Agenda
Monterey Peninsula Regional Water Authority (MPRWA)
Regular Meeting

7:00 p.m., Thursday Sep 24, 2015
Council Chambers
580 Pacific Street
Monterey, California

ROLL CALL

PLEDGE OF ALLEGIANCE

REPORTS FROM BOARD DIRECTORS AND STAFF

PUBLIC COMMENTS

PUBLIC COMMENTS allows you, the public, to speak for a maximum of three minutes on any subject which is within the jurisdiction of the MPRWA and which is not on the agenda. Any person or group desiring to bring an item to the attention of the Authority may do so by addressing the Authority during Public Comments or by addressing a letter of explanation to: MPRWA, Attn: Monterey City Clerk, 580 Pacific St, Monterey, CA 93940. The appropriate staff person will contact the sender concerning the details.

CONSENT AