaelis–Menten kinetics for the data, except for the 7 September nitrate values, which are fitted to a linear regression. Curve parameters are summarized in Table 2.

Table 2
Summary of literature values for nitrogen uptake kinetics of California natural assemblages and unialgal HAB cultures, and for non-HAB coastal assemblages

Species	Nitrate				Ammonium				References
	V_{max}	K_s	α	r^2 (n)	V_{max}	K_s	α	r^2 (n)	
Cultures									
Heterosigma akashiwo	18.0	1.47	12.2	0.92 (30)	28.0	1.44	19.4	0.81 (36)	Herndon and Cochlan (2007)
Pseudo-nitzschia australis	105.3	2.82	37.3	0.98 (19)	71.0	5.37	13.2	0.96 (20)	Cochlan et al. (2008)
Natural HAB assemblages									
Monterey Bay, CA (*Cochlodinium bloom*)	0.9	1.01	0.89	0.85 (12)	>4.0	–	0.3	0.94 (12)	Kudela et al. (2008)
Southern California, USA (*Lingulodinium polyedrum*)	3.85	0.467	0.82	0.56 (18)	8.09	0.586	1.3	0.92 (20)	Kudela and Cochlan (2000)[a]
Monterey Bay (*A. sanguinea*)									
7 September 2006	>4.0	–	0.04	0.99 (11)	8.78 (0.99)	2.05 (0.58)	4.28	0.86 (12)	This study[b]
8 September 2006	5.18 (0.50)	1.00 (0.22)	5.18	0.81 (12)	15.11 (0.50)	2.37 (0.22)	6.38	0.99 (12)	This study
Coastal waters									
Washington coast, USA	5.8	0.05	116	–	6.8	0.710	9.58	–	Dortch and Postel (1989)
Western New Zealand	13.8	1.1	12.5	–	20.7	0.5	41.4	–	Chang et al. (1995)
Neuse Estuary, NC, USA	3.98	0.54	7.37	–	52.9	2.38	22.2	–	Fan et al. (2003)[c]

Species	Urea				References
	V_{max}	K_s	α	r^2 (n)	
Cultures					
Heterosigma akashiwo	2.89	0.42	6.88	0.67 (18)	Herndon and Cochlan (2007)
Pseudo-nitzschia australis	>30	–	2.8	0.99 (18)	Cochlan et al. (2008)[d]
Natural HAB assemblages					
Monterey Bay, CA (*Cochlodinium bloom*)	0.19–0.22	1.57–6.56	0.35–1.24	0.94–0.96 (12)	Kudela et al. (2008)
Southern California, USA (*Lingulodinium polyedrum*)	10.6	0.99	1.07	0.73 (16)	Kudela and Cochlan (2000)[a]
Monterey Bay (*A. sanguinea*)					
7 September 2006	8.77 (0.99)	4.13 (1.16)	2.13	0.86 (12)	This study
8 September 2006	7.2 (0.34)	0.43 (0.07)	16.84	0.91 (11)	This study
Coastal waters					
Washington coast, USA	4.6	0.78	5.89		Dortch and Postel (1989)
Western New Zealand	12	0.5	24.0		Chang et al. (1995)
Neuse Estuary, NC, USA	5.77	0.37	15.6		Fan et al. (2003)[c]

Kinetic parameters are reported as $\times 10^3$ h^{-1} for V_{max}, μg-at N L^{-1} for K_s, and ($\times 10^3$ h^{-1})/(μg-at N L^{-1}) for α. When available, the coefficient of determination (r^2) and number of samples (n) used in the curve fits are reported. For *A. sanguinea*, the estimated standard error values of V_{max} and K_s are given in parentheses.

[a] V_{max} calculated from reported cell specific rates using cell abundance = 3.57×10^5 cells L^{-1} (incorrectly reported in original paper) and PN concentration = 44.5 μg-at N L^{-1}, α reported as (V_{max}/K_s).

[b] V_{max} for nitrate determined from highest measured uptake rate.

[c] V_{max} reported as fg at-N (cell h)$^{-1}$), α reported as (V_{max}/K_s).

[d] V_{max} estimated at [urea] = 40 μg-at N L^{-1} from linear fit of urea uptake vs. concentrations; α reported from initial slope ([urea] < 2.4 μg-at N L^{-1}) of linear fit.

study and routinely found in measurable concentrations in the coastal waters of California.

4. Discussion

4.1. Uptake kinetics by California HAB organisms

California has a long history of HAB monitoring. These efforts began in the early 1930s after discovery of saxitoxin (STX), the causative agent of paralytic shellfish poisoning (PSP), in San Francisco Bay. In 1991, a second major class of marine toxins was identified in California, responsible for Amnesic Shellfish Poisoning (ASP). A major mortality event of marine birds was linked to domoic acid, the causative agent of ASP, produced by several species of the pennate diatom *Pseudo-nitzschia* (Work et al., 1993). Since 1991, several more HAB organisms have been identified in California including causative organisms for diarrhetic shellfish poisoning (DSP; Kudela et al., 2005) and yessotoxin (YTX; Armstrong and Kudela, 2006). There have also been frequent occurrences of potentially harmful red tides caused by several organisms, including *Cochlodinium* (Curtiss et al., 2008; Kudela et al., 2008). We include *Akashiwo sanguinea* (this study), which while not typically classified as an HAB, is indicative of the recent increase in potentially disruptive red tides in central California (Ryan et al., 2005; Curtiss et al., 2008) and within San Francisco Bay (Cloern et al., 2005). Of these organisms, *Heterosigma akashiwo* and *Lingulodinium polyedrum* have already been linked to elevated levels of anthropogenic N substrates and their preferential utilization in coastal waters (Kudela and Cochlan, 2000; Herndon et al., 2003; Herndon and Cochlan, 2007). Finally, *Pseudo-nitzschia* has previously been associated with both eutrophication and a reduction in the ratio of N:Si elsewhere (cf. review by Bates et al., 1998), an indirect consequence of cultural eutrophication. Field and lab studies of *P. australis* have also shown that this diatom increases its toxicity (production of domoic acid) when provided with urea as a nitrogen source (Howard et al., 2007) although this trend was not observed in cultures of *Pseudo-nitzschia cuspidata* (Auro, 2007).

To assess the observed and potential role of urea (used here as a convenient metric for eutrophication), one can compare nutrient uptake kinetics for these organisms. Uptake kinetics can vary considerably as a function of strain variability, preconditioning of the cells (Fan et al., 2003), and enhanced short-term (surge) uptake in response to elevated nutrient concentrations when N starved (Conway et al., 1976; Goldman and Glibert, 1982). In the present study, we compare the kinetic parameters estimated for both natural assemblages and unialgal cultures, but in each case the methods employed to determine the N uptake kinetic parameters are very similar: multiple flask incubations where different concentrations of ^{15}N-labeled substrate were added to each flask and the incubation times were consistently short and constant. Thus we feel that these parameters can be confidently compared to each other, bearing in mind the plasticity of kinetics parameters in response to environmental and incubation conditions.

Nutrient uptake kinetics parameters can be used to assess the relative preference and affinity of various substrates in low and high nutrient environments. Preference can be assessed by comparing maximum uptake rates (V_{max}) at high ambient nutrient concentrations, or by comparing either K_s or α, the initial slope of the uptake kinetics curve. The initial slope (α) is generally considered to be a more robust indicator of preference at low ($<K_s$) ambient nutrient concentrations, since it is not dependent on V_{max}, unlike K_s (Healey, 1980).

Based on the nitrogen kinetics parameters of representative California HAB organisms (Table 2), V_{max} values for ammonium or urea are greater than for nitrate for all of the organisms except *P. australis*, which exhibited a greater maximal uptake for nitrate, consistent with expectations for a diatom (e.g. Lomas and Glibert, 2000). The variability observed between sampling events (Table 2) could be due to the effect of holding the whole water for a longer period of time (12 h) with little to no ambient nitrogen prior to conducting the kinetics experiments, although other factors, such as sampling different water masses on different days, cannot be ruled out. Qualitative assessment of the status of the algal assemblage, determined as cell abundance, motility and morphology as well as changes in nutrients and pigments, indicated that holding the whole water for up to 12 h on 8 September did not result in obvious changes in the community. Note however that V_{max} values are within about a factor of 2 for any given organism, and for all of these organisms, nitrate, ammonium, and urea are all capable of being used. At low ($<K_s$) nutrient concentrations, the initial slopes (α) for the various nitrogen compounds exhibit more variability. *Pseudo-nitzschia australis* exhibits the highest affinity (i.e., preference at $\ll K_s$) for nitrate, followed by ammonium then urea. *H. akashiwo* is similar, but with N affinity following the order: ammonium > nitrate > urea, while the dinoflagellates exhibit either similar affinities for all substrates (*L. polyedrum*), a slightly enhanced uptake rate at low substrate concentrations for nitrate and urea versus ammonium (*Cochlodinium*), or a preference for urea (*A. sanguinea*: $\alpha = 2.13$–16.84 $(\times 10^3\ h^{-1})/(\mu g\text{-at N L}^{-1})$ for urea, versus 0.04–6.38 $(\times 10^3\ h^{-1})/(\mu g\text{-at N L}^{-1})$ for nitrate and ammonium). Note that 'preference' as discussed here is based on nutrient kinetics parameters, and should not be confused with the Relative Preference Index (RPI: McCarthy et al., 1977). For all of these organisms, the half-saturation values (K_s) are reasonably high compared to more oceanic organisms (cf. review by Kudela and Cochlan, 2000) which is also consistent with these organisms being adapted to a neritic (high nutrient) environment. However, it is also important to note that the kinetics for these HAB organisms are not substantially different from non-HAB assemblages reported in the literature (Table 2). Thus, while there is clear evidence that HABs can utilize multiple sources of nitrogen, this is not a unique characteristic, and does not imply that urea "selects for" HAB species. The exact mechanisms selecting for HAB versus non-HAB organisms is complex (cf. Smayda, 1997), and it is unrealistic to expect that nitrogen kinetics are the sole, or even dominant, factor.

4.2. Availability of urea in coastal California

For anthropogenic nitrogen (urea) to be an important factor in the growth of harmful algal species, there must be both a physiological capacity to utilize organic nitrogen and a source of anthropogenic urea. Unfortunately, while the importance of urea as a nitrogen compound for phytoplankton growth and as an indicator of coastal runoff has long been recognized (e.g., McCarthy, 1972; Eppley et al., 1979), there are very few long-term measurements of urea concentrations in California (or in much of the global coastal oceans; cf. Glibert et al., 2006). Despite the lack of long-term data, limited observations suggest that urea is indeed directly supporting some HAB events in California. Kudela and Cochlan (2000) demonstrated that 38% of the nitrogen demand for an *L. polyedrum* red tide event in Southern California was supported by urea, despite relatively low (ca. 0.5 μg-at N L^{-1}) ambient urea concentrations, and relatively high (1 μg-at N L^{-1}) ammonium concentrations; similarly, Kudela et al. (2008) showed that a dinoflagellate bloom dominated by *Cochlodinium* in Monterey Bay was acquiring approximately 55–62% of its nitrogen from urea. Howard et al. (2007) showed that *Pseudo-nitzschia* assemblages in the Gulf of the Farallones (outside San Francisco Bay) were using multiple N sources, and that urea accounted for approximately 17% of the ambient nitrogen substrates measured (nitrate, ammonium, urea); this same study demonstrated that natural assemblages of *Pseudo-nitzschia* (dominated by *P. australis*) can potentially double their toxin production when growing on urea-N compared to growth on either nitrate or ammonium.

To assess the relative contribution of urea to the coastal ocean, we focus on two regions where reasonably long-term monitoring of nitrogen loads have been conducted: Monterey Bay, California, and San Francisco Bay. In the Monterey region, urea measurements from fifteen terrestrial sampling sites (streams, rivers, wastewater discharge) have been assayed approximately monthly since 2001 by the Central Coast Long-term Environmental Assessment Network (CCLEAN) regional monitoring program, together with macronutrients (nitrate + nitrite, phosphate, silicate, ammonium [since 2003]), and other water quality parameters. Data presented are from the 2004 to 2005 annual report (CCLEAN, 2006). Since 2001–2002, the annual load of urea from seven gauged river collection sites and four urban wastewater discharges have increased annually, from $<0.06 \times 10^5$ kg/yr to approximately 0.23×10^5 kg/yr (2004–2005). During the same interval, urea load from rivers (versus wastewater) have gone from a small percentage (approximately 1%) to greater than half the total urea load. In comparison, the ammonium-nitrogen load is negligible in the gauged rivers compared to the wastewater discharge (8.0–10.0×10^5 kg/yr), and nitrate remains the dominant source of nitrogen in rivers (3.5–6.0×10^5 kg/yr), as well as a significant source in wastewater discharge (0.6–2.5×10^5 kg/yr). Using the 2004–2005 data for seven gauged rivers, which account for most of the freshwater discharge into Monterey Bay, urea (by weight) accounts for approximately 2% of the nitrogen load, ammonium accounts for about 2.1% and the remainder of the N-load is as nitrate + nitrite.

Despite the small percentage of the total-N load accounted for by urea, it can nonetheless represent a significant source of nitrogen to the environment. Fig. 2 represents weekly nitrate,

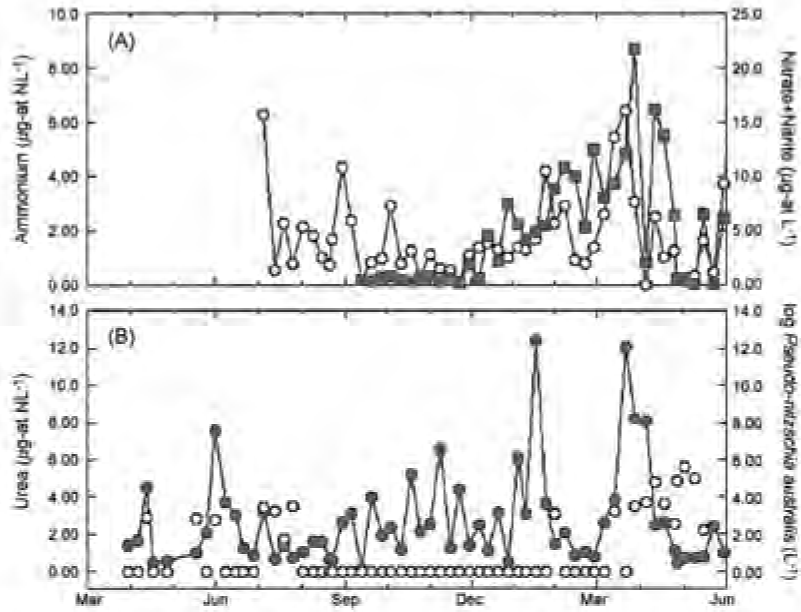

Fig. 2. Surface (0–2 m depth) nitrate + nitrite (filled squares), and ammonium (open circles) are plotted in Panel A, with urea (filled circles) concentrations from seawater and log-transformed values of *Pseudo-nitzschia australis* abundance [log (cells L^{-1})] plotted in Panel B. Samples were collected weekly from the Santa Cruz Municipal Wharf between March 2006 and May 2007.

ammonium, and urea concentrations from surface water samples collected at the Santa Cruz Municipal Municipal Wharf (note that nitrate concentrations were not available prior to September 2006). Values range from undetectable to 12.38 μg-at N L^{-1} or an average of 38% of the total N, with some seasonality. In contrast, monthly surface samples collected from sites offshore in Monterey Bay during the same time period (data not shown) never exceeded 0.74 μg-at N L^{-1}, or generally 10-fold lower than equivalent coastal concentrations. This, combined with the known loading from rivers and waste dischargers, strongly suggests that coastal urea concentrations in Monterey Bay are indicative of anthropogenic inputs. In the lower panel of Fig. 2, the dominant HAB organism from Monterey Bay, *P. australis* is plotted versus ambient urea concentrations. While these data are merely correlative, both *P. australis* and N loading (urea, nitrate, and ammonium) exhibit a seasonal increase in the late spring.

In San Francisco Bay, the monitoring of ambient concentrations of urea was initiated after the first recorded blooms of *H. akashiwo* in 2002 (Herndon, 2003; Herndon et al., 2003; O'Halloran et al., 2006). Time series from San Francisco Bay (Fig. 3) also exhibited measurable urea concentrations, which at times became the dominant nitrogen source in surface waters (e.g. early June 2005). Here we present data from May–October, 2005 from two sites in San Francisco Bay where *H. akashiwo* blooms have been seen previously; northeastern (Paradise Cay) and western (Richardson Bay) sides of the Tiburon Peninsula. Monthly, year-round concentrations of urea, ammonium and nitrate data are now being collected at a series of sites in San Francisco Bay as part of the National Estuarine Research Reserve and will presented elsewhere. The mean urea surface concentrations in these two embayments close to the open ocean (<10 km) range from 0.56 to 5.10 μg-at N L^{-1}, and represent between 3 and 42 percent (mean = 14%) of the total N (nitrate, ammonium and urea) available for phytoplankton growth. Recent urea measurements in the North Bay of San Francisco Bay also demonstrate strong seasonal variability, but ambient concentrations are much more elevated and concentrations exceeding >24 μg-at N L^{-1}, are commonly found (Cochlan and Herndon, unpublished data). Although urea concentrations in San Francisco Bay often represent a relatively small proportion of the total ambient N, given the strong affinity demonstrated by California HAB species for urea at low concentrations, and the potential inhibitory effects of urea on nitrate uptake seen elsewhere (e.g., Molloy and Syrett, 1988; Cochlan and Harrison, 1991), the role of urea in HAB development in California may be more important than previously realized.

Despite the evidence for both physiological capacity and availability of urea in coastal waters, most previous investigations have been unable to make direct links between eutrophication and harmful algal blooms in California. For example, both Otero and Siegel (2004) and Warrick et al. (2005) suggest that maximum nutrient input occurs during the winter, out of phase with high

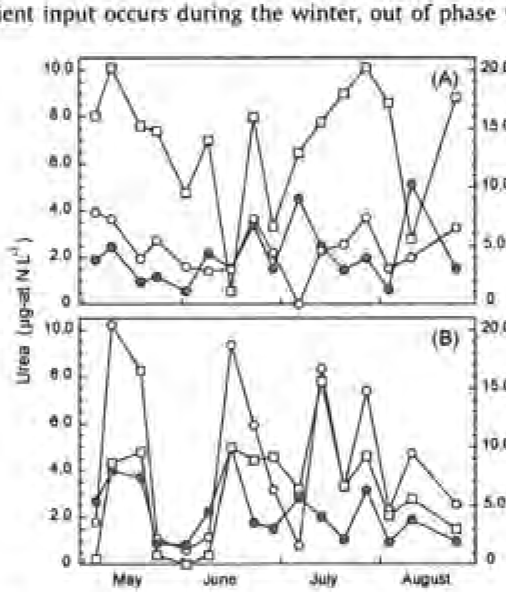

Fig. 3. Mean ($n = 2$) surface (0–0.5 m depth) concentrations during May–Sept 2005 of urea (closed circles), ammonium (open circles) and nitrate + nitrite (open squares) on the (A) northeastern (adjacent to Paradise Cay) and (B) western (Richardson Bay) sides of the Tiburon Peninsula in San Francisco Bay, California.

coastal productivity, while Wilkerson et al. (2006) state that nutrient availability only secondarily controls productivity in the eutrophied San Francisco Bay, and dismiss the contribution of urea as insignificant due to its relative abundance compared to elevated nitrate concentrations. Similarly, a recent study by Schnetzer et al. (2007) demonstrated a negative correlation between runoff, nutrients, and a large *Pseudo-nitzschia* event in Southern California, while Kudela et al. (2004) could not find a direct correlation between runoff and *Pseudo-nitzschia* blooms in central California. We suggest that the lack of correlation between runoff and HAB events in California may be due in part to the lack of measurements of urea during these and most other studies, since there is at least a qualitative correlative relationship between urea concentrations and *P. australis* abundance for the Santa Cruz Municipal Wharf time-series (Fig. 2B). During the 2007 bloom event, particulate domoic acid concentrations (ng DA L^{-1}) closely matched cell abundance, with maximum concentrations of 236.4 ng L^{-1} particulate domoic acid on 2 May 2007. Based on the reported findings, at minimum there is evidence that ambient urea concentrations can maintain (Kudela and Cochlan, 2000) or even exacerbate (Howard et al., 2007) HAB events.

4.3. Summary and Implication for HABs in California

Based on these data and observations, there is good evidence for the availability of urea for both documented harmful algal bloom events (Kudela and Cochlan, 2000; Herndon et al., 2003; Howard et al., 2007; Kudela et al., 2008) and as a common source of nitrogen in coastal waters of California. All of the HAB organisms tested showed an ability to utilize urea, with generally higher affinity at low ($<K_s$) ambient concentrations. As expected, the diatom *Pseudo-nitzschia* generally exhibited a preference (as determined by uptake kinetics parameters) for nitrate, and exhibited lower uptake and lower growth when given solely urea (Cochlan et al., 2008; Howard et al., 2007). In contrast, the three dinoflagellates compared herein exhibited higher V_{max} and α values (greater preference) for ammonium and urea, or demonstrated little or no difference in kinetics parameters with nitrogen source (*L. polyedrum*). Finally, the raphidophyte *H. akashiwo* exhibited greater uptake and affinity for ammonium, then nitrate, and finally urea. Significantly, all of these HAB organisms exhibited flexibility in the ability to utilize whatever nitrogen compounds were provided. Kinetics data alone are not sufficient to identify urea or other anthropogenic nutrients as a direct cause for HAB blooms in California. Assuming that urea is a good indicator of eutrophication, there is clear evidence that the increase in high biomass, noxious, and/or toxic harmful algal blooms in California coastal waters would be capable of utilizing enhanced nutrient loading, and may be directly or indirectly responding (e.g. via enhanced toxin production) to anthropogenic impacts.

Acknowledgements

This manuscript developed from a presentation given as part of the GEOHAB HABs and Eutrophication workshop, and represents a contribution to the GEOHAB Core Science Project on Harmful Algal Blooms and Eutrophication. We thank the organizers, and in particular Dr. Patricia Glibert, for the opportunity to participate. A first version of the manuscript also benefited from the comments of Dr. Glibert and two anonymous reviewers. Data from CCLEAN were kindly provided by Mr. Dane Hardin. Dr. Tawnya Peterson kindly provided the cell enumeration data. Partial funding was provided by NOAA MERHAB grant NA04NOS4780239-02 and NOAA grant NA108H-C, the Center for Integrated Marine Technology through NOAA grant NA160C2936, and as a fellowship (JQL) from an anonymous donor through the Center for the Dynamics and Evolution of the Land-Sea Interface (CDELSI).[SS]

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Vol. 383: 37–51, 2009
doi: 10.3354/meps07899

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Development of a logistic regression model for the prediction of toxigenic *Pseudo-nitzschia* blooms in Monterey Bay, California

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ABSTRACT: Blooms of the diatom genus *Pseudo-nitzschia* have been recognized as a public health issue in California since 1991 when domoic acid, the neurotoxin produced by toxigenic species of *Pseudo-nitzschia*, was first detected in local shellfish. Although these blooms are recurring and recognized hazards, the factors driving bloom proliferation remain poorly understood. The lack of long-term field studies and/or deficiencies in the scope of environmental data included within them hinders the development of robust forecasting tools. For this study, we successfully developed predictive logistic models of toxigenic *Pseudo-nitzschia* blooms in Monterey Bay, California, from a multi-project dataset representing 8.3 yr of sampling effort. Models were developed for year-round (annual model) or seasonal use (spring and fall–winter models). The consideration of seasonality was significant: chlorophyll *a* (chl *a*) and silicic acid were predictors in all models, but period-specific inclusions of temperature, upwelling index, river discharge, and/or nitrate provided significant model refinement. Predictive power for 'unknown' (future) bloom cases was demonstrated at ≥75% for all models, out-performing a chl *a* anomaly model, and performing comparably to, or better than, previously described statistical models for *Pseudo-nitzschia* blooms or toxicity. The models presented here are the first to have been developed from long-term (>1.5 yr) monitoring efforts, and the first to have been developed for bloom prediction of toxigenic *Pseudo-nitzschia* species. The descriptive capacity of our models places historical and recent observations into greater ecological context, which could help to resolve historical alternation between the implication of freshwater discharge and upwelling processes in bloom dynamics.

KEY WORDS: *Pseudo-nitzschia* · Predictive model · Logistic regression · Harmful algal bloom · Phytoplankton monitoring · Domoic acid

INTRODUCTION

Harmful algal blooms (HABs) can have severe deleterious consequences for local industry (e.g. shellfish, tourism), public health, and ecosystem health. In addition, the incidence of HABs appears to be increasing in both frequency and intensity (Hallegraeff 1993, Anderson et al. 2002, Glibert et al. 2005). This trend, and its potential to inflict rising economic and societal costs, has encouraged the development of HAB forecasting tools in recent years (Schofield et al. 1999, Johnsen & Sakshuag 2000, Fisher et al. 2003). Many of these efforts have focused on the prediction and monitoring of dinoflagellate blooms and associated red tides, and successful prediction models for these types of HABs span a wide range of modeling approaches and complexity. One of the simplest approaches utilizes satellite-derived chlorophyll anomalies to identify potentially harmful blooms (e.g. Allen et al. 2008) or even species-specific blooms (Tomlinson et al. 2004). Issues associated with satellite-derived models (non-specificity, infrequent data) can be overcome by com-

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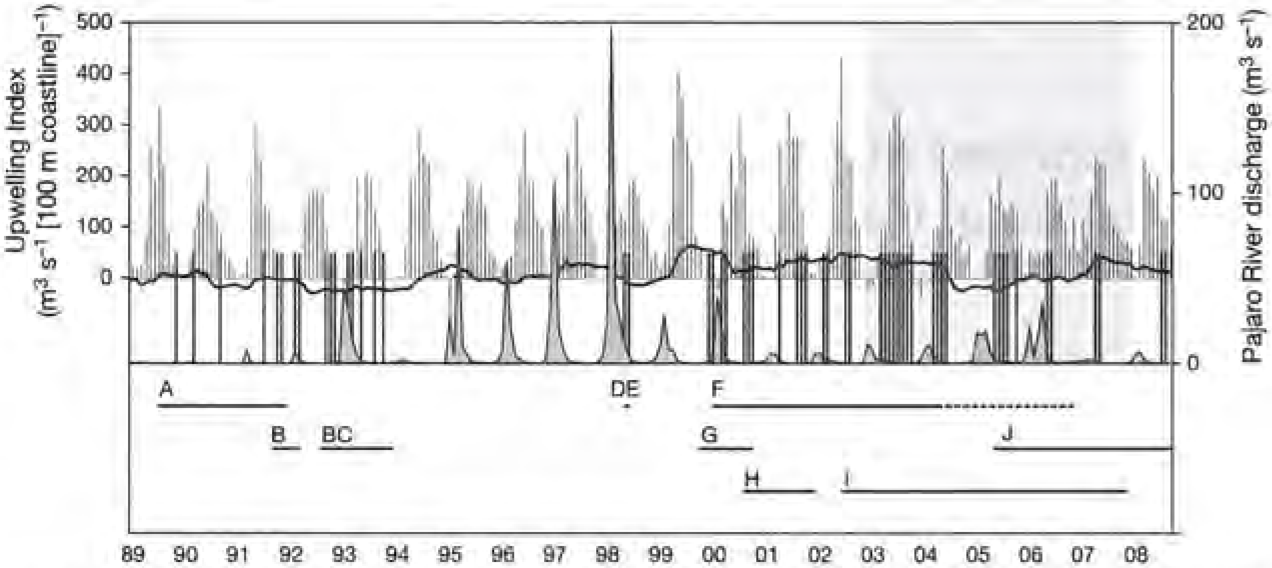

Fig. 1. Time series of bloom events, as reported in published literature and in the modeling dataset used here. The time periods addressed by the various studies are indicated below the plot and are as follows: A: Buck et al. (1992); B: Walz et al. (1994); C: Walz (1995); D: Scholin et al. (2000); E: Trainer et al. (2000); F: Jester et al. (2009); G: Lefebvre et al. (2002b); H: Goldberg (2003); I: Center for Integrated Marine Technologies model dataset (present study); J: California Program for Regional Enhanced Monitoring for PhycoToxins model dataset (present study). Grey shading: time-frame of data inclusion for the models developed in the present study. Vertical black bars: months for which blooms of toxigenic *Pseudo-nitzschia* (cell concentration ≥10 000 cells l^{-1}) were reported. A 12 mo moving average of monthly upwelling anomaly (black line), the monthly upwelling index for 36° N, 122° W (grey bars), and monthly mean Pajaro River discharge (area plot) are shown. Within the time-frame of Jester et al. (2009) (F), note the negative values of the upwelling anomaly and the relatively high monthly mean river discharges over the span of summer 2004 through 2006 (F; dashed line); this period was identified by Jester et al. (2009) as a period of severely decreased *Pseudo-nitzschia* abundance

bining satellite data with other predictors, as is done in the Southwest Florida (USA) operational forecast for *Karenia brevis*. This model includes satellite data, wind predictions, and rule-based modeling to improve forecasting success (Stumpf et al. 2009). A similar approach integrating multiple environmental datasets was used for the European Harmful Algal Bloom Expert System (HABES); this predictive modeling approach uses 'fuzzy logic' to identify blooms of *Nodularia spumigena*, *Dinophysis* spp., *Alexandrium minutum*, *K. mikimotoi*, and *Phaeocystis globosa* (Blauw et al. 2006). The authors state that fuzzy logic bridges the gap between purely empirical (statistical) predictions and fully deterministic models. Finally, seasonal initiation of HAB events and spatial/temporal distribution have been successfully predicted using fully coupled deterministic physical–biological models in the Gulf of Maine (USA) for *A. fundyense* (McGillicuddy et al. 2005). In contrast to these and other efforts, relatively little predictive skill has been developed for HABs of diatom species.

Toxigenic species of the diatom *Pseudo-nitzschia* are producers of domoic acid, which can cause neurotoxic poisoning in humans (Addison & Stewart 1989, Bates et al. 1989), marine mammals (Lefebvre et al. 1999, 2002a, Scholin et al. 2000, Kreuder et al. 2005), and birds (Fritz et al. 1992, Beltrán et al. 1997). Since initial documentation in 1991, HABs of toxigenic *Pseudo-nitzschia* have occurred in Monterey Bay, California, with regularity (Buck et al. 1992, Fritz et al. 1992, Work et al. 1993, Scholin et al. 2000, Trainer et al. 2001); the bulk of published *Pseudo-nitzschia* bloom data was generated through episodic, generally stand-alone, research projects undertaken in reaction to these periodic events (Fig. 1). Because these studies were relatively short and episodic in nature, they forcibly relied on circumstantial observations or single-variable correlations for identification of environmental conditions conducive to bloom formation; the constraints associated with this approach led to calls for long-term monitoring approaches (Trainer et al. 2000, Bates & Trainer 2006).

Despite the lack of long-term data, eutrophication via terrestrial freshwater runoff (Bird & Wright 1989, Trainer et al. 1998, Scholin et al. 2000), fluctuations in nutrient ratios (Marchetti et al. 2004), and upwelling processes (Buck et al. 1992, Trainer et al. 2000, Anderson et al. 2006) were implicated as prominent causative factors in historical literature, and our modeling design was developed with this historical ecological perspective in mind. While our data used for model development could not extend over the full time period represented within the literature due to sampling and methodological inconsistencies, the range of ecological circumstances addressed are not unlike those encountered and implicated previously as triggers for HAB events (Fig. 1).

Our efforts follow 2 previous modeling studies that used shorter duration datasets. The first (Blum et al. 2006) was an attempt to model cellular domoic acid in a toxigenic strain of *Pseudo-nitzschia* (*Pseudo-nitzschia pungens f. multiseries*). In that study, 4 models were developed: 2 linear models demonstrated 'good predictive ability', but were developed from laboratory data that failed to address the scope of nutrient concentrations and ratios encountered in the field and were therefore not appropriate for use with field data. A third linear model and a logistic regression model were developed from combined laboratory data and field data collected from monospecific blooms of *P. pungens f. multiseries* off the coasts of Prince Edward Island (Canada), and Washington State (USA). Split-sample validations of these models (75% data used for model development; 25% reserved for model validation) demonstrated their 'adequate reliability', but the limited amount of field data (N = 46) and the predominance of restrictive laboratory data within the modeling dataset left the applicability of these models undetermined.

The second modeling study (Anderson et al. 2009) developed linear regression (hindcast) models of *Pseudo-nitzschia* blooms, particulate domoic acid, and cellular domoic acid, from: (1) a 'full' (remotely sensed and *in situ*) suite of predictor variables and (2) a 'remote-sensing only' suite of predictor variables. This study was limited in the amount of data available for model development (N = 72 to 89), but provided preliminary insight into *Pseudo-nitzschia* bloom mechanisms, including macronutrient control. Both model sets presented by Anderson et al. (2009) demonstrated high rates of false negative predictions, presumably due to the relatively limited dataset.

Here, we develop logistic regression models of toxigenic *Pseudo-nitzschia* blooms in Monterey Bay, California. This modeling exercise had 3 goals: (1) to develop *Pseudo-nitzschia* bloom models that are straightforward and useful in their application towards bloom monitoring, (2) through model development, to identify environmental variables that are significant factors in bloom incidence, and (3) to test the recurrence of these significant environmental variables in the previous *Pseudo-nitzschia* models described by Anderson et al. (2009) and Blum et al. (2006). The previous modeling efforts and this one are not wholly consistent in terms of scope, evaluated variables, or specific aim: Anderson et al. (2009) developed models of 'generic' *Pseudo-nitzschia* blooms, cellular domoic acid, and particulate domoic acid from a 1.5 yr dataset collected from the Santa Barbara Channel, while Blum et al. (2006) developed models of particulate domoic acid from a mixture of experimental and field data. These previous studies and our efforts clearly differ in their region of interest and specific model subject. In the context of the present study, these disparities are an advantage, in that they allow for inter-model comparison capable of identifying factors that are likely to be universally significant to *Pseudo-nitzschia* bloom incidences and to the introduction of domoic acid into the marine environment through bloom proliferation. Thus, our model and the comparison of these 3 efforts should help to identify a common set of variables useful for predictive modeling of *Pseudo-nitzschia* in similar systems, such as major eastern boundary current regimes (Kudela et al. 2005).

We present 3 logistic regression models of toxigenic *Pseudo-nitzschia* blooms in Monterey Bay, California, as they occur throughout the year (annual model) and seasonally (spring and fall–winter models). A total of 31 environmental variables were evaluated, and 6 variables were identified as statistically significant for bloom prediction. This work is the first to present robust *Pseudo-nitzschia* bloom models developed from long-term monitoring data, and the first to evaluate eutrophication processes and seasonality in the prediction of *Pseudo-nitzschia* bloom incidences.

MATERIALS AND METHODS

Compilation of the model dataset. We compiled a dataset from publications that included *Pseudo-nitzschia* cell counts for Monterey Bay (Buck et al. 1992, Walz et al. 1994, Walz 1995, Villac 1996, Scholin et al. 2000, Goldberg 2003, Lefebvre et al. 2002b). Additional unpublished datasets were provided by Moss Landing Marine Laboratories (MLML), and internally generated through the Center for Integrated Marine Technologies (CIMT) and through the California Program for Regional Enhanced Monitoring for PhycoToxins (Cal-PReEMPT). Details on sampling and analytical methods for internally generated datasets are provided.

We obtained 2099 discrete cases from the above sources, 1156 of which were from surface waters (depth ≤ 5 m). All of the data were assessed to ensure methodological consistency, specifically: (1) unbiased sample collection and (2) true concurrency in environmental and *Pseudo-nitzschia* sampling. Of the 1071 cases remaining, 576 contained cell counts of toxigenic *Pseudo-nitzschia*. Not all data contained the same suite of environmental variables. For finalization of the modeling dataset, it was necessary to evaluate which data were sufficiently complete, i.e. evaluate the minimal combination of variables sufficient for the development of a successful model. The receiver operating characteristic (ROC) was used to conduct this evaluation. ROC is a measure of model fit that scales like a traditional (US) academic point system (<0.6 = poor; 0.6 to 0.7 = fair; 0.7 to 0.8 = good; 0.8 to 0.9 = very good; >0.9 = excellent). Models developed from single, single and universally available (i.e. river discharge, upwelling index), and pairs of predictor variables failed to achieve 'very good' model fit accuracy. To achieve this level of accuracy, model development required concurrent macronutrient, chlorophyll *a* (chl *a*), and temperature variables in combination (Tables 1 & 2). Final inclusion of cases for the models presented therefore required sample collection from Monterey Bay surface waters, and toxigenic *Pseudo-nitzschia* cell counts (*P. multiseries* and/or *P. australis*) with concurrent environmental measurements of seawater temperature, chl *a*, and macronutrients.

Internal data: sample collection. Samples were collected monthly from June 2002 to November 2007 from 11 stations throughout Monterey Bay as part of the CIMT project. PVC Niskin bottles (10 l volume fitted with silicone rubber band strings) mounted on an instrumented rosette were used to collect water from 5 m depth. Surface samples were collected from 2 stations by PVC bucket. Temperature data were obtained from a Seabird SBE-19 CTD deployed concurrently with water sampling.

Table 1. Evaluations of independent variable(s) as predictor variables were performed using all compiled literature and field data of toxic *Pseudo-nitzschia* in Monterey Bay at a depth ≤5 m (N = 576). The receiver operating characteristic (ROC) is a measure of model fit accuracy, where <0.6 = poor, 0.6 to 0.7 = fair, 0.7 to 0.8 = good, 0.8 to 0.9 = very good, and >0.9 is considered excellent. Inclusion of macronutrient, seawater temperature, and chlorophyll *a* as predictor variables was necessary to achieve 'very good' model fit accuracy. A key to variable names is provided in Table 2

Independent variable	N (cases)	Cases omitted	ROC
Salinity	427	149	0.462
Temp	493	83	0.573
ln(silicic acid)	516	60	0.614
ln(chl *a*)	497	79	0.618
ln(chl *a*), temp	473	103	0.638
ln(chl *a*), upwelling	492	84	0.638
ln(silicic acid), upwelling	516	60	0.713
ln(silicic acid), ln(chl *a*)	444	132	0.757
ln(nitrate), temp, ln(chl *a*)	419	157	0.766
ln(silicic acid), temp	438	138	0.785
ln(silicic acid), temp, ln(chl *a*)	422	154	0.848

Table 2. Complete list of the variables evaluated as independent (predictor) variables in the logistic regression models. *X*: all environmental variables and ratios, excluding temperature

Independent variable	Abbreviation	Units
Seawater temperature	Temp	°C
Total chlorophyll a	Chl *a*	$\mu g\ l^{-1}$
Nitrate	Nitrate	µM
Silicic acid	Silicic acid	µM
Ortho-phosphate	Phosphate	µM
Silicic acid (nitrate)$^{-1}$	Silicic acid:nitrate	
Nitrate (silicic acid)$^{-1}$	Nitrate:silicic acid	
Ortho-phosphate (nitrate)$^{-1}$	Phosphate:nitrate	
Nitrate (ortho-phosphate)$^{-1}$	Nitrate:phosphate	
Ortho-phosphate (silicic acid)$^{-1}$	Phosphate:silicic acid	
Silicic acid (ortho-phosphate)$^{-1}$	Silicic acid:phosphate	
Pajaro River discharge	Pajaro River	$m^3\ s^{-1}$
San Lorenzo River discharge	San Lorenzo River	$m^3\ s^{-1}$
Soquel River discharge	Soquel River	$m^3\ s^{-1}$
Salinas River discharge	Salinas River	$m^3\ s^{-1}$
Bakun upwelling index	Upwelling	$m^3\ s^{-1}$
Ln(*X* + 1)	Ln(*X*)	

Shore-based surface samples were collected weekly from May 2005 to April 2008 from the Santa Cruz Municipal Wharf (36° 57.48' N, 122° 1.02' W) as part of the Cal-PReEMPT project using a PVC bucket or by integration of water samples collected from 3 discrete depths (0, 1.5, and 3 m) with a FieldMaster 1.75 l basic water bottle. Temperature was measured in the field by digital thermometer immediately following sample retrieval.

River discharge rates for the Salinas, San Lorenzo, Soquel, and Pajaro Rivers were obtained from the United States Geological Survey National Water Information System (http://waterdata.usgs.gov/nwis/). Bakun daily upwelling index values for the Monterey Bay region (36°N, 122°W) were obtained from the National Oceanographic and Atmospheric Administration Pacific Environmental Research Division (www.pfeg.noaa.gov/products/PFEL/).

Internal data: analytical methods. Samples for chl *a* were collected in duplicate and filtered onto uncombusted glass-fiber filters (Whatman GF/F) and processed using the non-acidification method (Welschmeyer 1994). Macronutrients (Nitrate plus nitrite [hereafter referred to as nitrate], silicic acid and orthophosphate) were stored frozen prior to analysis with a Lachat Quick Chem 8000 Flow Injection Analysis system using standard colorimetric techniques (Knepel & Bogren 2001, Smith & Bogren 2001a,b). *Pseudo-nitzschia* species identification and enumeration utilized species-specific large subunit rRNA-targeted probes following standard protocols (Miller & Scholin 1998). Samples were enumerated with a Zeiss Standard 18 compound microscope equipped with a fluorescence Illuminator 100 (Zeiss). Duplicate filters were prepared for each species, and the entire surface area of each filter was considered in counting.

Model development. Logistic regression models were developed using MYSTAT Version 12.02.11. Logistic modeling is appropriate when the dependent variable is dichotomous (e.g. 0/1). Since our dataset contained continuous data of *Pseudo-nitzschia* abundance, logistic modeling required concatenation of *Pseudo-nitzschia* abundance data into a new dichotomous dependent variable (bloom_nonbloom), using a defined bloom threshold of 10 000 toxigenic *Pseudo-nitzschia* cells l^{-1} (Lefebvre et al. 2002b, Fehling et al. 2006, Howard et al. 2007, Jester et al. 2009). Similar model results were obtained (not shown) when a criteria of 5000 cells l^{-1} was used.

Independent variables evaluated during model development are provided in Table 2. We used an automatic stepwise approach (forward, backward, and bidirectional) to identify the most significant subset. Variable selections were refined to: (1) maximize the rate at which blooms were successfully predicted, (2) minimize the rate of false negative predictions, and (3) maximize model fit accuracy (ROC), while controlling for covariance among the independent variables. Variables exhibiting severe covariation, as determined by variance inflation factors and condition indices, were considered mutually exclusive. Only significant variables ($p < 0.05$) were included in the final models. For the development of the 2 seasonal models, the data were partitioned according to the seasonal periods previously described for Monterey Bay (Pennington & Chavez 2000), while the entire dataset was used for development of the annual model. The final 3 models are as follows: (1) year-round (annual model), (2) February 14 to June 30 (spring model), and (3) July 1 to February 13 (fall–winter model).

We compare our models to a simple bloom prediction method using chl *a* anomalies. Data from June 2004 to July 2008 were obtained from the LOBOVIZ website (www.mbari.org/lobo/loboviz.htm) for a nearshore mooring in Monterey Bay (M0), and a 30 d median chl *a* anomaly was calculated according to methods previously described for 60 d mean anomalies (Tomlinson et al. 2004, Wynne et al. 2006). The LOBOVIZ website was selected as a data source due to its ease of access and applicability. A median was employed in lieu of a mean, since it has recently been recognized as the generally more appropriate value (R. Stumpf pers. comm.).

Translating probability into prediction: prediction-point assignment. When the model equation is solved, the user is presented with the probability of a bloom occurrence. The degree of probability that can be tolerated is referred to here as the 'prediction-point'. Where the model solution, bloom probability, is greater than the prediction-point the model predicts a bloom. Conversely, where the model solution is lower than the prediction-point, the probability of a bloom is considered sufficiently low to warrant a non-bloom prediction. The prediction-point must be pre-defined by either: (1) the model developer, for optimization of predictive power, or (2) the model user, for selective risk management. We provide optimized prediction-points for each model and offer guidance for their adjustment. Optimized prediction-points were determined by generating model prediction failure rates over the full range of potential prediction-point assignments (0.000 to 1.000) at 0.005 increments (Fig. 2). The overall failure rate is minimized when the failure to predict blooms and failure to predict non-blooms are simulta-

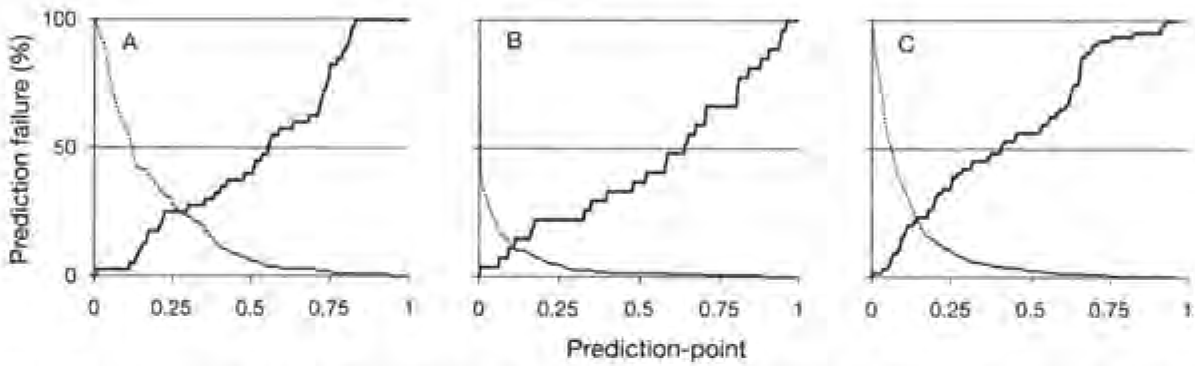

Fig. 2. Prediction failure rates for blooms (solid lines) and non-blooms (broken lines) for the spring (A), fall–winter (B), and annual model (C) along the range of possible prediction-points. The prediction failure rate is defined as the rate at which the model fails to predict a case type (bloom or non-bloom). The overall prediction failure rate is minimized at the optimized prediction-point, where the 2 lines cross

neously minimized. The optimized prediction-point values, therefore, occur where the failure rate curves intersect (Fig. 2).

Model validation. A jackknife cross-validation module was supplied by SYSTAT and used to validate model performance with respect to unknown (future) cases. This method is similar to the split-sample bootstrap validation approach taken by Blum et al. (2006) except that it does not reduce the dataset that can be used for initial model development, and it is an iterative process that allows for N instances of cross-validation against 'unknown' single cases. The cross-validation was run with the model-optimized prediction-points and with 'user-adjusted' prediction-points set according to the historical probability of blooms for Monterey Bay (2002 to 2005), calculated from an independent California Department of Public Health (CDPH) *Pseudo-nitzschia* bloom monitoring dataset. This historical probability is referred to as 'priors'.

RESULTS

After removing those cases from the original (N = 2099) dataset that did not fulfill the specified quality criteria, 506 cases from 2002 to 2008 remained, 74 of which were classified as bloom cases. There was clear seasonality in these data: the rate of bloom incidence was 28% during the spring model period, compared to a rate of 9% for the remainder of the year.

Logistic regression models are of the form:

$$\text{LOGIT(p)} = \ln[\text{p}/(1-\text{p})] = \beta_0 + \beta_1 z_1 + \beta_2 z_2 + \ldots + \beta_k z_k \quad (1)$$

where p is the probability of the condition being modeled; here, p represents the probability of a toxigenic *Pseudo-nitzschia* bloom. β_0 is a constant, and β_1, β_2, ... β_k are the regression coefficients of z_1, z_2, ... z_k, respectively. The year-round (annual) and seasonal (spring and fall–winter) models are as follows:

Annual model

$$\text{LOGIT(p)} = 9.763 - 1.700[\ln(\text{silicic acid})] + 1.132[\ln(\text{chl } a)] - 0.800(\text{temp}) + 0.006(\text{upwelling}) \quad (2)$$

Spring model

$$\text{LOGIT(p)} = 5.835 + 1.398[\ln(\text{chl } a)] - 1.135[\ln(\text{silicic acid})] - 0.549(\text{temp}) \quad (3)$$

Fall–Winter model

$$\text{LOGIT(p)} = 10.832 - 5.026[\ln(\text{Pajaro River})] - 3.893[\ln(\text{silicic acid})] + 1.972[\ln(\text{chl } a)] + 0.652(\text{nitrate}) \quad (4)$$

The regression curve for the spring model is presented for visualization of how the model solution [LOGIT (p)] translates into a bloom probability (p) and, through the implementation of a prediction-point, into a bloom or non-bloom prediction (Fig. 3).

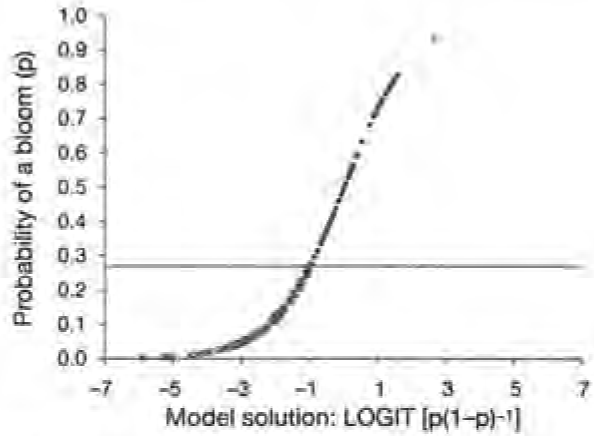

Fig. 3. The spring model logistic regression curve. Cases lying above the optimized prediction-point (probability = 0.275) are predicted as blooms (●); cases lying below the optimized prediction-point are predicted as non-blooms (×)

The models demonstrated 'very good' to 'excellent' model fit accuracy (Table 3). Other demonstrations of model proficiency include the determination of a model p-value through calculation and evaluation of a likelihood-ratio statistic; and the determination of adjusted R^2 statistics, McFadden's ρ^2 and Nagelkerke's R^2, for which values >0.2 are indicative of very good model fit (Hensher & Johnson 1981) (Table 3). Each of the models achieved a high level of statistical proficiency with 4 or fewer predictive variables.

Two predictive variables, ln(chl *a*) and ln(silicic acid), were included in all models. The set of predictive variables used in the annual model and spring model were most similar, differing only in the inclusion of upwelling in the annual model. The fall–winter model is the most disparate of the 3 models with the variable set ln(Pajaro River), nitrate, ln(silicic acid) and ln(chl *a*). Of particular note is the omission of temp and upwelling from the fall–winter model, and the inclusion of a river discharge variable, ln(Pajaro River), and nitrate. All variables included in the models demonstrated extreme to maximum statistical significance.

The annual model did not emerge as an explicit sum of the 2 seasonal models. An annual model with ln(Pajaro River) and nitrate included (not shown) achieves results very similar to those of the presented annual model, but with slightly improved bloom and non-bloom prediction. These variables, however, were non-significant additions and caused inflation in the standard errors of the other (significant) variable coefficients; this is a general risk assumed when non-significant predictors are included in any model (Menard 1995). The inclusion of additional variables in the annual model also resulted in unacceptable levels of covariance (condition indices > 30). Dueling complexity and covariance restrictions likely promoted the usefulness of a 'composite' variable, such as upwelling, as a predictor within this, the most temporally comprehensive of the models.

Analysis of model performance at the default prediction-point (0.500) is useful, because it allows for an even comparison of predictive success under equalizing but unrealistic assumptions that: (1) blooms are evenly distributed throughout the year and (2) blooms are expected to occur with as much frequency as non-bloom conditions. As shown in Table 4, the development of seasonal models significantly enhanced predictive ability: the rate at which blooms were successfully predicted was 16% (spring model) and 19% (fall–winter model) greater than for the annual model. The rates of false positive prediction were slightly improved in the seasonal models. The rates of false negative prediction were more unequal among the models, and ranged most significantly between the two seasonal models.

Model performance at optimized prediction-points is summarized in Table 4; the fall–winter model demonstrated the highest rates of case prediction, followed by the annual and spring models, respectively. As with the default prediction-point, the rates of false negative prediction are most disparate among the seasonal models. The rates of false positive prediction are lowest for the seasonal models, but are increased overall with the implementation of the optimized prediction-points. The relatively high rates of false positive prediction result from a relatively low frequency of non-bloom predictions, which is an artifact of prediction-point optimization.

All of the models were assessed for predictive performance with unknown (future) cases by jackknife validation (Table 5). At the model-optimized prediction-points (Table 5), the rates at which blooms are successfully predicted are more comparable between the spring and annual models, and highest in the fall-winter model. Each model significantly out-performed a null model, improving bloom prediction by as much as 80%. This advantage does not extend to the prediction of non-bloom cases. The discrepancy in bloom versus non-bloom predictive improvement is a result of the model development, which focused on prediction of blooms. The Pearson's chi-squared test statistic for each model indicates extreme significance in the association of modeled predictions and the true outcome of future cases.

The models were also assessed by jackknife cross-validation under conditions simulating the application of 'user-adjusted' prediction-points. In Table 5, the application of 'low' prediction-points set by historical priors provides a demonstration of model performance in a period when future blooms occur with unexpectedly high frequency. The apparently conservative response is in part an artifact of logistic regression: logistic models generally guard against the misclassification of cases

Table 3. Model specifications and diagnostics for the logistic regression models presented in this study. The likelihood-ratio test is a test of the null hypothesis that the predictor variable coefficients are zero (i.e. have no predictive value), and can be evaluated for significance as a deviate chi-squared. McFadden's ρ^2 is a transformation of the likelihood-ratio statistic to mimic an R^2 statistic; values between 0.20 and 0.40 are considered very satisfactory (Hensher & Johnson 1981). The Nagelkerke's R^2 is based on both log likelihood and sample size. ROC: receiver operating characteristic

	Spring	Fall–Winter	Annual
Predictor variables	ln(silicic acid) ln(chl *a*) Temp	ln(silicic acid) ln(chl *a*) ln(Pajaro River) Nitrate	ln(silicic acid) ln(chl *a*) Temp Upwelling
N (total cases)	144	289	422
N (bloom cases)	40	27	64
ROC	0.848	0.943	0.860
Likelihood-ratio statistic	45.885	96.859	102.377
p-value	0.000	0.000	0.000
McFadden's ρ^2	0.270	0.540	0.285
Nagelkerke's R^2	0.394	0.616	0.376

Table 4. Prediction success and failure rates (%) at the default prediction-point of 0.500 and at model-specific optimized prediction-points. A modeled bloom probability higher than the prediction-point results in a bloom prediction. 'False negative' is the rate at which non-bloom predictions were incorrect. 'False positive' is the rate at which bloom conditions were predicted where none existed

	Spring	Fall–Winter	Annual
Default prediction-point			
Prediction-point	0.500	0.500	0.500
Blooms successfully predicted	60	63	44
Non-blooms successfully predicted	94	99	98
False negative	14	4	9
False positive	20	19	24
Model-optimized prediction-point			
Prediction-point	0.275	0.110	0.145
Blooms successfully predicted	75	89	77
Non-blooms successfully predicted	75	89	78
False negative	11	1	5
False positive	46	55	62

Table 5. Jackknife validation results for the logistic regression models at optimized prediction-points, where overall prediction error is minimized and at prediction-points equal to the priors of an independent California Department of Public Health (CDPH) bloom monitoring dataset. Improvement in bloom prediction is relative to the performance of a null model. Square brackets: negative scores

	Spring	Fall–Winter	Annual
Optimized prediction-points			
Prediction-point	0.275	0.110	0.145
Blooms successfully predicted (%)	75	89	77
Non-blooms successfully predicted (%)	76	89	77
False negative (%)	11	1	5
False positive (%)	45	55	62
Improvement in bloom prediction (%)	47	80	62
Improvement in non-bloom prediction (%)	4	[2]	[8]
Pearson's chi-squared (χ^2)	31.78	98.98	74.10
χ^2 p-value	0.000	0.000	0.000
CDPH priors prediction-points			
Prediction-point (priors)	0.101	0.066	0.081
Blooms successfully predicted (%)	98	93	91
Non-blooms successfully predicted (%)	42	82	60
False negative (%)	2	1	3
False positive (%)	61	65	71
Improvement in bloom prediction (%)	70	84	76
Improvement in non-bloom prediction (%)	[30]	[9]	[25]
Pearson's chi-squared (χ^2)	21.31	74.37	54.63
χ^2 p-value	0.000	0.000	0.000

belonging to the under-represented case group, a quality that makes them especially attractive for application in high-risk predictive contexts such as environmental regulation and clinical health (Fan & Wang 1998). The use of the CDPH priors is therefore an appropriate but conservative approach, increasing the probability of correctly identifying blooms (≥91% for all models), while reducing rates of false negative prediction (≥3% for all models), but at a cost to non-bloom prediction.

DISCUSSION

Model application: prediction-point adjustment

We sought to develop and deliver robust predictive models of toxigenic *Pseudo-nitzschia* blooms that were straightforward in their application. Further, we hoped to lay a framework for future modeling studies and independent model application, since this is the first time logistic regression has been applied to *Pseudo-nitzschia* bloom prediction. Providing these models with predetermined, optimized prediction-points satisfies the former; application of the models without end-user adjustment provides a statistically robust method for bloom prediction. Optioning how, and when, the optimized prediction-points can be adjusted satisfies the latter; the ability to modify the prediction-points grants an opportunity to consider and integrate local bloom ecology, specifically frequency, within the model design.

Statistical models should be developed and implemented while remaining mindful of the system under investigation. In particular, the model should be developed and implemented with consideration of: (1) the general frequency at which blooms occur (the priors), (2) the prediction error rates that are inherent to the model, and (3) the cost of prediction error to the model user. The first of these is taken into account by the designation of an optimized prediction-point. Consideration of Points 2 and 3 is left to the discretion of the model user, since it is only necessary when the risk of a *specific type* of predictive error, rather than *overall* predictive error, needs to be reduced.

Use of a shifted prediction-point, rather than the default prediction-point, should be implemented whenever the probabilities of the 2 outcomes are significantly unequal (Neter et al. 1989). At present, blooms of *Pseudo-nitzschia* are relatively rare occurrences (Fig. 1). Because the probability of a bloom is generally not near 50%, a default prediction-point of 0.500 cannot provide optimized predictive capability. By the same reasoning, if a system generally demonstrates priors that are overwhelmingly different from our assumptions, the prediction-point can be reduced (inflated) to account for the more infrequent (frequent) occurrence, and therefore likelihood, of blooms. Similarly, if the cost of a certain type of incorrect prediction (false positive or false negative) is disproportionately high, the prediction-point can be adjusted to protect from that exaggerated cost. Fig. 2 may be used as a guide for balancing the probability of these errors and controlling their relative costs.

Shifting a prediction-point affects the predictive behavior of the model, always forcing compromise: Fig. 4 illustrates the trade-off between minimizing the number of blooms that the model fails to predict and minimizing the number of non-blooms that are identified as blooms. Reducing the prediction-point minimizes overall failure to predict a bloom by relaxing the criteria for bloom prediction. Conversely, increasing the prediction-point means that the criteria for bloom prediction are more strenuous, and blooms will be forecasted only when they are extraordinarily likely to occur.

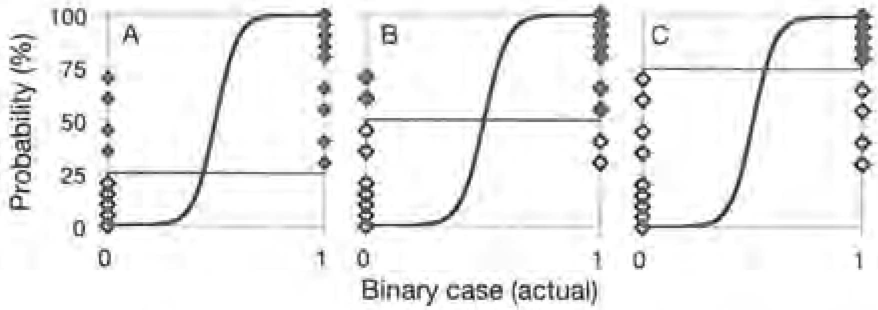

Fig. 4. A schematic diagram of a logistic regression with prediction-points of 0.250 (A), 0.500 (B), or 0.750 (C). Cases lying on the '0' vertical axis are actual non-bloom cases; cases lying on the '1' vertical axis are actual bloom cases. Filled symbols are predicted as blooms; open symbols are predicted as non-blooms. Reducing the prediction-point increases the number of cases that are predicted as blooms overall, maximizing the percent of actual blooms that are successfully predicted but reducing the percent of actual non-blooms that are successfully predicted (A). Increasing the prediction-point has the opposite effect (C)

Comparative model performance

In Table 6, we present the predictive performance of our annual and seasonal models compared to those of: (1) a chl *a* anomaly, (2) linear hindcasting models developed for *Pseudo-nitzschia* blooms in the Santa Barbara Channel (Anderson et al. 2009), and (3) logistic regression models developed for pDA from a combination of field and experimental data (Blum et al. 2006).

Our logistic regression models were developed from the largest dataset to date, and demonstrate a relatively high level of predictive capacity. Our models out-perform the chl *a* anomaly model throughout the year and on a seasonal basis, although the predictive capacity of the chl *a* anomaly model was surprisingly comparable during the spring model period. Interestingly, the chl *a* anomaly model completely failed to predict blooms during the fall–winter model period. We suggest that dinoflagellate blooms, particularly common in Monterey Bay in the fall–winter model period, mask blooms of *Pseudo-nitzschia* otherwise identified by the chl *a* anomaly. Conversely, the chl *a* anomaly works well in the spring model period, when *Pseudo-nitzschia* is more likely to be the dominant bloom organism. It should be noted that the chl *a* anomaly model is advantageous in that it is generally applicable to all potential HABs, particularly 'red tides' (e.g. Kudela et al. 2008b, Ryan et al. 2008), and may therefore be a better model choice when not applied specifically for *Pseudo-nitzschia* bloom prediction.

Table 6. Performance comparisons (%) among the annual and seasonal models developed in the present study and in previous *Pseudo-nitzschia* modeling publications. 'Sensitivity' is the rate at which the binary value '1' cases (blooms or high toxicity) were successfully predicted. 'Specificity' is the rate at which the binary value '0' cases (non-blooms or low toxicity) were successfully predicted. Improvement in bloom prediction is relative to the performance of a null model. Square brackets: negative scores

Dependent variable	Toxigenic *Pseudo-nitzschia* bloom[a]	*Pseudo-nitzschia* toxicity[b]	Generic *Pseudo-nitzschia* bloom[c]	Toxigenic *Pseudo-nitzschia* bloom[d]
Annual				
Sensitivity	77	77	75	39
Specificity	78	75	93	72
False negative	5	–	25	5
False positive	62	–	7	88
Improvement in bloom prediction	61	–	–	31
N	422	139	75	182
Spring				
Sensitivity	75	–	–	50
Specificity	75	–	–	62
False negative	11	–	–	10
False positive	46	–	–	71
Improvement in bloom prediction	47	–	–	35
N	144	–	–	65
Fall–Winter				
Sensitivity	89	–	–	0
Specificity	89	–	–	77
False negative	1	–	–	3
False positive	55	–	–	100
Improvement in bloom prediction	80	–	–	(2.6)
N	289	–	–	117

[a]Present study
[b]Blum et al. (2006)
[c]Anderson et al. (2009)
[d]Study of chl *a* anomaly (present study)

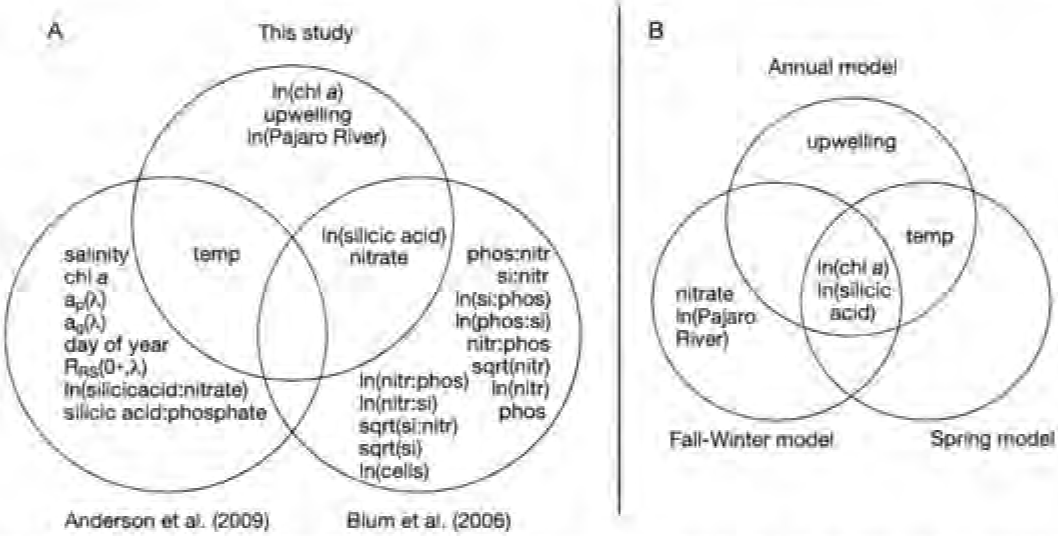

Fig. 5. Venn diagrams illustrating the shared and unique variables included in models of *Pseudo-nitzschia* ecophysiology shown within the present study, Anderson et al. (2009), and Blum et al. (2006) (A) and included in the annual, spring, and fall–winter models (B). Nutrient abbreviations for Blum et al. (2006) are as follows—phos: phosphate; si: silicic acid; nitr: nitrate. Variable abbreviations used in Anderson et al. (2009) are as follows—ap(λ): particulate absorption [412–665 nm]; ag(λ): CDOM absorption [412–665 nm]; RRS(0+,λ): remote-sensing reflectance [412–665 nm]. 'Sqrt': square-root operation

Inter-study patterning: recurrent predictor variables

Fig. 5A illustrates the predictor variables that are shared and not shared between the models developed by Blum et al. (2006), Anderson et al. (in press), and in the present study. While the regions of interest and, in some cases, the dependent variable differ between these studies, the similarities and differences shared between the models can provide insight into universal patterns of *Pseudo-nitzschia* ecophysiology and, in turn, indicate which variables may be fundamental to future monitoring and modeling.

Seawater temperature was identified as a significant predictor whenever it was included in a study for evaluation. In all cases, a negative relationship was demonstrated between temperature and the dependent variable. Cold surface temperatures are often associated with upwelling, one of the processes previously identified as a causative factor of *Pseudo-nitzschia* blooms. The direct assessment of the upwelling index was unique to the present study; where it emerged as a predictor variable, it had a weak positive association with *Pseudo-nitzschia* bloom incidence.

Silicic acid (ln-transformed) and nitrate both emerged as predictors in models developed for *Pseudo-nitzschia* toxicity (Blum et al. 2006) and in the models developed here. In both studies, the patterns agree: association with the dependent variable is negative for silicic acid and positive for nitrate. While neither variable emerged as an individual predictor in the models developed by Anderson et al. (2009), a negative relationship was demonstrated between the silicic acid to nitrate ratio and blooms of *Pseudo-nitzschia*, indicating a possibly confounded negative and positive relationship between blooms and silicic acid and nitrate, respectively.

Additional recurrent patterns are suggested by variables that are related, but not explicitly shared, between the studies. Anderson et al. (2009) chose not to evaluate river discharge as a model variable, but presented a *Pseudo-nitzschia* bloom model and a cellular toxicity model that included particle absorption and absorption of chromophoric dissolved organic matter (CDOM), variables which are associated with significant recent river discharge events (Warrick et al. 2004, 2007). In both models, high particulate absorption was negatively associated with the dependent variable, suggesting a direct negative relationship between high river discharge and *Pseudo-nitzschia* blooms. Our fall–winter model, which addresses the time period in which 'first flush' and high discharge events generally occur, also demonstrates a direct negative relationship between river discharge and bloom incidence. The consideration of seasonality when modeling river discharge and blooms and the patterning of blooms and high discharge events through time reveal complexity in this relationship, as discussed in the next subsection.

Intra-study (seasonal) patterning: ecological context and implications

The predictor variables shared and not shared between the annual, spring, and fall–winter models are presented in Fig. 5B, effectively 'zooming in' on the modeled relationships with a lens of added dimension and ecological context. The 2 most similar models are the annual and spring models; this is not entirely surprising, given that the majority of *Pseudo-nitzschia* blooms occur in the springtime (Fig. 1). Upwelling is the only predictor unique to the annual model; its omission from the spring model may arise from a general predominance of upwelling throughout the spring model period. The independent variables in the spring model exhibited particular propensity for covariation; this would further suggest that *Pseudo-nitzschia* bloom dynamics in Monterey Bay are largely dominated by a specific environmental forcing, i.e. upwelling, over the spring model period.

The fall–winter model includes oceanic periods that are not (by definition) generally dominated by upwelling processes. All of the models, including the fall–winter model, demonstrate that conditions of low silicic acid and concurrently high chl *a* are associated with blooms of toxigenic *Pseudo-nitzschia* in Monterey Bay. The fall–winter model, however, includes 2 unique predictor variables: nitrate (positive coefficient) and Pajaro River discharge (negative coefficient). The inclusion of nitrate in the fall–winter model suggests that the macronutrient control observed by Anderson et al. (2009), specifically the negative relationship between *Pseudo-nitzschia* blooms and the ratio of silicic acid to nitrate, may have been underscored by confounding seasonal relationships. Our results are therefore similar to those presented by Anderson et al. (2009), but are either more specific, due to the explicit assessment of seasonality, or representative of a similar relationship more heavily impacted by eutrophication. Annual dissolved inorganic nitrate loading via terrestrial storm runoff is relatively low in the region addressed by Anderson et al. (2009); however, nitrate input via storm runoff can be significant during winter runoff events (McPhee-Shaw et al. 2007).

The association of fall–winter blooms with conditions of high nitrate suggests that a nitrate eutrophication process is uniquely significant during this period. Notably, the Pajaro River in Monterey Bay introduces disproportionately high nitrate loads (CCLEAN 2006, 2007) on a strictly seasonal basis. In our dataset, blooms within the fall–winter model period occurred during periods of minimal freshwater discharge, while blooms within the spring model period occurred during periods of decreasing river discharge following a 'flush' event (Fig. 1). We also observed this pattern within the broader time-series, in which blooms are generally not associated with peak discharge events and occur either with the declining shoulder of a high river discharge event or within a period marked by minimal discharge (Fig. 1; note that a 4 yr period of relatively high discharge between 1994 and 1998 accompanies an absence of data, not necessarily an absence of blooms). As described by the models, river discharge, through concentrated low-flow periods and 'load' events, may provide a eutrophic source of nitrate conducive to seasonal bloom formation, while allaying immediate bloom formation during periods of peak discharge.

Although not observed in the modeling dataset compiled here, one independent study recently reported 'a shift in toxin-producing species associated with an overall restructuring of the phytoplankton community' for Monterey Bay (Jester et al. 2009). Jester et al. (2009) used a similar dataset to ours (Monterey Bay, 2000 to 2006); the discrepancy in *Pseudo-nitzschia* abundance observations between the datasets may be due to differences in spatial coverage. The 'shift in toxin-producing species' was defined by a sharp decline in the incidence of toxigenic *Pseudo-nitzschia* in the summer of 2004, which persisted until the end of the study in 2006. This period was marked by anomalously low upwelling conditions and anomalously

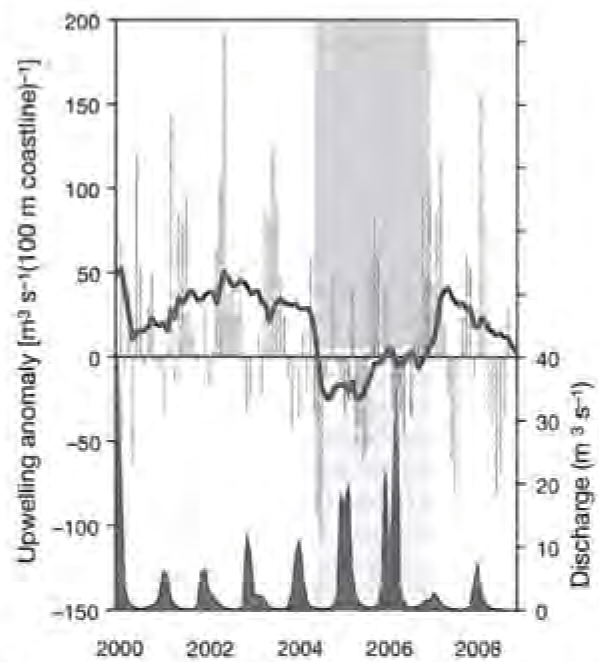

Fig. 6. Monthly upwelling anomaly for 36°N, 122°W (grey bars) with a 12 mo moving average trendline (black line), and the monthly mean discharge for the Pajaro River (area plot) are shown for the period from 2000 to 2008. An independent study addressing toxigenic *Pseudo-nitzschia* abundance in Monterey Bay for the period from 2000 to 2006 identified the summer 2004 period as a harmful species shifting-point (from *Pseudo-nitzschia* to *Alexandrium* and *Dinophysis*), and showed the summers from 2004 through 2006 to be periods of severely decreased *Pseudo-nitzschia* abundance (greyed area) (Jester et al. 2009). This 'shifted' period demonstrates relatively low upwelling and high river discharge activity

high periods of river discharge (Fig. 6), conditions which our models identify as non-conducive to toxigenic *Pseudo-nitzschia* blooms. Both of these conditions were alleviated in 2007, marked by a significant toxigenic *Pseudo-nitzschia* bloom event in Monterey Bay (Jester et al. 2009); a bloom of toxigenic *Pseudo-nitzschia* was also observed in 2008 (data not shown). According to the models and these observations, climatological conditions associated with low upwelling and high river discharge conditions may be conducive to suppressed toxigenic *Pseudo-nitzschia* bloom activity. The forecast of these conditions may now translate into the anticipation of large-scale shifts, such as the 'shift in toxin-producing species' described by Jester et al. (2009).

Bloom modeling versus toxin modeling

The monitoring of domoic acid for public health purposes is carried out continually by the CDPH and focuses, quite appropriately, on the protection of human health from domoic acid intoxication. This monitoring effort is more accurately described as the monitoring of domoic acid bioaccumulation in sentinel shellfish supplies (*Mytilus californianus*). Modeling or monitoring efforts that are focused on toxin load alone, while useful and appropriate for regulatory purposes, obviously do not allow for the estimation or monitoring of *Pseudo-nitzschia* blooms, which can be highly variable in their toxicity (Trainer et al. 2002, Marchetti et al. 2004, Anderson et al. 2006). This variability translates into a weak relationship between toxin bioaccumulation and toxigenic *Pseudo-nitzschia* abundance, evidenced here by CDPH/Cal-PReEMPT project data compiled from study sites in northern, central, and southern California over a 3 yr time period (Fig. 7). Note that there were cases where extreme bloom concentrations of toxigenic *Pseudo-nitzschia* were associated with sub-regulatory toxin levels (<20 µg g^{-1}), but no observed cases where sub-bloom concentrations of toxigenic *Pseudo-nitzschia* were associated with toxin levels approaching the regulatory limit in shellfish. Logistic regression models developed for toxigenic *Pseudo-nitzschia* blooms can therefore be used for detection of both acute and sub-acute toxic bloom events, while models developed for domoic acid alone will fail to address the injection of toxin into the system via sub-acute bloom events. This is a significant failure inherent to all toxin models, since chronic or early life stage exposure to sub-lethal levels of domoic acid are increasingly being recognized as an emerging threat to both human health and wildlife (Kreuder et al. 2005, Goldstein et al. 2008, Grattan et al. 2008, Ramsdell & Zabka 2008, M. Miller pers. comm.). By providing estimations of all toxigenic *Pseudo-nitzschia* bloom events, whether low or high in toxicity, *Pseudo-nitzschia* bloom models have the unique ability to address this emerging threat. Ideally, future models should be developed for both cell abundance (present study) and for toxin production (Blum et al. 2006, Anderson et al. 2009). While the domoic acid data associated with the cases used herein were insufficient for inclusion of a toxin component, a 2-step model would maximize both regulatory monitoring and our understanding of the ecophysiological conditions associated with toxin production.

CONCLUSIONS

The models presented here demonstrate toxigenic *Pseudo-nitzschia* bloom classification rates of ≥75%. These predictive success rates are comparable to, or improved over, those reported for previous models of toxicity and generic *Pseudo-nitzschia* blooms. The assessment of our model alongside a chl *a* anomaly model, a useful tool designed for the detection of HABs more generally, demonstrates the capacity for improved predictive ability through more rigorous model development. Although we have reported the largest modeling dataset to date, consisting of 506 cases from 2002 to 2008, the removal of approximately 75% of the full dataset highlights the need for more consistent data collection. The parameters common to the 3

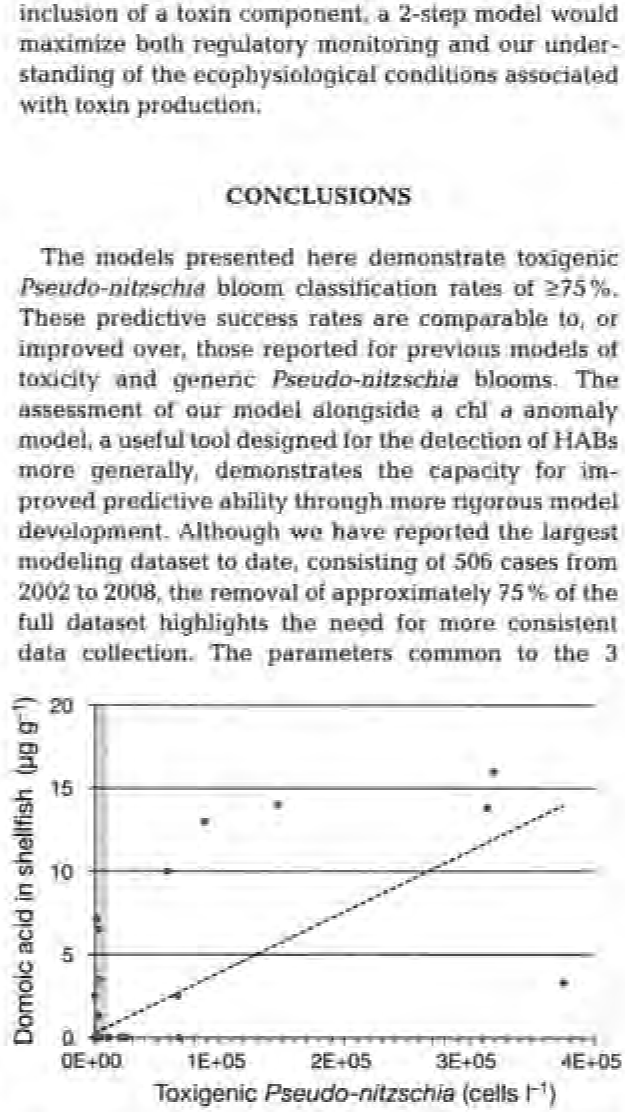

Fig. 7. Micrograms of domoic acid per gram shellfish plotted against counts of toxigenic *Pseudo-nitzschia*. Data are from study sites in northern, central, and southern California, monitored from 2005 to 2007 by Cal-PReEMPT in conjunction with the California Department of Public Health. Domoic acid never approached the regulatory limit of 20 µg domoic acid g^{-1} shellfish when toxigenic *Pseudo-nitzschia* concentrations were at sub-bloom levels, i.e. ≤10000 cells l^{-1} (shaded area), and only began to approach the regulatory limit at cell concentrations that were significantly higher than ≤10000 cells l^{-1}. The dashed line shows the results of a linear regression for domoic acid toxicity versus cell abundance

regional models developed for the west coast of the United States (Fig. 5A) provide direction for the design of ongoing and future HAB monitoring. We note that several parameters identified as being important (e.g. urea [Howard et al. 2007, Kudela et al. 2008a]; lithium [Subba Rao et al. 1998]; ammonium [Trainer et al. 2007]; iron and copper [Rue & Bruland 2001, Maldonado et al. 2002, Wells et al. 2005]) were not included for evaluation and could potentially further improve model prediction. All models included macronutrient variables as predictors of toxigenic *Pseudo-nitzschia* blooms, indicating the influence of upwelling and possibly cultural eutrophication on toxigenic *Pseudo-nitzschia* bloom proliferation. The seasonal significance of river discharge during periods associated with weak upwelling suggests that both natural (upwelling) and cultural (freshwater discharge) eutrophication processes, and the timing and seasonality of these processes, are significant factors influencing toxigenic *Pseudo-nitzschia* bloom dynamics. Although our models are specific to Monterey Bay, we have identified several factors common to all 3 modeling efforts for *Pseudo-nitzschia*. Given appropriate validation data, we suggest that some variant of this reduced subset of environmental variables could be applied to other regions, particularly similar coastal upwelling systems where *Pseudo-nitzschia* is prevalent (e.g. the west coast of the United States and Baja, Mexico, the southern Benguela, and the Iberian peninsula; Bates et al. 1998, Kudela et al. 2005, Fawcett et al. 2007).

Acknowledgements. We thank P. E. Miller (University of California, Santa Cruz, UCSC) and the Cal-PReEMPT team for contributing to the modeling dataset. We gratefully acknowledge the significant contribution made by M. W. Silver (UCSC) to the CIMT dataset and thank CIMT participants for their efforts. We thank G. J. Smith and K. Hayashi for their contribution of the MLML dataset. Special thanks to G. W. Langlois (CDPH) for providing shellfish toxicity data and an independent *Pseudo-nitzschia* monitoring dataset. Three anonymous reviewers contributed significantly to the improvement of this manuscript. Partial funding was provided by NOAA MERHAB Award NA04NOS4780239 (Cal-PReEMPT), NOAA Award NA160C2936 (CIMT), and, as a fellowship (J.Q.L.), from an anonymous donor through the Center for the Dynamics and Evolution of the Land-Sea Interface (CDELSI). This contribution is part of the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) Core Research Project on Harmful Algal Blooms in Upwelling Systems, and is MERHAB (Monitoring and Event Response for Harmful Algal Blooms) Publication Number 70.

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Editorial responsibility: Matthias Seaman, Oldendorf/Luhe, Germany

Submitted: September 25, 2008; Accepted: March 5, 2009
Proofs received from author(s): April 21, 2009

5

Assessment of river discharge as a source of nitrate-nitrogen to Monterey Bay, California

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Running head: Nitrogen loading: rivers vs. upwelling

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Acknowledgements

We thank Dane Hardin (Applied Marine Sciences) and Marc Los Huertos (CSU Monterey Bay) for their guidance and suggestions. We appreciate the assistance of Gary Conley and Bridget Hoover (Monterey Bay National Marine Sanctuary), Melissa Blakely (UCSC), Larry Breaker (Moss Landing Marine Laboratories), and the staff and volunteers of the Pathogens Pollution (P3) Project and the Central Coast Ambient Monitoring Program (CCAMP). This manuscript was substantially improved by the comments from two anonymous reviewers. Partial funding was provided as a Benjamin and Ruth Hammett Award for Research on Climate Change; a Science, Technology, Engineering, Policy and Society (STEPS) Institute graduate student research award; and a Center for the Dynamics and Evolution of the Land-Sea Interface (CDELSI) graduate student research award. Additional funding was provided as a fellowship (JQL) from an anonymous donor through CDELSI and from National Science Foundation project OCE-9912361 (RMK) and NOAA Awards NA04NOS4780239 and NA08NOS4730382. This contribution is part of the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) Core Research Project on Harmful Algal Blooms in Upwelling Systems, and is Monitoring and Event Response to Harmful Algal Blooms (MERHAB) Publication #XXX.

Abstract

Characterizations of coastal regions as 'upwelling-dominated' have promoted a concomitant assumption that, relative to upwelling, river contributions of nitrogen-nitrate (N_{NO3}) to these systems are insignificant. Here, we use 10 years (2000 – 2009) of daily load estimates to evaluate the relativity of river and upwelling N_{NO3} loads introduced to Monterey Bay, an open embayment located along the central coast of California, United States (i.e. within a coastal upwelling regime). The characterization of Monterey Bay as 'upwelling dominated' is affirmed at low temporal resolutions (upwelling loads exceed river loads by two orders-of-magnitude), but is inconsistent at higher-resolution timescales which are also of ecological relevance (days and weeks): river N_{NO3} loading, compared to upwelling N_{NO3} loading, can predominate across short timescales and does so with significant frequency (28% of days in a given year). There is a clear onshore-offshore gradient in river N_{NO3} load influence even at low (annual) temporal resolution, demonstrating that a failure to refine spatial resolution may alternately preclude an accurate characterization of river N_{NO3} load relevance. We observe an upward trend in river N_{NO3} loads and no trend in upwelling N_{NO3} loads, indicating that the relativity and influence of river N_{NO3} loads as described may be expected to increase under environmental conditions observed during the study period. The positive trending of N_{NO3} river loads suggests that the eutrophic conditioning of Monterey Bay's high-discharge rivers, identified here according to the Indicator for Coastal Eutrophication Potential (N-ICEP), may become more severe and should be monitored at multiple temporal resolutions within a local and global context.

Introduction

Historically, freshwater nitrogen delivery to Monterey Bay CA, has been presumed to be non-significant due to the much greater magnitude and spatial scale of nitrate introduction by wind-driven upwelling (Kudela and Chavez 2004), and pivotal investigations of its hydrography either omit the consideration of fluvial impacts or determine them to be minor (Bolin and Abbott 1963; Breaker and Broenkow 1994; Olivieri and Chavez 2000; Pennington and Chavez 2000; Ramp et al. 2005; Rosenfeld et al. 1994; Shulman et al. 2010). Regional blooms of the toxigenic diatom *Pseudo-nitzschia*, however, have alternately been linked to river discharge and upwelling processes, suggesting that river discharge may influence the ecology of this region. A recently published model for toxigenic *Pseudo-nitzschia* blooms in Monterey Bay, California (Lane et al. 2009) reconciles these viewpoints through the consideration of seasonality: seasonal modeling identified Pajaro River discharge and nitrate concentration as significant predictors specific to the period of the year when local oceanographic conditions are not dominated by upwelling processes (Bolin and Abbott 1963; Pennington and Chavez 2000). As described by the models, river discharge may provide a source of nitrogen conducive to seasonal bloom formation, while allaying immediate bloom formation during periods of peak discharge. This empirically-derived description indicates a relationship between river discharge events and bloom incidence that is biphasic: blooms are immediately dissociated from high-discharge ('flush') events, but subsequently promoted by the high nitrate/declining discharge conditions which follow. The Pajaro River introduces disproportionately large nitrate loads on a highly seasonal basis, and is frequently paired with nitrate in descriptions of changing regional water quality: nitrate concentration in the Pajaro River has risen from <0.1 mM in the 1950's to levels that regularly exceed the drinking-water standard of 0.714 mM in more recent years (Ruehl et al. 2007). As a result of this conditioning, the Pajaro and Salinas rivers and their vicinities are now designated as impaired for nitrate by the Clean Water Act [303 (d)]. The identification of river discharge as a seasonally significant factor in *Pseudo-nitzschia* bloom formation, and the recognition of substantially elevated nitrate concentrations in rivers such as the Pajaro and the Salinas, suggest that the historical perspectives on the relative significance (or insignificance) of freshwater nitrogen loading to the Monterey Bay system may be based on assumptions that no longer apply. The present study is in part a reevaluation of the temporal and spatial scales over which those assumptions may or may not be valid.

Since the necessity for a reevaluation of riverine nitrate paradigm was determined from an empirical (statistical) model linking nitrate, wind-driven upwelling, and river discharge, it clearly did not account for all possible sources of nitrogen. We acknowledge the limitations introduced through our approach [e.g. we do not address N_{NO3} input from sources such as advection, atmospheric deposition, internal tide flux, or nitrification (Mackey et al. 2010; Rosenfeld et al. 1994; Shea and Broenkow 1982; Wankel et al. 2007; Ward 2005)] but we emphasized the utility of a simple first-order comparison. This paper provides a first-order comparison of how inviolate the omission of rivers as a component in complex modeling building or nutrient budgets may be, and is intended to provide a framework for evaluation. A comprehensive nutrient budget for Monterey Bay is beyond the scope of this study. Similarly, while we index the eutrophication risk of Monterey Bay rivers according their potential to promote new production of non-siliceous algae through nutrient delivery (a particularly relevant exercise in Monterey Bay, where dinoflagellate blooms occur with regularity), the investigation of how this potential may or may not be fulfilled is beyond the scope of this paper and is addressed elsewhere (Armstrong et al. 2007; Kudela and Chavez 2004; Kudela et al. 2004; Kudela et al. 2008a; Kudela and Peterson 2009; Kudela et al. 2008b; Ryan et al. 2008).

A comparison of annual nitrate loading by freshwater discharge versus upwelling has previously been described for the Santa Barbara Channel (Warrick et al. 2005). In that study, the authors recognized that "although [river nutrient] contributions are significantly less than upwelling inputs to the channel, they are highly pulsed and supply nutrients in significantly different proportions and at different times of the year compared to upwelling". At the northern extreme of the California Current System (CCS), similar comparative studies of the Columbia River also describe river nitrate contributions that are relatively small, but indicate that "despite the relatively small contributions on a seasonal basis, the Columbia River can be important as a local source during periods of downwelling or weak upwelling winds" (Hickey and Banas 2008). While the significance of river nitrate supply and cultural eutrophication in non-upwelling coastal systems is well-documented (Billen and Garnier 2007; Bricker et al. 2007; Cloern 2001; Conley et al. 2009; Heisler et al. 2008; Howarth 2008; Howarth et al. 2000; Justic et al. 1995a; Justic et al. 1995b; Li et al. 2007; Ludwig et al. 2009; Spruill and Bratton 2008; Turner and Rabalais 1991; Turner and Rabalais 1994), the Santa Barbara Channel and the Columbia River region provide unique examples of river/upwelling nitrate input comparisons from an upwelling-dominated system. These previous studies were constrained to river/upwelling load assessments at coarse (annual or seasonal) temporal resolution; nonetheless, these comparisons either suggest or demonstrate the significance of temporality as opposed to consideration of load magnitude alone. Here we present the first comparative study of river nitrate supply relative to that of upwelling at a temporal resolution higher than seasonal, and the first comparative study from the central region of the CCS.

We compare annual, monthly and daily nitrate-nitrogen (N_{NO3}) loads introduced to Monterey Bay by rivers and by wind-driven upwelling over a 10 y period (Jan 2000 – Aug 2009). We describe N_{NO3} input to Monterey Bay by wind-driven upwelling using two methods to calculate the upwelling index (UI): (1) the Pacific Fisheries Environmental Laboratory (PFEL) UI for 36N 122W, based on the offshore component of Ekman transport (Bakun 1973), and (2) UI from wind velocities observed at the Monterey Bay Aquarium Research Institute (MBARI) M1 mooring, also using the offshore component of Ekman transport. We describe N_{NO3} input to Monterey Bay by rivers according to load models developed for seven Central California Ambient Monitoring Program (CCAMP) Coastal Confluences monitoring sites within Monterey Bay (Figure 1), and compare our annual N_{NO3} load estimates to those developed through a simpler modeling approach used by the Central Coast Long-term Environmental Assessment Network (CCLEAN). Upwelling N_{NO3} loading and river N_{NO3} loading are compared through time for the identification of load trending across the 10 y period for which data are available. To understand and recognize the influence of river N_{NO3} loading and upwelling N_{NO3} loading across the marine receiving waters of Monterey Bay, we describe the generalized patterns of river and upwelling N_{NO3} loading through a hydrological year (i.e. as annual climatologies), and compare them to analogous patterns of surface nitrate concentration at the Santa Cruz Municipal Wharf (SCMW), and at moorings M0 (8 km offshore), M1 (18 km offshore), and M2 (56 km offshore).

We further analyze two independent data sets to characterize nutrient source waters and nutrient receiving waters according to their nutrient stoichiometry. Nitrogen species omitted in our analysis include urea-nitrogen (N_{UREA}) and ammonium-nitrogen (N_{NH4}). While the contribution of nitrogen as N_{UREA} and N_{NH4} loading is generally less than the contribution of nitrogen as N_{NO3}, the introduction of N_{UREA} and N_{NH4} may have a disproportionate influence on harmful algal bloom (HAB) dynamics: recent studies indicate that *Pseudo-nitzschia* growth dynamics and toxicity vary according to N-substrate supplied for growth (Armstrong et al. 2007; Radan 2008). In recognition of their potentially differential impact, the stoichiometries for N_{UREA} and N_{NH4} relative to N_{NO3} are provided.

Lastly, Monterey Bay rivers are further characterized using the Indicator of Coastal Eutrophication Potential (N-ICEP) index, which summarizes in a single figure the relevant information provided both by the absolute and relative values of the nitrogen and silica fluxes delivered by large river systems to identify systems susceptible to or impacted by eutrophication (Billen and Garnier 2007).

Methods

Estimation of daily N_{NO3} loads: upwelling—Upwelling nitrate load was calculated by taking the product of an upwelling index (UI; vertical mass transport of upwelling source water per day) and the nitrate concentration of upwelling source water (estimated from daily average water temperature, described below). Both components of this approach [(1) the load calculation as a product of mass transport and nitrate concentration, and (2) the estimation of nitrate concentration from temperature] conjointly allow for derivation of upwelling nitrate supply or surface nitrate concentration estimates, often for the approximation of new production (Chavez and Toggweiler 1995; Dugdale et al. 1989; Garside and Garside 1995; Kamykowski 1987; Kamykowski and Zentara 1986; Kudela and Chavez 2000; Kudela and Dugdale 1996; Messie et al. 2009; Olivieri 1996; Olivieri and Chavez 2000; Pennington et al. 2010; Toggweiler and Carson 1995). We use two independent time series of UI estimates to generate two comparative (local and regional) estimates of N_{NO3} upwelling loading to Monterey Bay. The first series of UI estimates were obtained from the National Oceanographic and Atmospheric Administration Pacific Fisheries Environmental Laboratory (PFEL; www.pfel.noaa.gov). The PFEL derives UI for 26 positions along the Eastern Pacific coast; the PFEL UI for 36N 122W (Figure 1) is readily available and represents variations in coastal upwelling for the Monterey Bay region. The second series of UI estimates was calculated from wind vector data (using a MATLAB [Mathworks Inc.] script originally developed by L. Breaker) using daily averaged wind velocities at mooring M1 (http://dods.mbari.org/lasOASIS). As with the PFEL UI estimates, UI at M1 is an estimate of vertical mass transport derived according to Ekman's theory of mass transport due to wind stress (Smith 1995). The derivations of PFEL UI and M1 UI differ, however, according to: (1) the location at which the UI is derived (PFEL UI is for an offshore site located south of Monterey Bay while M1 is centrally located within Monterey Bay; Figure 1), and (2) the source of the wind stress data/estimates used for the calculation of Ekman transport (the PFEL UI is calculated from geostrophic wind stresses derived from surface atmospheric pressure fields provided by the U.S. Navy Fleet Numerical Meteorological and Oceanographic Center, while the M1 UI is calculated from observed winds at mooring M1).

The UI describes the quantity (mass) of source water being upwelled from depth; the delivery of nitrate load through this transport process is calculated by taking the product of UI (vertical mass transport) and the nitrate concentration of upwelling source water. This requires, then: (1) a definition of upwelling source (i.e. depth) in Monterey Bay, and (2) estimation of the nitrate concentration of the upwelling source water. In Monterey Bay and for the California Current System, the depth of upwelling source water has been described and validated elsewhere as 60 m (Kudela and Chavez 2000; Messie et al. 2009; Olivieri 1996). We use this approximation to satisfy the two requirements specified above, as follows: (1) the characteristics of upwelling source water are those of water at 60 m depth, and (2) the nitrate concentration of upwelling source water ($[NO_3]$) can be estimated according to the 60 m temperature record from MBARI mooring M1 (http://dods.mbari.org/lasOASIS) and the following temperature-nitrate relationship, established previously from 6 y of M1 mooring data (Olivieri and Chavez 2000):

$$[NO_3] = 0.6075(T)^2 - 19.078(T) + 149.436$$

The product of a concentration (daily average nitrate in upwelling source water, estimated from source-water temperature measurements and an established temperature-nitrate relationship) and a flux (daily average vertical mass transport: UIs by PFEL and from observed wind stress at M1) is a load – here, daily average nitrate load according to regional and local upwelling indices.

Estimation of daily N_{NO3} loads: rivers—All major stream and river discharges to the ocean from southern San Mateo County to Santa Barbara County have been monitored monthly since 2001 through CCAMP coastal confluences monitoring, characterizing the primary sources of freshwater discharge to the ocean in this area. The resulting dataset is unique in its capability to identify long-term trends in water quality, to estimate total river loads of pollutants to the ocean, and to provide benchmark data for flow model validation. Related but simpler modeling efforts utilizing CCAMP data have been employed in previous studies, including epidemiological evaluations of spatial risk to marine mammals (or their food items) of various land-based pathological diseases, based on animal location relative to freshwater outflows and other pollution sources (Miller et al. 2002; Miller et al. 2006; Miller et al. 2005; Stoddard et al. 2008).

Daily N_{NO3} loads (and Si loads, where available for the purpose of N-ICEP calculations) were calculated by application of a CCAMP stream flow model to macronutrient concentrations derived to daily resolution for the following streams and rivers: San Lorenzo River, Soquel Creek, Aptos Creek, Pajaro River, Salinas River, Carmel River, and Big Sur River (Figure 1). Salinas River N_{NO3} load estimates include those introduced to Monterey Bay through the Moss Landing Harbor entrance.

The CCAMP stream flow estimation model was developed to enhance stream flow information presented within the National Hydrography Dataset Plus (NHD+) geospatial framework (U.S. Environmental Protection Agency and the U.S. Geological Survey 2005) The CCAMP model uses Unit Runoff Model (UROM) estimates provided in the NHD+ geospatial framework to develop more spatially and temporally explicit estimates of flow (i.e. it describes flow at CCAMP Coastal Confluence monitoring sites at daily resolution). Unmodified, the NHD+ UROM model can provide annual average daily flows for each medium resolution hydrographic stream reach. The underlying NHD+ approach uses five United States Geological Survey (USGS) stream gages from the Hydro-Climatic Data Network (HCDN) within a 322 km (200 mile) radius as calibration gages to produce an estimation of average daily flows for each stream reach, accounting for upstream watershed area and other climatic and hydrologic features. The CCAMP stream flow model reconciles the following issues inherent in the NHD+ UROM model, which otherwise disqualifies its application for CCAMP purposes: (1) a spatial scale of 322 km is insufficient to resolve California hydrologic climate regimes, (2) anthropogenic influences on stream and river flows are beyond the scope of the NHD+ effort, (3) USGS gage network measurements provide high temporal data density and low spatial data density, while (4) stream transect method measurements provide low temporal data density, high accuracy and improved spatial density.

CCAMP enhancements to the NHD+ UROM model include selection of one to three USGS gages that more directly represent localized flow conditions at the site of interest. In some cases the gage may reside on the same stream system. Ratios are developed between gaged daily flow measurements and the UROM mean daily flow at each gage location, and if more than one gage is used these ratios are averaged. Mean daily flow ratios are then multiplied by the NHD+-derived annual mean daily flow at the discharge location of interest to estimate flow at that location and point in time. Gage choice is optimized by evaluating performance against CCAMP measured stream flows collected monthly along a ten-point cross section using a Marsh-McBirney conductive probe flow meter and setting rod. Modeled and observed flow estimates match closely (data not shown) and linear correlation of modeled and observed flow demonstrate an excellent model representation of observed flow variability ($R^2 > 0.94$ for the seven Coastal Confluence sites addressed in this study).

Monthly macronutrient data were collected by CCAMP in accordance with California State Board's Surface Water Ambient Monitoring Program Quality Assurance Program Plan www.waterboards.ca.gov/water_issues/programs/swamp/). Depth-integrated samples are collected into 1 L plastic bottles from the center of the stream flow or thalweg and immediately placed in cold ice chests (4 °C) for transport to the analyzing laboratory (BC Laboratories, Inc.). Macronutrient concentration estimates were derived to daily resolution by linear interpolation of monthly measurements.

Error associated with linear interpolation of monthly macronutrient measurements was examined in more detail as part of the CCAMP monitoring program using high frequency nitrate concentration data from an in-situ ultraviolet spectrophotometer sensor, deployed by Monterey Bay Aquarium Research Institute through its Land Ocean Biogeochemical Observatory (LOBO) network. The L03 sensor is located at the lower end of the Old Salinas River in Moss Landing Harbor. This instrument collects nitrate readings continuously at an hourly interval and has been in operation since 1994. Its location in a tidal area presents additional sources of variability that would not be encountered were the sensor located in a non-tidal riverine environment. We adapted this data for use by selecting daily measurements collected at salinity low points. We extracted monthly interval measurements from this dataset and used the subset to create a daily linear interpolation of nitrate concentrations. Linear regression between the measured and interpolated daily concentrations produced a significant relationship ($p < 0.001$, $R^2 = 0.53$). When averaged daily interpolated concentrations were compared to averaged measured concentrations for the period of record, the interpolated values underestimated average concentrations by 3%. An additional round of validation was performed for the CCAMP N_{NO3} daily load estimates using an independent data set (P3 Project, described below). This exercise allowed for validation of the CCAMP-modeled N_{NO3} daily loads with N_{NO3} loads calculated from direct measurement of macronutrients (UCSC) and discharge rates (USGS) and demonstrated high precision of CCAMP N_{NO3} load estimation (RMSD = 10.7%, N = 100).

Non-CCAMP confluence monitoring and coastal sampling—River and creek samples were collected by volunteers and staff at the California Department of Fish and Game (CDFG) as part of the Pathogens Pollution Project (P3 Project). Sampling was conducted monthly (May 2007 – Sept 2008) at six CCAMP Coastal Confluences monitoring locations described previously (all except Aptos Creek), and from 2 additional sites (Waddell Creek and Scott Creek; Figure 1). Macronutrient grab samples were collected into acid-washed polyethylene terephthalate (PTEG) bottles and transported to the analyzing laboratory (UCSC) in a cooler with blue ice. The grab samples were filtered upon arrival either by syringe-filtration (Whatman® 0.2 μm GD/X) or canister-filtration (Poretics® 0.6 μm polycarbonate membrane; <100mm Hg). Filtrates for ammonium and urea analyses were collected into 50 mL polypropylene (PP) centrifuge tubes (Corning®); previous tests have confirmed that these tubes are contaminant free for both urea and ammonium. Filtrates for macronutrient analysis [nitrate plus nitrite, silicic acid, and ortho-phosphate (hereafter referred to as phosphate)] were collected in 20 mL low-density polyethylene (LDPE) scintillation vials and stored frozen at -20 °C until analysis. Macronutrients were analyzed with a Lachat Quick Chem 8000 Flow Injection Analysis system using standard colorimetric techniques (Knepel and Bogren 2001; Smith and Bogren 2001a; Smith and Bogren 2001b). Ammonium samples were manually analyzed using a fluorescence method (Holmes et al. 1999). Urea samples were manually analyzed using the diacetylmonoxime thiosemicarbazide technique (Price and Harrison 1987) modified to account for a longer time period and lower digestion temperature (Goeyens et al. 1998).

Shore-based macronutrient sampling was conducted weekly at SCMW (Figure 1) as part of the California Program for Regional Enhanced Monitoring for PhycoToxins (Cal-PReEMPT) project. Samples were collected from the surface with a PVC bucket (Jan – Aug 2006) or were mixtures of water samples collected from three discrete depths (0, 1.5 and 3 m) with a FieldMaster 1.75 L basic water bottle (Aug 2006 – Nov 2009). Offshore macronutrient sampling was conducted approximately monthly June 2002 – November 2007 at eleven stations throughout Monterey Bay as part of the Center for Integrated Marine Technology (CIMT) program. Ten-liter PVC Niskin bottles (refitted with silicone rubber band strings) mounted on an instrumented rosette were used to collect water from 0, 5, 10 and 25 m depth. At two of the stations surface (0 m) samples were collected using a PVC bucket. All Cal-PReEMPT and CIMT grab samples were processed and analyzed for macronutrients at UCSC as described for P3 Project macronutrient samples. For the development of nitrate-salinity mixing curves, CIMT cruises were categorized *a priori* according to concurrent Pajaro River discharge (USGS 11159000) as either (a) 'high river flow' ($\geq$ 80 CFS), or (b) 'ambient'.

Data used for the development of monthly climatologies of nearshore/offshore nitrate at three MBARI moorings (M0, M1, M2; Figure 1) were obtained from the LOBOViz 3.0 LOBO Network Data Visualization website, which is managed and maintained as a public data source by MBARI (www.mbari.org/lobo/loboviz). Surface nitrate data were obtained at hourly resolution for the timeframes over which they were available [M0 (Aug 2004 – Jul 2009), M1 (Oct 2009 – Jun 2010), M2 (Jul 2002 – Jun 2010)].

River basin characterization per the Indicator for Coastal Eutrophication Potential (ICEP) index—In addition to nutrient stoichiometries, we characterize the Pajaro and Salinas rivers according to their ICEP indices for nitrogen export. The ICEP index for nitrogen export (hereafter referred to as N-ICEP) is defined as

$$\text{N-ICEP} = [\text{NFlx} / (14 \times 16) - \text{SiFlx} / (28 \times 20)] \times 106 \times 12 \qquad (1)$$

where NFlx and SiFlx are the mean specific fluxes of total nitrogen and dissolved silica (Si), respectively, delivered at the outlet of the river basin, expressed in kg N km^{-2} d^{-1} and kg Si km^{-2} d^{-1}. The N-ICEP index is expressed in kg C km^{-2} d^{-1}; the scaling of the index according to watershed area allows unbiased comparisons between large river systems (Billen and Garnier 2007). Si daily loads were available in the CCAMP data as a partial record (November 2007 –

July 2009). The daily average N_{NO3} and Si loads were used for the calculation of monthly average N-ICEP. Annual N-ICEP for the Pajaro and Salinas Rivers are provided for hydrological years (July – June) 2004 and 2005 based on annual loads previously reported by CCLEAN (CCLEAN 2006; CCLEAN 2007) and from CCAMP load data for hydrological year 2008 (July 2008 – June 2009).

Results

N_{NO3} from rivers and upwelling: load comparison —N_{NO3} loading into Monterey Bay by rivers and by wind-driven upwelling is shown in Figure 2 at annual (Figure 2A), monthly (Figure 2B), and daily (Figure 2C) resolution; N_{NO3} loading statistics are presented in Table 1. River N_{NO3} input from rivers is 2 orders-of-magnitude lower than N_{NO3} input by wind-driven upwelling at lower (annual and monthly) temporal resolutions, timescales over which previous comparative analyses have been conducted (e.g. Warrick et al. 2005). The 2 orders-of-magnitude difference between river and upwelling N_{NO3} input is not consistently observed at higher (daily and weekly) resolution (Figure 3), where N_{NO3} input from rivers is maintained while N_{NO3} input by wind-driven upwelling is relatively lower or zero during some winter months. These 2-4 week periods of comparatively higher river N_{NO3} input coincide with periods of southerly winds and/or wind relaxation, when river flows and river N_{NO3} input remain positive (river loading is switched 'on') while daily mean upwelling is essentially zero (loading by upwelling is switched 'off'). The day-to-day recurrence of this circumstance throughout our 10 y time series is 28%; this statistic generally reflects the proportion of days for which daily mean upwelling was zero (or negative, in instances of downwelling). River input is generally not significant compared to upwelling N-

loading when the analysis is constrained to days where upwelling wind stress is positive, and when only load magnitude (but not temporality) is considered (Table 1).

In addition to their constancy as a source of N_{NO3}, rivers differ from upwelling in their annual loading character; the greater proportion of river N_{NO3} load is introduced over relatively short periods during the rainy season, and the summarization of river N_{NO3} loading into cumulative sum profiles across hydrological years demonstrates the 'stepped' character of river loading (Figure 4). Upwelling contributes most significantly towards its cumulative load total in the early and late periods of the hydrological year, when the percent contribution from rivers is relatively small. Conversely, plateaus in the upwelling annual cumulative load profiles coincide with periods of the year when rivers are contributing the bulk of their annual cumulative N_{NO3} load, generally across the mid-point of the hydrological year (i.e. winter). The characteristics described for the cumulative sum N_{NO3} loading profiles are consistent across years: the profiles in Figure 4B (cumulative sum, in percentage units) are similar for all years, even those which precede and follow years of relatively high absolute loading, e.g. 2004 and 2005 (Figure 4A).

Linear salinity-nitrate mixing curves developed for CIMT cruises categorized *a priori* according to concurrent river discharge as either (a) 'high flow' or (b) 'ambient' showed a reversal in the salinity-nitrate relationship according to river state, although linear correlations were not statistically significant in either case. Under conditions of high river flow, the relationship between nitrate and salinity was inverse ($\alpha = -0.3047$), counter the relationship identified for 'ambient' conditions ($\alpha = 1.130$). Based on the 'high-flow' mixing curve developed from the regional cruise data, we would expect the freshwater endmember to Monterey Bay (i.e. the freshwater source of nitrate) to have a nitrate concentration of 13.58 μM;

this agrees well with average nitrate concentrations of 'typical' Monterey Bay rivers, calculated from P3 Project data (e.g. San Lorenzo: 16.45 μM, Scotts Creek: 7.16 μM).

Using monthly climatological data for surface nitrate concentrations and N_{NO3} loading by upwelling, a significant correlation exists at the two moorings located furthest offshore (M1 and M2; Figure 5C-D); the correlations between N_{NO3} loading and surface nitrate weaken and become statistically non-significant at the more inshore stations M0 and SCMW (Figure 5A-B). The correlation between river N_{NO3} loading and surface nitrate is strongest at the most inshore location, SCMW, and maintains statistical significance at the next most inshore station (M0), but is not significant at the offshore moorings (Figure 5E-H).

N_{NO3} from rivers and upwelling: trend comparison —As the longest continual monitoring program addressing nutrient loading to central California coastal waters, the 10 y of CCAMP N_{NO3} load data used for this study provided a unique opportunity to assess the presence of intra-decadal load trending. Mann-Kendall trend analysis of N_{NO3} loading by rivers and by wind-driven upwelling revealed a difference in trends for the 10 y loading record used in this study. River N_{NO3} loading demonstrated a significant upward trend with a slope of 0.012; upwelling loading trend was non-negative, but its slope was zero (Table 2). Trend results for upwelling N_{NO3} load estimates were the same whether the load estimates were based on UI at Monterey Bay mooring M1 (UI according to locally observed winds) or PFEL estimates for 36N 122W (UI according to wind stress derived from mean surface atmospheric pressure fields). The absence of a trend in upwelling N_{NO3} loading over the time-period addressed in our study (2001-2009) is consistent with observations of intra-annual oceanographic and climatic variability in Monterey Bay (e.g. phase changes, regime shifts) which would preclude monotonic trending, including (1)

increased nitrate at 60 m from 1998-2005, with (2) increased water column stratification after 2003 and a concomitant reduction in near-surface nitrate (Chavez et al. 2006).

While our trend analysis for upwelling is an accounting of changes in its strength and potential (i.e. wind-stress, thermocline depth, etc.), our use of a static temperature-nitrate relationship, albeit with precedent, would prevent the identification of a trend caused by interchange of the water mass (and its properties) from which source waters are drawn. Since our focus is the contextualization of riverine N_{NO3} loading (positive trend), failure here would be the non-recognition of an matching (positive) trend in the upwelling N_{NO3} loading. According to two parameters which are representative of the temperature-nitrate relationship, the Nitrate Depletion Temperature (NDT; (Kamykowski and Zentara 2003; Kamykowski et al. 2002) and the coefficient of the linear nitrate-temperature regression (α), calculated for each year from 2000 – 2010 from daily averages of temperature and nitrate at MBARI mooring M1 (Figure 1), there is a significant trend in the nitrate-temperature relationship across this period ($p < 0.05$), but one which would translate to decreasing N_{NO3} loading (and a progressive over-estimation of upwelling N_{NO3} loads) across the decade. According to our trend analysis and this preliminary evaluation of inter-annual variability in the temperature-nitrate relationship at M1, we find no evidence of a positive trend in upwelling N_{NO3} loading and the suggestion that in fact a negative trend, potentially masked by our use of a single nitrate-temperature across years, may exist. The trend differential of upwelling to river N_{NO3} loading is therefore as stated according to our load estimates (no-trend for upwelling versus positive trend for rivers) or more extreme (negative for upwelling versus positive trend for rivers). While specification of this differential is sufficient for our purposes of context and comparison, a comprehensive evaluation of upwelling N_{NO3} load trending requires multi-decadal-to-centennial scale data and their careful analysis according to the specific purpose of long-term trend identification.

Differential loading: nutrient source stoichiometry—If we assess the stoichiometry of Monterey Bay rivers and streams nutrient concentrations according to the Redfield-Brzezinski ratio of 106:16:15:1 (Brzezinski 1985; Redfield 1934), six of the eight fluvial sources would be enriched according to Si >> P > N (Table 3). The remaining 2 rivers, the Pajaro and Salinas, would be enriched according to N > Si > P with the Salinas demonstrating extreme nitrogen enrichment (N >> Si > P). All rivers are enriched with Si relative to P; this proportionality is especially pronounced in the 2 southernmost rivers (Carmel and Big Sur). The Salinas and the Pajaro Rivers have their outfalls in the mid-Bay region, making them distinct from the other rivers in terms of both nutrient stoichiometry (as relatively nitrogen-enriched) and outfall locale (Figure 1). The prevalence of additional nitrogen species (N_{UREA} and N_{NH4}, collectively referred to as N_X) was also evaluated; for all rivers, N_{NO3} is the most prevalent of the 3 nitrogen species that were quantified (N_{NO3}, N_{UREA}, N_{NH4}).

The nutrient stoichiometry of Monterey Bay waters from shipboard sampling (0, 5, 10 and 25 m) shows relatively low surface $N_{NO3}$with values approaching the Redfield-Brzezinski ratio with increased depth (Table 3). Ratios of N_{NO3}:N_X in surface waters measured throughout Monterey Bay are low compared to N_{NO3}:N_X ratios of the major rivers (Pajaro and Salinas), and equivalent to N_{NO3}:N_X ratios for the northernmost rivers (e.g. Waddell Creek). Nutrient stoichiometry in integrated water (0, 1.5, 3 m) from SCMW resembled that of Monterey Bay surface waters, but with relatively lower N_{NO3} for all ratios. Unlike rivers and offshore Monterey Bay, N_{NO3} was not the predominant nitrogen species at SCMW: N_{UREA} was generally 3-fold higher than N_{NO3}, while N_{NO3}:N_{NH4} approached 1:1 (Table 3).

Eutrophication risk assessment—Monthly N-ICEP values for the Pajaro and Salinas rivers are shown in Figure 6. While there is clear variability in monthly N-ICEP, the Pajaro River was characterized by positive N-ICEP values from early- to mid-year (Jan – Aug 2008, Mar – Jul 2009) while N-ICEP for the Salinas River was significantly positive only for 2 months in early 2009 (February and March). This monthly comparison of the Pajaro River and Salinas River N-ICEP indexes is necessarily limited, and the monitoring of Si and N should be adjusted (or implemented) within water quality assessment programs to afford the regular determination of N-ICEP at sub-annual resolution. Annual N-ICEP indices for the hydrological years 2004 and 2005 were positive for the Salinas River (0.15 kg C km^{-2} d^{-1} in both years). These annual N-ICEP figures, determined from annual loads reported by CCLEAN, are in agreement with the annual N-ICEP determined from CCAMP data for the hydrological year 2008 (0.12 kg C km^{-2} d^{-1}). Annual N-ICEP indices for the Pajaro River were consistently negative in the hydrological years 2004 and 2005, as determined from CCLEAN load data (-2.08 and -1.07, respectively), and in the hydrological year 2008, as determined from CCAMP load data (-0.05 kg C km^{-2} d^{-1}).

Discussion

Riverine N_{NO3} loading along an 'upwelling-dominated' coastline—The comparative subject of this study is not unprecedented: N_{NO3} load comparisons are available for the Columbia and Santa Clara rivers, near the northern and southern termini of the California Current System, respectively (Hickey and Banas 2008; Hickey et al. 2010; Warrick et al. 2005). These studies provide reference points from opposite ends of the eastern boundary current system in which Monterey Bay is centrally located, and from regions which differ significantly in hydrological setting and climate. The Columbia River is a significant source of freshwater discharge, contributing 77% of the drainage along the west coast of the United States of America north of San Francisco (Barnes et al. 1972). Nitrate input by the Columbia River is an order-of-magnitude lower than nitrate input by coastal upwelling in the outfall region, but has been shown to maintain the ecosystem during periods when upwelling is depressed (Hickey and Banas 2008; Hickey et al. 2010; Kudela et al. 2010). To the south, the Santa Clara River drains a much smaller and drier watershed, but one which is heavily influenced by patterns of land-use (agricultural and urban). For this relatively dry system in the southern CCS, river nitrate input is 2-3 orders of magnitude lower than nitrate input by upwelling, but nutrient contributions from the river are regarded as significant due to differences in nutrient quality (i.e. Si:N:P for upwelled waters was 16:5:1; the same ratio for rivers was 13:10:1), and input timing.

Our evaluation of N_{NO3} loading to Monterey Bay by rivers and by wind-driven upwelling confirms the significance of river N_{NO3} load timing and indicates that the consideration of temporality, and not simply magnitude, must be taken into consideration – even in a region identified as one that is dominated by coastal upwelling. Our comparison of river and upwelling N_{NO3} loads on annual and monthly timescales affirms the classification of Monterey Bay as an upwelling-dominated region (the minimum differences between nitrate input from rivers and from upwelling were 2 orders of magnitude for annual and monthly timescales), but also affirms this classification as a generality. Most water quality monitoring programs cannot afford the opportunity to describe river nitrate loading on a daily basis, and the present study is the first to compare river and upwelling nitrate inputs at sub-seasonal resolution. As such, this study is the first to describe nitrate inputs within a region of the CCS at the temporal resolution at which regional discharge and upwelling events are often defined (e.g. wind-relaxation events, 'first flush' discharge events) and relevance to phytoplankton response has been described by others

(Malej et al. 1995; Small and Menzies 1981; Walsh et al. 1977). We note that only when our order-of-magnitude load comparison was conducted at this ecologically relevant temporal resolution (Beman et al. 2005) did the rate at which rivers exceed wind-driven upwelling as a nitrate source become apparent (28%; Figure 3). Similarly, the refined development of salinity-nitrate mixing curves from region-wide cruise data according to river flow status ('high flow' versus 'ambient') demonstrates: (1) regional riverine influence sufficient to cause a reversal in the salinity-nitrate mixing curve, i.e. a negative correlation between nitrate and salinity in Bay waters when river flow is high, and (2) further evidence for regional riverine N_{NO3} source predominance under high flow conditions, per the agreement of average nitrate concentrations in 'typical' Monterey Bay rivers with the freshwater N_{NO3} endmember concentration predicted by the 'high flow' salinity-nitrate mixing curve.

Onshore-to-offshore gradient in N_{NO3} source climatology correlations—Our comparison of upwelling and river N_{NO3} loading was designed to address N_{NO3} loading for Monterey Bay. In our comparison, the refinement of temporal scale (annual to monthly to weekly/daily) allowed for the recognition of periods when N_{NO3} loads from rivers surpassed those introduced by upwelling across an entire region, while the climatological comparisons from nearshore to offshore (Figure 5) provide some indication of the cross-shelf gradient. The development of surface nitrate climatologies at discrete locations spanning the onshore-to-offshore distance encompassed by Monterey Bay (SCMW, M0, M1, M2; Figure 1) indicates the predominance of river N_{NO3} loading even on a broad temporal scale at discrete nearshore (but still 'oceanographic') observational locations. While there is strong correlation between the climatology of surface nitrate and the climatology of N_{NO3} loading by upwelling at the offshore stations M1 and M2, the correlation becomes non-significant further inshore. Conversely, the correlation between the climatologies for surface nitrate and N_{NO3} loading by rivers is strongest at the most inshore station (SCMW), and weakens with increasing distance offshore. These onshore/offshore correlation gradients for river N_{NO3} loading and for N_{NO3} loading by upwelling suggest that the relative significance of N_{NO3} river loading cannot be ignored, even without regard to temporality, at inshore locations such as SCMW and M0. The relative importance of this loading suggests an enhanced capacity to influence algal growth and harmful algal bloom dynamics within the onshore coastal zone, nearest to coastal communities and economies (Anderson et al. 2008; Anderson et al. 2002; Glibert et al. 2005a; Glibert et al. 2005b; Howarth 2008; Kudela et al. 2006; Kudela et al. 2008a).

The southward advection of upwelling waters from an upwelling center immediately to the north of Monterey Bay has been observed during upwelling events (Ramp et al. 2009; Ramp et al. 2005; Rosenfeld et al. 1994), but this delivery requires sustained winds of 10 m s^{-1} on the order of a week (Ramp et al. 2005). More recently, a publication synthesizing the results of two Autonomous Ocean Sampling Network field experiments described in one case (August 2006) a failure to simulate salinity and temperature fields (demonstrated successfully for August 2003) using a nested, data assimilating model supported by focused, high-resolution sampling of the upwelling center. New consideration of minor, but evidently important, N_{NO3} sources to Monterey Bay (Mackey et al. 2010; Wankel et al. 2007), have demonstrated circumstances when these processes exert significant influence within an 'upwelling dominated' regime. Our correlation of surface N_{NO3} climatologies to river and upwelling N_{NO3} loading climatologies (Figure 5) indicates the predominance of river N_{NO3} loading on a *broad temporal scale* at nearshore locations. Under circumstances of high river flow, we identify evidence of this predominance on a *broad spatial scale*: the development of salinity-nitrate mixing curves from regional cruise data according to river flow condition ('high-flow' versus 'ambient') demonstrates a sign reversal in the salinity-nitrate relationship (i.e. an inverse relationship between nitrate and salinity) during periods of high river flow.

Implications for water quality monitoring programs—While there are several ongoing water quality monitoring programs in the Monterey Bay region, the CCAMP dataset was used for this study because (1) it afforded estimates of river nitrate loads at daily resolution, and (2) it had been generated from continual monitoring over the longest timespan (2000 – 2009). In these two respects, the CCAMP data are relatively unique. While a long-term, high resolution dataset was necessary for the primary purpose of this study (upwelling/river N_{NO3} load comparison), it is useful to consider whether the higher precision modeling required to generate daily river load estimates is necessary to inform annual estimates of riverine N_{NO3} loads. For the hydrological years 2004 (July 2004 – June 2005) and 2005 (July 2005 – June 2006), annual load estimates from six monitoring locations are available for comparison from CCAMP and CCLEAN [Aptos Creek (2005 only), San Lorenzo River, Soquel Creek, Pajaro River, Carmel River, Big Sur River (2004 only); Figure 1]. Across these sites, annual N_{NO3} load estimates agreed in both years to within an order-of-magnitude. The largest discrepancies between the annual load estimates occurred for the rivers with relatively small drainage areas (Carmel River and Big Sur River in 2004; Aptos Creek and Soquel Creek in 2005); for all other rivers, the factor difference between CCLEAN and CCAMP annual load estimates ranged from < 1 to 3. In both 2004 and 2005, the CCLEAN estimates of total N_{NO3} river load to Monterey Bay were lower than the estimates from CCAMP, and this difference is not wholly unexpected: annual loading figures generated by CCLEAN were presumed to be underestimates since CCLEAN estimates were generated by calculating daily loads from each monthly grab sample (from measured N_{NO3} and NHD+

modeled discharge), averaging the daily loads across the hydrological year, and multiplying the average by the number of days in the hydrological year (365). While the approach taken by CCLEAN is simple and less time-intensive, the resulting annual load calculations were reported as "estimates, based on individual grab samples, (which) may underestimate actual loads because high loads associated with episodic storm events are not consistently sampled" (CCLEAN 2007). Since CCAMP annual load estimates are annual sums of daily loads, they have the potential to more precisely resolve and represent N_{NO3} loads introduced during episodic high-flow ('flush') events. Our comparison of CCAMP annual load estimates with those generated by CCLEAN suggests that the simpler approach (CCLEAN) is adequate for large-scale (Bay-wide, annual) estimates. Where higher precision is required, large-scale estimates generated by programs such as CCLEAN could be augmented with data provided by programs designed to characterize river contributions during episodic events (e.g. 'First Flush' monitoring, with the addition of flow measurement or estimation). The significance of local water quality data may be more effectively extended to the coastal environment if, either individually or in concert, water quality programs include the parameters required for calculation of N-ICEP (and the analogous index for ortho-phosphate, P-ICEP) on daily, weekly, monthly, and annual timescales.

Differential loading among Monterey Bay rivers—In most years, the annual N_{NO3} loads introduced by the Pajaro and the Salinas rivers comprise >95% of total annual river N_{NO3} load to Monterey Bay (Figure 7). While the relative contribution from the Pajaro and Salinas is consistently large, the relative contribution from each of the two rivers is variable. Within the 2001 – 2009 timeframe, 2005 and 2006 stand out as years of relatively high freshwater discharge: mean annual discharge from the Salinas River was an order-of-magnitude higher in 2005 – 2006 than across the other years (16.7 versus 1.7 $m^3 s^{-1}$). In these high discharge years, the Salinas River dominated the relatively high total N_{NO3} load (Figure 7). Conversely, in years of low to moderate discharge, the Pajaro River tends to dominate. The unusually high contribution of N_{NO3} from the Big Sur River in 2009 is unexplained, but presumed to be an artifact of severe wildfires that affected the region in the summer of 2008, and the drainage of burned landscape over the 2009 rainy season.

While we can illustrate disproportionate N_{NO3} loading by the Pajaro and Salinas Rivers by comparing annual N_{NO3} load contributions (Figure 7) and nutrient ratios (Table 3), the N-ICEP index provides added insight into the character of the Salinas and Pajaro River basins. The N-ICEP refers to the potential for new primary production (non-siliceous algae only) based upon the nutrient fluxes delivered by a river system. Designed as a summary characterization index, the N-ICEP represents the relevant information contained in both absolute and relative values of nitrogen and silica fluxes delivered by large river systems (Billen and Garnier 2007). The damming of rivers and reservoir construction (increased retention of biogenic silica), urbanization (increased discharge of low Si:N wastewater) and agriculture (increased nitrogen, thereby decreasing Si:N) all promote positive N-ICEP values, while rivers draining pristine watersheds are rich in silica and low in nitrogen (Billen and Garnier 2007; Table 3, this study), resulting in negative N-ICEP values. Our analysis of N-ICEP is constrained to the Salinas and Pajaro rivers since (1) the ICEP was formulated for the characterization of relatively large-scale river systems, and (2) N_{NO3} loading by the Pajaro and Salinas regularly contributes >95% of total river N_{NO3} loading on a consistent basis (Figure 7). Although the N-ICEP indices of the 5 additional rivers included in the CCAMP dataset are unavoidably inflated in terms of absolute value [an artifact of inserting a small drainage area into the N-ICEP calculation], they trend strongly negative in the winter months and trend to less negative values through the remainder of the year. As expected, the most consistent and extreme negative N-ICEP indices are observed in rivers that drain relatively pristine watersheds (e.g. Big Sur River; data not shown).

The monthly N-ICEP figures reveal extended periods during which the Pajaro River is characterized by positive N-ICEP (e.g. Jan – Aug 2008, Figure 6) while on an annual basis (e.g. for the 2008 hydrological year) the Pajaro River was characterized by negative N-ICEP. As with our comparisons between N_{NO3} loading from upwelling and from river discharge, considerable information is gained by comparing annual and monthly patterns. Billen and Garnier (2007) recommended calculation of the N-ICEP on varying timescales (daily, monthly, yearly) according to the surface area of the impacted coastal marine zone and the residence time of freshwater masses within it. A thorough evaluation of N-ICEP for Monterey Bay rivers will require a more extensive collection of high-resolution Si and N_{NO3} loading data than were available for this study, and future assessments should be undertaken across various temporal resolutions selected according to the question and conditions under consideration.

Broad implications—Our preliminary assessment of N-ICEP for Monterey Bay rivers identifies it as a useful and appropriate index for the characterization of large rivers within the Monterey Bay region, one which allows comparison of Monterey Bay rivers to rivers from different climatic regions of the world now and into the future. A recent collection of N-ICEP values based upon measured (versus modeled) load data demonstrates a general association of positive N-ICEP for river basins draining to the Mediterranean Sea, Black Sea, Baltic Sea and the North Atlantic and negative N-ICEP for rivers draining to the North and South Pacific, South Atlantic, the Arctic, and the Indian Ocean (Garnier et al. 2010). Our identification of the Salinas River as consistently positive N-ICEP highlights the Salinas River as an exception to these general patterns. Worldwide, N-ICEP generally increases with population density, and shifts to a positive value in river basins with >30% agricultural land (Garnier et al. 2010). The Pajaro River N-ICEP appears to be shifting towards a positive value (-2.08, -1.07, and -0.05 kg C km^{-2} d^{-1} in 2004, 2005 and 2008, respectively), in agreement with previous observations of increasing agricultural activity and water quality impairment within the watershed (Los Huertos et al. 2001; Ruehl et al. 2007). The positive trend identified in Monterey Bay river N_{NO3} loads (CCAMP; 2000 – 2009), and the increasing N-ICEP values in the Pajaro River both suggest that N-ICEP values will continue trending positive in the absence of intervention. Industrialized countries in Europe and the United States have seen N-ICEP values stabilize or decrease as a result of nitrogen removal in wastewater treatment and increases in the efficiency of agricultural nitrogen use; positive trends for Monterey Bay river N-ICEP values suggest a trajectory more similar to areas such as the Japanese and Chinese Seas, Indian and South African coasts, where rapidly increasing agricultural production and fast urbanization have led to increased N-ICEP across a 30 year period (1970 – 2000; Garnier et al. 2010).

There is increasing scientific consensus that eutrophication plays a role in the development, persistence, and expansion of HABs in the United States and worldwide (Anderson et al. 2008; Heisler et al. 2008; Kudela et al. 2008a). More generally, regions that are not typically strongly influenced by riverine nutrient sources may exhibit strong responses by the phytoplankton community to relatively small changes in loading and stoichiometry; for example, the Washington and Oregon coast appear to be poised to shift from N-limitation to P or Si-limitation with very moderate increases in N-loading to the Columbia River (Kudela and Peterson 2009). This susceptibility can be introduced or augmented by climatological events such as El Niño, when river outflows provide significant macronutrient loads to nutrient-deplete surface coastal waters (Castro et al. 2002; Wilkerson et al. 2002); these conditions can induce a significant phytoplankton response (Friederich et al. 2002; Kudela and Chavez 2004) and have been implicated in HAB conditions leading to mass wildlife mortality (Scholin et al. 2000). While toxigenic blooms of *Pseudo-nitzschia* in Monterey Bay are predominantly associated with upwelling conditions on an annual basis, the influence of river discharge becomes apparent on a seasonal basis (Lane et al. 2009). Our demonstration here of the predominance of river N_{NO3} loading on short timescales (~28% of the time), the onshore-offshore gradient of its influence, and its upward temporal trend, indicate that rivers are exerting significant (and increasing) influence within a coastal upwelling system. Based on previous descriptions of the linkage between HABs and eutrophication (Anderson et al. 2008; Heisler et al. 2008; Kudela et al. 2008a; Lane et al. 2009), this influence, and its strengthening, should be expected to enhance the development, persistence and expansion of phytoplankton blooms, including HABs, in coastal waters of the present day and of the future.

Table 1. Comparative statistics for nitrogen as nitrate (N_{NO3}) loading by rivers monitored as part of the Central Coast Ambient Monitoring Program (CCAMP; Coastal Confluences) and by wind-driven upwelling according to observed daily mean winds at Monterey Bay mooring M1 (36.75N 122.03W) and according to daily mean upwelling index (UI) estimates issued by the Pacific Fisheries Environmental Laboratory (PFEL) for 36N 122W.

	Rivers (CCAMP)	Upwelling (M1 / PFEL)
Average N_{NO3} load ($\times 10^9$ kg y^{-1})	0.001	0.3 / 0.7
Days of positive N_{NO3} load	100%	73% / 87%
Days (river load > UI load)	28%	-- / --
Days (river load > UI load); UI > 0	1%	-- / --
Mean relative contribution (% y^{-1})	0.4 (range: 0.1–1.3)	>99 / --

Table 2. Sen's slope estimates from Mann-Kendall trend analysis of 10 y (01 Jan 2000 through 06 Aug 2009) of daily nitrogen loadings (nitrogen as nitrate; kg) to Monterey Bay by rivers monitored as part of the Central Coast Ambient Monitoring Program (CCAMP; Coastal Confluences), and by wind-driven upwelling according to observed daily mean winds at Monterey Bay mooring M1 (36.75N 122.03W) and according to daily mean upwelling index (UI) estimates issued by the Pacific Fisheries Environmental Laboratory (PFEL) for 36N 122W.

	Rivers (CCAMP)	Upwelling (M1 and PFEL)
Upward	0.012 ($p = 0.000$)	0.000 ($p = 0.000$)
Downward	$p > 0.05$	$p > 0.05$
n	3506	3503

Table 3. Nutrient ratios, expressed in phosphate (P), silica (Si), and nitrogen [urea-nitrogen (N_{UREA}) nitrate-nitrogen (N_{NO3}); ammonium-nitrogen (N_{NH4})]. Ratios were determined from river and creek grab samples collected monthly (May 2007 – Sept 2008) from rivers and creeks throughout Monterey Bay as part of the Pathogens Pollution Project. Stoichiometries for onshore/offshore receiving waters are provided from cruise samples collected monthly at stations throughout Monterey Bay (Center for Integrated Marine Technology; 2002 – 2007); stoichiometries for inshore receiving waters are from integrated-depth (0, 1.5, 3 m) samples collected weekly at the Santa Cruz Municipal Wharf (SCMW; 2005 – 2009). For comparison, nutrient ratios for the Mississippi River, Santa Clara River, and upwelled water in the Santa Barbara (SB) Channel are included (Justic et al. 1995a; Warrick et al. 2005).

	Si:P	Si:N_{NO3}	N_{NO3}:P	N_{NO3}:N_{UREA}	N_{NO3}:N_{NH4}
Waddell Creek	291	50	3	4	5
Scott Creek	213	56	5	4	2
San Lorenzo River	108	24	5	8	5
Soquel Creek	175	133	2	6	7
Pajaro River	290	0.4	356	100	34
Salinas River	228	0.1	3277	424	884
Carmel River	443	55	7	18	29
Big Sur River	673	128	3	9	28
— –					
Mississippi River	14	0.9	15	n/a	n/a
Santa Clara River	16	3	5	n/a	n/a
— –					
Monterey Bay (0 m)	23	2	9	5	5
Monterey Bay (5 m)	20	2	9	4	7
Monterey Bay (10 m)	14	1	10	38	11
Monterey Bay (25 m)	13	1	12	54	28
SB Channel upwelling	13	1	10	n/a	n/a
— –					
SCMW	30	6	5	0.3	0.8

Figure Legends

Figure 1. Map of the Monterey Bay region, annotated with Coastal Confluences Ambient Monitoring Project (CCAMP) river and creek coastal confluences (San Lorenzo River, Soquel Creek, Aptos Creek, Pajaro River, Salinas River, Carmel River, Big Sur River) which contributed to estimates of daily river nitrate-nitrogen (N_{NO3}) loading to Monterey Bay, the coastal confluences sampled through the Pathogens Pollution Project for their characterization according to nutrient stoichiometry (same as CCAMP coastal confluence sites, omitting Aptos Creek and including Waddell Creek), the Monterey Bay Aquarium Research Institute (MBARI) offshore moorings (M0, M1, M2), the location of 36N 122W for which daily upwelling index (UI) is generated by the Pacific and Fisheries Environmental Laboratory (PFEL), and the location of the Santa Cruz Municipal Wharf (SCMW). Filled symbols denote river monitoring sites (versus sites used for coastal monitoring).

Figure 2. Nitrate-nitrogen (N_{NO3}) loads introduced to Monterey Bay by rivers (grey bars) and by wind-driven upwelling estimated from observed winds at the Monterey Bay Aquarium Research Institute (MBARI) mooring M1 (filled circles) and from an upwelling index (UI) provided by the Pacific and Fisheries Environmental Laboratory (PFEL) for 36N 122W (open diamonds). The same N_{NO3} load data are presented in each panel but at increasing temporal resolution, as follows: annual (A), monthly (B), and daily (C; daily N_{NO3} loads are from M1 winds only). Note the unit difference between upwelling loads (plotted on the left vertical axis) and river loads (plotted on the right vertical axis).

Figure 3. Daily nitrate-nitrogen (N_{NO3}) loads introduced to Monterey Bay by rivers (grey bars) and by wind-driven upwelling estimated from observed winds at the Monterey Bay Aquarium Research Institute (MBARI) mooring M1 (black bars) across periods for which N_{NO3} loads introduced by rivers were consistently higher than N_{NO3} loads introduced by upwelling (i.e. upwelling winds were effectively turned 'off', while river loading remained switched 'on'). This figure illustrates the relativity of river N_{NO3} loading for only 3 select timeframes across which river loads are particularly competitive; across the entire study period (2000 – 2009), daily loads of N_{NO3} from rivers exceed daily loads of N_{NO3} from upwelling at a rate of 28%.

Figure 4. Nitrate-nitrogen (N_{NO3}) loading by rivers (grey fill) and by wind-driven upwelling estimated from observed winds at the Monterey Bay Aquarium Research Institute (MBARI) mooring M1 (black line), as expressed in absolute cumulative sum (A), and percent cumulative sum (B). The cumulative sums are calculated and displayed according to hydrological year (July – June). Note in (A) the unit difference between upwelling loads (plotted on the left vertical axis) and river loads (plotted on the right vertical axis).

Figure 5. The surface nitrate climatology for Santa Cruz Municipal Wharf (SCMW; A and E), mooring M0 (B and F), mooring M1 (C and G), and mooring M2 (D and H) are shown; the climatologies are arranged top-to-bottom according to offshore distance (i.e. SCMW is a pier-based monitoring location; the M0, M1, and M2 moorings are located 8, 18, and 56 km offshore, respectively. The climatology of N_{NO3} loading to Monterey Bay by upwelling is repeated through panels A-D for its comparison with the onshore (top panel) to offshore (bottom panel) series of surface nitrate climatology. The climatology for N_{NO3} loading to Monterey Bay by rivers is

repeated through panels E-H for its comparison with the onshore (top panel) to offshore (bottom panel) series of surface nitrate climatology. The correlation coefficient (r) for each pair of climatologies is shown. Light grey bars (surface nitrate climatology), black lines (upwelling load climatology) and dark grey lines (river load climatology) denote standard deviation for each month's climatological average.

Figure 6. Monthly values of the Indicator for Coastal Eutrophication Potential with respect to nitrogen (N-ICEP) for the Pajaro and Salinas Rivers. The N-ICEP refers to the potential for new primary production (non-siliceous algae only) based upon the nutrient fluxes delivered by a river system. Designed as a summary characterization index, the N-ICEP encompasses and represents the relevant information contained in both absolute and relative values of nitrogen and silica fluxes delivered by large river systems (Billen and Garnier 2007). A negative value of the N-ICEP indicates silica delivery in excess over nitrogen delivery and the prevalence of relatively pristine conditions (i.e. the absence of eutrophication problems). A positive value of the N-ICEP indicates the reverse circumstance (nitrogen delivery in excess of silica delivery); positive values are generally indicative of eutrophication problems exerting their influence within the river basin.

Figure 7. Relative percent nitrate-nitrogen (N_{NO3}) load contribution (bars) from each of the rivers and creeks monitored by the Central Coast Ambient Monitoring Program (CCAMP). The total (absolute) N_{NO3} load introduced to Monterey Bay in each year is shown (white circles) to illustrate the differential between the Pajaro and Salinas load contributions across years of moderate N_{NO3} loading (corresponding to years of dry to normal hydrology) and years when

N_{NO3} loading was enhanced (i.e. the relatively wet years of 2005 and 2006).

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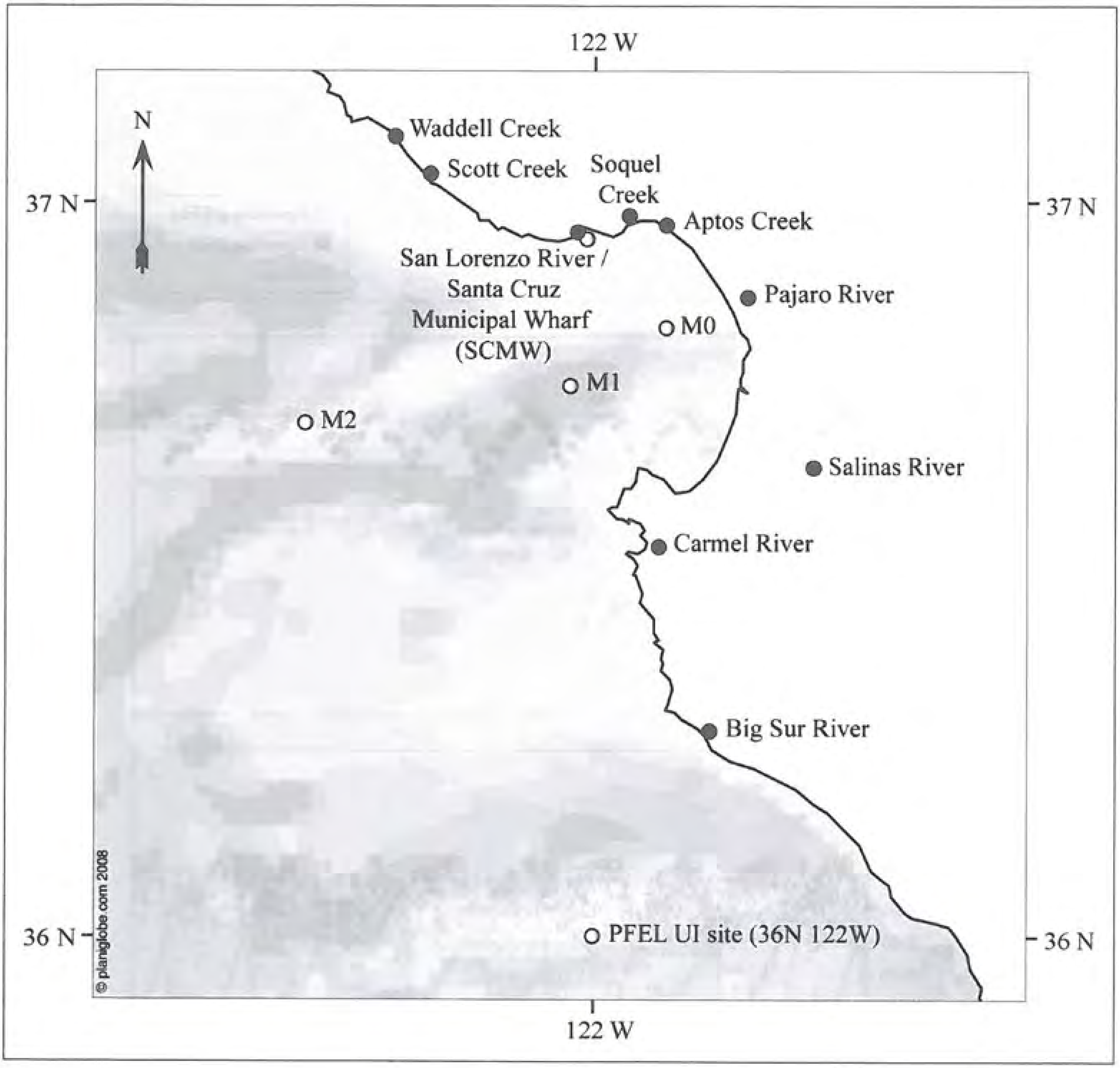
Figure 1



122 W
N
37 N
37 N
Waddell Creek
Scott Creek
Soquel
Creek
Aptos Creek
San Lorenzo River /
Santa Cruz
Municipal Wharf
(SCMW)
Pajaro River
M0
M1
M2
Salinas River
Carmel River
Big Sur River
© planiglobe.com 2008
36 N
36 N
PFEL UI site (36N 122W)
122 W

Figure 2

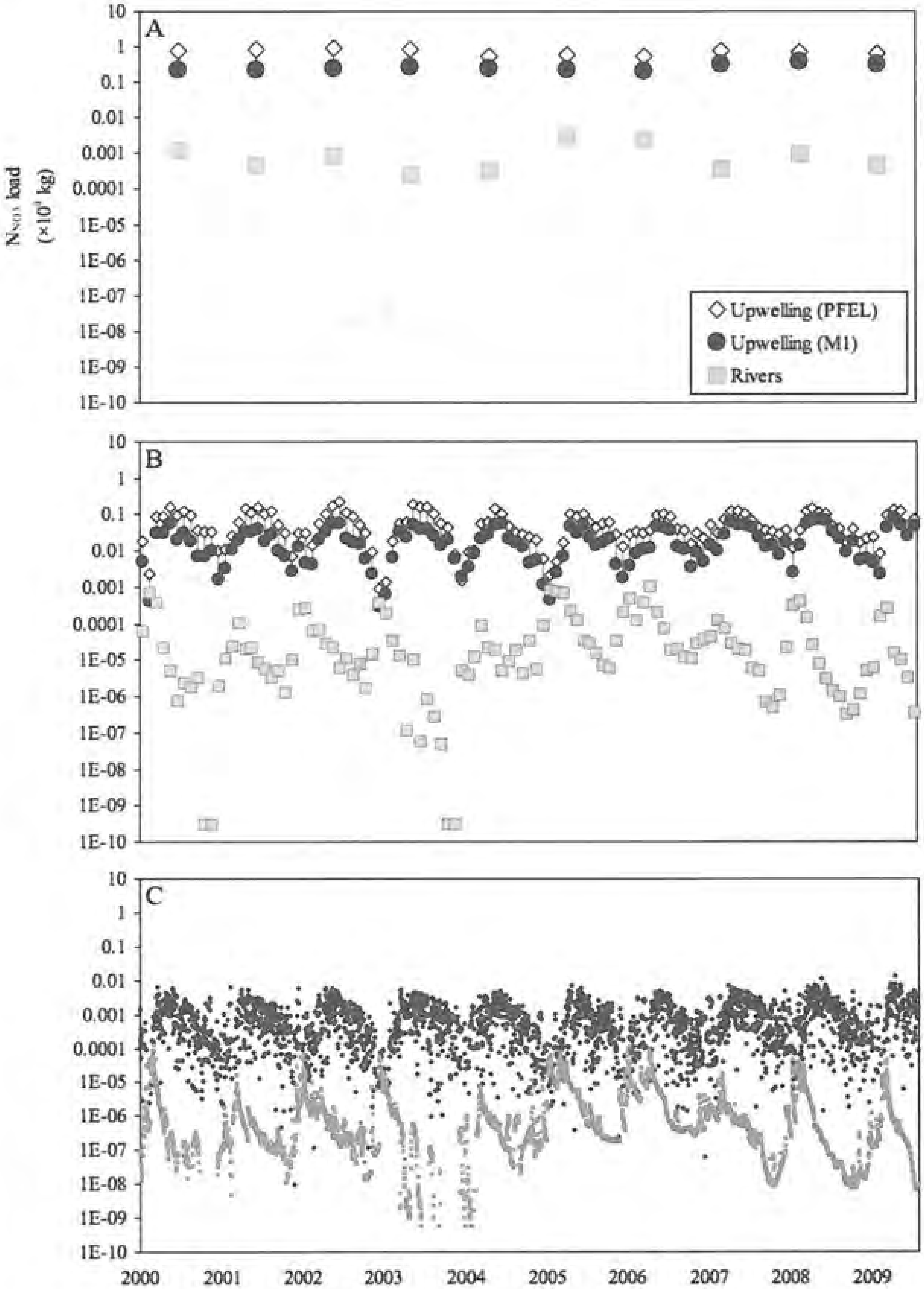

A
B
C
N_{NO3} load ($\times 10^{9}$ kg)
◇ Upwelling (PFEL)
● Upwelling (M1)
Rivers
10
1
0.1
0.01
0.001
0.0001
1E-05
1E-06
1E-07
1E-08
1E-09
1E-10
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009

Figure 3

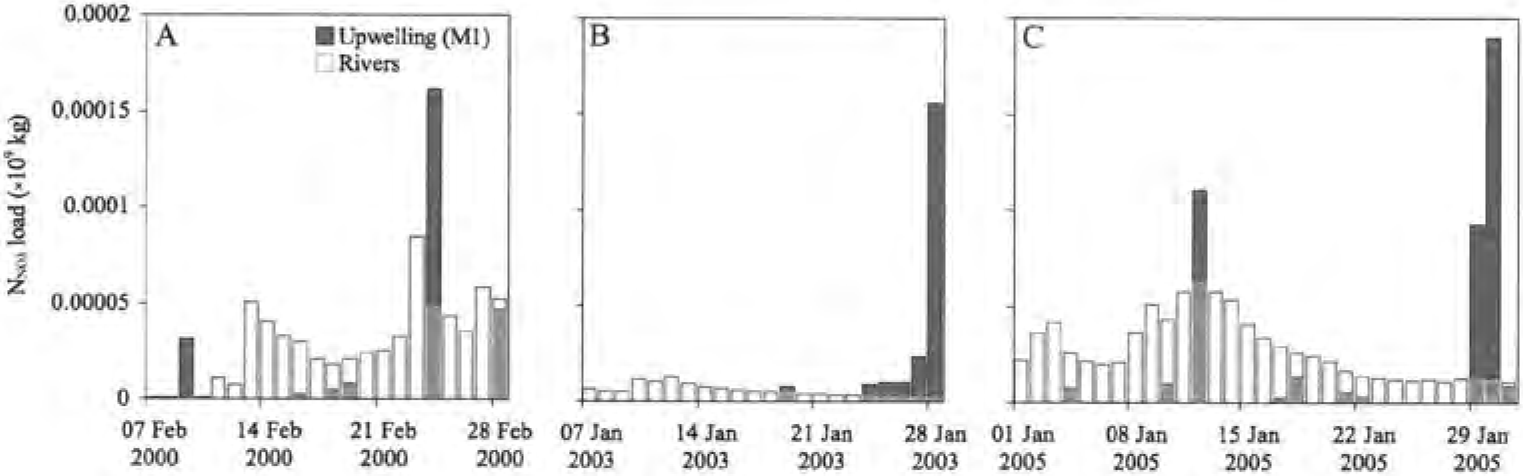

0.0002
0.00015
0.0001
0.00005
0
A
Upwelling (M1)
Rivers
B
C
07 Feb 2000
14 Feb 2000
21 Feb 2000
28 Feb 2000
07 Jan 2003
14 Jan 2003
21 Jan 2003
28 Jan 2003
01 Jan 2005
08 Jan 2005
15 Jan 2005
22 Jan 2005
29 Jan 2005

Figure 4

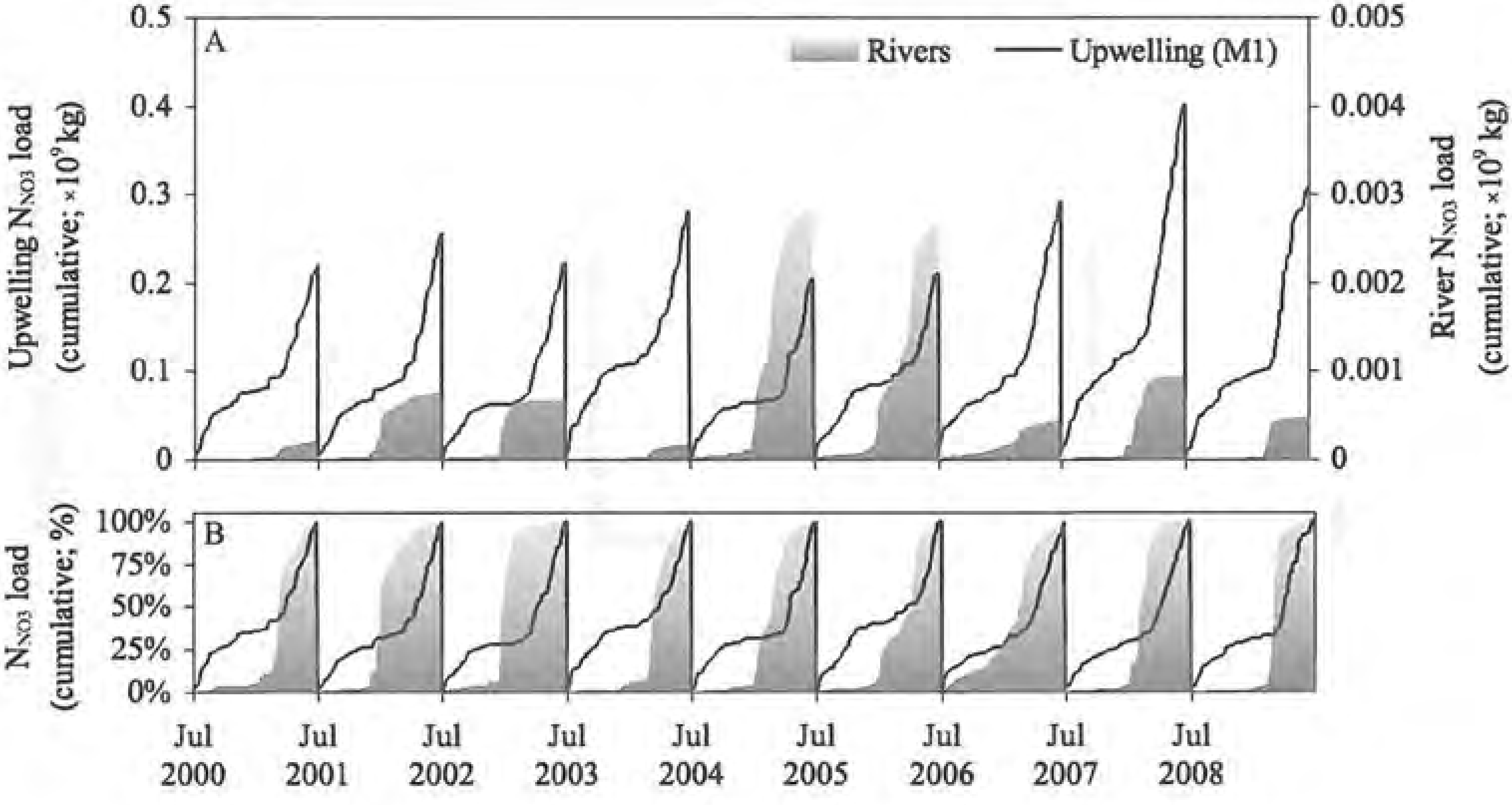
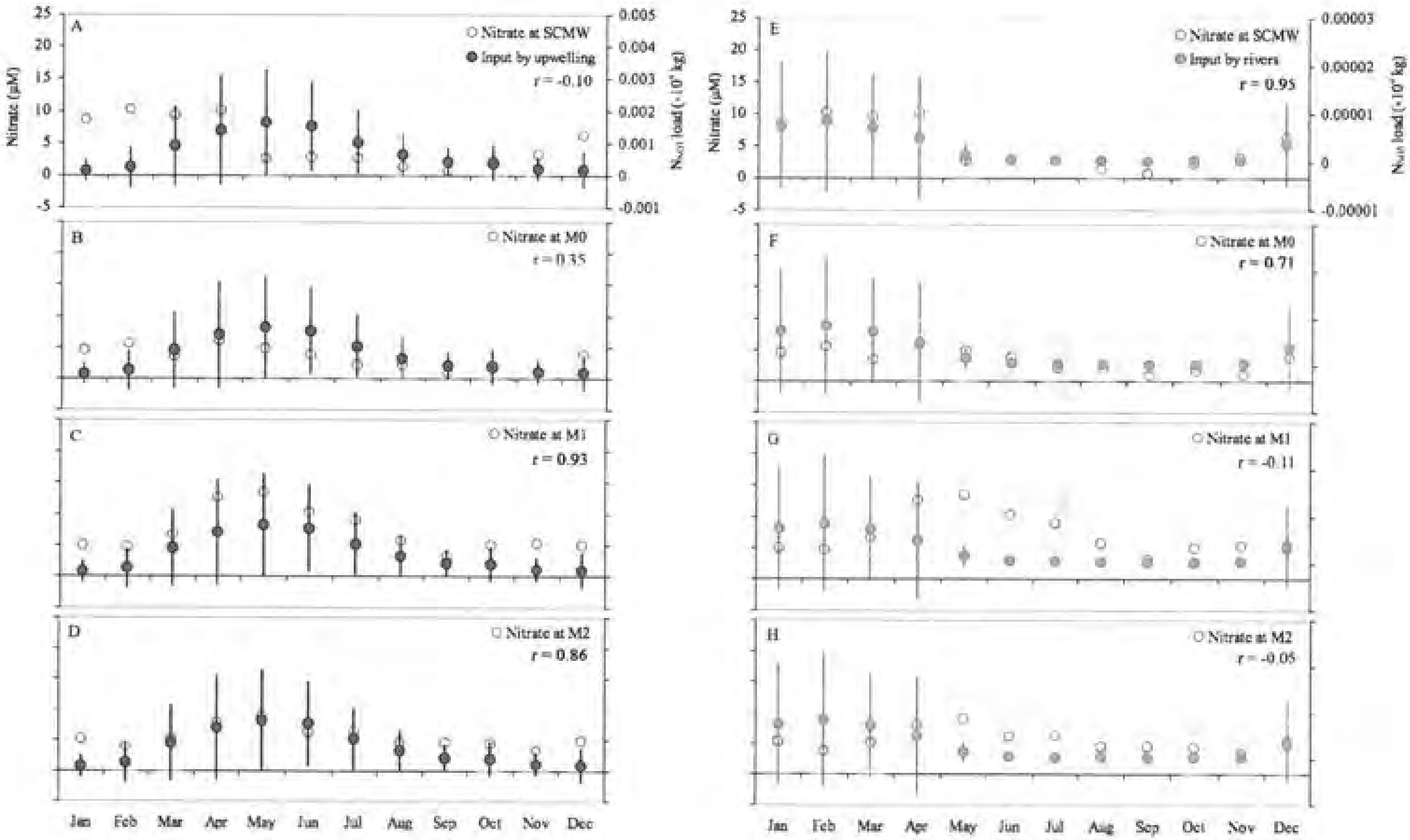
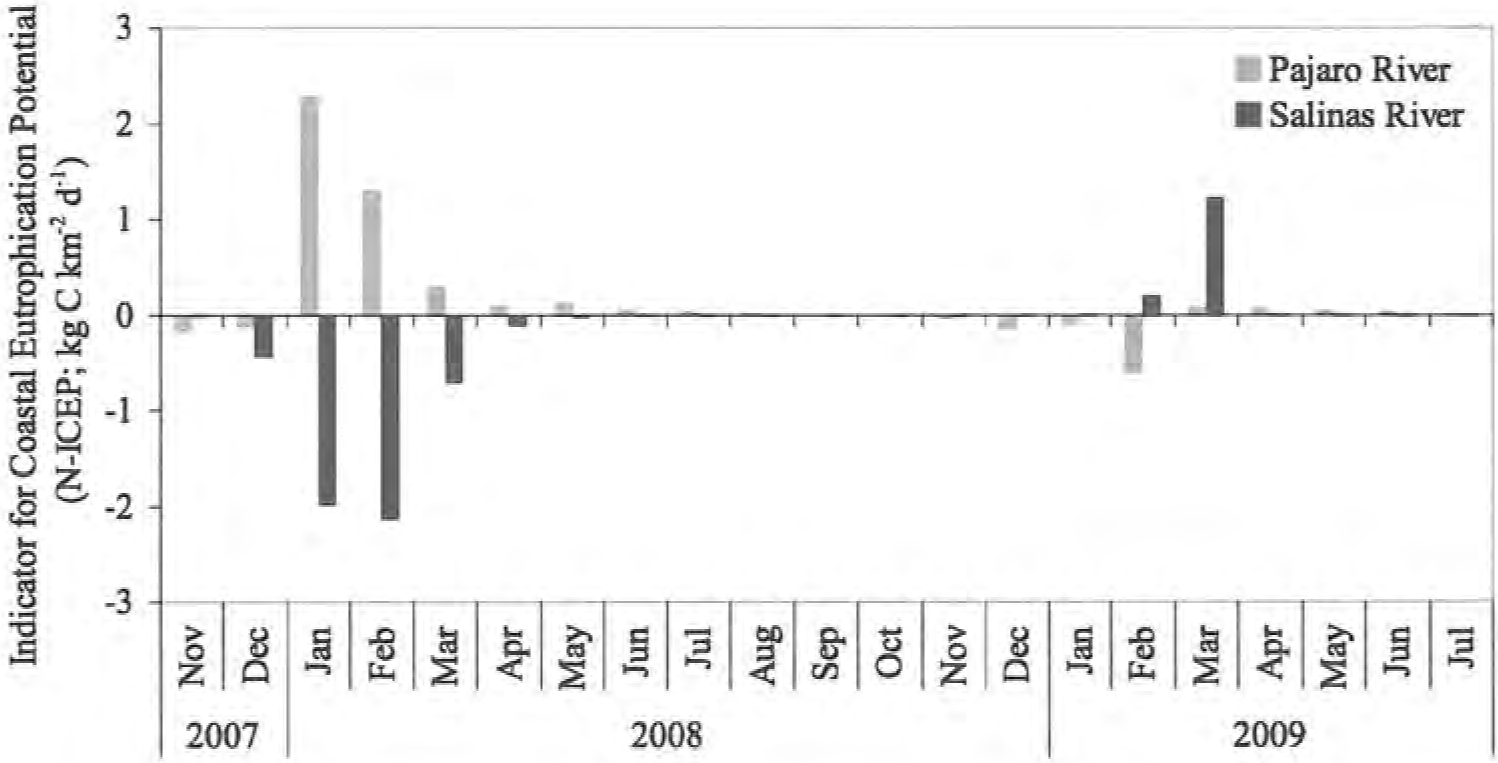

A
Rivers
Upwelling (M1)
Upwelling N_{NO3} load (cumulative; $\times 10^9$ kg)
River N_{NO3} load (cumulative; $\times 10^9$ kg)
0.5
0.4
0.3
0.2
0.1
0
0.005
0.004
0.003
0.002
0.001
0
B
N_{NO3} load (cumulative; %)
100%
75%
50%
25%
0%
Jul 2000
Jul 2001
Jul 2002
Jul 2003
Jul 2004
Jul 2005
Jul 2006
Jul 2007
Jul 2008

Figure 5



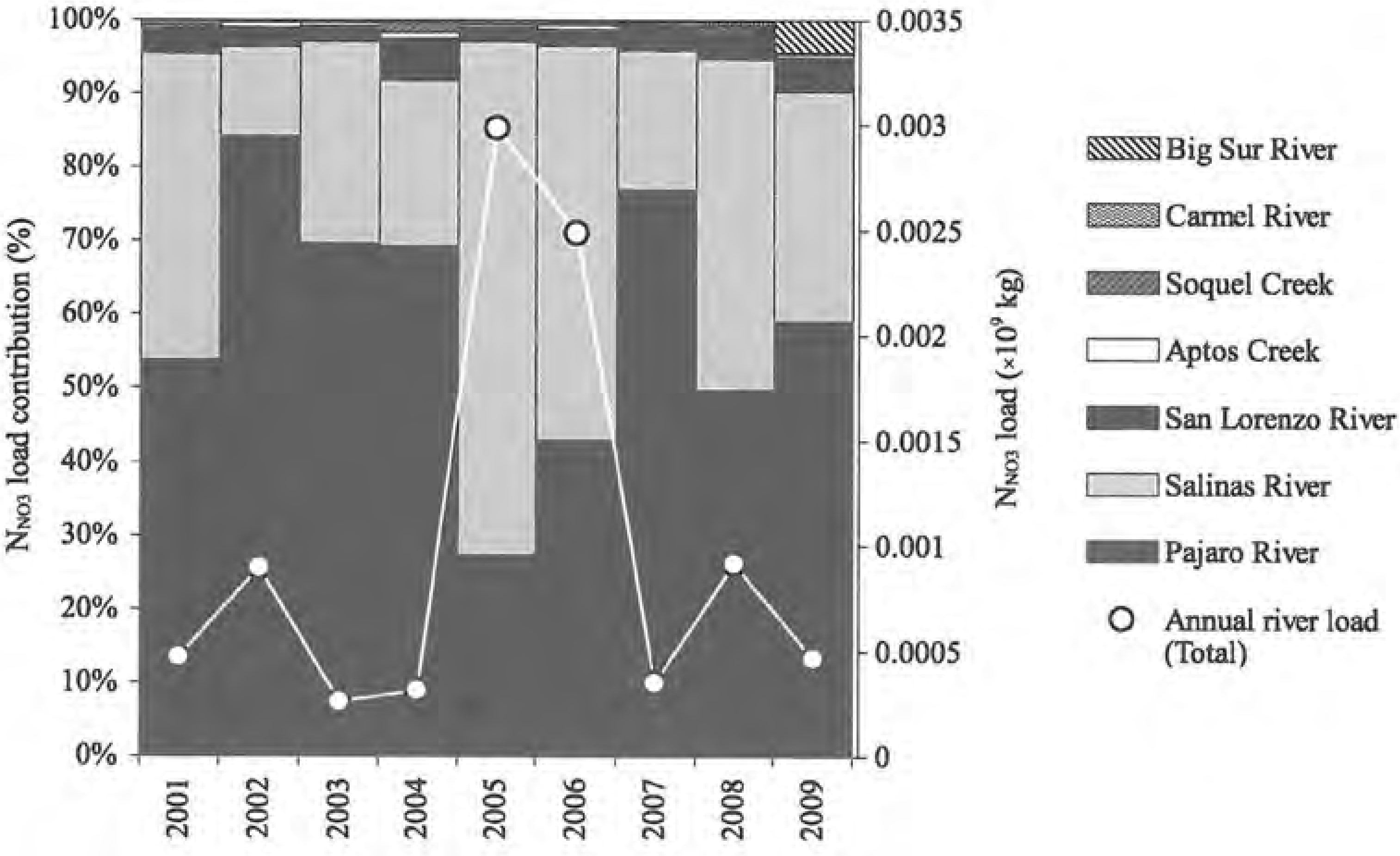
A
Nitrate at SCMW
Input by upwelling
r = -0.10
B
Nitrate at M0
r = 0.35
C
Nitrate at M1
r = 0.93
D
Nitrate at M2
r = 0.86
E
Nitrate at SCMW
Input by rivers
r = 0.95
F
Nitrate at M0
r = 0.71
G
Nitrate at M1
r = -0.11
H
Nitrate at M2
r = -0.05
Nitrate (μM)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Figure 6



Indicator for Coastal Eutrophication Potential (N-ICEP; kg C km-2 d-1)
3
2
1
0
-1
-2
-3
Pajaro River
Salinas River
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
2007
2008
2009

Figure 7



100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
N_{NO3} load contribution (%)
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
N_{NO3} load ($\times10^9$ kg)
2001
2002
2003
2004
2005
2006
2007
2008
2009
Big Sur River
Carmel River
Soquel Creek
Aptos Creek
San Lorenzo River
Salinas River
Pajaro River
Annual river load (Total)

6

7th Symposium on Harmful Algae in the US

Sarasota, Florida

OCTOBER 27 – 31, 2013

AGENDA, ABSTRACTS, & PARTICIPANTS

FORECASTING THE TERRESTRIAL INFLUENCE ON DOMOIC ACID PRODUCTION: A MECHANISTIC APPROACH

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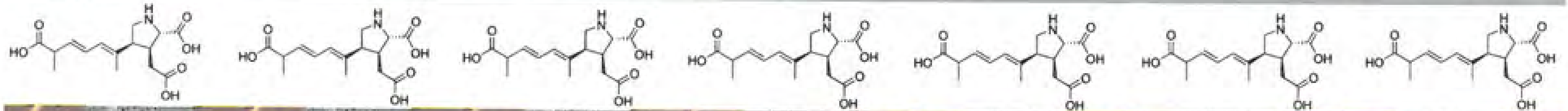
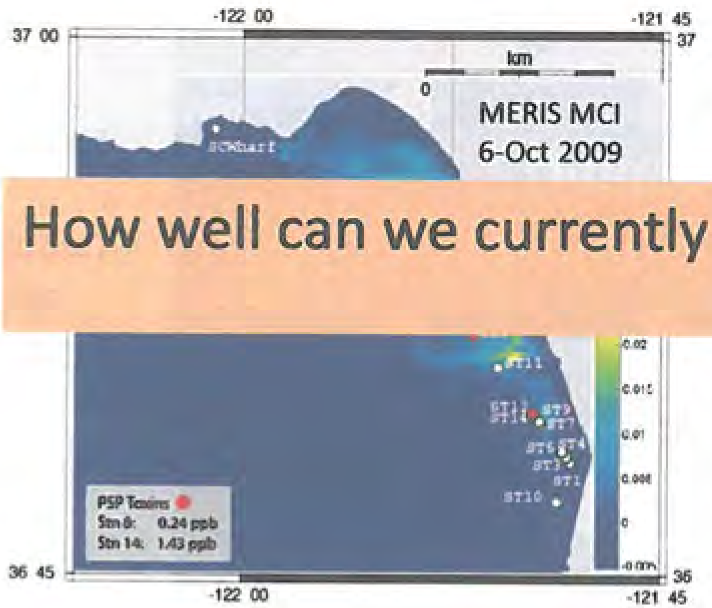
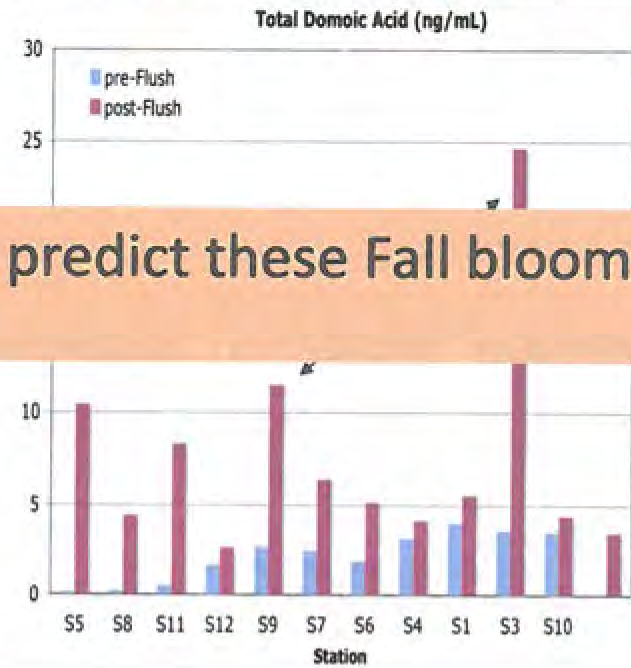
Physical-biological models are an increasingly important tool for expanding our heuristic view of phytoplankton community structure. Ideally, biological models will have a mechanistic component based on first principles of planktonic life cycles and physiology. Several studies from the Monterey Bay and southern California suggest that the dominant HAB-former, the toxigenic diatom genus, *Pseudo-nitzschia*, is alternately associated with 1) upwelling pulses 2) periods of river runoff and 3) resuspension of seeding populations into the euphotic zone during upwelling and storms. Laboratory manipulations of toxigenic *Pseudo-nitzschia* species in culture have shown that production of its deadly neurotoxin, domoic acid (DA), is in turn often a function of silicic acid or phosphate limitation at different phases of *Pseudo-nitzschia* growth (Bates et al. 1991; Fehling et al. 2004; Pan et al. 1996). Increased nutrient inputs from river runoff are expected to reduce water column Si:N ratios on time scales relevant to phytoplankton growth (Kudela 2008). At the same time, these changes in nutrient stoichiometry are likely coupled to increased loading of urea and other regenerated forms of N, which further enhance toxin production by at least some species of *Pseudo-nitzschia* (Howard et al. 2007; Kudela et al. 2008). We hypothesize that heavy river discharge to the Monterey Bay following the first large storms of the rainy season - "first flush" events - increases the toxicity of *Pseudo-nitzschia* blooms in response to an adjustment in nutrient stoichiometry. The altered stoichiometry in favor of Si-limitation and regenerative forms of N increases particulate DA concentrations due to a physiological stress response associated with DA production. To examine this, we developed a mechanistic model of DA production, defined as the product of the phytoplankton growth rate, DA-producing phytoplankton biomass, and a DA production factor where the growth rate follows the Michaelis-Menten form for individual nutrient limitation. Various forms of nutrient limitation (Si-lim, N-lim) are tested as adjustments to the DA growth factor. Two tunable parameters determine the maximum rate of production and its rate of decline with increasing growth. Our first-year effort has focused on optimizing model parameters with bootstrapping methods to fit laboratory data from Si-limited chemostats. We have also tested these fits against batch culture data from the literature (Fehling et al. 2004) in order to compare our one-dimensional model with a recently published mechanistic DA model (Terseleer et al. 2013). In this presentation, we show model comparison results and discuss the implications of a carbon-based approach (Terseleer et al. 2013) versus our simpler deterministic model for examining DA production as a function of nutrient ratios and nitrogen source. An advantage to the latter approach is its suitability for incorporation into a wide variety of NPZ-Regional Ocean Model Systems without requiring major modification to the NPZ construct and thereby facilitating model evaluation against observations of "first flush" events in the Monterey Bay.

Forecasting the Terrestrial Influence on Domoic Acid Production: A Mechanistic Approach

Clarissa Anderson, Chris Edwards, Nicole Goebel, and Raphe Kudela
UC Santa Cruz





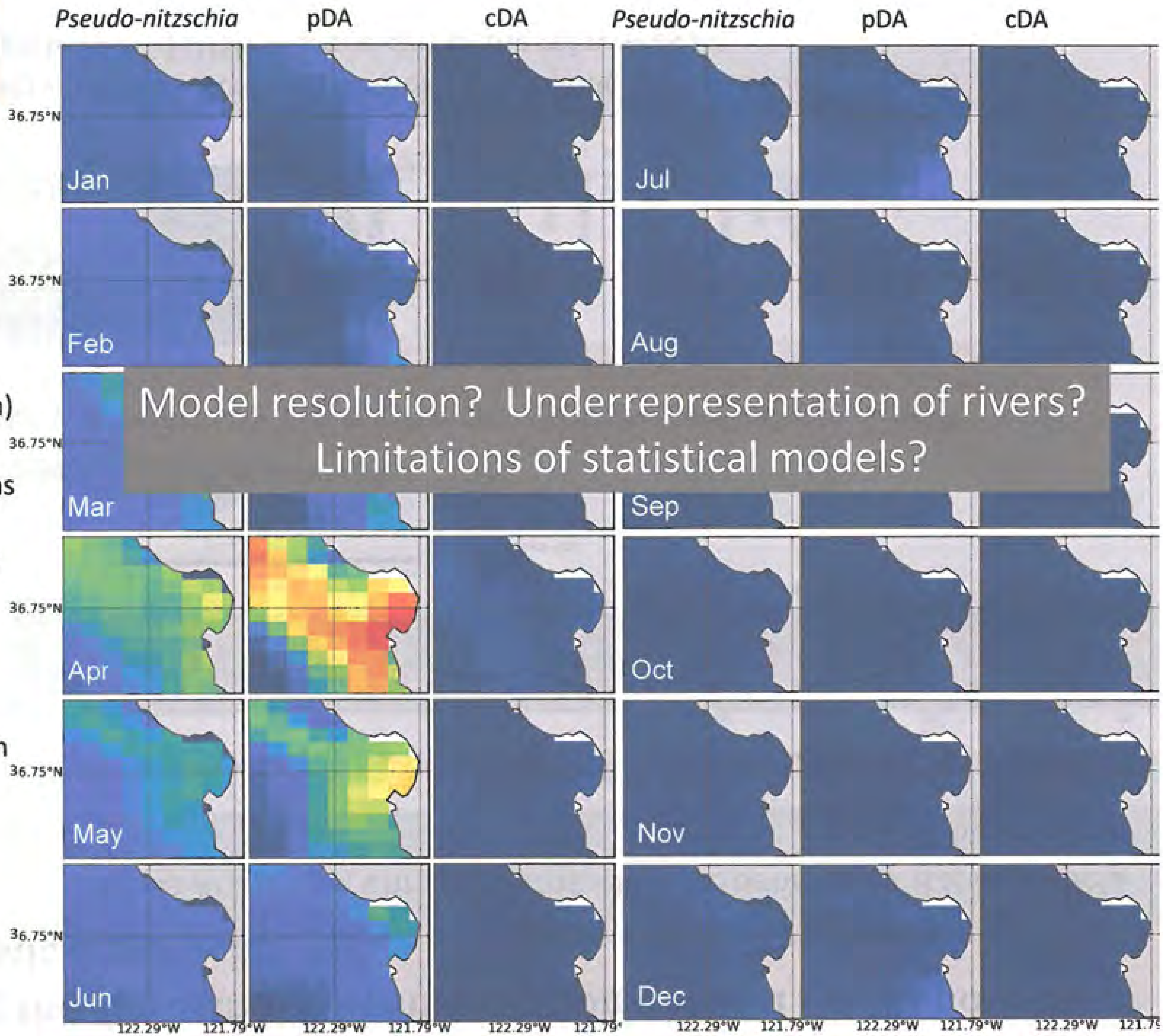


How well can we currently predict these Fall blooms?

Field observations of increased domoic acid production by *Pseudo-nitzschia* following the FIRST FLUSH storm event of the rainy season

2008 Bloom Predictions

- NCOM CCS circulation model for MB coupled with modified CoSiNE and IOP module (Shulman & Penta)
- HAB predictions generated from statistical models forced with NCOM-COSiNE output
- Poor prediction of blooms and Domoic Acid in fall rainy season



MODEL FORMULATION

What *does* a phytoplankton model look like anyway ???

DA Production = $\alpha\mu P$

- P = *Pseudo-nitzschia* biomass
- μ = growth rate
- α = DA production factor

$\mu = \mu_{max} * N_{Lim}$

Michaelis-Menten Nutrient Limitation

$Si_{Lim} = Si(OH)_4/[K_{Si} + Si(OH)_4]$

$NO_{3Lim} = NO_3/[K_{NO3} + NO_3]$

$N_{Lim} = \min(NO_{3Lim}, Si_{Lim})$

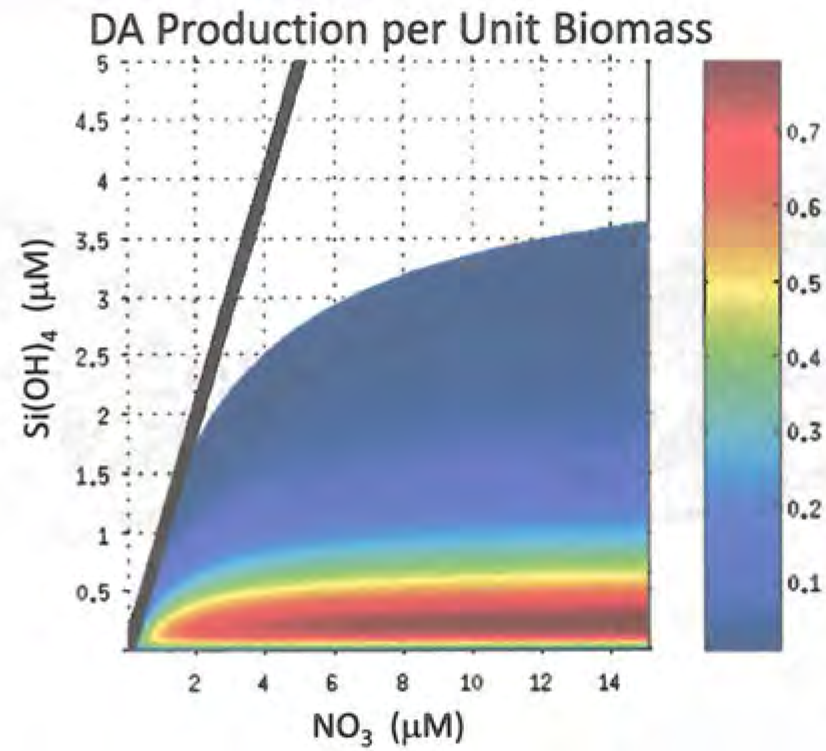
MODEL FORMULATION

DA Production = μ P

Based on results from statistical modeling exercises and laboratory experiments, we model DA production as a function of the Si:N ratio.

This can be tested with an adjustment to α:

$\alpha =$ $(1\text{-}\min(SiLim/NO_3Lim), 1)$

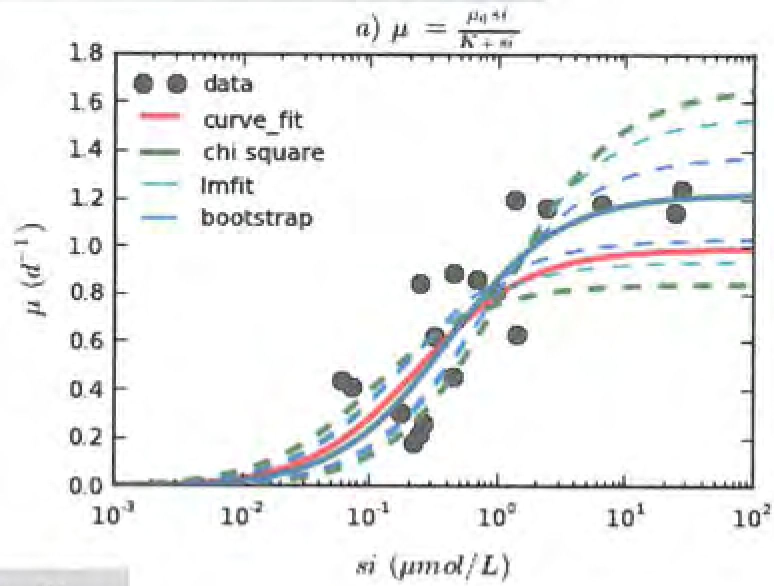


β sets the maximum rate of DA production

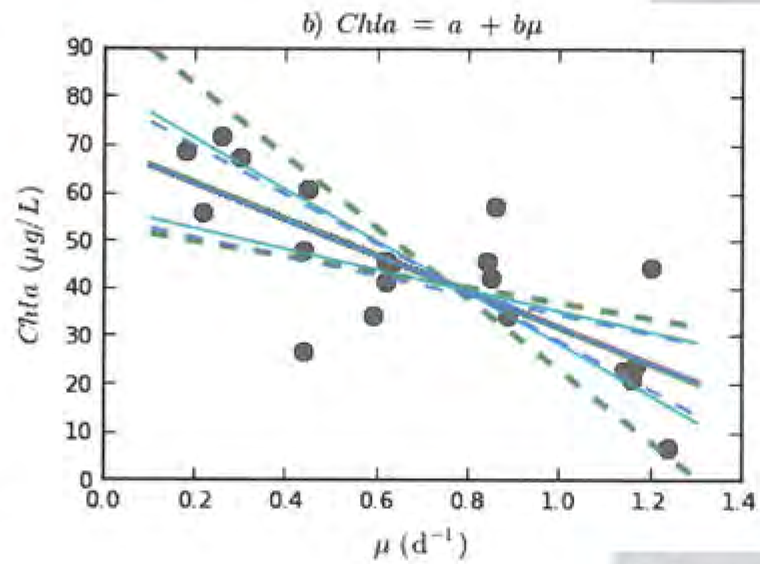
γ determines rate at which DA production declines with increasing Si levels

FITTING MODEL TO CHEMOSTAT DATA

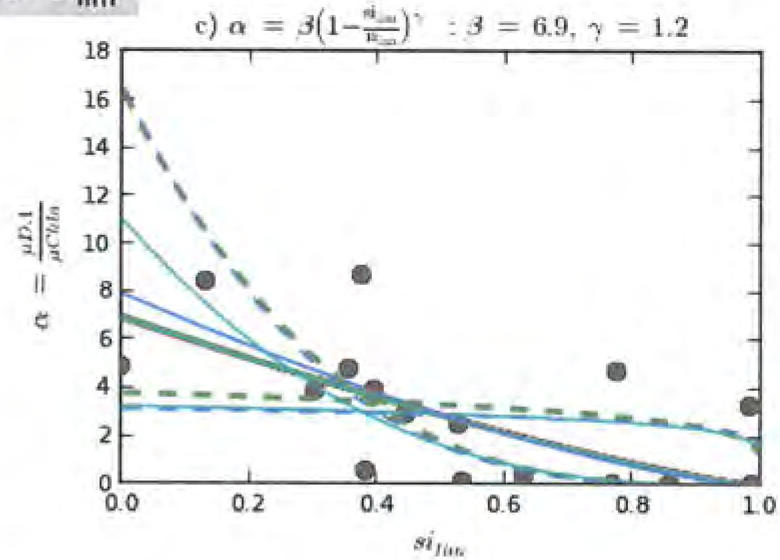
Michaelis-Menten Model for μ



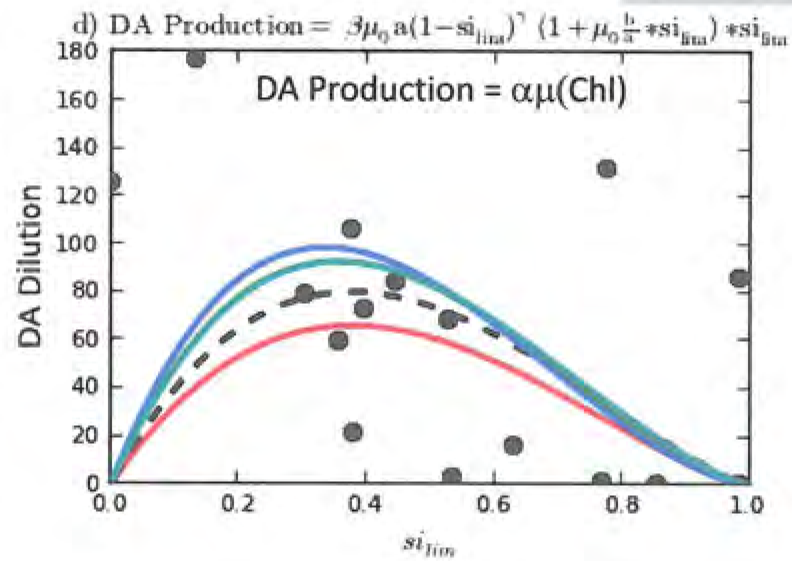
Chl-a vs. μ



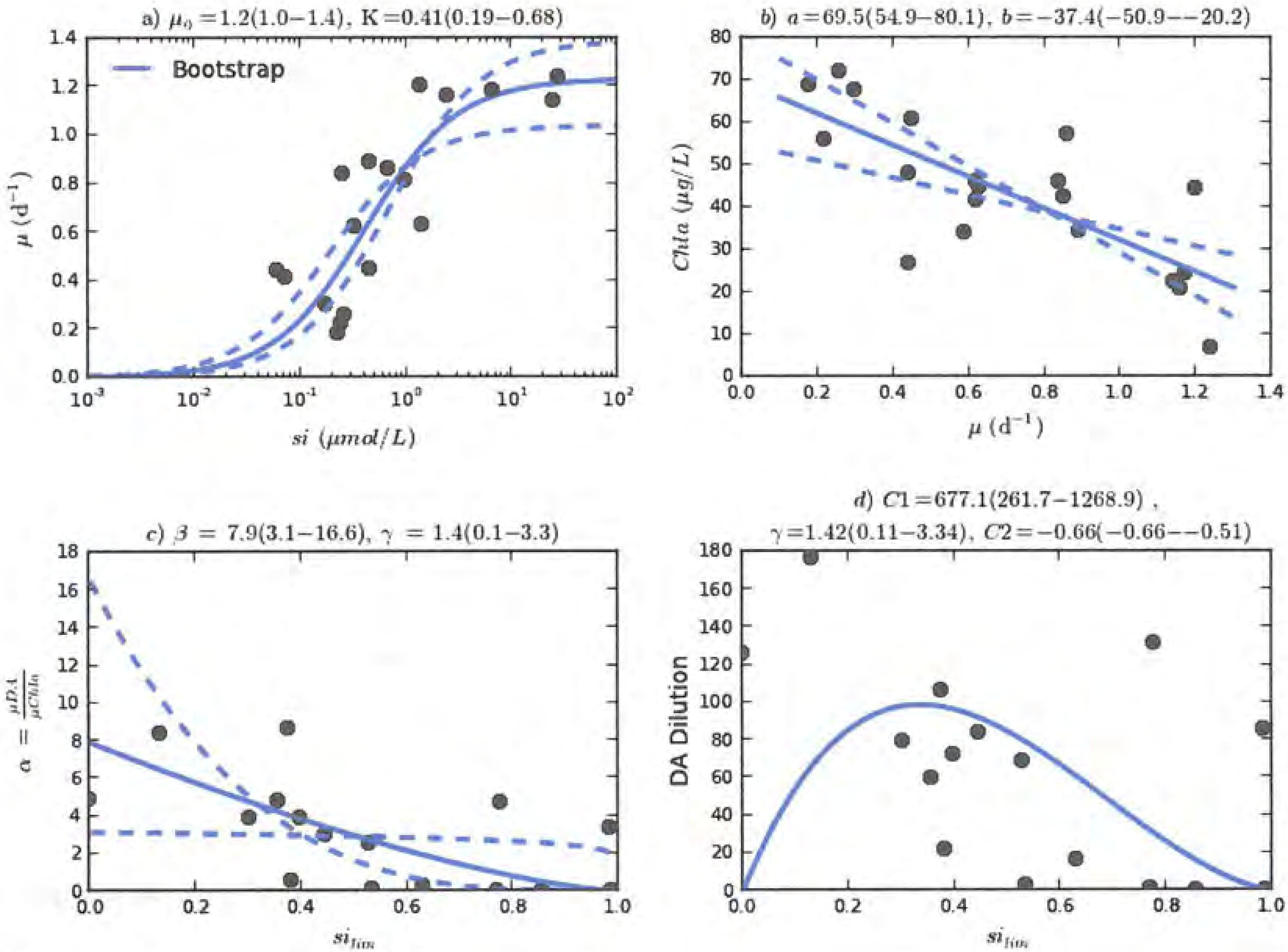
α vs. Si_{lim}



DA vs. Si_{lim}



BOOTSTRAP PARAMETERIZATION LOOKED BEST!



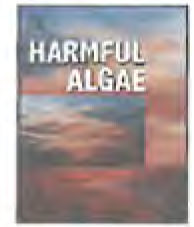
1000 iterations

Harmful Algae 24 (2013) 45–53

Contents lists available at SciVerse ScienceDirect

Harmful Algae

journal homepage: www.elsevier.com/locate/hal



Factors controlling the production of domoic acid by *Pseudo-nitzschia* (Bacillariophyceae): A model study

Nathan Terseleer *, Nathalie Gypens, Christiane Lancelot

Université Libre de Bruxelles, Écologie des Systèmes Aquatiques, CP-221, Bd du Triomphe, B-1050 Brussels, Belgium

ARTICLE INFO

Article history:
Received 28 June 2012
Received in revised form 28 January 2013
Accepted 28 January 2013

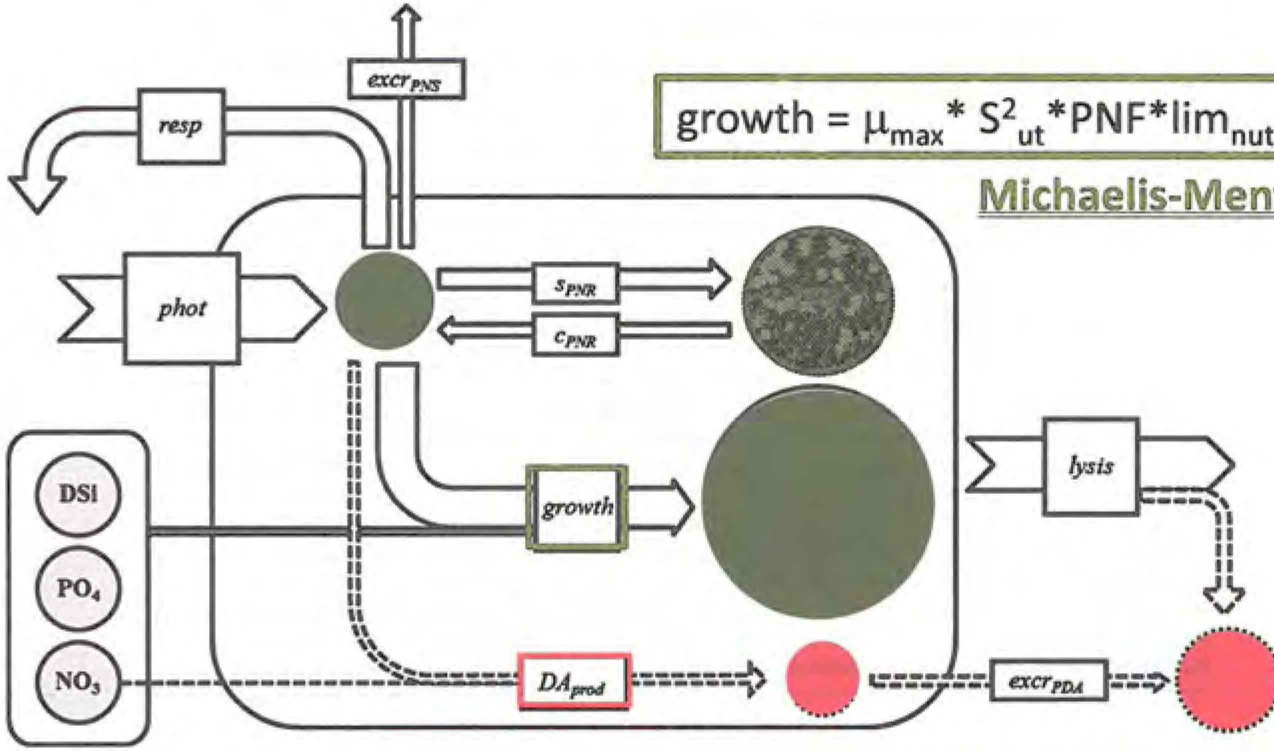
Keywords:
Harmful algal blooms
Pseudo-nitzschia
Domoic acid
Mechanistic modelling

ABSTRACT

A mechanistic model has been developed to explore the factors controlling the production of domoic acid (DA) by the pennate diatom *Pseudo-nitzschia*. The idealized model allows consideration of the uncoupling between photosynthesis and growth, while DA production has been set as a secondary metabolism sharing common precursors with growth. Under growth limitation, these precursors can accumulate, resulting in an increased DA production. The model was first evaluated based on its ability to simulate the observed DA production by either silicon (Si) or phosphorus (P) limited batch cultures of *Pseudo-nitzschia* available in the literature. Sensitivity tests were further performed to explore how the ambient nutrients and the light regime (intensity and photoperiod length) are possibly directing the *Pseudo-nitzschia* toxicity. The general pattern that emerged is that excess light, in combination with Si or P limitation, favours DA production, provided nitrogen (N) is sufficient. Model simulations with varying nutrient stocks supporting *Pseudo-nitzschia* blooms under non-limiting light suggest two potential ways for nutrients to control DA production. First, N excess in comparison to available Si and P relieves DA production from its limitation by N, an absolute requirement of the DA molecule. Second, increased nutrient stocks amplify the DA production phase of the blooms (in addition to enhancing *Pseudo-nitzschia* biomass) which leads to an even more toxigenic bloom. Simulations investigating the light regime suggest a light threshold below which an important delay in DA production could be expected in *Pseudo-nitzschia* cultures. In the natural environment, the monitoring of light conditions during *Pseudo-nitzschia* blooms might help to anticipate the magnitude of the toxic event. *Pseudo-nitzschia* toxicity is indeed linked to the excess of primary carbon that accumulates during photosynthesis under growth limitation by nutrients.

Terseleer Model

$DA_{prod} = k_{DA} * PNS * lim_N$



$growth = \mu_{max} * S^2_{ut} * PNF * lim_{nut}$

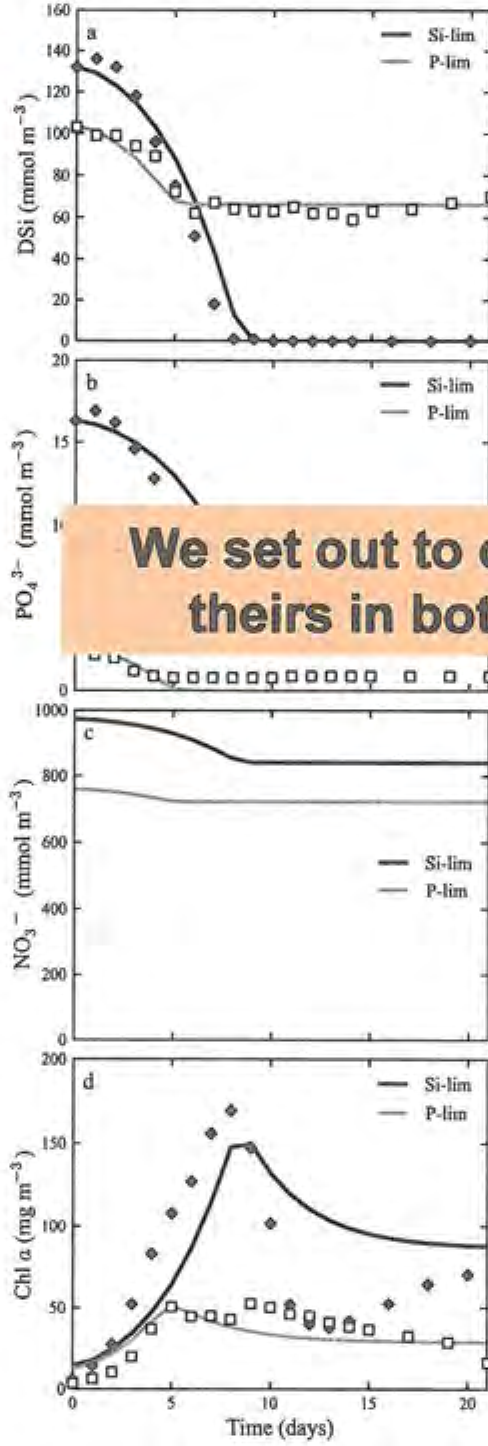
Michaelis-Menten

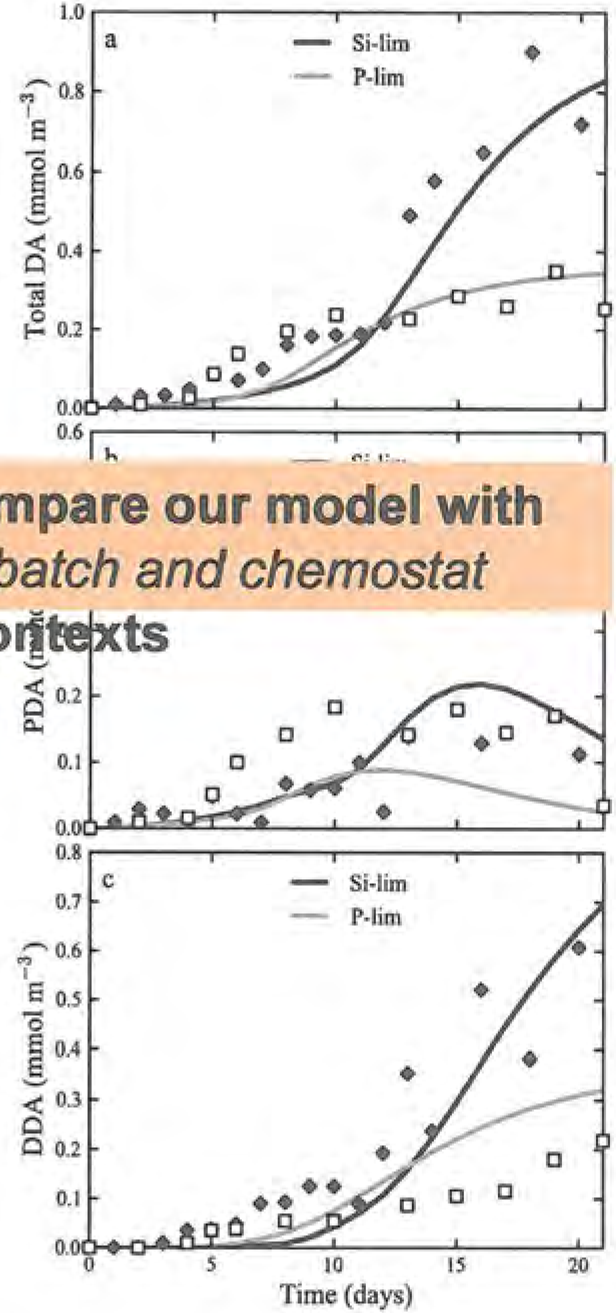
[illegible]

PDA: Intracellular (Particulate) Domoic Acid	$dPDA/dt = DA_{prod} - excr_{PDA} - lysis_{PDA}$
DDA: Extracellular (Dissolved) Domoic Acid	$dDDA/dt = excr_{PDA} + lysis_{PDA}$

Terseleer Model Results

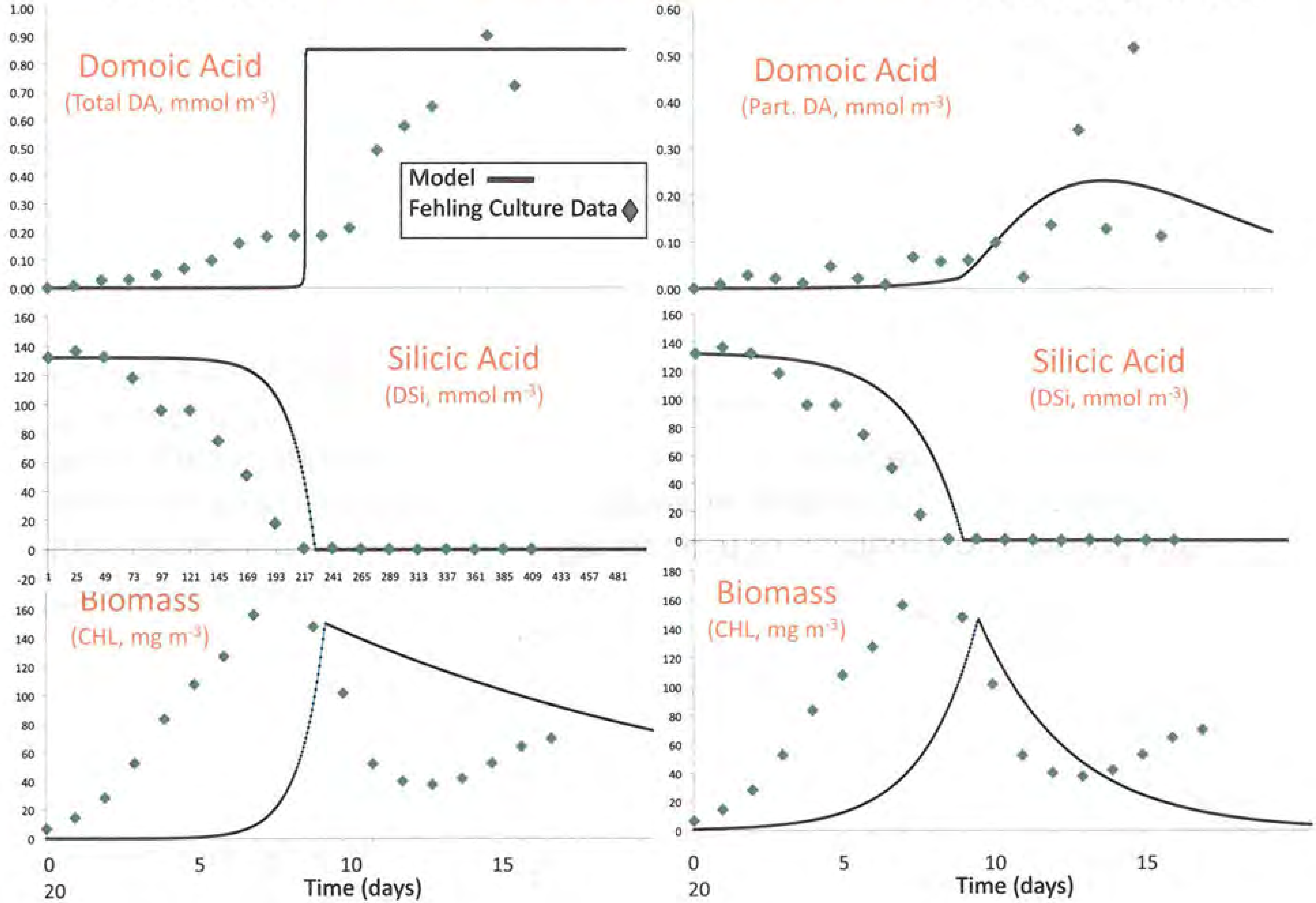
They compared their model with Si-limited and P-limited batch culture data for *P. seriata* from Fehling et al. (2004)

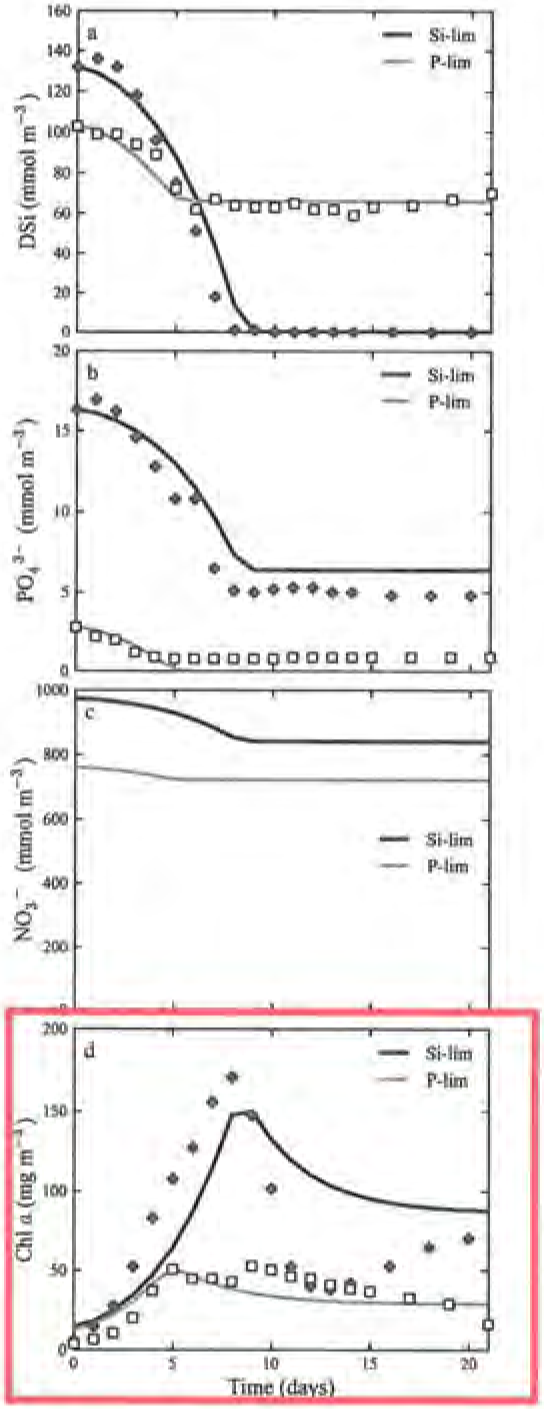


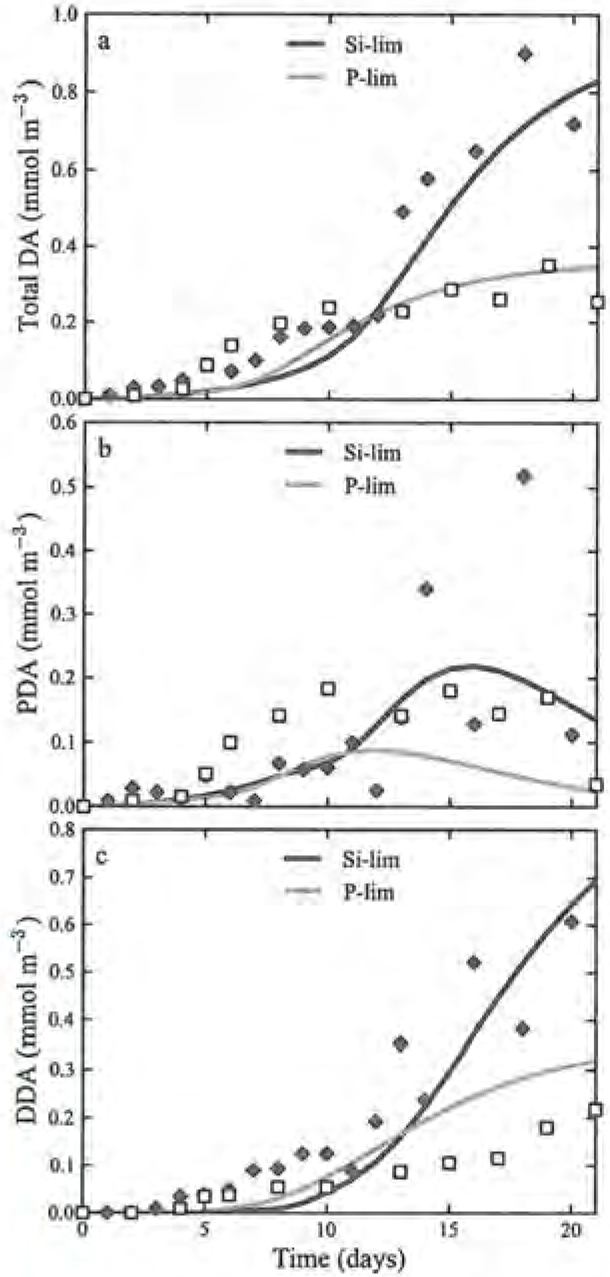


We set out to compare our model with theirs in both *batch and chemostat* contexts

Our MODEL ******* BATCH CULTURE TEST ******* Terseleer MODEL







Terseleer MODEL

Chlorophyll:
better model fit shown in their paper

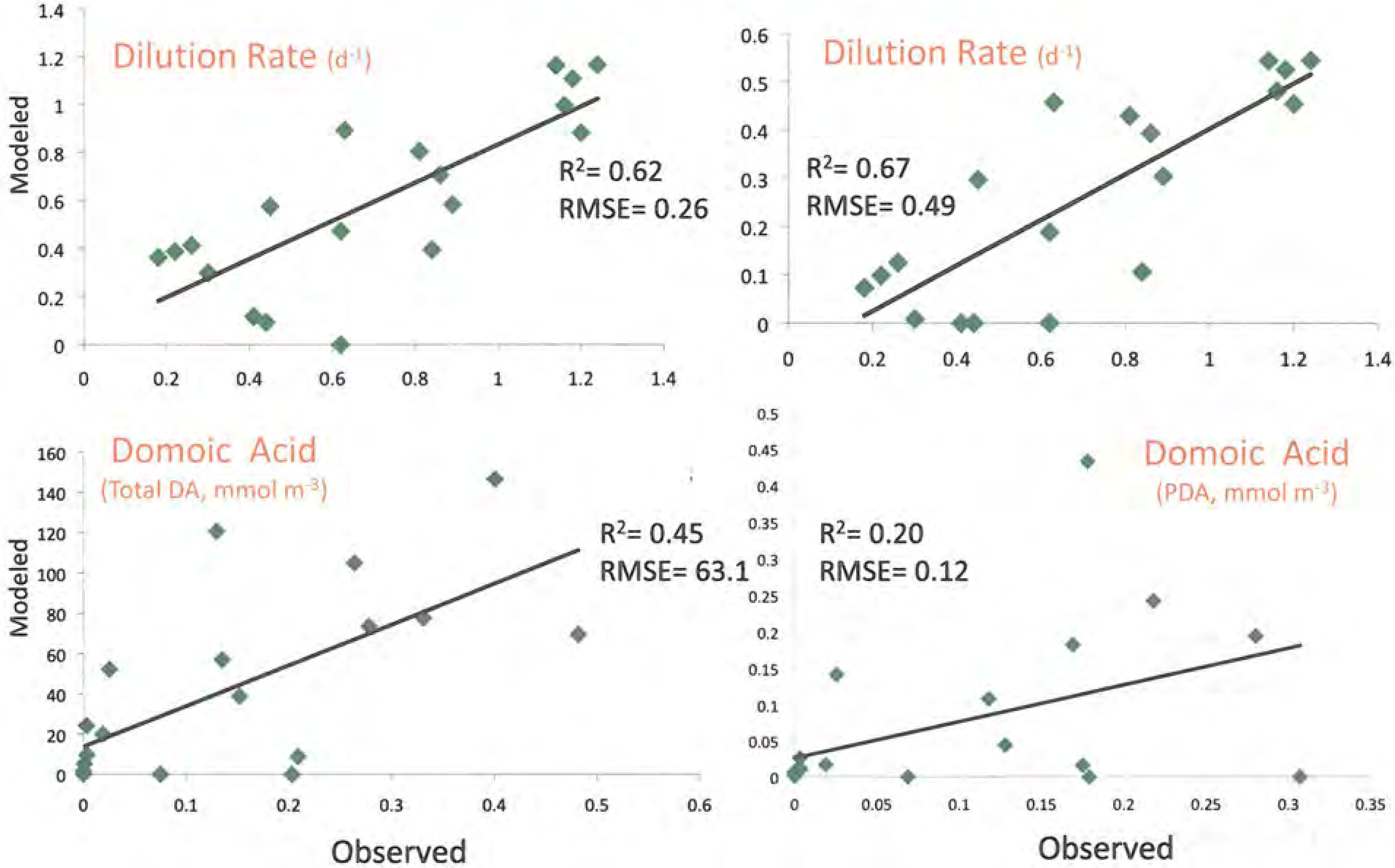
We could not reproduce their model 100% accurately

Initial conditions?

Our MODEL ******* **CHEMOSTAT TEST** (n=18) ******* Terseleer MODEL

BOOTSTRAPPED PARAMETERS

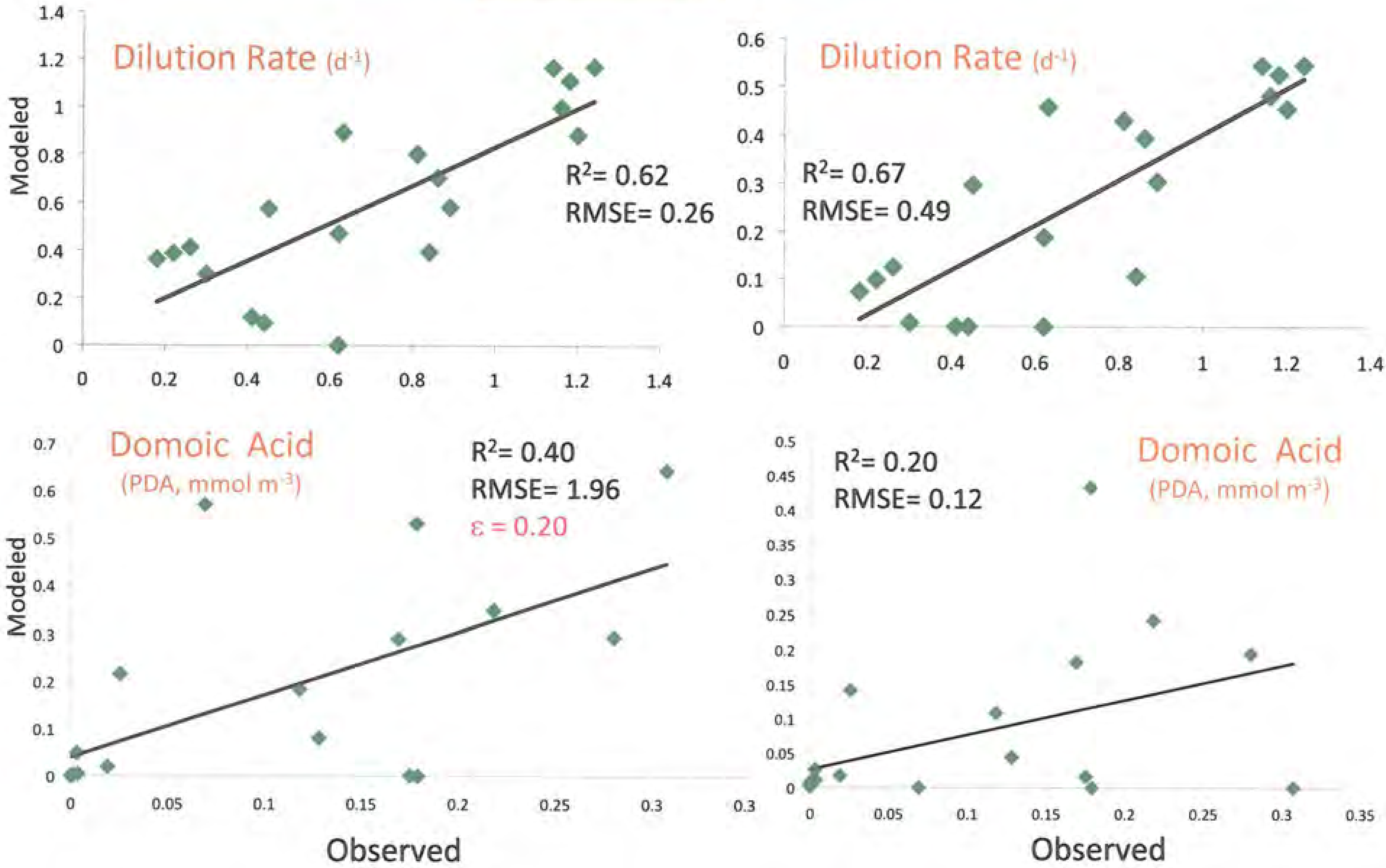
dN/dt=0   DA Loss =0   dil rate = *mod dil*



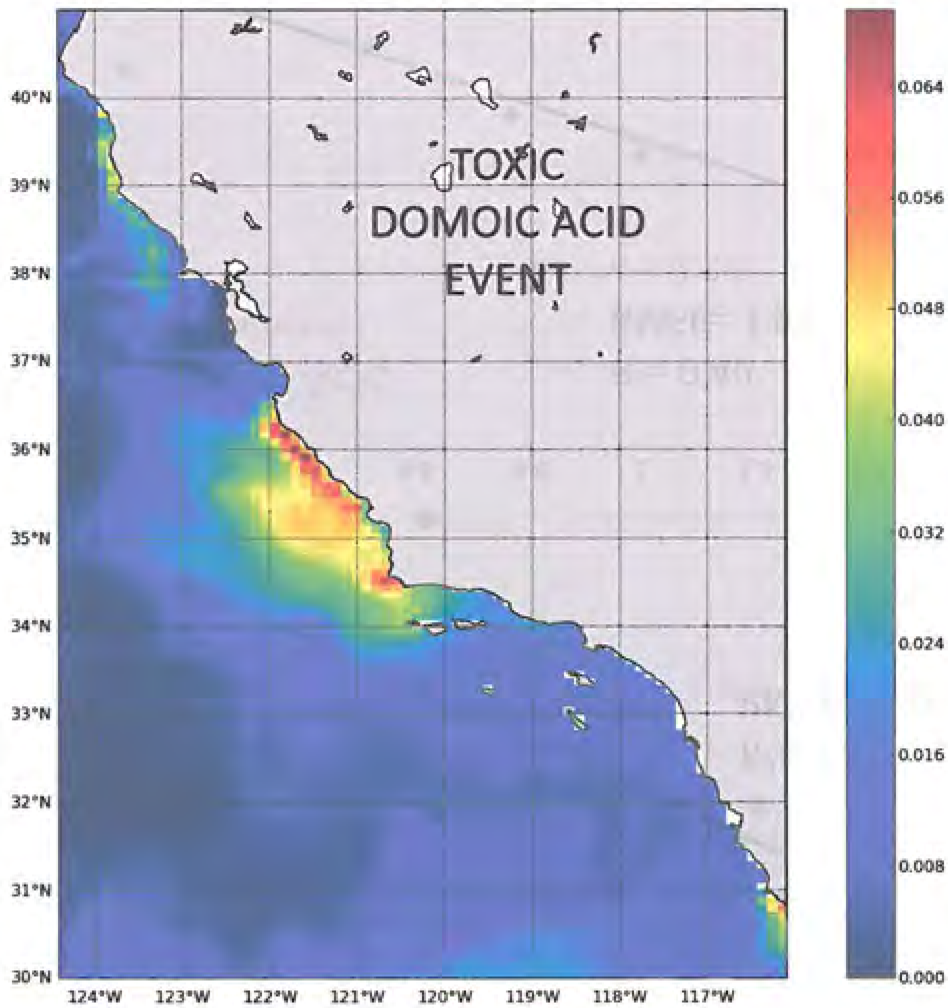
Our MODEL ******* **CHEMOSTAT TEST** (n=18) ******* Terseleer MODEL

MANUAL ADJUSTMENT TO PARAMETERS (β, γ)

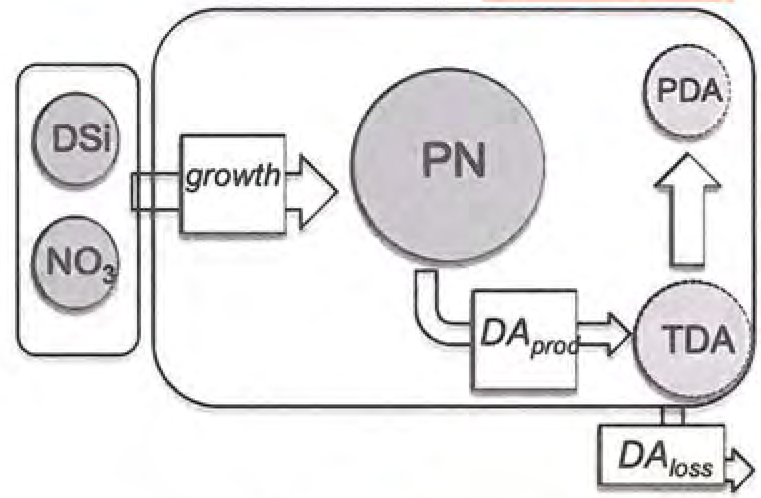
dN/dt=0 $\boxed{DA_{loss} = \varepsilon DA_{prod}}$ dil rate = *mod dil*



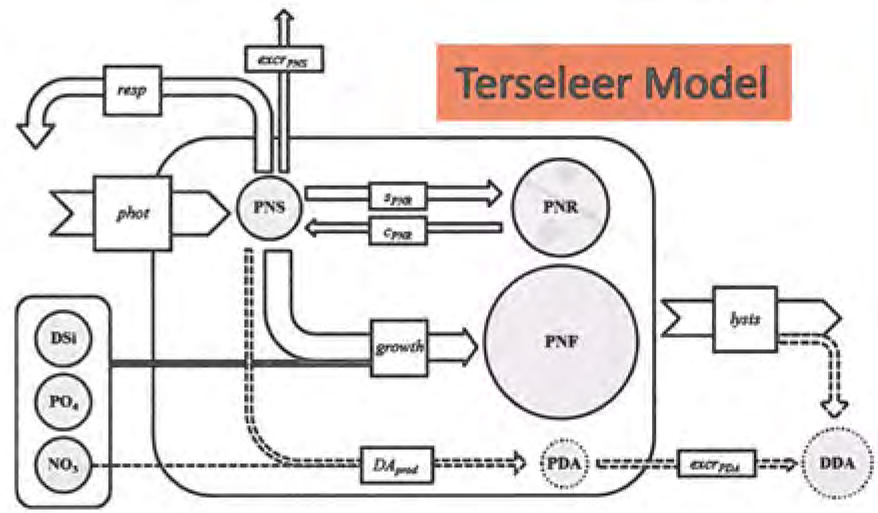
END GOAL: Create realistic simulations of DA events in coastal California - Is more model complexity really better?



Our Model



Terseleer Model



Betty Nebb

From:	mlsalerno3209@comcast.net
Sent:	Thursday, October 08, 2015 3:07 PM
To:	Betty Nebb
Cc:	Chayito Ibarra
Subject:	Item 5A Thursday, October 8, 2015 Special Meeting (please distribute to board)
Attachments:	SKMBT_28315100814260.pdf

Dear Members of the Board,

Regarding Item 5A: The Board should deny certification of the Pure Water final EIR and not approve the project

- The EIR is fundamentally flawed in that it relies on wastewater that Salinas Valley farmers have a claim to -- up to 31,000 AFY
- Wastewater and wash water are a declining resource: The EIR is fundamentally flawed in that it fails to analyze that historical flows to the treatment plant have been in decline and that future flows can reasonably be expected to further decline as peninsula residents continue to conserve water. The EIR should also include an analysis that takes into account adoption of conservation methods by growers that will result in less wash water and reclamation water, etc. available over time.

Recently, it has come to light that local agencies are actively negotiating the inclusion of Marina Coast Water District in the Pure Water project. This was not contemplated in the EIR. These negotiations include the possibility of Marina Coast Water District receiving potable water from the Pure Water project. Marina Coast Water District receiving potable water from the Pure Water project would represent a tangible expansion of the project not analyzed in the current EIR. It is clear local agencies are now moving towards a larger version of the Pure Water project. In fact, the FORA board will consider endorsement of an expanded Pure Water project with inclusion of Marina Coast Water District on 10/9/15 -- (See Attachment of 10/9/15 FORA Board packet)

Certification of the current EIR by the board would represent piece-mealing under CEQA. Additionally, if Marina Coast Water District is to receive potable water from the Pure Water project, there would be growth inducing effects that would need to be analyzed in the EIR of the expanded project.

Thank you for your consideration.

Regards,
Michael Salerno
Marina, CA

October 8, 2015

Monterey Regional Water Pollution Control Agency
Mr. Bob Holden
Principal Engineer
VIA EMAIL gwr@mrwpca.com

Re: Comments on Final Environmental Impact Report ("FEIR") for the Pure Water Monterey Groundwater Replenishment Project

Dear Mr. Holden,

The Surfrider Foundation Monterey Chapter ("Surfrider Foundation") hereby submits the following comments on the Pure Water Monterey Groundwater Replenishment Project FEIR.

Surfrider again reemphasizes the preference for the RUWAP Product Water Conveyance alignment, as opposed to the Coastal Alignment option. The RUWAP alignment is located inland and would therefore avoid unnecessary and harmful impacts to coastal resources, including impacts to the riparian, wetland, and coastal dune resources, which could occur from the currently proposed Coastal Alignment option. As for the Cal-Am Distribution system pipelines, the Alternative Monterey Pipeline is preferable to the proposed Monterey Pipeline for similar reasons; namely, the Alternative Monterey Pipeline would obviate the need for a Transfer pipeline, and all of the impacts of constructing said pipeline. The Alternative Monterey Pipeline also would avoid the impact related to coastal erosion and bluff retreat due to sea level rise because the alternative alignment is located outside of the 2030 to 2050 coastal erosion hazard zone.

We appreciate that the FEIR acknowledges that the Project and all related brine discharges must comply with the California Ocean Plan, and Desalination Amendment. Additionally, the Project should comply with the recommendations of the Southern California Coastal Water Research Project, which recently produced a technical report on brine discharges to California's coastal waters for the State Water Resources Control Board, which recommends an incremental salinity limit at the mixing zone boundary of no more than 5% of that occurring naturally in the waters around the discharge.[1] Expressing the limit as a percentage increase allows for natural variability in the background waters, and for most California open

[1] *See* http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/694_BrinePanelReport.pdf, at iii.

coastal waters this increment will be about 1.7 ppt.[2] Thus, salinity levels at the zone of dilution boundary must be limited to an increase of either 2 ppt or 5% above ambient salinity levels, whichever is less.

Further, with respect to other desalination projects proposed in the region, the FEIR must consider all in order to adequately analyze cumulative impacts. Under CEQA Guidelines § 15130(a)(1), "[…] a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts." Contrary to the FEIR's response to Surfrider's comments, "V-8," cumulative impacts should not only include brine discharges which are made through the same outfall. (CEQA Guidelines § 15130(b)(1)(a).) The FEIR should include all other brine discharges in the same geographic region, which cumulatively, could have significant impacts (e.g., Marina Coast Water District's brine discharges near Reservation Road and Marina State Beach).

The FEIR's response in V-8, "The geographic scope for the cumulative analysis of impacts to the marine environment is the immediate vicinity of the ocean outfall because the analysis of the Proposed Project's impacts shows that the Proposed Project discharges would meet Ocean Plan objectives at the edge of the zone of initial dilution" is non-responsive. An analysis of whether the Project's brine discharges will meet Ocean Plan objectives or would otherwise be significant is inadequate if it does not include or consider other desalination or brine impacts in the region, which could cumulatively create significant impacts; particularly as Monterey Bay is a region with numerous existing and proposed desalination facilities. The geographic scope of analysis should include the project area that is located offshore, as well as other portions of Monterey Bay where other desalination facilities and other seawater intakes are located or would be located. (See, e.g., http://www.scwd2desal.org/documents/Draft_EIR/7-0_Cumulative_DEIR.pdf, at p. 7-13.) An agency must "define the geographic scope of the area affected by the cumulative effect and provide a reasonable explanation for the geographic limitation used." CEQA Guidelines § 15130(b)(3). Failure to explain that limitation renders an EIR inadequate. *Citizens to Preserve the Ojai v. County of Ventura* (1985) 176 Cal.App.3d 421, 430; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1216.

Nor does the fact that another project's brine may be comparable to this Project's brine discharges mean that those discharges do not have to be considered for their cumulative impacts; the amount and extent of additional brine could render cumulative impacts significant. CEQA Guidelines § 15130(a)(2) provides, "[…] A lead agency shall identify facts and analysis supporting the lead agency's conclusion that the cumulative impact is less than significant." Without consideration of other projects' brine discharges into the Monterey Bay and any cumulative effects that may arise when these discharges occur at the same time and within adjacent areas

[2] *Id*.

to the proposed project, and subsequently any mitigation measures that may be required if a significant environmental impact is found to exist, the FEIR's cumulative impacts analysis is insufficient. This deficiency must be resolved prior to certification of the FEIR. Surfrider Foundation therefore urges the Pollution Control Agency to remedy this defect prior to approval.

On behalf of the Surfrider Foundation Monterey Chapter, thank you for the opportunity to submit these comments on the DEIR for the Pure Water Monterey Groundwater Replenishment Project.

Staley Prom

Staley Prom, Esq.
Legal Associate
Surfrider Foundation

4. Presentation to Board regarding EIR Certification and Project Approval

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MRWPCA
BOARD OF DIRECTORS
OCTOBER 8, 2015

Agenda Item # 5A
Public Hearing Regarding
Pure Water Monterey
Groundwater Replenishment Project

Pure Water Monterey

Purpose of Public Hearing

Certify the Final EIR for the Pure Water Monterey Groundwater Replenishment Project, Adopt Findings and a Statement of Overriding Considerations, Approve a Mitigation Monitoring and Reporting Program, and Approve the Project or an Alternative to the Project

Pure Water Monterey

CEQA Team Members Present

Denise Duffy & Associates

- Denise Duffy
- Alison Imamura, AICP
- Margaret H. Nellor, P.E. (subconsultant)

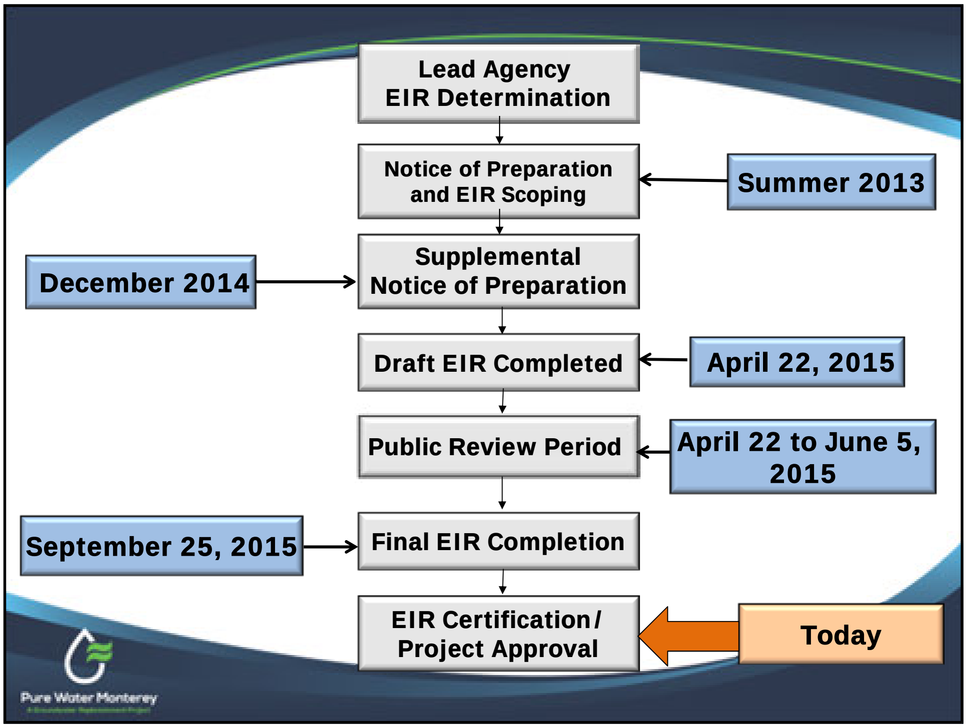
Perkins Coie

- Barbara Schussman

Pure Water Monterey

California Environmental Quality Act (CEQA) Compliance

Pure Water Monterey



EIR Purpose

- Disclose the environmental effects of a proposed project
- Identify mitigation measures to avoid, reduce, minimize significant environmental effects
- Evaluate alternatives potentially capable of substantially reducing impacts while accomplishing most project objectives

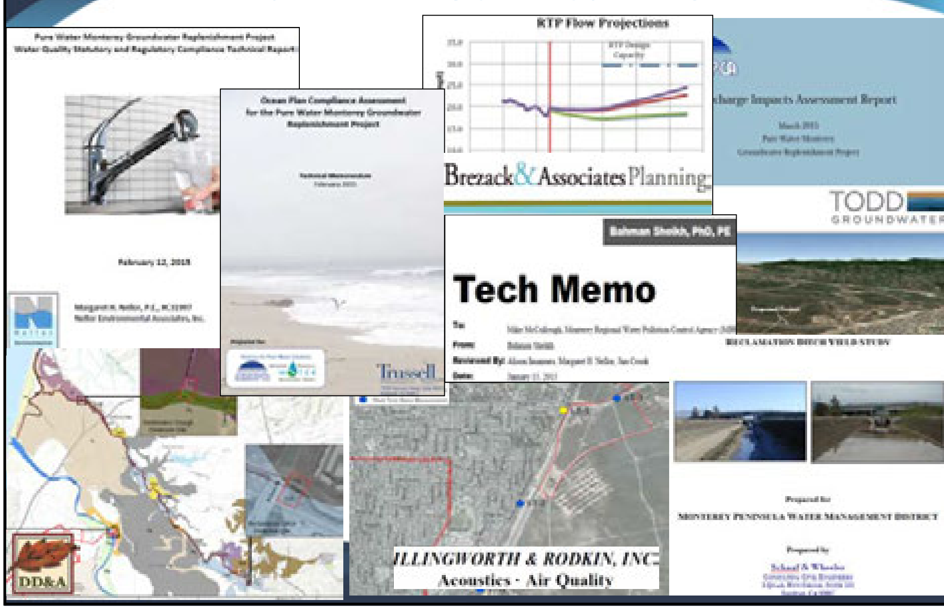
Pure Water Monterey

Key Chapters of Draft EIR

- Chapter 2: Project Description
- Chapter 3: Water Quality Compliance Overview
- Chapter 4: Environmental Analyses
  (includes Introduction and 17 topical sections)
- Chapter 6: Alternatives to the Proposed Project

Pure Water Monterey

Draft EIR Technical Work



Draft EIR Appendices

APPENDICES

Appendix A:	Scoping Report for the Pure Water Monterey Groundwater Replenishment Project Environmental Impact Report
Appendix B:	Source Water Assumptions Memorandum
Appendix C:	Source Water Rights White Paper
Appendix D:	Pure Water Monterey Groundwater Replenishment Project Water Quality

Plus, Appendices E through Z with more detail on specific issues in the DEIR

Pure Water Monterey

Temporary Construction Impacts

- air quality
- biology
- cultural resources
- energy
- geology and soils
- hazardous materials
- hydrology/water quality
- land use/agricultural resources
- noise* and vibration
- public services
- traffic

Pure Water Monterey

* = significant and unavoidable

Operational Impacts

- Aesthetics (light and glare from safety lighting)
- Biology (fish flows downstream of source water diversion)
- Biology (maintenance at source water diversions)
- Surface water quality (operation of source water diversion pumps)

Pure Water Monterey

Beneficial Impacts

- Groundwater:
  - Salinas Valley Groundwater Basin Depletion, Levels, and Quality
  - Seaside Groundwater Basin Water Quality
- Marine water quality due to diversion and treatment of impaired waters
- Carmel River hydrology and biological resources

Pure Water Monterey

Alternatives Evaluated

- No Project Alternative
- Reduced Scale Alternative
- Alternative combinations of source waters (8)
- Alternative Designs and Locations by Project Component (source water, treatment, conveyance, injection, distribution)

Comparative analysis provided plus discussion of which alternative would be considered environmentally superior.

Pure Water Monterey

Key Action Overall Alternatives

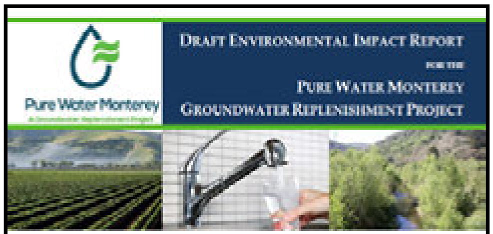
A. Reduced Seaside Basin (3,000 AFY)

B. Reduced Source Water Alternative No. 2 with Alternative Monterey Pipeline

C. Reduced Source Water Alternative No. 7 with Alternative Monterey Pipeline

Comparative analysis plus discussion of environmentally superior alternative.

Pure Water Monterey



Public Review of the Draft EIR and Public Hearings

Draft EIR Notice of Availability distributed April 22:

- Email to 700 interested organizations, responsible/trustee agencies
- Newspapers
- State Clearinghouse
- Placing in public places, including key project sites
- Posted with County Clerk

Public Meetings on May 21 and 22 for:

- Explaining project, CEQA process, and Draft EIR
- Answer questions
- Receive oral comments

Comments on Draft EIR

- 29 comment letters
- Key environmental issues raised:
  - Recycled water quality
  - Habitat impacts of diversions
  - Alternatives/mitigation to avoid impacts
- Other issues raised:
  - Code compliance
  - Water rights/agreements
  - Other projects

Pure Water Monterey

Final EIR Contents

- Draft EIR, including appendices;
- Comments received during the public review period and written responses to significant environmental issues raised in those comments; and
- Relevant text changes to the Draft EIR.

Pure Water Monterey

Master Responses Prepared

- Adequacy of Draft EIR
- Availability of Source Water Supplies
- Reduction in Surface Water Flows
- Fisheries Analysis
- Nutrients in Recycled Water and Ocean Outfall Discharge
- Well Construction and Maintenance Water Use
- Fort Ord Environmental Issues
- MCWD/City of Marina Water Supply Issues
- Relationship to CalAm Desalination Project
- Alternatives

Pure Water Monterey

Summary of GWR Project to be Approved

- Staff recommends approval of a modified GWR Project evaluated in the EIR
- Options and alternatives recommended based on reducing and avoiding impacts and requested in Draft EIR comments
- Enhanced permitting and cost information

Pure Water Monterey

Placeholder slide for overall GWR Project Figure

(*I don't recommend… features would not be visible at this scale*)

Pure Water Monterey

GWR Project Components

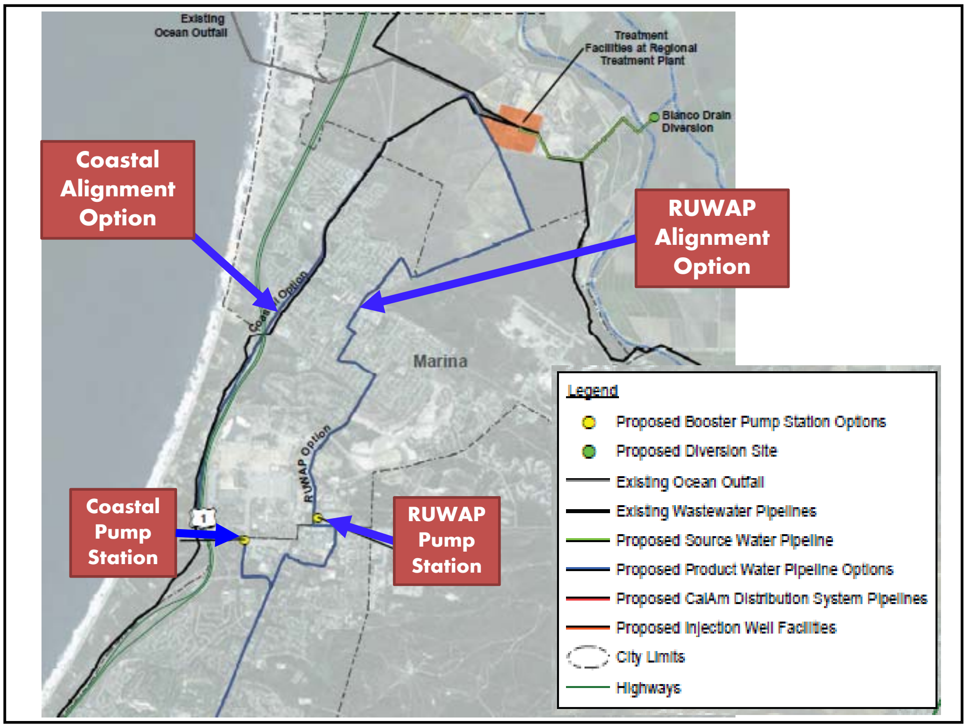
- Conveyance of five types of source water to the Regional Treatment Plant
- New Advanced Water Treatment Facility and other improvements to the Regional Treatment Plant
- Treated water conveyance pipelines and booster pump stations - *RUWAP option recommended*
- Groundwater injection well facilities
- Potable water distribution system – *Alternative Monterey Pipeline recommended*

Pure Water Monterey

Specific action on two GWR Project components

- ***RUWAP Alignment Option*** – for Product Water Conveyance pipeline and booster station
- ***Alternative Monterey Pipeline*** – for Cal Am water distribution pipeline

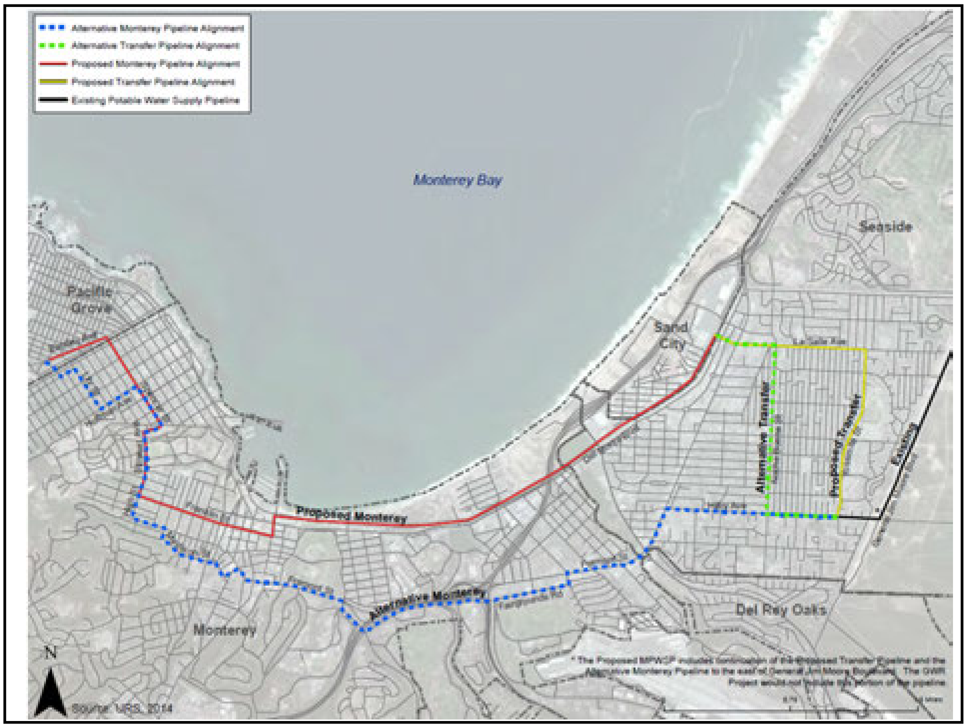
Pure Water Monterey



Why RUWAP alignment?

- Fewer / less severe environmental impacts:
  - Avoids coastal zone
  - Avoids wetlands and other sensitive habitat
- City of Marina and Marina Coast Water District stated preference for the alignment
- Better meets timeframe objective and potential for cost savings

Pure Water Monterey



Why Alternative Monterey Pipeline?

- Fewer / less severe environmental impacts:
  - Shorter route, eliminates Transfer Pipeline
  - Avoids coastal zone and coastal erosion area
  - Avoids sensitive habitat
  - Avoids recreation trail and TAMC right of way
- Better meets timeframe objective

Pure Water Monterey

Recommended Board Action Today

- Open Public Hearing
- Receive Testimony
- Close Public Hearing
- Deliberations
- Move Approval of Resolution #2015-24, if desired

Pure Water Monterey

CEQA Findings

- The Board, as Lead Agency, must adopt specific findings to certify EIR and approve the project:
  - o Board has reviewed and considered Final EIR;
  - o The EIR process and contents comply with CEQA; and
  - o The Final EIR reflects the agency's independent judgement and analysis.

Pure Water Monterey

Resolution #2015-24 Contents

- CEQA Findings for GWR Project*
- Statement of Overriding Considerations for significant and unavoidable noise impacts*
- Project* approval, including:
  - Summary of Impacts and Mitigation Measures
  - Mitigation Monitoring and Reporting Program

**Applicable to staff-recommended GWR Project*

Pure Water Monterey

Project Approval Action

Authorize staff to proceed immediately with obtaining necessary agreements, permits, funding and financing, and approvals to construct and operate the GWR Project as specified in Resolution #2015-24

Pure Water Monterey

Questions ?

Pure Water Monterey

5. MRWPCA Resolution No. 2015-24 to:

(1) Certify the Final EIR for the Pure Water Monterey Groundwater Replenishment Project, (2) Adopt California Environmental Quality Act Findings, (3) Approve Mitigation Measures and a Mitigation Monitoring and Reporting Program, (4) Adopt a Statement of Overriding Considerations, and (5) Approve the Project as Modified

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RESOLUTION No. 2015-24

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY TO (1) CERTIFY THE FINAL EIR FOR THE PURE WATER MONTEREY GROUNDWATER REPLENISHMENT PROJECT, (2) ADOPT CALIFORNIA ENVIRONMENTAL QUALITY ACT FINDINGS, (3) APPROVE MITIGATION MEASURES AND A MITIGATION MONITORING AND REPORTING PROGRAM, (4) ADOPT A STATEMENT OF OVERRIDING CONSIDERATIONS, AND (5) APPROVE THE PROJECT AS MODIFIED

The Monterey Regional Water Pollution Control Agency ("MRWPCA"), as lead agency under the California Environmental Quality Act ("CEQA"), has completed the Final Environmental Impact Report ("Final EIR" or "EIR") for the Pure Water Monterey Groundwater Replenishment Project (the "Project"). The Project is being proposed by the MRWPCA in partnership with the Monterey Peninsula Water Management District ("MPWMD").

The Project is a water supply project that would serve northern Monterey County. The project would provide: (1) purified recycled water for recharge of a groundwater basin that serves as drinking water supply; and (2) recycled water to augment the existing Castroville Seawater Intrusion Project's agricultural irrigation supply:

- *Replenishment of the Seaside Groundwater Basin.* The Project would enable California American Water Company (CalAm) to reduce its diversions from the Carmel River system by up to 3,500 acre-feet per year by injecting the same amount of purified recycled water into the Seaside Basin. The purified recycled water would be produced at a new facility at the MRWPCA Regional Wastewater Treatment Plant (Regional Treatment Plant) and would be conveyed to and injected into the Seaside Groundwater Basin via a new pipeline and new well facilities. The injected water would then mix with the existing groundwater and be stored for future urban use by CalAm, thus enabling a reduction in Carmel River system diversions by the same amount.
- *Additional recycled water for agricultural irrigation in northern Salinas Valley.* An existing water recycling facility at the Regional Treatment Plant (the Salinas Valley Reclamation Plant) would be provided additional source waters in order to provide additional recycled water for use in the Castroville Seawater Intrusion Project's agricultural irrigation system. It is anticipated that in normal and wet years approximately 4,500 to 4,750 acre-feet per year of additional recycled water supply could be created for agricultural irrigation purposes.

The Project would also include a drought reserve component to support use of the new supply for crop irrigation during dry years. With the drought reserve component, the Project could provide up to 5,900 acre feet per year for crop irrigation in drought conditions. The Project components include: conveyance of five potential types of source water to the Regional Treatment Plant for treatment; a new Advanced Water Treatment (AWT) Facility and other improvements to the Regional Treatment Plant; treated water conveyance system, including pipelines and booster pump stations; groundwater injection wells; and potable water distribution system improvements.

The new source waters would supplement the existing incoming wastewater flows, and would include the following: 1) water from the City of Salinas agricultural wash water system, 2) stormwater flows from the southern part of Salinas and the Lake El Estero facility in Monterey, 3) surface water and agricultural tile drain water that is captured in the Reclamation Ditch and Tembladero Slough, and 4) surface water and agricultural tile drain water that flows in the Blanco Drain. The Project would require modifications to existing facilities and construction of new physical facilities, briefly listed below.

- *Source water diversion and storage.* New facilities would be required to divert and convey the new source waters through the existing municipal wastewater collection system and to the Regional Treatment Plant.
- *Treatment facilities at the Regional Treatment Plant.* A new AWT facility would be constructed at the Regional Treatment Plant site. This facility would include a state-of-the-art treatment system that uses multiple membrane barriers to purify the water, product water stabilization to prevent pipe corrosion due to water purity, a pump station, and a brine and wastewater mixing facility. There would also be modifications to the existing Salinas Valley Reclamation Plant to optimize and enhance the delivery of recycled water to growers.
- *Product water conveyance.* A new pipeline, a pump station and appurtenant facilities would be constructed to transport the purified recycled (product) water from the Regional Treatment Plant to the Seaside Groundwater Basin for injection.
- *Injection well facilities.* The injection facilities would include new wells (in the shallow and deep aquifers), back-flush facilities, pipelines, electricity/power distribution facilities, and electrical/motor control buildings.
- *Distribution of groundwater from Seaside Basin.* CalAm water distribution system improvements would deliver the extracted groundwater to CalAm customers.

As described below, the MRWPCA Board has determined to approve the Project as modified by the Alternative Monterey Pipeline, which eliminates the need for the proposed Transfer Pipeline to be built. Further, the MRWPCA Board has decided to select the Regional Urban Water Augmentation Project (RUWAP) alignment for the Product Water Conveyance pipeline and booster pump station.[1] Throughout the remainder of these findings, the term "Project" refers to the Proposed Project described in the EIR's Project Description chapter as modified by the Alternative Monterey Pipeline and the Board's selection of the RUWAP alignment for the Product Water Conveyance pipeline and booster pump station.

This resolution contains the MRWPCA's certification of the EIR, its CEQA findings, its adopted mitigation measures and mitigation monitoring and reporting program, its statement of

[1] The RUWAP alignment option was so named because it would follow a portion of the recycled water pipeline alignment of Marina Coast Water District's previously approved and partially-constructed RUWAP Recycled Water Project. The proposed new product water conveyance pipeline would be located primarily along paved roadway rights-of-way within urban areas. The Recycled Water Project was approved by the Marina Coast Water District in 2005; however, only portions of the recycled water distribution system have been built and no recycled water has been delivered to urban users.

overriding considerations supporting approval of the Project, and its Project approval. The State Clearinghouse number for the Project is SCH#2013051094.

A Draft Environmental Impact Report ("Draft EIR") was released for public and agency review on April 22, 2015. The Draft EIR assesses the potential environmental effects of implementation of the Project, identifies means to eliminate or reduce potential adverse impacts, and evaluates a reasonable range of alternatives to the Project.

The Final EIR is comprised of the Draft EIR together with one additional volume that includes the comments on the Draft EIR submitted by interested public agencies, organizations, and members of the public; written responses to the environmental issues raised in those comments; revisions to the text of the Draft EIR reflecting changes made in response to comments and other information; and other minor changes to the text of the Draft EIR. The Final EIR is hereby incorporated in this document by reference.

I. CERTIFICATION OF THE FINAL EIR

The MRWPCA Board (the "Board") certifies that it has been presented with the Final EIR and that it has reviewed and considered the information contained in the Final EIR prior to making the following findings and statement of overriding considerations in Section II, below.

Pursuant to CEQA Guidelines section 15090 (Title 14 of the California Code of Regulations, section 15090) the Board certifies that the Final EIR has been completed in compliance with CEQA and the CEQA Guidelines. The Board certifies the Final EIR for the Project as described above.

The Board further certifies that the Final EIR reflects its independent judgment and analysis.

II. FINDINGS

Having received, reviewed, and considered the Final EIR and other information in the record of proceedings, the Board hereby adopts the following findings in compliance with CEQA and the CEQA Guidelines:

Part A: Findings regarding the environmental review process and the contents of the Final EIR.

Part B: Findings regarding the significant environmental impacts of the Project and the mitigation measures for those impacts identified in the Final EIR and adopted as conditions of approval, as well as the reasons that some potential mitigation measures are rejected.

Part C: Findings regarding alternatives and the reasons that alternatives are rejected.

Part D: Statement of Overriding Considerations determining that the benefits of implementing the Project outweigh the significant unavoidable environmental impacts that will result and therefore justify approval of the Project despite such impacts.

The Board certifies that these findings are based on full appraisal of all viewpoints, including all comments received up to the date of adoption of these findings, concerning the environmental issues identified and discussed in the Final EIR. The Board adopts the findings and the statement in Parts A through D for Project.

In addition to the findings regarding environmental impacts, alternatives and overriding considerations, Part E, below, identifies the custodian and location of the record of proceedings, as required by CEQA.

Part F describes the Mitigation Monitoring and Reporting Program for the Project. As described in Part F, the Board hereby adopts the Mitigation Monitoring and Reporting Program as set forth in Exhibit B to these findings.

Part G, below, summarizes the findings and determinations regarding the Project.

A. Environmental Review Process

1. Notice of Preparation and Scoping Meeting

On May 30, 2013, the MRWPCA issued a Notice of Preparation announcing the intended preparation of the Draft EIR and describing its proposed scope. The NOP had a 30-day review period until July 2, 2013. A supplement to the NOP was prepared and circulated December 9, 2014 through January 8, 2015 to reflect updates to the Project that had occurred since the original NOP was issued. The MRWPCA received written responses to the NOPs from agencies, organizations and individuals.

The MRWPCA held a public scoping meeting on Thursday, June 18, 2013 from 6:00 to 8:00 PM at the Oldemeyer Center located at 986 Hilby Avenue, Seaside, CA 93955 to present the Project to the public and agencies and to solicit input as to the scope and content of the EIR. Public notices were placed in local newspapers informing the general public of the scoping meetings. The MRWPCA received oral comments at the public Scoping Meeting. Appendix A to the Draft EIR provides a summary of all written comments received in response to the initial and supplemental NOPs and oral comments received at the public Scoping Meeting.

2. Preparation of the EIR

The MRWPCA completed the Draft EIR for the Project and, beginning on April 22, 2015, the MRWPCA made the Draft EIR available for review and comment. A notice of availability and notice of completion of the Draft EIR was sent to the State Clearinghouse/ Governor's Office of Planning and Research. A notice of availability also was published in the *Monterey County Herald* and the *Salinas Californian*. A hard copy of the Draft EIR was made available for review during normal business hours at the MRWPCA Administrative Office, 5 Harris Court, Bldg. D, Monterey, CA 93940 and at the MPWMD Offices, 5 Harris Court, Bldg. G, Monterey, CA 93940. The Draft EIR was available online at the GWR Project website at: www.purewatermonterey.org. The Draft EIR was also available at the following libraries: Seaside Public Library, Marina Public Library, Salinas Public Libraries, Castroville Public Library, Monterey Public Library, Carmel Valley Public Library, and Harrison Memorial Library (Carmel).

The period for receipt of comments on the Draft EIR remained open until June 5, 2015. During the 45-day Draft EIR review period, the MRWPCA held two noticed public meetings to provide information and answer questions about the Project and the EIR. The first meeting was held on May 20, 2015 from 6:00 p.m. to 8:00 p.m. at the Oldemeyer Center (986 Hilby Avenue, Seaside, CA 93955). The second public meeting was held on May 21, 2015 from 4:00 p.m. to 6:00 p.m. at Hartnell College (411 Central Avenue, Salinas, CA 93901). Spanish translation was available, and both venues were accessible under the Americans with Disabilities Act (ADA). The notice of availability contained information about the meetings.

During the comment period, the MRWPCA received written comments from state and local agencies, organizations and individuals. A total of 26 comment letters were received on the Draft EIR during the public review process. Three letters from key agencies were received after the close of the review period and are included in the Final EIR.

The Final EIR was completed and made available to public agencies and members of the public on September 25, 2015.

The Final EIR contains all of the comments received during and immediately after the public comment period, together with written responses to significant environmental issues raised in those comments, which were prepared in accordance with CEQA and the CEQA Guidelines.

The Board finds and determines that the Final EIR provides adequate, good faith, and reasoned responses to all comments raising significant environmental issues.

3. Absence of Significant New Information

CEQA Guidelines Section 15088.5 requires a lead agency to recirculate an EIR for further review and comment when significant new information is added to the EIR after public notice is given of the availability of the draft EIR but before certification of the final EIR. New information added to an EIR is not "significant" unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect that the project proponent declines to implement. The Guidelines provide examples of significant new information under this standard. Recirculation is not required where the new information added to the EIR merely clarifies or amplifies or makes insignificant modifications in an adequate EIR.

The Board recognizes that the Final EIR incorporates information obtained by the MRWPCA since the Draft EIR was completed, and contains additions, clarifications, modifications, and other changes. With respect to this information, the Board finds as follows:

Changes to Mitigation Measures. As described in Chapter 5 of the Final EIR (Changes to the Draft EIR) and in the responses to comments, several mitigation measures have been modified, including Mitigation Measures AE-3, AE-4, AQ-1, BF-1a through BF-1c, BF-2a/Alternate BF-2a, BT-1a, BT-2c, HS-4, HS-C/MR-C, NV-1d, NV-2b, TR-2, and TR-3. Language within Mitigation Measures CR-1 and CR-2a has been modified, for consistency with the discussion in the Draft EIR on pages 6-41 and 6-42 regarding the applicability of Impacts CR-1 and CR-2 to the Alternative Monterey Pipeline. The Board finds that these changes to the mitigation measures in the Final EIR augment the mitigation measures as proposed in the Draft EIR, strengthen the effectiveness of the proposed mitigation measures, respond to agency input, and/or enhance their clarity, but do not cause any new or more severe environmental impacts. Therefore, in accordance with CEQA and the CEQA Guidelines, no recirculation of the EIR is necessary based on the changes and additions to the mitigation measures in the Final EIR.

Other Changes. Various minor changes and edits have been made to the text and tables of the Draft EIR, as described in Chapter 5 of the Final EIR. These changes are generally of an administrative nature such as correcting typographical errors, making minor adjustments to the data, and adding or changing certain phrases to improve readability. The Board finds that these changes are of a minor, non-substantive nature and do not require recirculation of the EIR.

In addition to the changes and corrections described above, the Final EIR provides additional information in response to comments and questions from public agencies, private organizations, and individuals. The Board finds that this additional information does not constitute significant new information requiring recirculation, but rather that the additional information clarifies or amplifies an adequate EIR. The public has not been deprived of a meaningful opportunity to comment upon a substantial adverse environmental effect of the Project or a feasible project alternative or mitigation measure

Recirculation is required in four situations. Here, the Board finds that the additional information, including the changes described above, does not show that:

(1) A new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented.

(2) A substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted that reduce the impact to a level of insignificance.

(3) A feasible project alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the significant environmental impacts of the project, but the project's proponents decline to adopt it.

(4) The Draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

Based on the foregoing, and having reviewed the information contained in the Final EIR and in the record of the MRWPCA's proceedings, including the comments on the Draft EIR and the responses thereto, and the above-described information, the Board hereby finds that no significant new information has been added to the Final EIR since public notice was given of the availability of the Draft EIR that would require recirculation of the EIR. Therefore, in accordance with CEQA Guidelines Section 15088.5(b), no recirculation of the Draft EIR is required.

4. Differences of Opinion Regarding the Impacts of the Project

In making its determination to certify the Final EIR and to approve the Project, the Board recognizes that a range of technical and scientific opinion exists with respect to certain environmental issues. The Board has acquired an understanding of the range of this technical and scientific opinion by its review of the Draft EIR, the comments received on the Draft EIR and the responses to those comments in the Final EIR, as well as testimony, letters, and reports regarding the Final EIR and its own experience and expertise in these environmental issues. The Board has reviewed and considered, as a whole, the evidence and analysis presented in the Draft EIR, the evidence and analysis presented in the comments on the Draft EIR, the evidence and analysis presented in the Final EIR, the information submitted on the Final EIR, and the reports prepared by the experts who prepared the EIR, by the MRWPCA's consultants, and by staff, addressing those comments. The Board has gained a comprehensive and well-rounded understanding of the environmental issues presented by the Project. In turn, this understanding has enabled the Board to make its decisions after weighing and considering the various viewpoints on these important issues. The Board accordingly certifies that its findings are based on full appraisal of all of the evidence contained in the Final EIR, as well as the evidence and other information in the record addressing the Final EIR.

B. Impacts and Mitigation Measures

These findings provide the written analysis and conclusions of the Board regarding the environmental impacts of the Project and the mitigation measures identified by the Final EIR and adopted by the Board as conditions of approval for the Project.

In making these findings, the Board has considered the opinions of other agencies and members of the public, including opinions that disagree with some of the analysis and significance thresholds used in the EIR. The Board finds that the determination of significance thresholds is a judgment that is within the discretion of the Board; the significance thresholds used in the EIR are supported by substantial evidence in the record, including the expert opinion of the EIR preparers and MRWPCA staff; and the significance thresholds used in the EIR provide reasonable and appropriate means of assessing the significance of the adverse environmental effects of the Project.

In particular, the EIR relied on significance criteria for evaluating impacts that are tailored to this type of project. The criteria used in this EIR to determine whether an impact is or is not "significant" are based on (a) CEQA-stipulated "mandatory findings of significance" listed in CEQA Guidelines section 15065; (b) the relationship of the project effect to the adopted policies, ordinances and standards of the MRWPCA and of responsible agencies; and (c) commonly accepted practice and the professional judgment of the EIR authors and MRWPCA staff.

1. Findings on the Project's Environmental Impacts.

Exhibit A, Summary of Impacts and Mitigation Measures for the Staff Recommended Alternative, attached to these findings and incorporated herein by reference summarizes the environmental determinations of the Final EIR about the Project's significant impacts before and after mitigation. This exhibit does not attempt to describe the full analysis of each environmental impact contained in the Final EIR. Instead, Exhibit A provides a summary description of each significant impact, describes the applicable mitigation measures identified in the Final EIR and adopted by the Board where the measure is within the Board's jurisdiction to adopt, and states the Board's findings on the significance of each impact after imposition of the adopted mitigation measures. A full explanation of these environmental findings and conclusions can be found in the Final EIR, and these findings hereby incorporate by reference the discussion and analysis in the Final EIR supporting the Final EIR's determinations regarding the Project's impacts and mitigation measures designed to address those impacts. In making these findings, the Board ratifies, adopts, and incorporates the analysis and explanation in the Final EIR, and ratifies, adopts, and incorporates in these findings the determinations and conclusions of the Final EIR relating to environmental impacts and mitigation measures, except to the extent any such determinations and conclusions are specifically and expressly modified by these findings.

2. Adoption of Project Design Features and Mitigation Measures as Conditions of Approval.

The Board adopts, and incorporates as conditions of approval of the Project, the mitigation measures set forth in the Mitigation Monitoring and Reporting Program attached to these findings as Exhibit B to reduce or avoid the potentially significant and significant impacts of the Project. In adopting these mitigation measures, the Board intends to adopt each of the mitigation measures recommended for approval by the Final EIR that applies to a component of the Project that would be constructed by or funded by the Board. Accordingly, in the event an applicable mitigation measure recommended in the Final EIR has inadvertently been omitted from Exhibit B, such mitigation measure is hereby adopted and incorporated in the findings below by reference. In addition, in the event the language describing a mitigation measure set forth in Exhibit B fails to accurately reflect the mitigation measures in the Final EIR due to a clerical error, the language of the mitigation measure as set forth in the Final EIR shall control, unless the language of the mitigation measure has been specifically and expressly modified by these findings.

The Board hereby finds that the adopted mitigation measures are changes or alterations that have been required in, or incorporated into, the Project which mitigate or avoid significant effects on the environment.

- Some of the mitigation measures identified in the EIR cannot be fully implemented by the Board because the measures apply to a Project component that the Board does not control. The Alternative Monterey Pipeline would be implemented by CalAm and is not subject to regulatory approvals by MRWPCA. CalAm has confirmed that it would implement all of the mitigation measures that the EIR identifies for the Alternative Monterey Pipeline, including the following: AE-2; AQ-1; BT-1a; BT-1k; BT-1m; CR-1; CR-2(a); CR-2(b); CR-2(c); EN-1; HH-2(a); HH-2(b); HH-2(c); LU-2; NV-1(b); NV-1(c); PS-3; TR-2; TR-3; and TR-4.

The Board hereby finds that these mitigation measures are within the jurisdiction of other public agencies issuing regulatory approvals to CalAm, and can and should be approved by those other agencies.

3. Findings on Additional Suggested Mitigation Measures.

In several comments on the Draft EIR, various measures were suggested by commenters as proposed additional mitigation measures or modifications to the mitigation measures identified by the EIR. As described above, several of the EIR's mitigation measures were modified in response to such comments. Other comments requested minor modifications in mitigation measures identified in the Draft EIR, requested mitigation measures for impacts that were less than significant, or requested additional mitigation measures for impacts as to which the Draft EIR identified mitigation measures that would reduce the identified impact to a less than significant level; these requests are declined as unnecessary.

With respect to the additional measures suggested by commenters that were not added to the Final EIR, the Board hereby adopts and incorporates by reference the reasons set forth in the responses to comments contained in the Final EIR as its grounds for rejecting adoption of these mitigation measures.

C. Basis for the Board's Decision to Approve the Project (as Modified)

1. Summary of Discussion of Alternatives in the Final EIR

The Final EIR evaluates a number of potential alternatives to the Project. The EIR examines the environmental impacts of each alternative in comparison with the Project and the relative ability of each alternative to satisfy project objectives.

The EIR also describes the criteria used to identify a range of reasonable alternatives for review in the EIR and describes proposals that the MRWPCA concluded did not merit additional, more-detailed review because they did not present viable alternatives to the Project.

2. The Board's Findings Relating to Alternatives

In making these findings, the Board certifies that it has independently reviewed and considered the information on alternatives provided in the Final EIR, including the information provided in comments on the Draft EIR and the responses to those comments in the Final EIR. The Final EIR's discussion and analysis of these alternatives is not repeated in these findings, but the discussion and analysis of the alternatives in the Final EIR is incorporated in these findings by reference.

The Final EIR describes and evaluates in detail several alternatives to the Project. As set forth in section B above, the Board has adopted mitigation measures that mitigate the significant environmental effects of the Project. As explained in section D of these findings, while these mitigation measures will not mitigate all Project impacts to a less than significant level, they will mitigate those impacts to a level that the Board finds is acceptable. The Board finds that only the Project would satisfy all of the Project Objectives. The Board finds that the remaining alternatives are unable to satisfy the project objectives to the same degree as the Project. The

Board further finds that, on balance, none of the remaining alternatives has environmental advantages over the Project that are sufficiently great to justify approval of such an alternative instead of the Project, in light of each such alternative's inability to satisfy the project objectives to the same degree as the Project. Accordingly, the Board has determined to approve the Project instead of approving one of the remaining alternatives.

In making this determination, the Board finds that when compared to the other alternatives described and evaluated in the Final EIR, the Project, as mitigated, provides a reasonable balance between fully satisfying the project objectives and reducing potential environmental impacts to an acceptable level. The Board further finds and determines that the Project should be approved, rather than one of the other alternatives, for the reasons set forth below.

a. Description of Project Objectives

The primary objective of the Project is to replenish the Seaside Groundwater Basin with 3,500 AFY of purified recycled water to replace a portion of CalAm's water supply as required by state orders. To accomplish this primary objective, the Project would need to meet the following objectives:

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

Secondary objectives of the Project include the following:

- Provide additional water to the Regional Treatment Plant that could be used for crop irrigation through the Salinas Valley Reclamation Plant and Castroville Seawater Intrusion Project system;
- Develop a drought reserve to allow the increased use of Project source waters as crop irrigation within the area served by the Castroville Seawater Intrusion Project during dry years
- Assist in preventing seawater intrusion in the Seaside Groundwater Basin;
- Assist in diversifying Monterey County's water supply portfolio.

b. Discussion and Findings Relating to the Alternatives Evaluated in the Draft EIR

Chapter 6 of the Draft EIR provides a full discussion of the following alternatives, which are summarized below:

- No Project

- Alternatives to Project
  - Reduced Seaside Basin Replenishment Alternative
  - Component-by-component alternatives for Source Water Diversion and Use, for Product Water Conveyance, and for CalAm Distribution System Pipelines
  - Three overall alternatives to the Project were considered that combined component-by-component alternatives into overall alternatives:
    - Alternative A: Reduced Seaside Basin Replenishment and Alternative Monterey Pipeline
    - Alternative B: Reduced Source Water Alternative #2 (No Tembladero Slough) and Alternative Monterey Pipeline
    - Alternative C: Reduced Source Water Alternative #7 (Salinas Source Waters Only) and Alternative Monterey Pipeline

No Project Alternative.

Under CEQA, a "No-Project Alternative" compares the impacts of proceeding with a proposed project with the impacts of not proceeding with the proposed project. A No-Project Alternative describes the environmental conditions in existence at the time the Notice of Preparation was published, along with a discussion of what would be reasonably expected to occur in the foreseeable future, based on current plans and consistent with available infrastructure and community services.

Here, the No Project Alternative would not include construction of any of the Project components, which in turn would eliminate all construction and operational impacts at all of the Project component sites, avoiding all significant impacts identified for the Project. However, the beneficial impacts of the project with respect to the restoration of flows in the Carmel River would potentially be delayed or would not occur if the No Project Alternative was implemented. Benefits of the Project related to additional irrigation water for CSIP (and related to offset of groundwater pumping by delivering additional recycled water for crop irrigation) and potential improvements in seawater intrusion conditions would also not occur.

Under the No Project Alternative, none of the objectives of the Project would be met, and the benefits of the Project would not occur. The No Project Alternative would not enable CalAm to reduce its diversions from the Carmel River system by up to 3,500 AFY by injecting the same amount of purified recycled water into the Seaside Basin. This alternative also would not meet the project objective of providing additional water to the Regional Treatment Plant to be used for crop irrigation through the Salinas Valley Reclamation Plant and CSIP system, and there would be no drought reserve for crop irrigation within the CSIP area during dry years.

On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to provide the environmental benefits of the Project or to achieve the project objectives, and the Board rejects this alternative.

A commenter on the Draft EIR suggested that the larger desalination plant proposed by CalAm for the Monterey Peninsula Water Supply Project (MPSWP) would result from disapproval of the Proposed GWR Project. The MPSWP is an independent project undergoing its own CEQA process, and that project is not an approved plan, nor is it consistent with available infrastructure. Nevertheless, the EIR describes the relationship between the Project and the MPSWP, and discloses that if the Project is approved and implemented, the desalination plant that CalAm would pursue as part of the MPSWP would be the smaller, 6.4 million gallons per day (mpg) plant rather than the larger 9.6 mpg plant. The scenario under which the smaller desalination plant could be combined with the GWR Project is described in the MPSWP Draft EIR as the "MPSWP Variant" and the combined impacts of the two projects are described in the EIR for the GWR Project as potential cumulative impacts.

The Board finds that the potential effects of approval and denial of the GWR Project on the size of the desalination plant proposed by CalAm for the MPSWP have been adequately disclosed in the EIR for the Project.

Reduced Seaside Basin Replenishment Project Alternative.

This alternative would constitute a 3,000 AFY capacity project for water deliveries for the Project to the Seaside Basin, instead of 3,500 AFY. All of the Project facilities would be constructed, and the proposed additional recycled water for crop irrigation in the CSIP area (4,500 to 4,750 AFY) would be included. Under this alternative, the required diversions of source water would be reduced. To produce 3,000 AFY of water, approximately 3,703 AFY of new source waters would be required to be diverted to the AWT Facility. This compares to the 4,320 AFY needed to produce 3,500 AFY under the Project.

This alternative would result in nearly the same environmental impacts as the Project, since all diversion, conveyance, storage, treatment and injection facilities would need to be constructed under this alternative, even though there would be a reduction of product water provided to the Seaside Groundwater Basin. This alternative would partially meet the project objectives during normal and dry years, in that a reduced water supply would be produced and available to CalAm – 3,000 AFY instead of the proposed 3,500 AFY to replenish the Seaside Groundwater Basin. This alternative would fully meet the Crop Irrigation water supply project objectives.

On balance, the relatively small environmental benefits that might be achieved with this alternative are outweighed by its failure to fully provide the environmental benefits that would be achieved by replacement of 3,500 acre feet per year of CalAm's water supply as required by state orders. This alternative would not fully achieve the project objectives, and the Board rejects this alternative.

Alternatives to Source Water Diversions and Use.

The Draft EIR considered eight different Reduced Source Water Alternatives, in which one or more source water components would be eliminated:

Reduced Source Water Alternative #1 (No Lake El Estero)

In this alternative, the Lake El Estero source water diversion facilities would not be implemented. The construction of the new physical facilities at the Lake El Estero site would not occur, and no operational diversions of water from this water body to the wastewater collection system would occur.

Significant impacts related to biological resources (wetlands), construction and land use policy consistency would be eliminated at the Lake El Estero site. However, the alternative would not meet the project objectives to the extent that the Project would, including water demands for CalAm Monterey District of 3,500 AFY and for Crop Irrigation in the CSIP area of 4,500 – 4,750 AFY and up to 5,900 AFY in drought years. While the necessary amount of yield could be provided by the other proposed source waters without the Lake El Estero diversion, this component provides source water in certain drought years to more easily meet the project objectives and to provide more certainty that those objectives would be consistently achieved.

On balance, the relatively small environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Water Alternative #2 (No Tembladero Slough)

This alternative consists of a reduced source water diversion through elimination of the proposed diversion facilities at the Tembladero Slough Diversion site. Under this alternative, the construction of the new physical facilities at the Tembladero Slough Diversion site would not occur, and no operational diversions of water from this water body to the wastewater collection system would occur.

In comparison to the Project, elimination of this component would eliminate all of the significant impacts at the Tembladero Slough diversion, including the significant and unavailable noise impact. The alternative would meet the primary project objective of replenishment of the Seaside Basin but would not accomplish the project objectives to the extent that the Project would for CSIP irrigation in some drought years in comparison to the Project. During normal/wet years while building the drought reserve, the Tembladero Slough source water diversion would yield approximately 535 AFY. On average during such years, the Project would increase water supplied to the CSIP growers by approximately 5,456 AFY. If the Tembladero Slough diversion were eliminated from the Project, the Project would increase water supplied to the CSIP growers by 4,921 AFY (90% of the amount with Tembladero Slough).

During normal/wet years with a full drought reserve, water from the Tembladero Slough would not be needed if all other sources were available. The Tembladero Slough diversion would, however, provide a back-up source in the event other sources were not available.

Drought years when the drought reserve is used for the CSIP growers, the Tembladero Slough diversion would yield approximately 772 AFY. On average during such years, the Project would increase water supplied to the CSIP growers by approximately 5,728 AFY. If the Tembladero Slough diversion were eliminated from the Project, the Project would increase water supplied to the CSIP growers by 4,956 AFY (87% of the amount with Tembladero Slough).

On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Water Alternative #3 (No Tembladero Slough and No Lake El Estero)

In this alternative, there would be no source water diversion facilities constructed or operated at Tembladero Slough or at Lake El Estero. The construction of the new physical facilities at Tembladero Slough Diversion site at Lake El Estero would not occur, and no operational diversions of water from these water bodies to the wastewater collection system would occur.

Significant impacts related to noise, biological resources, cultural resources and land use policy consistency at the Lake El Estero and Tembladero sites would be eliminated. Additionally, impacts of public services, traffic, hazards and hazardous materials and energy would also be avoided at the Tembladero Slough and Lake El Estero sites due to the elimination of these diversion facilities. The significant and unavoidable noise impact at the Tembladero Slough diversion site also would be avoided.

This alternative would meet the primary project objective of replenishment of the Seaside Basin. However, elimination of the Tembladero Slough and Lake El Estero Diversions would not accomplish the Project objectives to the extent that the Project would because these source waters are needed to provide sufficient water supply during certain dry/drought year conditions, as explained under Reduced Source Water Alternatives 1 and 2, above. On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Alternatives #4 (No Blanco Drain Diversions)

Under this alternative, there would be no diversion of surface waters from the Blanco Drain and the construction of the new Blanco Drain pump station and pipeline (including the trenchless construction or directionally drilling activities to install the pipeline under the Salinas River) would not occur.

The impacts of eliminating the Blanco Drain Diversion component would reduce the physical changes to this site because no construction would occur to install the facilities needed to divert the surface water. In addition, the less-than-significant operational changes to flow and water levels and associated habitat and special status species impacts in the downstream reaches of the watershed (a short segment of the Blanco Drain, Salinas River and lagoon) would not occur. Biological, cultural, traffic, energy, land use, public services and noise impacts would also be reduced at the Blanco Drain site due to the elimination of these facilities.

The alternative would not fully accomplish the project objectives; in some drought years, the yield of the alternative would only provide from 2,800 to 4,300 AFY for the proposed Crop Irrigation component, as compared to up to 5,900 AFY under the Project. On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Alternatives #5 (No Reclamation Ditch and Tembladero Slough Diversions)

This alternative assumes no diversion from the source waters of the Reclamation Ditch or Tembladero Slough. No construction of physical facilities would be built at the Reclamation Ditch or Tembladero Slough Diversion sites, and no operational diversion of water and the resulting flow and water level changes to the existing surface water hydrology and habitat in the affected reaches (below the diversion points) would occur.

The impacts of eliminating these components would reduce the physical changes to these sites because no construction would occur to install the facilities needed to divert the surface water. In addition, the operational changes to flow and water levels in the downstream reaches of the watershed would not occur.

This alternative would not fully accomplish the project objectives: in some drought years, the yield of this alternative would be from 2,800 to 4,300 AFY for the proposed Crop Irrigation component, as compared to up to 5,900 AFY under the Project. On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Alternative #6 (No Surface Water Appropriative Permits)

Under this alternative, the following diversions would be eliminated from the Project: Reclamation Ditch, Tembladero Slough, and Blanco Drain. The impacts of eliminating these components would reduce the physical changes to these sites because no construction would occur to install the facilities needed to divert the surface water. In addition, the operational changes to flow and water levels in the downstream reaches of the watershed would not occur.

The alternative would not fully accomplish the project objectives; in some drought years, the yield of the alternative would only provide from 2,800 to 4,300 AFY for the proposed Crop Irrigation component, as compared to up to 5,900 AFY under the Project. On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Water Alternative #7 (City of Salinas Sources Only - No Source Water Diversions to Augment CSIP Deliveries)

This alternative assumes new source waters would be conveyed to the Regional Treatment Plant for project use from the City of Salinas sources only, and this alternative eliminates all diversions from surface waters including the Reclamation Ditch, Tembladero Slough, Blanco Drain, and the diversion facility at Lake El Estero. This alternative assumes that no additional waters would be diverted to provide augmentation of recycled water for CSIP area crop irrigation as proposed under the Project.

Elimination of all of the surface water diversion components would reduce the physical changes to those sites because no construction would occur to install the facilities need to divert the surface water. In addition, the operational changes to flow and water levels in the downstream reaches of the Reclamation Ditch watershed would not occur.

This alternative would produce 3,500 AFY of purified recycled water to replace a portion of CalAm's water supply to meet project objectives to replenish the Seaside Basin. However, irrigation waters for CSIP would not be augmented in comparison to the Project. This alternative would not fully meet the Crop Irrigation objectives.

On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Reduced Source Water Alternative #8 (No Agricultural Wash Water or South Salinas Stormwater)

Under this alternative, no physical changes would be made to the Salinas Pump Station source water diversion site, the Salinas Treatment Facility or the 33-inch wastewater pipeline to enable agricultural wash water and south Salinas stormwater to be stored and recovered for recycling and reuse. Construction and operational impacts related to biological (terrestrial and fisheries) resources, cultural resources, noise, energy, public services (waste disposal), and traffic impacts would be reduced under this alternative at the City of Salinas facilities due to the elimination of construction and operation of these facilities.

The alternative would not fully meet the project objective to provide additional agricultural irrigation water as the yield of the alternative would not provide the total Crop Irrigation yield of the Project, and in drought years would require the use of CSIP wells in the peak irrigation demand months.

On balance, the environmental benefits that might be achieved with this alternative are outweighed by its failure to fully achieve the project objectives, and the Board rejects this alternative.

Alternatives for Product Water Conveyance.

The Draft EIR describes two options for the Product Water Conveyance system, including two pipeline alignments and two associated locations for a booster pump station, called the RUWAP and Coastal Alignment Options. Only one of the two Product Water Conveyance pipeline alignments and booster pump stations would be constructed as part of the Project.

A comparison of the severity of impacts between the two alternative Product Water Conveyance Systems shows that they are very similar. The primary difference in impacts is in construction and operational impacts to riparian habitat and federally protected wetlands as defined by Section 404 of the Clean Water Act or waters of the state; specifically, the impacts of the RUWAP alignment option would be less than significant while the Coastal alignment option would be significant, but reduced to less than significant with mitigation in the EIR.

Either of the Product Water Conveyance options evaluated in the EIR would fully achieve the project objectives. The RUWAP Alignment Option would result in fewer adverse environmental impacts compared to the Coastal Alignment Option and is expected to be less costly to construct than the Coastal Alignment Option. For these reasons, the Board has determined that it will pursue the necessary permits and approvals to enable it to construct the RUWAP Alignment Option.

Alternatives to CalAm Distribution System Pipelines.

The CalAm Distribution System Transfer and Monterey Pipelines are proposed to be built by CalAm, and the Draft EIR considers alternative alignments for the proposed Transfer and Monterey Pipelines alignments. Importantly, if the Alternative Monterey Pipeline were constructed instead of the Proposed Project's alignment for the Monterey Pipeline, then the Transfer Pipeline would no longer be needed and the impacts associated with construction of the Transfer Pipeline would be eliminated.

Alternative Transfer Pipeline

Similar to the Project's alignment, the Alternative Transfer Pipeline would be 2.4 miles long. The level of significance and the severity of the impacts would be the same or similar for all impact topics if the Alternative Transfer Pipeline were constructed instead of the Proposed Transfer Pipeline, because both would be 2.4 miles long and both would be entirely within existing, paved, public roadways. The alternative would achieve the project objectives.

Because, as described below, the Board supports and selects the Alternative Monterey Pipeline, neither the proposed Transfer Pipeline nor the Alternative Transfer Pipeline is necessary for the Project to proceed, the Board rejects inclusion of either Transfer Pipeline alignment as part of the Project.

Alternative Monterey Pipeline

The Alternative Monterey Pipeline is 6.5 miles long. The entire Alternative Monterey Pipeline is located outside of the Coastal Zone. If the Alternative Monterey Pipeline is selected for construction, neither the proposed Monterey Pipeline, proposed Transfer Pipeline, nor the Alternative Transfer Pipeline would be built to deliver the required water quantities to meet CalAm customers' demands. The Alternative Monterey Pipeline would avoid and reduce significant impacts compared to the proposed Monterey Pipeline, and would avoid impacts of the Transfer Pipeline.

The Alternative Monterey Pipeline would fully achieve the project objectives. Due to being located outside of the Coastal Zone and the elimination of the need for the Transfer Pipeline, the Alternative Monterey Pipeline would also have the potential to be implemented more expeditiously and thus would better meet the objective of being implemented in a timely manner.

Because the Alternative Monterey Pipeline would substantially lessen the Project's adverse environmental impacts while also fully achieving the project objectives, the Board supports construction of the Alternative Monterey Pipeline, and hereby selects this alternative.

Overall Alternatives to the Project.

The Draft EIR also discusses several combinations of alternatives discussed above. These are called Alternative A, Alternative B, and Alternative C, and Table 6-6 in the Draft EIR provides an overview of the environmental impacts of each combined alternative compared to the Project.

Alternative A: Reduced Seaside Basin Replenishment and Alternative Monterey Pipeline

The Reduced Seaside Basin Replenishment Alternative would reduce the amount of water for Seaside Basin replenishment by 500 AFY compared to the Project (i.e., 3,000 AFY rather than 3,500 AFY of purified recycled water would be produced, conveyed to, and injected into the Seaside Basin, for later extraction by CalAm). The need to divert source waters would be reduced by approximately 600 AFY which could be achieved by eliminating one or more source water diversion sites, or by constructing and operating all of the source water diversions, but operating them with a lower total diversion amount.

If the Reduced Seaside Basin Replenishment Alternative were combined with the Alternative Monterey Pipeline (i.e., rather than the Proposed Transfer and Monterey Pipelines), numerous other significant construction impacts would be reduced due to reduced construction areas and activities, and the Project may be implemented more quickly, better meeting the project timeframe objective.

On balance, the relatively small environmental benefits that might be achieved by the Reduced Seaside Basin Replenishment component of this alternative are outweighed by the alternative's failure to fully provide the environmental benefits that would be achieved by replacement of 3,500 acre feet per year of CalAm's water supply as required by state orders. This alternative would not fully achieve the project objectives, and the Board rejects this alternative.

The Board selects the Alternative Monterey Pipeline.

Alternative B: Reduced Source Water Alternative # 2 (No Tembladero Slough) and Alternative Monterey Pipeline

Reduced Source Water Alternative # 2 would avoid the significant and unavoidable noise impact at the Tembladero Slough diversion due to exceedances of the MRWPCA's noise level ordinance; however, the alternative would not meet the project objectives as fully as the Project. Specifically, the Reduced Source Water Alternative #2 would only provide up to 5,200 AFY for the proposed Crop Irrigation component in some drought years (compared to up to 5,900 AFY under the Project).

If the Reduced Source Water Alternative #2 was combined with the Alternative Monterey Pipeline (i.e., rather than the Proposed Transfer and Monterey Pipeline), numerous other significant construction impacts would be reduced due to reduced construction areas and activities. Because the Alternative Monterey Pipeline avoids the Coastal Zone, it may be implemented more quickly than the Proposed Monterey Pipeline, better meeting the project timeframe objective.

The EIR determined that other than the No Project Alternative, the Environmentally Superior Alternative would be the Reduced Source Water (No Tembladero Slough) Alternative combined with the Alternative Monterey Pipeline.

On balance, the environmental benefits that might be achieved by eliminating the Tembladero Slough diversion are outweighed by this alternative's failure to fully achieve the project objectives, and the Board rejects this alternative.

The Board selects the Alternative Monterey Pipeline.

Alternative C: Reduced Source Water Alternative # 7 (Salinas Source Waters Only) and Alternative Monterey Pipeline

Reduced Source Water Alternative #7 (Salinas Source Waters Only) was found to avoid the significant and unavoidable noise impact at the Tembladero Slough Diversion, in addition to reducing environmental impacts related to source water diversions from surface waters, such as changes in flow, induced water level changes, and direct and indirect impacts on biological resources (albeit the latter would be less-than-significant under the Project). The Reduced Source Water Alternative #7 would not meet the Crop Irrigation objective to the extent that the Project would; in fact it would provide very little or no augmentation of the existing supplies to the CSIP area.

If the Reduced Source Water Alternative #7 was combined with the Alternative Monterey Pipeline (i.e., rather than both the Proposed Transfer and Monterey Pipelines), numerous other significant construction impacts would be reduced due to reduced construction areas and activities. Because the Monterey Pipeline avoids the Coastal Zone, it may be implemented more quickly than the Project, better meeting the project timeframe objective.

On balance, the environmental benefits that might be achieved by eliminating all new source waters except for the Salinas source waters are outweighed by this alternative's failure to fully achieve the project objectives, and the Board rejects this alternative.

The Board selects the Alternative Monterey Pipeline.

Summary of Findings Regarding Alternatives. For all of the foregoing reasons, the Board has determined to approve the Project as modified by the Alternative Monterey Pipeline, instead of any of the other alternatives. As noted above, with the construction of the Alternative Monterey Pipeline, the Transfer Pipeline is no longer needed, and the impacts associated with construction of the Transfer Pipeline are eliminated. On balance, the Board finds that the Project as modified by the Alternative Monterey Pipeline best achieves the project objectives and environmental benefits.

c. Findings Regarding Suggestions for Modifying the Project, Variations on the Alternatives, and a Suggested Off-Site Alternative

Various modifications to the Project and variations on the alternatives were proposed in comments on the Draft EIR.

Certain commenters expressed their preference for an alternative to the Project or components thereof, and these are thoroughly discussed in Chapter 3 of the Final EIR (Master Responses to Comments on the Draft EIR), which is incorporated by reference into these findings. These proposed variations included a reduced Seaside Basin replenishment alternative, increased proposed project yield or AWT facility size alternatives, alternative water supply sources, a request for the Project to be considered an independent project, alternative pipeline alignments, and an additional no project alternative. The Final EIR determined that no additional alternatives were considered necessary to be added in the Final EIR because the alternatives suggested either would not reduce identified significant impacts, or would not feasibly meet most of the basic project objectives.

With respect to the additional alternatives suggested by commenters that were not added to the Final EIR, the Board hereby adopts and incorporates by reference the reasons set forth in the responses to comments contained in the Final EIR as its grounds for rejecting the addition of these alternatives.

Findings Regarding Adequacy of Range of Alternatives. The Board finds that the range of alternatives evaluated in the EIR reflects a reasonable attempt to identify and evaluate various types of alternatives that would potentially be capable of reducing the Project's environmental effects, while accomplishing most but not all of the project objectives. The Board finds that the alternatives analysis is sufficient to inform the Board and the public regarding the tradeoffs between the degree to which alternatives to the Project could reduce environmental impacts and the corresponding degree to which the alternatives would hinder the MRWPCA's ability to achieve the project objectives.

D. Statement of Overriding Considerations

1. Impacts That Remain Significant

As discussed in Exhibit A, the Board has found that the following impacts of the Project would or could remain significant following MRWPCA adoption of the mitigation measures described in the Final EIR:

- Impact NV-1: Construction Noise (Alternative Monterey Pipeline)
- Impact NV-2: Construction Noise That Exceeds or Violate Local Standards (Tembladero Slough)

2. Overriding Considerations Justifying Project Approval

In accordance with CEQA Guidelines Section 15093, the Board has, in determining whether or not to approve the Project, balanced the economic, social, technological, and other project benefits against the Project's unavoidable environmental risks, and finds that the benefits of the Project set forth below outweigh the significant adverse environmental effects that are not mitigated to less than significant levels. This statement of overriding considerations is based on the Board's review of the Final EIR and other information in the administrative record. The benefits identified below provide separate and independent bases for overriding the significant environmental effects of the Project.

- The Project would replace 3,500 AFY of unauthorized Carmel River diversions for municipal use with additional groundwater pumping enabled by recharge of purified recycled water;

- The Project would provide up to 4,500 – 4,750 AFY and up to 5,900 AFY in drought years of additional recycled water to Salinas Valley growers for crop irrigation;

- The Salinas Valley Groundwater Basin is in overdraft and the Project would reduce the volume of water pumped from Salinas Valley aquifers;

- The Project would increase water supply reliability and drought resistance;

- The Project would maximize the use of recycled water in compliance with the state Recycled Water Policy;

- The Project would reduce pollutant loads from agricultural areas to sensitive environmental areas including the Salinas River and Monterey Bay.

E. **Record of Proceedings**

Various documents and other materials constitute the record upon which the Board bases these findings and the approvals contained herein. The location and custodian of these documents and materials is: Mike McCullough, Governmental Affairs Administrator, Monterey Regional Water Pollution Control Agency, 5 Harris Court, Building D, Monterey, CA 93940.

F. **Mitigation Monitoring and Reporting Program**

In accordance with CEQA and the CEQA Guidelines, the Board must adopt a mitigation monitoring program to ensure that the mitigation measures adopted herein are implemented. The Board hereby adopts the Mitigation Monitoring and Reporting Program for the Project attached to these findings as Exhibit B.

G. **Summary**

1. Based on the foregoing findings and the information contained in the administrative record, the Board has made one or more of the following findings with respect to each of the significant environmental effects of the Project identified in the Final EIR:

a. Changes or alterations have been required in, or incorporated into, the Project which avoid or substantially lessen the significant environmental effects on the environment.

b. Those changes or alterations that are wholly or partially within the responsibility and jurisdiction of another public agency have been, or can and should be, adopted by that other public agency.

c. Specific economic, social, technological, or other considerations make infeasible the mitigation measures or alternatives identified in the Final EIR that would otherwise avoid or substantially lessen the identified significant environmental effects of the Project.

2. Based on the foregoing findings and information contained in the record, it is hereby determined that:

a. All significant effects on the environment due to approval of the Project have been eliminated or substantially lessened where feasible.

b. Any remaining significant effects on the environment found unavoidable are acceptable due to the factors described in the Statement of Overriding Considerations in Section II.D. above.

III. PROJECT APPROVAL

1. The Board hereby approves the Project as modified by the Alternative Monterey Pipeline, and the Board hereby selects the RUWAP Alignment Option for the Product Water Conveyance pipeline and booster pump station.

2. The Board hereby authorizes staff to proceed immediately with obtaining necessary agreements, permits, funding and financing, and approvals to construct and operate any or all of the following Project components, including applying to the State Water Resources Control Board for financing provided by the Clean Water State Revolving Fund Loan program or other grant and loan programs:

a. Diversion and use of the following Source Waters: unused treated wastewater from the MRWPCA Regional Treatment Plant; agricultural wash water from the Salinas Treatment Facility; Salinas Treatment Facility pond storage and recovery; City of Salinas urban runoff; Reclamation Ditch; Tembladero Slough; Blanco Drain; and Lake El Estero.[2]

b. Treatment Facilities at the Regional Treatment Plant including a new AWT Facility and Salinas Valley Reclamation Plant modifications.

c. Product Water Conveyance RUWAP Alignment Option including a pipeline and booster pump station.

d. Injection Well Facilities including injection wells, back-flush facilities, monitoring wells, and electrical power supply facilities, driveways, motor control and instrumentation buildings for the injection wells and back-flush operations .

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[2] Although Tembladero Slough and Lake El Estero source water diversions are included as a component of the Project in this Project approval, the MRWPCA and their partner agency may not include these facilities in the initial phase of the Project, in particular they may not be included in permit applications, loan applications, and/or grant applications. There would be no effect on Project yields due to elimination of the Lake El Estero source water diversion due to the amount and timing of water available from this source. The effect of not implementing the Tembladero Slough diversion would be a reduction in the crop irrigation water yield for the Castroville Seawater Intrusion Project (CSIP) of approximately 500 to 750 acre feet per year (AFY) within some drought years. Based on source water analysis in the EIR, the Project would be expected to achieve a CSIP crop irrigation additional yield of 4,750 to 4,950 AFY and, although less frequently, up to 5,292 AFY in drought years.

e. All necessary infrastructure, construction equipment, construction staging and lay down areas, mitigation, and other activities needed to carry out the Project, with the exception of the Alternative Monterey Pipeline, which would be constructed by CalAm and is not within the control of the MRWPCA.

PASSED AND ADOPTED by the Board of Directors of the Monterey Regional Water Pollution Control Agency at a Special Board Meeting duly held on October 8, 2015 by the following votes:

AYES: De La Rosa, Fischer, Grier, Stefani, Phillips, Allion, Le, Downey, Pendergrass, and Rubio

NOES: None

ABSENT: Razzeca

Gloria De La Rosa

Gloria De La Rosa, Chair
MRWPCA Board of Directors

ATTEST:

Paul Sciuto, General Manager
Secretary to Board of Directors

CERTIFICATION

I, Paul Sciuto, Secretary of the Board of Directors of the Monterey Regional Water Pollution Control Agency, hereby certify the foregoing to be a full, true and correct copy of the record of the action taken by the said Board of Directors, and of the resolution adopted by said Board, by vote of the members present at its meeting of October 8, 2015, as the same appears in the Official Minutes of said Board.

Paul Sciuto, General Manager/Secretary

Exhibit A.
Summary of Impacts and Mitigation Measures for the Staff-Recommended Alternative DRAFT

Impact Statement	Source Water Diversion and Storage Sites						Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
	Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero						
KEY TO ACRONYMS: NI – No Impact; LS – Less than Significant; LSM – Less than Significant with Mitigation; SU – Significant and Unavoidable; BI- Beneficial Impact												
Aesthetics (AE)												
AE-1: Construction Impacts on Scenic Views, Scenic Resources and Visual Quality of the Surrounding Areas. Project construction would not result in substantial effects on scenic views, scenic resources or the visual character of the areas surrounding Project facilities.	LS	NI	LS	LS	NI	LS	NI	LS	LS	LS	**LS**	None required.
AE-2: Construction Impacts due to Temporary Light and Glare. Project construction could result in substantial, temporary sources of light or glare.	LS	NI	NI	NI	LS	LS	LS	NI	LSM	LSM	**LSM**	**Mitigation Measure AE-2**: Minimize Construction Nighttime Lighting. (Applies to the Injection Well Facilities Site and CalAm Distribution System: Alternative Monterey Pipeline). 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.
AE-3: Degradation of Visual Quality of Sites and Surrounding Areas. Project components would not result in a substantial degradation of the visual character of the project area and its surroundings.	LS	LS	LS	LS	LS	LS	LS	LS	LS	NI	**LS**	The following mitigation measure will be adopted by the MRWPCA due to City of Seaside comments on the Draft EIR and Notice of Preparation: **Mitigation Measure AE-3: Provide Aesthetic Screening for New Above-Ground Structures.** (Applies to the following project components: Product Water Conveyance: RUWAP Booster Pump Station and Injection Well Facilities). 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.
AE-4: Impacts due to Permanent Light and Glare during Operations. Operation of Project facilities may result in a substantial new source of light or glare that would adversely affect day or nighttime views in the area.	NI	NI	NI	NI	NI	NI	LS	LSM	LSM	NI	**LSM**	**Mitigation Measure AE-4**: Exterior Lighting Minimization. (Applies to the following project components: Product Water Conveyance: RUWAP Booster Pump Station and Injection Well Facilities) To prevent exterior lighting from affecting nighttime views, the design and operation of lighting at the Product Water Conveyance RUWAP 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.
Air Quality and Greenhouse Gas (AQ)												
AQ-1: Construction Criteria Pollutant Emissions. Construction of the Project would result in emissions of criteria pollutants, specifically PM_{10}, that may conflict with or obstruct implementation of the applicable air quality plan and may violate an air quality standard or contribute substantially to an existing or projected air quality violation in a region that is non-attainment under State ambient air quality standards.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LSM**[1]	**Mitigation Measure AQ-1**: Construction Fugitive Dust Control Plan. (Applies to all Project Component Sites where ground disturbance would occur.) 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 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

[1] Under Impact AQ-1, the implementation of each component when looked at individually would not a have a significant impact; it is only when all components are implemented together (with overlapping construction schedules) that a significant impact would occur triggering Mitigation Measures to reduce the impact to less than significant (LS).

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
KEY TO ACRONYMS: NI – No Impact; LS – Less than Significant; LSM – Less than Significant with Mitigation; SU – Significant and Unavoidable; BI- Beneficial Impact												
												and take corrective action within 48 hours. The phone number of the MBUAPCD shall also be visible to ensure compliance with MBUAPCD rules.
AQ-2: Construction Exposure of Sensitive Receptors to Pollutant Emissions. Construction of the Project would not expose sensitive receptors to substantial pollutant concentrations.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-3: Construction Odors. Construction of the Project would not create objectionable odors affecting a substantial number of people.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-4C: Construction Greenhouse Gas Emissions. Construction of the Project would generate greenhouse gas emissions, either directly or indirectly, but would not make a considerable contribution to significant cumulative impacts due to greenhouse gas emissions and the related global climate change impacts.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-5: Operational Air Quality Violation. Operation of the Project would result in criteria pollutant emissions, but would not violate air quality standards or contribute substantially to an existing or projected air quality violation.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-6: Operational Criteria Pollutant Emissions. Operation of the Project would result in a net increase of criteria pollutants in a region that is non-attainment under State ambient air quality standards, but the increase would not be cumulatively considerable.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-7: Operational Exposure of Sensitive Receptors to Pollutants. Operation of the Project would not expose sensitive receptors to substantial pollutant concentrations.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
AQ-8: Operational Odors. Operation of the Project would not create objectionable odors affecting a substantial number of people.	LS	LS	LS	LS	LS	NI	LS	NI	NI	NI	**LS**	None required.
AQ-9C: Operational Greenhouse Gas Emissions. Operation of the Project would generate greenhouse gas emissions, either directly or indirectly. These emissions would not exceed significance thresholds such that they would result in a considerable contribution to significant cumulative impacts of greenhouse gas emissions and the related global climate change impacts. In addition, the Project would not conflict with applicable plan, policy or regulation adopted for the purpose of reducing greenhouse gas emissions.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

Impact Statement	Source Water Diversion and Storage Sites						Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
	Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero						
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Biological Resources: Fisheries (BF)												
BF-1: Habitat Modification Due to Construction of Diversion Facilities. Construction of the proposed Reclamation Ditch and Tembladero Slough diversions could indirectly result in habitat modifications for endangered or threatened fish species as a result of construction activities and dewatering the construction sites.	NI	NI	LSM	LSM	LS	NI	NI	NI	NI	NI	**LSM**	**Mitigation Measure BT-1a** (see text after this table under Mitigation Measures for Impact BT-1: Construction Impacts to Special-Status Species and Habitat) **Mitigation Measure BF-1a**: Construction during Low Flow Season. (Applies to Blanco Drain[2], Reclamation Ditch and Tembladero Slough Diversions) 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. **Mitigation Measure BF-1b:** Relocation of Aquatic Species during Construction. (Applies to Reclamation Ditch and Tembladero Slough Diversions). 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. **Mitigation Measure BF-1c:** Tidewater Goby and Steelhead Impact Avoidance and Minimization. (Applies to Reclamation Ditch and Tembladero Slough Diversions) 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. • 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.
BF-2: Interference with Fish Migration. Operation of the Project would result in changes in stream flows that may interfere with fish migration in the Salinas River and Reclamation Ditch.	LS	LS	LSM	LS	LS	NI	NI	NI	NI	NI	**LSM**	**Mitigation Measure BF-2a:** Maintain Migration Flows. (Applies to the Reclamation Ditch Diversion) 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

[2] Although Impact BF-1 was found to be less than significant due to the construction of the Blanco Drain Source Water Diversion, this mitigation measure will be implemented for construction of the pipeline under Salinas River under the Blanco Drain component of the Project based on comments from the State Lands Commission (see comment and response to comment D-3 in Chapter 4 of the Final EIR document).

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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												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.* *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. (Applies to the Reclamation Ditch Diversion) 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.
BF-3: Reduction in Fish Habitat or Fish Populations Due to Project Operations. Operation of the Project diversions would not reduce the habitat of a fish species or substantially affect fish populations.	LS	LS	LS	LS	LS	NI	NI	NI	NI	NI	**LS**	None required.
Biological Resources: Terrestrial (BT)												
BT-1: Construction Impacts to Special-Status Species and Habitat. Project construction may adversely affect, either directly or through habitat modification, special-status plant and wildlife species and their habitat within the Project Study Area.	LSM	LSM	LSM	LSM	LSM	LSM	NI	LSM	LSM	LSM	**LSM**	See complete text of Mitigation Measures BT-1a through BT-1q and their applicability to each component in the text following this table.
BT-2: Construction Impacts to Sensitive Habitats. Project construction may adversely affect sensitive habitats (including riparian, wetlands, and/or other sensitive natural communities) within the Project Study Area.	NI	NI	LSM	LSM	LSM	NI	NI	LS	LS	LS	**LSM**	**Mitigation Measure BT-1a** (see text after this table under Mitigation Measures for Impact BT-1: Construction Impacts to Special-Status Species and Habitat) **Mitigation Measure BT-2a**: Avoidance and Minimization of Impacts to Riparian Habitat and Wetland Habitats. (Applies to Reclamation Ditch, Tembladero Slough Diversion, Blanco Drain Diversion) 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. **Mitigation Measure BT-2b:** Not required for Project Staff-Recommended Alternative (selection of RUWAP Alignment Option and Alternative Monterey Pipeline) **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

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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												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.
BT-3: Construction Impacts to Movement of Native Wildlife and Native Wildlife Nursery Sites. Project construction would not adversely affect native wildlife corridors and wildlife nursery sites.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
BT-4: Construction Conflicts with Local Policies, Ordinances, or Approved Habitat Conservation Plan. Project construction would potentially conflict with local policies or ordinances protecting biological resources. A conflict may occur if the HMP plant species within the Project component sites on the former Fort Ord that do not require a take authorization from the Service or CDFW are impacted, and seed salvage is not conducted. There are no approved HCPs applicable to the Project.	LS	LS	LS	LS	LS	LS	LS	LSM	LSM	LS	**LSM**	**Mitigation Measure BT-4**. HMP Plant Species Salvage. (Applies to Product Water Conveyance: RUWAP Alignment, and Injection Well Facilities site within the former Fort Ord only) 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.
BT-5: Operational Impacts to Special-Status Species. Project operations would not adversely affect, either directly or through habitat modification, special-status plant and wildlife species and their habitat.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
BT-6: Operational Impacts to Sensitive Habitats. Project operations may adversely affect sensitive habitats (including riparian, wetlands, and/or other sensitive natural communities) within and adjacent to the Project Study Area.	LS	LS	LS	LS	LS	LS	NI	LS	LS	LS	**LS**	None required.
BT-7: Operational Impacts to Movement of Native Wildlife and to Native Wildlife Nursery Sites. Project operations would not adversely affect native wildlife corridors and wildlife nursery sites.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
BT-8: Operational Conflicts with Local Policies, Ordinances, or approved Habitat Conservation Plan. Project operations would not conflict with local policies or ordinances protecting biological resources.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

Impact Statement	Source Water Diversion and Storage Sites						Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
	Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero						
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Cultural and Paleontological Resources (CR)												
CR-1: Construction Impacts on Historic Resources. Project construction may result in a substantial adverse change in the significance of a known historic resource as defined in 15064.5 of the CEQA Guidelines or historic properties pursuant to 36 CFR 800.5.	NI	NI	NI	NI	NI	NI	NI	NI	NI	LSM	**LSM**	**Mitigation Measure CR-1**: 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)[3] 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 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.
CR-2: Construction Impacts on Archaeological Resources or Human Remains. Project construction may result in a substantial adverse change in the significance of one known archaeological resource and to unknown archaeological resources during construction and/or encounter unknown human remains.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	**Mitigation Measure CR-2a**: Archaeological Monitoring Plan. (Applies to the segment of the CalAm Distribution Pipeline through the Presidio of Monterey and along W. Franklin Street and to the Lake El Estero Diversion Site) 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.[4] 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 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.

[3] Note: The Staff-Recommendation Alternative of the GWR Project required that this mitigation measure be modified compared to the version in the Final EIR. Specifically, the text highlighted in gray has been added and the following text deleted: "W. Franklin Street in downtown Monterey." This change to the mitigation measure does not constitute significant new information.
[4] Note: The Staff-Recommendation Alternative of the GWR Project requires that this mitigation measure be modified compared to the version in the Final EIR. Specifically, the text highlighted in gray has been added and the following text deleted: "in downtown Monterey on W. Franklin Street between High and Figueroa Streets, and at potentially sensitive archaeological sites at Lake El Estero."

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												Mitigation Measure CR-2b: Discovery of Archaeological Resources or Human Remains. (Applies to all Project components) 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. **Mitigation Measure CR-2c**: Native American Notification. (Applies to all Project components) 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.
CR-3: Construction Impacts on Unknown Paleontological Resources. Project construction would not result in damage to or destruction of unknown paleontological resources.	LS	LS	NI	NI	NI	NI	LS	NI	NI	LS	**LS**	None required.
Energy and Mineral Resources (EN)												
EN-1: Construction Impacts due to Temporary Energy Use. Project construction could result in wasteful or inefficient use of energy if construction equipment is not maintained or if haul trips are not planned efficiently. The Project would not conflict with existing energy standards.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	**Mitigation Measure EN-1**: Construction Equipment Efficiency Plan. (Applies to all Project components) 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.
EN-2: Operational Impacts due to Energy Use. Project operations would not result in the consumption of energy such that existing supplies would be substantially constrained nor would the Project result in the unnecessary, wasteful, or inefficient use of energy resources.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
EN-3: Operational Impacts on Mineral Resources. The Project would not result in a significant impact due to the loss of availability of known mineral resources of value to the region or to the state or to any locally-important mineral recovery site.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Geology, Soils, and Seismicity (GS)												
GS-1: Construction-Related Erosion or Loss of Topsoil. Construction of the Project would not result in substantial soil erosion or the loss of topsoil.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
GS-2: Construction-Related Soil Collapse and Soil Constraints during Pipeline Trenching. Construction of some Project pipeline components would be located on geologic units or soils that are unstable, or that may become unstable during project construction, and potentially result in soil instability or collapse; however, this exposure would not result in a substantial risk to people or structures.	LS	LS	NI	NI	LS	LS	NI	LS	LS	LS	**LS**	None required.
GS-3: Exposure to Fault Rupture. The Project would be located in a seismically active area, and portions of the Project may be affected by fault rupture from an earthquake on local faults; however, this exposure would not result in a substantial risk to people or structures.	NI	NI	NI	NI	NI	NI	NI	NI	NI	LS	**LS**	None required.
GS-4: Exposure to Seismic Ground Shaking and Liquefaction. The Project would be located in a seismically active area; however, Project operations would not expose people or structures to a substantial	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Source Water Diversion and Storage Sites: Salinas Treatment Facility Storage and Recovery	Source Water Diversion and Storage Sites: Reclamation Ditch	Source Water Diversion and Storage Sites: Tembladero Slough	Source Water Diversion and Storage Sites: Blanco Drain (Pump Station and Pipeline)	Source Water Diversion and Storage Sites: Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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risk of loss, injury, or death involving exposure to seismic groundshaking and liquefaction.												
GS-5: Exposure to Coastal Erosion and Sea Level Rise. The Proposed CalAm Distribution System Monterey Pipeline would be exposed to substantial soil erosion as a result of sea level rise.	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	**NI**	None required. This impact would only be significant for the proposed Monterey Pipeline. Because the staff-recommended alternative includes the Alternative Monterey Pipeline and not the proposed Monterey Pipeline, this impact would not occur and no mitigation is required.
GS-6: Hydro-Collapse of Soils from Well Injection. Project operation would not create a substantial risk to life or property due to its facilities being located on a geologic unit or soils that are unstable, or that would become unstable as a result of hydro-collapse.	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	**LS**	None required.
GS-7: Exposure to Expansive and Corrosive Soils. The Project would not result in substantial risks to the public or other facilities due to location on expansive or corrosive soil types.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Hazards and Hazardous Materials (HH)												
HH-1: Use and Disposal of Hazardous Materials During Construction. Project construction would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HH-2: Accidental Release of Hazardous Materials During Construction. Project construction would potentially cause upset and accident conditions involving the release of hazardous materials into the environment.	LS	LS	LS	LS	LS	LSM	LS	LSM	LSM	LSM	**LSM**	**Mitigation Measure HH-2a**: Environmental Site Assessment. (Applies to the Lake El Estero Diversion, Product Water Conveyance: RUWAP Alignment, Injection Well Facilities and the CalAm Distribution System) 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. **Mitigation Measure HH-2b**: Health and Safety Plan. (Applies to the Lake El Estero Diversion, Product Water Conveyance RUWAP Alignment, the Injection Well Facilities, and the CalAm Distribution System) 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. **Mitigation Measure HH-2c**: Materials and Dewatering Disposal Plan. (Applies to the Lake El Estero Diversion, Product Water Conveyance System Options, the Injection Well Facilities, and the CalAm Distribution System) 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

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												appropriate offsite disposal or discharge (see Section 4.11, Hydrology and Water Quality: Surface Water, for more information regarding this NPDES permit). 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.
HH-3: Construction of Facilities on Known Hazardous Materials Site. Project construction would occur on a known hazardous materials site pursuant to Government Code Section 65962.5; however, the Project would not result in a significant hazard to people or the environment.	NI	NI	NI	NI	NI	NI	NI	LS	LS	LS	**LS**	None required.
HH-4: Use of Hazardous Materials During Construction Within 0.25-Miles of Schools. Project construction would not result in nor create a significant hazard to the public or the environment due to handling of hazardous materials or hazardous emissions within 0.25 mile of a school during construction.	NI	NI	NI	NI	NI	NI	LS	LS	LS	NI	**LS**	None required.
HH-5: Wildland Fire Hazard during Construction. Project construction would not increase the risk of wildland fires in high fire hazard areas.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HH-6: Use and Disposal of Hazardous Materials During Operation. Project operations would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HH-7: Operation of Facilities on Known Hazardous Materials Site. Project facilities would be located on a known hazardous materials site; however, the Project would not result in a significant hazard to people or the environment.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Hydrology and Water Quality: Groundwater (GW)												
GW-1: Construction Groundwater Depletion, Levels, and Recharge. Construction of the Project components would not deplete groundwater supplies nor interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of local groundwater levels.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
GW-2: Construction Groundwater Quality. Project construction would not violate any water quality standards or otherwise degrade water quality.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
GW-3: Operational Groundwater Depletion and Levels: Salinas Valley Groundwater Basin. Operation of the Project would not deplete groundwater supplies in the Salinas Valley nor interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater levels in the Salinas Valley Groundwater Basin.	LS	LS	LS	LS	NI	NI	BI	NI	NI	NI	**BI**	None required.
GW-4: Operational Groundwater Depletion and Levels: Seaside Basin. Operation of the Project would not deplete groundwater supplies in the Seaside Basin nor interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater levels in the Seaside Basin.	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	**LS**	None required.

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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GW-5: Operational Groundwater Quality: Salinas Valley. Operation of the Project would not degrade groundwater quality in the Salinas Valley.	BI	BI	LS	LS	LS	NI	BI	NI	NI	NI	**BI**	None required.
GW-6: Operational Groundwater Quality: Seaside Basin. Project operations would not degrade groundwater quality in the Seaside Basin, including due to injection of purified recycled water into the basin.	NI	NI	NI	NI	NI	NI	BI/ LS[4]	NI	BI/ LS[4]	NI	**BI/ LS[5]**	None required.
Hydrology and Water Quality: Surface Water (HS)												
HS-1: Construction Impacts to Surface Water Quality due to Discharges. Project construction involving well drilling and development, and dewatering of shallow groundwater during excavation would generate water requiring disposal. Compliance with existing regulatory requirements would ensure that water disposal during construction would not violate any water quality standards or waste discharge requirements, would not cause substantial erosion or siltation, and would not otherwise substantially degrade surface water quality.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HS-2: Construction Impacts to Surface Water Quality due to Earthmoving, Drainage Alterations, and Use of Hazardous Chemicals. Project construction would not violate any water quality standards or waste discharge requirements, would not cause substantial erosion or siltation, and would not otherwise substantially degrade surface water quality including marine water quality, due to earthmoving, drainage system alterations, and use of hazardous chemicals.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HS-3: Operational Impacts to Surface Water Quality due to Well Maintenance Discharges. Project operations would not violate any water quality standards or waste discharge requirements, would not cause substantial erosion or siltation, and would not otherwise substantially degrade surface water quality due to well maintenance discharges.	NI	NI	NI	NI	NI	NI	NI	NI	LS	NI	**LS**	None required.
HS-4: Operational Surface Water Quality Impacts due to Source Water Diversions. Project diversions would result in water quality benefits due to diversion and treatment of polluted waters; however, rapid water fluctuation from diversions at the Reclamation Ditch could induce erosion and sedimentation in downstream waters.	LS	LS	LSM	LS	LS	LS	NI	NI	NI	NI	**LSM**	**Mitigation Measure HS-4**: Management of Surface Water Diversion Operations (Applies to Reclamation Ditch Diversion, only) 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 are noted, the diversion structure shall be redesigned and the project proponents shall modify it in accordance with the new design.

[5] For concentrations of total dissolved solids and chloride, the impact would be beneficial; for all other water quality parameters, the impact would be less than significant.

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HS-5: Operational Marine Water Quality due to Ocean Discharges. Project operational discharges of reverse osmosis concentrate to the ocean through the MRWPCA outfall would not violate water quality standards or waste discharge requirements, or otherwise substantially degrade water quality.	BI	BI	BI	BI	BI	BI	LS	NI	NI	NI	**LS**	None required.
HS-6: Operational Drainage Pattern Alterations. The Project would alter existing drainage patterns of the component sites by increasing impervious surfaces, but would not substantially increase the rate or amount of runoff such that it would: (1) cause erosion or siltation on- or off-site, (2) cause flooding on- or offsite, or (3) exceed the existing storm drainage system capacity.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
HS-7: Operational Carmel River Flows. Project operations would result in reduced pumping of the Carmel River alluvial aquifer resulting in increased flows in Carmel River that would benefit habitat for aquatic and terrestrial species.	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	**BI**	None required.
HS-8: Operational Risks due to Location within 100-Year Flood Area. Portions of the Project would be located within a 100-year flood hazard area but would not impede or redirect flood flows.	LS	LS	LS	LS	LS	LS	NI	LS	LS	NI	**LS**	None required.
HS-9: Operational Risks due to Flooding due to Levee/Dam Failure, or Coastal Inundation. During operations, some Project facilities may be exposed to flooding due to failure of a levee or dam, sea level rise, and storm surges/tides related to climate change, but this exposure would not pose a substantial nor significant risk of loss, injury, or death.	LS	LS	NI	LS	LS	LS	NI	NI	NI	LS	**LS**	None required.
HS-10: Operational Seiche, Tsunami, or Mudflow Risk. The Project operations would not expose people or structures to substantial risk from flooding due to a seiche, tsunami, or mudflow.	NI	NI	NI	LS	LS	LS	NI	NI	NI	LS	**LS**	None required.
Land Use, Agriculture, and Forest Resources (LU)												
LU-1: Temporary Farmland Conversion during Construction. The Project would result in a temporary disruption to agricultural production on designated prime, unique and statewide important farmlands during construction, but would not directly or indirectly convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to a non-agricultural use.	NI	LSM	NI	NI	LSM	NI	NI	LS	NI	NI	**LSM**	**Mitigation Measure LU-1**: Minimize Disturbance to Farmland. (Applies to the Salinas Treatment Facility and a portion of the Blanco Drain Diversion) 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.
LU-2: Operational Consistency with Plans, Policies, and Regulations. The Project would have one or more components that would potentially conflict, or be inconsistent with, applicable land use plans, policies, and regulations without implementation of mitigation measures identified in this EIR.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	See other applicable mitigation measures in this table by component. See also, Table 4.12-4 of the Draft EIR for a complete list of mitigation measures by policy and topic.
LU-3: Operational Indirect Farmland Conversion. The Project would not change the existing environment such that Prime Farmland, Unique Farmland, or Farmland of Statewide Importance is converted to non-	LS	LS	LS	LS	LS	LS	LS	NI	NI	NI	**LS**	None required.

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Source Water Diversion and Storage Sites: Salinas Treatment Facility Storage and Recovery	Source Water Diversion and Storage Sites: Reclamation Ditch	Source Water Diversion and Storage Sites: Tembladero Slough	Source Water Diversion and Storage Sites: Blanco Drain (Pump Station and Pipeline)	Source Water Diversion and Storage Sites: Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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agricultural use.												
Marine Biological Resources (MR)												
MR-1: Operational Impacts on Marine Biological Resources. Operation of the Project would not result in substantial adverse effects on candidate, sensitive, or special-status species and would not interfere substantially with the movement of any native resident or migratory fish or wildlife species.	BI	BI	BI	BI	BI	BI	LS	NI	NI	NI	**LS**	None required.
Noise and Vibration (NV)												
NV-1: Construction Noise. Construction activity would result in a temporary increase in ambient noise levels in the vicinity of all Project sites during construction that would not be substantial at most construction sites, except at the Injection Well Facilities and CalAm Distribution System: Improvements: Alternative Monterey Pipeline sites.	LS	LS	LS	LS	LS	LS	LS	LS	LSM	SU	**SU**	**Mitigation Measure NV-1a**: Drilling Contractor Noise Measures. (Applies to Injection Well Facilities) 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 at 50 feet. This would reduce the nighttime noise level to less than 60 dBA Leq 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. **Mitigation Measure NV-1b**: Monterey Pipeline Noise Control Plan for Nighttime Pipeline Construction. (Applies to CalAm Distribution System: Alternative Monterey Pipeline) 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. **Mitigation Measure NV-1c**: Neighborhood Notice. (Applies to Injection Well Facilities and CalAm Distribution System: Alternative Monterey Pipeline) 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. **Mitigation Measure NV-1d:** RUWAP Pipeline Construction Noise. (Applies to the RUWAP Alignment Option of the Product Water Conveyance) The following measures will be implemented by the project proponents in response to comments from the Marina Coast Water District if the RUWAP alignment option of the Product Water Conveyance Pipeline is selected for implementation. • 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.

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Source Water Diversion and Storage Sites: Salinas Treatment Facility Storage and Recovery	Source Water Diversion and Storage Sites: Reclamation Ditch	Source Water Diversion and Storage Sites: Tembladero Slough	Source Water Diversion and Storage Sites: Blanco Drain (Pump Station and Pipeline)	Source Water Diversion and Storage Sites: Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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NV-2: Construction Noise That Exceeds or Violate Local Standards. Construction activity would result in a temporary increase that at some locations could generate noise levels in excess of standards established in the local general plans and/or could violate local regulations.	NI	NI	LSM	SU	LSM	NI	NI	LSM	NI	NI	**SU**	**Mitigation Measure NV-2a**: Construction Equipment. (Applies to Source Water Diversion and Storage Sites – Reclamation Ditch, Tembladero Slough and Blanco Drain, Product Water Conveyance Pipeline segments within the City of Marina and RUWAP Booster Station) 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, **Mitigation Measure NV-2b:** Construction Hours. (Applies to Product Water Conveyance Pipelines and Booster Pump Station in the City of Marina). 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.
NV-3: Construction Vibration. Construction of the Project would not expose sensitive receptors to excessive groundborne vibration.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
NV-4: Operational Noise. Operation of the Project facilities would potentially increase existing noise levels, but would not exceed noise level standards and/or result in nuisance impacts at sensitive receptors.	NI	LS	LS	LS	LS	LS	LS	LS	LS	NI	**LS**	None required.
Population and Housing (PH)												
PH-1: Construction-Related Growth Inducement. Project construction would result in temporary increases in construction employment, but would not induce substantial population growth.	-	-	-	-	-	-	-	-	-	-	**LS**	None required.
PH-2: Operations and Infrastructure-Related Growth Inducement. Operation of the Project would not directly result in population growth, and would not indirectly result in inducement of substantial population growth.	-	-	-	-	-	-	-	-	-	-	**LS**	None required.
Public Services, Utilities, and Recreation (PS)												
PS-1: Construction Public Services Demand. Construction of the Project would not result in public service demands for fire and police protection services, schools, or parks that would result in the need for new or physically altered facilities to maintain service capacity or performance objectives.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Source Water Diversion and Storage Sites: Salinas Treatment Facility Storage and Recovery	Source Water Diversion and Storage Sites: Reclamation Ditch	Source Water Diversion and Storage Sites: Tembladero Slough	Source Water Diversion and Storage Sites: Blanco Drain (Pump Station and Pipeline)	Source Water Diversion and Storage Sites: Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
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PS-2: Construction Landfill Capacity. Construction of the Project would result in generation of solid waste; however, the solid waste would be disposed at a landfill with sufficient permitted daily and overall capacity to accommodate the project's solid waste disposal needs.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
PS-3: Construction Solid Waste Policies and Regulations. Construction of the Project would potentially conflict with state and local statutes, policies and regulations related to solid waste.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	**Mitigation Measure PS-3**: Construction Waste Reduction and Recycling Plan (relevant to all Project components). 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, MRWPCA and CalAm shall collect the receipts from the contractor(s) to document that the waste reduction, recycling, and diversion goals have been met.
PS-4: Public Services Demand During Operation. Operation of the Project would not result in public service demands for fire and police protection services, schools, or parks that would result in the need for new or physically altered facilities to maintain service capacity or performance objectives.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
PS-5: Landfill Capacity for Operations. Operation of the Project would not result in adverse effects on landfill capacity or be out of compliance with federal, state, and local statutes and regulations related to solid waste.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Traffic and Transportation (TR)												
TR-1: Construction Traffic. Project construction would result in a temporary increase in traffic volumes on regional and local roadways due to construction-related vehicle trips, which would not result in conflicts with any applicable plan, ordinance, or policy establishing measures of effectiveness for performance of the circulation system.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
TR-2: Construction-Related Traffic Delays, Safety and Access Limitations. Construction activities could result in temporary traffic delays, safety hazards, and/or disruption of access.	LS	LS	LS	LS	LS	NI	LS	LSM	NI	LSM	**LSM**	**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 (Alternative 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

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
KEY TO ACRONYMS: NI – No Impact; LS – Less than Significant; LSM – Less than Significant with Mitigation; SU – Significant and Unavoidable; BI- Beneficial Impact												
												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 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.
TR-3: Construction-Related Roadway Deterioration. Construction truck trips could result in increased wear-and-tear on the designated haul routes, which could result in temporary impacts to performance of the regional circulation system.	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	LSM	**LSM**	**Mitigation Measure TR-3**: Roadway Rehabilitation Program (applies to all Project components) Prior to commencing project construction, MRWPCA (for all components other than the CalAm Distribution System Improvements) and CalAm (for CalAm Distribution System Improvements: Alternative Monterey Pipeline) 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.
TR-4: Construction Parking Interference. Construction activities may temporarily affect parking availability.	NI	NI	NI	NI	NI	LSM	NI	LSM	NI	LSM	**LSM**	**Mitigation Measure TR-4**: Construction Parking Requirements.(Applies to Product Water Conveyance: RUWAP Alignment in Marina and Seaside, and CalAm Distribution System: Alternative Monterey Pipeline). 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.
TR-5: Operational Traffic. Operation and maintenance of the Project would result in small traffic increases on regional and local roadways, but would not substantially affect the performance of the regional circulation system.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
Water Supply and Wastewater Systems (WW)												
WW-1: Construction-Related Water Demand. The Project would result in a temporary increase in water use due to construction-related demands, but existing water supplies would be sufficient to serve construction-related demands and construction activities would not require new or expanded water supply resources or entitlements.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.

Exhibit A (continued)

Impact Statement	Source Water Diversion and Storage Sites: Salinas Pump Station	Salinas Treatment Facility Storage and Recovery	Reclamation Ditch	Tembladero Slough	Blanco Drain (Pump Station and Pipeline)	Lake El Estero	Treatment Facilities at Regional Treatment Plant	Product Water Conveyance RUWAP Alignment Option	Injection Well Facilities	CalAm Distribution System: Alternative Monterey Pipeline	Project Overall	Mitigation Measures
KEY TO ACRONYMS: NI – No Impact; LS – Less than Significant; LSM – Less than Significant with Mitigation; SU – Significant and Unavoidable; BI- Beneficial Impact												
WW-2: Construction-Related Wastewater Generation. The Project would result in a temporary increase in wastewater generation due to demand from construction workers, but existing wastewater treatment facilities have sufficient capacity to serve construction-related demands.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
WW-3: Operational Water Supply and Entitlements. Sufficient water supplies are available for operation of the Project; prior to construction of each source water diversion component and prior to diversion of secondary treated effluent, the project proponents would obtain applicable water rights, permits, or agreements.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	**LS**	None required.
WW-4: Operational Wastewater Treatment Capacity. Operation of the Project would not result in a determination by the wastewater treatment provider that would serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments.	LS	LS	LS	LS	LS	LS	LS	LS	LS	NI	**LS**	None required.

Mitigation Measures for Impact BT-1: Construction Impacts to Special-Status Species and Habitat

Mitigation Measure BT-1a: Implement Construction Best Management Practices. (Applies to All Project Components) 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 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.

Mitigation Measure BT-1b: Implement Construction-Phase Monitoring. (Applies to Salinas Pump Station, Salinas Treatment Facility, Blanco Drain Diversion, Project Water Conveyance: RUWAP Alignment Option, Injection Well Facilities) 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.

Mitigation Measure BT-1c: Implement Non-Native, Invasive Species Controls. (Applies to All Project Components, except Alternative Monterey Pipeline) 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.

Mitigation Measure BT-1d: Conduct Pre-Construction Surveys for California Legless Lizard. (Applies to the Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, and Injection Well Facilities) 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 pre-construction 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.

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. (Applies to Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, and Injection Well Facilities; does not apply to HMP species within the former Fort Ord) 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.

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. (Applies to non-HMP species at 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:
    - 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 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.

Mitigation Measure BT-1g: Conduct Pre-Construction Surveys for Special-Status Bats. (Applies to Salinas Pump Station, Salinas Treatment Facility, Blanco Drain Diversion, Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, and Injection Well Facilities) 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.

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. (Applies to Blanco Drain Diversion, Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, Injection Well Facilities) 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.

Mitigation Measure BT-1i: Conduct Pre-Construction Surveys for Monterey Dusky-Footed Woodrat. (Applies to Blanco Drain Diversion, Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station, and Injection Well Facilities) 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.

Mitigation Measure BT-1j: Conduct Pre-Construction Surveys for American Badger. (Applies to Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station) 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 re-using 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.

Mitigation Measure BT-1k: Conduct Pre-Construction Surveys for Protected Avian Species, including, but not limited to, white-tailed kite and California horned lark. (Applies to All Components, except Alternative Monterey Pipeline) 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 pre-construction 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.

Mitigation Measure BT-1l: Conduct Pre-Construction Surveys for Burrowing Owl. (Applies to Product Water Conveyance: RUWAP Alignment Pipeline and Booster Pump Station) 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 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.

Mitigation Measure BT-1m: Minimize Effects of Nighttime Construction Lighting. (Applies to Injection Well Facilities and CalAm Distribution System: Alternative Monterey Pipeline) Nighttime construction lighting shall be focused and downward directed to preclude night illumination of the adjacent open space area.

*Because **Mitigation Measure BT-1n** (Mitigate Impacts to Smith's Blue Butterfly) was only applicable to the Product Water Conveyance: Coastal Alignment Option and the proposed CalAm Distribution System: Monterey Pipeline, and not the Alternative Monterey Pipeline; therefore, it is not required for the staff-recommended alternative.*

*Because **Mitigation Measure BT-1o** (Avoid and Minimize Impacts to Monarch Butterfly) was only applicable to the proposed CalAm Distribution System: Monterey Pipeline, and not the Alternative Monterey Pipeline; therefore, it is not required for the staff-recommended alternative.*

Mitigation Measure BT-1p: Avoid and Minimize Impacts to Western Pond Turtle. (Applies to Blanco Drain Diversion) 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.

Mitigation Measure BT-1q: Avoid and Minimize Impacts to California Red-Legged Frog. (Applies to Salinas Treatment Facility and Blanco Drain Diversion) 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 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 on-site 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.
- 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.

Exhibit A (continued)

Summary of Cumulative Impacts and Mitigation Measures – Staff-Recommended Alternative

#	Topical Section/ Cumulative Impact Issue		Determination of Significance and Discussion of Contribution of the Project to Cumulative Impacts (if applicable)	Mitigation Measures
4.2	Aesthetics		LS: There would be no significant cumulative construction or operational aesthetic impacts.	
4.3	Air Quality and Greenhouse Gas	Construction Greenhouse Gas Emissions	LS: The Project construction would not make a considerable contribution to significant cumulative impacts due to greenhouse gas emissions and the related global climate change impacts.	
		Overall Greenhouse Gas Emissions	LS: The Project would not make a considerable contribution to significant cumulative impacts of greenhouse gas emissions and the related global climate change impacts	
		Air Quality: Overall PM10	**LSM:** The Project would potentially make a considerable contribution to significant cumulative of regional emissions of PM_{10}; however, with implementation of Mitigation Measure AQ-1, the impact would be reduced to less than significant and the Project would not make a considerable contribution to a significant cumulative impact.	AQ-1 (see table above)
4.4	Biological Resources: Fisheries		LS: There would be no significant construction or operational cumulative impacts to biological resources: fisheries.	
4.5	Biological Resources: Terrestrial		LS: The Project would not make a considerable contribution to significant cumulative impacts to biological resources: terrestrial.	
4.6	Cultural and Paleontological Resources		LS: There would be no significant construction or operational cumulative impacts to cultural and paleontological resources.	
4.7	Energy and Mineral Resources	Energy	LS: The Project would not make a cumulatively considerable contribution to a significant cumulative energy impact.	
		Minerals	LS: There would be no significant construction or operational cumulative impacts to mineral resources.	
4.8	Geology, Soils, and Seismicity		LS: There would be no significant construction or operational cumulative geology, seismicity or soils impacts.	
4.9	Hazards and Hazardous Materials		LS: There would be no significant construction or operational cumulative impacts related to hazards or hazardous materials.	
4.10	Hydrology/Water Quality: Groundwater		LS: The Project would not contribute to significant cumulative impacts to groundwater levels, recharge, storage or quality in the Salinas Valley Groundwater Basin. There would be no significant construction or operational impact to groundwater levels, recharge or storage in the Seaside Groundwater Basin. The Project would not make a considerable contribution to cumulative impacts to groundwater quality in the Seaside Basin.	
4.11	Hydrology/Water Quality: Surface Water	Inland Surface Waters	LS: There would be no significant construction or operational cumulative impacts to hydrology and water quality of inland surface waters.	
		Marine Surface Waters	**LSM:** The Project would potentially make a considerable contribution to significant cumulative impacts to marine water quality due to the potential exceedance of the California Ocean Plan water quality objectives for several constituents; however, with implementation of Mitigation Measure HS-C, the impact would be reduced to less than significant and the Project would not make a considerable contribution to a significant cumulative impact.	HS-C (see full text following this table)
4.12	Land Use, Agriculture, and Forest Resources		LS: There would be no significant construction or operational cumulative land use impacts, and the Project would not make a considerable contribution to significant cumulative impacts related to conversion of agricultural lands within unincorporated Monterey County.	
4.13	Marine Biological Resources		LSM: The Project would potentially result in a considerable contribution to significant cumulative impacts on	MR-C

Exhibit A (continued)

Summary of Cumulative Impacts and Mitigation Measures – Staff-Recommended Alternative

#	Topical Section/ Cumulative Impact Issue		Determination of Significance and Discussion of Contribution of the Project to Cumulative Impacts (if applicable)	Mitigation Measures
			marine biological resources due to the potential exceedance of the Ocean Plan water quality objectives for several constituents; however, with implementation of Mitigation Measure MR-C, the impact would be reduced to less than significant and the Project would not make a considerable contribution to a significant cumulative impact.	(Implement HS-C, see full text following this table)
4.14	Noise and Vibration		LS: There would be no significant construction or operational cumulative noise and vibration impacts.	
4.15	Population and Housing		LS: The Project would not make a considerable contribution to significant cumulative impacts related to population and housing.	
4.16	Public Services, Recreation, and Utilities		LS: The Project would not contribute to cumulative impacts related to schools, parks, and recreational facilities. The Project would not make a considerable contribution to significant cumulative impacts to other public services and utilities (fire and police protection, solid waste).	
4.17	Traffic and Transportation		LS: There would be no significant cumulative construction-related traffic and transportation impacts. The Project would not make a considerable contribution to significant cumulative traffic and transportation impacts due to cumulative development.	
4.18	Water Supply and Wastewater Systems	Water Supply	LS: The Project would not make a considerable contribution to significant cumulative impacts to water supply.	
		Wastewater	LS: There would be no significant cumulative impacts on wastewater treatment capacity or ocean outfall disposal capacity.	

Mitigation Measure HS-C/MR-C: Implement Measures to Avoid Exceedances over Water Quality Objectives at the Edge of the Zone of Initial Dilution

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:

a. **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.

b. **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.

c. **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 (see MPWSP DEIR Chapter 3, Project Description) 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.

d. **Biologically Active Filtration at the Regional Treatment Plant**: As part of the AWT Facilities 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 mgd desalination plant). 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 mgd desalination plant). This optional component of the Project is described in the Draft EIR in **Chapter 2, Project Description** (see **Section 2.8.1.3**), would become a required process if the MPWSP with 6.4 mgd desalination plant is in operation and the other components of the mitigation do not achieve Ocean Plan compliance. The impacts of implementation of this portion of the mitigation measure are discussed in Sections 4.2 through 4.18 as a component of the proposed AWT Facility (within the "Treatment Facilities at the Regional Treatment Plant" component of the Project).

EXHIBIT B

FINAL DRAFT

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.

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[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.	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.

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	• Wheel washers shall be installed and used by truck operators at the exits of the construction sites to the AWT Facility site, the 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	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 Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	the species. • 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	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]
	protective fencing remains intact. 3. Protective fencing shall be placed prior to and during construction to keep construction equipment and personnel from impacting 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.	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]
	4. All non-native, invasive plant species shall be removed from disturbed areas prior to replanting.					
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	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

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	specifications, including, if appropriate, increased planting ratio to ensure the applicable success ratio. Specifically, seed shall be 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

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implemen-tation	Implemen-tation Responsi-bility[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.	Product Water Conveyance: RUWAP Pipeline Alignment	Prior to project construction	Construction contractor, MRWPCA, qualified	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]
	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 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.			biologist		
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	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

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	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. • 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	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 Implemen-tation	Implemen-tation Responsi-bility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	vibration to below the 0.12 inches per second (in/sec) peak particle velocity vibration PPV) threshold. If CalAm determines that the pipeline 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.	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]
	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 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	Lake El Estero Diversion, Product Water Conveyance RUWAP Pipeline	Prior to project construction	Construction contactors	During project construction	MRWPCA, CalAm, Monterey County Dept. of Environmental

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	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.	Alignment , the Injection Well Facilities, and the CalAm Distribution System: Alternative Monterey Pipeline				Health
	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	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]
	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). • ***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,	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	See other lines for responsibilities for each	See other rows for specific timing of	See other rows for responsibilities for each mitigation measure

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
Policies, and Regulations			measure	mitigation measure	each mitigation measure	
Cumulative impacts to marine biological resources	**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 (specifically, the MPWSP with 6.4 mgd desalination plant)	Prior to operation of 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)
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

Exhibit B.
Mitigation Monitoring and Reporting Program – Pure Water Monterey Groundwater Replenishment Project: Staff-Recommended Alternative

Impacts	Mitigation Measures	Applicable Components	Timing of Implementation	Implementation Responsibility[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	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]
	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, 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	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 Implementation	Implementation Responsibility[1]	Timing of Monitoring	Responsibility for Compliance Monitoring[1]
	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 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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6. Notice of Determination and Receipts

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REC'D DEC 10 2015

Notice of Determination

To:

☒ Office of Planning and Research

U.S. Mail: P.O. Box 3044, Sacramento, CA 95812-3044

Street Address: 1400 Tenth St. Rm 113, Sacramento, CA 95814

☒ County Clerk

County of: Monterey

Address: 168 W. Alisal Street, 1st Floor, Salinas, CA 93901

From:

Public Agency: Monterey Regional Water Pollution Control Agency

Address: 5 Harris Court, Building D, Monterey, CA 93940

Contact: Leara Sampson, MRWPCA

Phone: 831-645-4650

Lead Agency: Same as above.

FILED OCT 08 2015 STEPHEN L. VAGNINI MONTEREY COUNTY CLERK DEPUTY

2015-0108

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number (if submitted to State Clearinghouse): SCH#2013051094

Project Title: Pure Water Monterey/Groundwater Replenishment Project (GWR Project)

Project Applicant: Monterey Regional Water Pollution Control Agency (MRWPCA)

Project Location (include county): Northern Monterey County (*See also below under Project Description)

Project Description:
The GWR Project would create a reliable source of water supply from: 1) purified recycled water for recharge of the Seaside Groundwater Basin, and 2) recycled water to augment the existing Castroville Seawater Intrusion Project's agricultural irrigation supply. Water supplies proposed to be recycled and reused by the GWR Project include municipal wastewater, industrial wastewater, urban stormwater runoff, and surface water diversions. *The GWR Project would be located within northern Monterey County and would include new facilities located within unincorporated areas of the Salinas Valley and the cities of Salinas, Marina, Seaside, Monterey, and Pacific Grove.

This is to advise that the Monterey Regional Water Pollution Control Agency (☒Lead Agency or ☐ Responsible Agency) has approved the above described project on October 8, 2015 (Date) and has made the following determinations regarding the above described project:

1. The project [☒will ☐will not] have a significant effect on the environment.
2. ☒An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☐A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation Measures [☒were ☐were not] made a condition of approval of the project.
4. A Mitigation Monitoring and Reporting Program [☒was ☐was not] adopted.
5. A Statement of Overriding Considerations [☒was ☐was not] adopted for this project.
6. Findings [☒were ☐were not] made pursuant to the provisions of CEQA.

This is to certify that the Final EIR with comments and responses and record of project approval, or the negative declaration, is available to the General Public at:

MRWPCA administrative office at 5 Harris Court, Building D, Monterey, CA 93940.

Signature (Public Agency): Leara Sampson Title: Human Resources Administrator

Date: October 8, 2015 Date Received for Filing at OPR: ____________

Authority cited: Sections 21083, Public Resources Code.
Reference Section 21000-21174, Public Resources Code. Revised 2011

POSTED 30 DAYS

State of California—Natural Resources Agency
CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
2015 ENVIRONMENTAL FILING FEE CASH RECEIPT

RECEIPT# 27-2015-0108

STATE CLEARING HOUSE # (if applicable)
2013051094

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY

LEAD AGENCY Monterey Regional Water Pollution Control Agency	DATE 10/08/2015
COUNTY/STATE AGENCY OF FILING Monterey	DOCUMENT NUMBER 2015-0108
PROJECT TITLE Pure Water Monterey/Groundwater Replenishment Project (GWR Project)	
PROJECT APPLICANT NAME Leara Sampson	PHONE NUMBER (831) 645-4650

PROJECT APPLICANT ADDRESS	CITY	STATE	ZIP CODE
5 Harris Court Bldg D	Monterey	CA	93940

PROJECT APPLICANT *(Check appropriate box):*

☐ Local Public Agency ☐ School District ☐ Other Special District ☐ State Agency ☐ Private Entity

CHECK APPLICABLE FEES:

☒ Environmental Impact Report (EIR)	$3,069.75	$	3,069.75
☐ Mitigated/Negative Declaration (MND)(ND)	$2,210.00	$	0.00
☐ Application Fee Water Diversion *(State Water Resources Control Board only)*	$850.00	$	0.00
☐ Projects Subject to Certified Regulatory Programs (CRP)	$1,043.75	$	0.00
☒ County Administrative Fee	$50.00	$	50.00
☐ Project that is exempt from fees			
☐ Notice of Exemption (attach)			
☐ CDFW No Effect Determination (attach)			
☐ Other ______		$	

PAYMENT METHOD:

☐ Cash ☐ Credit ☒ Check ☐ Other ______ TOTAL RECEIVED $ 3,119.75

SIGNATURE	PRINTED NAME AND TITLE
X	Luizan Gonzalez/Deputy Clerk

ORIGINAL - PROJECT APPLICANT COPY - CDFW/ASB COPY - LEAD AGENCY COPY - COUNTY CLERK DFG 753.5a (Rev. 11/14)

Stephen L. Vagnini
Monterey County
Clerk

10/08/15 16:34:43

Receipt # 143301
Wrkstn ID W523121972
File # X-0000000000

Miscellaneous Fees

Public
MONTEREY REGIONAL WATER POLLUT

Fees	$3,119.75
** TOTAL	3,119.75
Check	3,119.75
	#742

PLEASE KEEP THIS RECEIPT FOR REFERENCE

TRANSMISSION VERIFICATION REPORT

TIME : 10/08/2015 16:07
NAME :
FAX :
TEL :
SER.# : 000F5J224139

DATE,TIME	10/08 16:07
FAX NO./NAME	19163233018
DURATION	00:00:26
PAGE(S)	02
RESULT	OK
MODE	STANDARD ECM

DD&A

Denise Duffy & Associates, Inc.

PLANNING AND ENVIRONMENTAL CONSULTING

FAX TRANSMITTAL OF NOTICE OF DETERMINATION
FOR IMMEDIATE POSTING

October 8, 2015

TO: State Clearinghouse: (916) 323-3018 (fax)

RE: **Notice of Determination – Pure Water Monterey/Groundwater Replenishment Project (GWR Project) SCH#2013051094**

FOR IMMEDIATE POSTING

Please post the attached Notice of Determination (NOD) under document posting at the CEQAnet site for environmental documents.

This is in reference to the Pure Water Monterey/Groundwater Replenishment Project (GWR Project), SCH#2013051094, EIR.

The NOD was also filed with the Monterey County Clerk's office on October 8, 2015. The California Department of Fish And Wildlife required filing fee for the above referenced project was paid at the Monterey County Clerk's office on October 8, 2015.

Thank you. Should you have any questions please contact me immediately at 831-595-0267.

Sincerely

Denise Duffy

Notice of Determination

To:

☒ Office of Planning and Research

U.S. Mail:
P.O. Box 3044
Sacramento, CA 95812-3044

Street Address:
1400 Tenth St. Rm 113
Sacramento, CA 95814

☒ County Clerk
County of: Monterey
Address: 168 W. Alisal Street, 1st Floor
Salinas, CA 93901

From:

Public Agency: Monterey Regional Water Pollution Control Agency
Address: 5 Harris Court, Building D
Monterey, CA 93940
Contact: ,Leara Sampson, MRWPCA
Phone: 831-645-4618

Lead Agency: Same as above

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number (if submitted to State Clearinghouse): SCH#2013051094

Project Title: Pure Water Monterey/Groundwater Replenishment Project (GWR Project)

Project Applicant: Monterey Regional Water Pollution Control Agency (MRWPCA)

Project Location (include county): Northern Monterey County (*See also below under Project Description)

Project Description:
The GWR Project would create a reliable source of water supply from: 1) purified recycled water for recharge of the Seaside Groundwater Basin, and 2) recycled water to augment the existing Castroville Seawater Intrusion Project's agricultural irrigation supply. Water supplies proposed to be recycled and reused by the GWR Project include municipal wastewater, industrial wastewater, urban stormwater runoff, and surface water diversions. *The GWR Project would be located within northern Monterey County and would include new facilities located within unincorporated areas of the Salinas Valley and the cities of Salinas, Marina, Seaside, Monterey, and Pacific Grove.

This is to advise that the Monterey Regional Water Pollution Control Agency (☒Lead Agency or ☐ Responsible Agency) has approved the above described project on October 8, 2015 (Date) and has made the following determinations regarding the above described project:

1. The project [☒will ☐will not] have a significant effect on the environment.
2. ☒An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☐A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation Measures [☒were ☐were not] made a condition of approval of the project.
4. A Mitigation Monitoring and Reporting Program [☒was ☐was not] adopted.
5. A Statement of Overriding Considerations [☒was ☐was not] adopted for this project.
6. Findings [☒were ☐were not] made pursuant to the provisions of CEQA.

This is to certify that the Final EIR with comments and responses and record of project approval, or the negative declaration, is available to the General Public at:

MRWPCA administrative office at 5 Harris Court, Building D, Monterey, CA 93940.

Signature (Public Agency): Robert B Holden Title: MRWPCA Principal Engineer

Date: October 8, 2015 Date Received for Filing at OPR: ______

Authority cited: Sections 21083, Public Resources Code.
Reference Section 21000-21174, Public Resources Code.

Revised 2011

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7. Approved Minutes for MRWPCA October 8, 2015 Board Meeting

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APPROVED
November 30, 2015

M I N U T E S
of the Special Meeting
Monterey Regional Water Pollution Control Agency
Board of Directors
October 8, 2015

1. **CALL TO ORDER**

The Special Meeting of the Board of Directors of the Monterey Regional Water Pollution Control Agency was Called to Order by Chair De La Rosa at 3:31 pm, on Thursday, October 8, 2015 in the Board Room at 5 Harris Court, Building D, Monterey, California.

2. **ROLL CALL**

BOARD MEMBERS PRESENT:

Gloria De La Rosa, Chair	Salinas
Rudy Fischer, Vice Chair	Pacific Grove
Linda Grier [arrived 3:33 pm]	Boronda County Sanitation District
Ron Stefani	Castroville Community Services District
John M. Phillips	County of Monterey
Dennis Allion	Del Rey Oaks
Peter Le	Marina Coast Water District
Libby Downey	Monterey
Dave Pendergrass	Sand City
Ralph Rubio	Seaside
Vacant – Ex-Officio	United States Army

BOARD MEMBERS ABSENT:

Tom Razzeca	Moss Landing County Sanitation District

MRWPCA STAFF PRESENT:

Paul Sciuto	General Manager
Stephen Hogg	Assistant General Manager
Tori Hannah	Chief Financial Officer
Bob Holden	Principal Engineer
George Thacher	Legal Counsel
Mike McCullough	Gov. Affairs Administrator

Mark Malanka	Maintenance Manager
Garrett Haertel	Associate Engineer
Chayito Ibarra	Executive Assistant
Betty Nebb	Executive Assistant

CEQA PROJECT TEAM PRESENT:

Barbara Schussman	CEQA Attorney with Perkins
Denise Duffy	Denise Duffy and Associates (DDA)
Alison Imamura	Project Manager for EIR, DDA
Margaret Nellor	Nellor and Associates

OTHERS PRESENT:

Frank Aguayo	Rick Riedl	Andy Sterbenz
Travis Faris	Joelle Lobo	Norm Groot
George T. Riley	Nancy Isakson	Catherine Stedman
John Narigi	Steve Shimek	Tom Crowley
Bill Carrothers	Larry Hampson	David Stoldt
Dave Chardavoyne	Cathy Paladini	Jason Campbell
Margaret Bonelti	Kelly White	Ian Crooks

3. PLEDGE OF ALLEGIANCE

Mr. Fischer led the Pledge of Allegiance.

4. PUBLIC COMMENTS

Announcement – Sustainable groundwater group will be hosting Ms. Gina Barrett who will moderate for the Consensus Building Institute of San Francisco Bay Area for their first meeting in Monterey in January.

5. PUBLIC HEARINGS

A. **Public Hearing for Final EIR for Pure Water Monterey Groundwater Replenishment Project**

Mr. Sciuto thanked everyone for attending the Final Public Hearing for the Pure Water Monterey (PWM) Groundwater Replenishment (GWR) Project. He noted that a Spanish translator was present and headphones were available for anyone who would like to hear the proceedings in Spanish. He congratulated the staff and technical team of consultants who have done incredible work as far as the quality of work to get us to this point.

Mr. Holden introduced the CEQA Team members: Ms. Barbara Schussman, CEQA Attorney from Perkins Coie; Alison Imamura, Project Manager for the EIR with Denise Duffy & Associates (DD&A); Denise Duffy, DD&A; Margie Nellor, Nellor Environmental. Mr. Holden stated that the Notice of Preparation and EIR Scoping began in summer of 2013, the Draft EIR was completed in April 2015, public review period from April – June 2015; and the Final EIR was completed September 25,

2015. He added that the process tonight is to consider EIR Certification and Project Approval.

Ms. Schussman stated the purpose of the Public Hearing and summarized all the prior public participation to distribute and discuss the Draft EIR. She verified that the CEQA has been completed in full compliance and that certification of the EIR is a necessary perquisite to later actions to implement the Project, such as, complete source water agreements and secure project funding.

Ms. Imamura spoke about the efforts by the Project Team to provide the public with information about the project and answer questions. She explained that 29 comment letters had been received on the Draft EIR and described the matters that were addressed and then included in the Final EIR document.

Mr. Holden stated that the project the Board is being asked to approve includes the following key elements:

- Conveyance of five types of source waters to the Regional Treatment Plant (RTP)
- New Advanced Water Treatment Facility and other improvements to the RTP
- Treated water conveyance pipelines and booster pump station (RUWAP Alignment Option recommended)
- Groundwater injection well facilities
- Potable water distribution system (Alternative Monterey Pipeline recommended for Cal Am water distribution)

Mr. Holden provided a map showing the RUWAP Alignment, as well as an alternative Coastal Alignment Option for getting the product water to the proposed injection well facilities. He also presented a map showing the Alternative Monterey Pipeline that will allow Cal Am to distribute water from the Seaside Basin.

Ms. Schussman stated that the MRWPCA Board, as Lead Agency, must adopt specific findings to certify EIR:

- that the Board has reviewed and considered the Final EIR;
- that the EIR has been completed in compliance with CEQA; and
- that the EIR reflects the Board's independent judgment and analysis.

Ms. Schussman noted that the CEQA findings address the alternative pipelines that were evaluated and she provided reasons why the new pipeline is superior. She added that there were two significant impacts that remain unavoidable – that construction noise will not result in any sensitive receptor and that the resolution contains approval in what is required before source water or any other permits can be pursued.

Mr. Holden noted that this concluded the staff presentation; the meeting turned to Questions from Board to Staff prior to opening the Public Hearing on this matter.

Mr. Le stated that MCWD approves this project; however there remain questions. He asked why there is no RUWAP budget in the FEIR since MCWD has a capital budget of $750k for construction. Ms. Schussman responded by citing page 3-41 in the Final EIR – The RUWAP MOU does not require MRWPCA or any other entity to contribute to the cost of completing such improvement. The RUWAP Recycled Water Project has not been finished and there does not appear to be a plan for completing it in the near future. The EIR analyzes the RUWAP Recycled Water Project as a cumulative project.

Mr. Le referenced the apparent change in AF of water that would be furnished by MRWPCA to MCWD and asked for an explanation for the sentence in section 10.2 that references MCWD's full allotment of planned recycled water demands (and no more than the RTP receives as influent from MCWD). Mr. Holden stated that portion means that the agreements we have provide that whatever MCWD provides to our Agency as influent is allowed equal tertiary recycled water back.

Ms. Schussman responded to additional questions from Mr. Le referencing a specific section of the EIR and noted that any new concerns that have not been previously been addressed in the EIR would be reviewed and comments provided.

Chair De La Rosa opened the floor to Public Comments to receive testimony.

Mr. Steve Shimek, The Otter Project/Monterey Coast Keepers, expressed his concern for discharge of nutrients to the Bay and the impact to tourism if the discharges have an adverse effect on sea life.

Mr. Tom Rowley, Monterey Peninsula Taxpayers Association, stated he is historically supportive of technically feasible programs that will help solve the water crisis; however, feels this is premature action until the source water agreements are secure.

Mr. Dave Stoldt, MPWMD General Manager, commended the Board for going forward with the EIR certification and confirmed there will be time to address any issues being presented.

Mr. Frank Aguayo, City of Salinas, stated that the City is in support of this project and has been working successfully with the Agency to finalize the agreement for Ag wash water. He stated that additionally the City agrees diverting the pond water to the regional system is environmentally correct to limit contamination of the Salinas River. By taking the water from the ponds, the City can proceed with the needed maintenance for the ponds and eventually be able to possibly provide storage for stormwater.

Mr. Norm Groot, Monterey County Farm Bureau, stated support for the project but feels more analysis is needed in considering use of the Ag wash water that processes lettuce and vegetables. He also noted that an interruptible water source may affect our water supply.

Ms. Nancy Isakson, Salinas Valley Water Coalition, stated support of the project, echoed Mr. Groot's concerns and expressed concern about getting the Definitive Agreement in place. She also noted that the competing resources may affect the water from the Salinas River Diversion Facility.

Mr. George Riley, Public Water Now, stated that he feels MRWPCA has done more to solve Monterey Bay water problems and encouraged the Board to move forward.

Chair De La Rosa Closed Public Comments and called for Board Comments.

Mr. Le asked a question about the route of the Coastal Alignment Option, and Ms. Imamura stated that the Project Engineering Team did feasibility studies on both of the pipeline alignments. The Coastal Alignment option follows along the Monterey transportation right-of-way and was chosen as an alternative because it provided an option for an efficient way to get the pipeline to the injection site.

Mr. Pendergrass asked the Project Team if they felt that any comments made tonight would prevent the Board from moving forward with the recommended action to certify the EIR. Ms. Duffy stated that her staff prepared a technical memo in response to issues raised by Mr. Shimek. Based on the information provided in the memo, she qualified that no new significant impacts and no increase in severity of impacts would result from implementation of the GWR project. Ms. Imamura added that the question about nutrients in the water has been addressed in detail in the EIR and that the implementation of the GWR project would ultimately have a pollutant load reduction. Ms. Nellor added that the project is governed by permits and follows the California ocean plan.

Ms. Downey stated that although she is also anxious to get the source water and definitive agreement established, she understands now that these agreements are not directly connected to the EIR. Ms. Schussman added that it would not be proper or allowed to enter into the source water agreements before certifying the EIR – the EIR certification has to be done first.

To Ms. Downey's question about the importance of the EIR being certified for possible state funding, Mr. Sciuto explained that the amount of funding has decreased and it is imperative to move quickly to position this project to qualify for state funding.

__ACTION TAKEN__: It was moved by Member Allion, seconded by Member Pendergrass, to adopt MRWPCA Resolution 2015-24 to:

1) **Certify the Final EIR for the Pure Water Monterey Groundwater Replenishment Project;**
2) **Adopt findings required by the California Environmental Quality Act;**
3) **Approve mitigation measures and a mitigation monitoring and reporting program;**
4) **Adopt a Statement of Overriding Considerations:**
5) **Approve the GWR Project, as modified by the Alternative Monterey Pipeline and select the RUWAP Alignment Option for the Product Water Conveyance pipeline and booster pump station; and**
6) **Authorize staff to proceed immediately with obtaining necessary agreements, permits, funding and financing, and approvals to construct and operate the Project components specified in Section III or Resolution 2015-24.**

And carried by the following roll call vote:

Ayes: De La Rosa, Fischer, Grier, Stefani, Phillips, Allion, Downey, Pendergrass, Rubio

Noes: None

Absent: None

Abstained: Le

Mr. Phillips stated that this is a result of the growers, City of Salinas, and this Agency working together to create a win-win for everyone. He added that the source water agreements come next and while the matters are complex everyone is moving in the right direction to get these agreements approved. Chair De La Rosa added that the entire region is going to benefit and thanked staff and consultants for their comments and presentation tonight.

6. __ACTION ITEMS__

A and B. __Amend Resolution 2015-19 and Resolution 2015-21 to reflect comments received from the State Water Resources Control Board; and, allow modifications to Resolution 2015-21 for minor changes pending the Agency and State Attorney's Final Review –__ **__Approval of Resolution 2015-26 will clarify all the changes needed in the amended Resolutions__**

Ms. Hannah requested that Resolution 2015-19 and Resolution 2015-21 previously approved by the Board and submitted as part of the application to the State Water Resources Control Board for 1% interest loan for the Pure Water Monterey Groundwater Replenishment Project be modified to include language recommended as a result of the legal review by the SWRCB. She reviewed the proposed changes to the Board in order to explain the clarifications being requested. She noted that materials presented to the members include a red-lined copy of both Resolutions 19 and 21 with Resolution 26 describing the need for these changes.

Legal Counsel clarified that Board approval of Resolution 2015-26 would amend MRWPCA Resolutions 2015-19 and 2015-21 to meet the State's requirements for the Project loan funding.

<u>ACTION TAKEN</u>: It was moved by Member Downey, seconded by Member Rubio, to approve Resolution 2015-26 amending Resolution 2015-19 and Resolution 2015-21 to reflect comments received from the State Water Resources Control Board, and carried by the following vote:

Ayes: De La Rosa, Fischer, Grier, Stefani, Phillips, Allion, Le, Downey, Pendergrass, Rubio

Noes: None

Absent: None

C. <u>Approve Resolution 2015-25, Establishing an Enterprise Fund System of Accounting for the Pure Water Monterey Fund</u>

Ms. Hannah explained that this Resolution would segregate the accounting for Pure Water Monterey from the Agency's main operations. This would also provide more transparency for any reporting that is required. She added that through the establishment of a separate fund, PWM is viewed as having a dedicated revenue source to fund its specific operations and may, therefore, qualify for a debt coverage ratio of 1.10x.

Some discussion followed regarding the Water Purchase Agreement and Mr. Sciuto explained that the State Board will review the draft agreement even before it comes before the Board as they may have some questions that will need to be addressed.

Public Comments:
Tom Crowley, Monterey Peninsula Taxpayers Association, stated that public discussion on how GWR is going to be paid for has been skimpy – when you submit an application for a $113M loan, you should know how it is going to be paid.

<u>ACTION TAKEN</u>: It was moved by Member Downey, seconded by Member Stefani, to approve Resolution 2015-25 to Establish an Enterprise Fund System of Accounting for the Pure Water Monterey Fund, and carried by the following vote:

Ayes: De La Rosa, Fischer, Grier, Stefani, Phillips, Allion, Le, Downey, Pendergrass, Rubio

Noes: None

Absent: None

C. Consider Establishing Rate Formula Factors for Primary and Secondary Treatment of Interruptible Source Waters

Mr. Holden stated that as part of the PWM project there was a need to provide primary and secondary treatment for waters not provided by MPRWPCA sewage ratepayers. The Recycled Water Committee has been involved in discussions regarding development of an interruptible rate for treating Ag Wash water and Lake El Estero water for the PWM project. With assistance from a financial consultant, Municipal Financial Services, and an legal opinion from Colantuono, Highsmith, Whatley, PC an interruptible rate was developed that is reasonable as compared to other fees and is voluntary (not imposed) and therefore not covered by Propositions 218 or 26. He added that this new rate only applies to waters that do not contain sewage, have another legal method of treatment/disposal, and only with flows within the existing capacity of MRWPCA's infrastructure.

Mr. Holden reviewed with the Rate Equation Factors (per million gallons per day) as shown on Table 1, as well as how the rate equation factors result in the interruptible rates as shown on Table 2 (information attached). He responded to questions clarifying that the rate for treating ag wash water was nearly twice as much as ditch or storm water because of the additional chemicals needed to treat the produce water. Mr. Rubio stated that the Recycled Water Committee has reviewed this information and recommends Board approval.

ACTION TAKEN: It was moved by Member Rubio, seconded by Member Le, to establish an Interruptible Rate following the description in the Interruptible Rate Qualifications (Attachment A) and established the three Interruptible Rate Equation Factors listed in Table 1 for Fiscal Years 2015/16 and 2016/17, and carried by the following vote:

Ayes: De La Rosa, Fischer, Grier, Stefani, Phillips, Allion, Le, Downey, Pendergrass, Rubio

Noes: None

Absent: None

7. STAFF REPORTS

A. General Manager/Assistant General Manager/Legal Counsel

Mr., Sciuto stated that in response to questions raised about revenue sources needed to support the State Revolving Loan, the majority of funding will be through the Water Purchase Agreement among MRWPCA, MPWMD and Cal Am – PCA will operate the treatment plant and MPWMD will pay that cost; as Cal Am extracts the water, they will pay MPWMD for the water based on the 30-year water purchase agreement. He noted additional funding will come through our agreement with MCWRA for the diversion of the source waters and the allocation of treatment costs and O&M expenses. Ms. Hannah added that the loan criteria process requires that the Agency validate that we have contracts to support the loan amount.

Public Comments:
Mr. Tom Crowley stated that Mr. Sciuto's explanation provided the most complete information to date on how the costs would be covered.

Mr. John Narigi stated that the Mayors' Authority TAC was still working on what the final costs would be to determine what the cost will be when we turn on the tap.

Mr. David Stoldt added that working with Cal Am, we should have the "externalities study" work product ready for internal review in four weeks.

8. BOARD MEMBER COMMENTS/REPORTS

Mr. Fischer stated that there are concerns about some issues related to the PWM project; however, nothing will ever be accomplished if all questions have to be answered.

Mr. Allion noted that Mayor Edelen would be attending the Board Meeting on his behalf on October 26. He stated that the Board has analyzed this to death – there are risks, but not moving forward would cost the community millions of dollars more – we need to get this done now.

Chair De La Rosa noted the conclusion of the MRWPCA Board Meeting and announced that the Joint Workshop with Monterey County Water Resources Agency will convene in ten minutes.

9. ADJOURNMENT

At 5:03 p.m. with no further business, Chair De La Rosa adjourned the meeting to the next regularly scheduled Board Meeting to be held in the Regional Treatment Plant Conference Room at 14811 Del Monte Blvd, in Marina, California on Monday, October 26, 2015 at 6:00 p.m.

Paul A. Sciuto, General Manager Secretary to the Board	Gloria De La Rosa, Chair MRWPCA Board of Directors

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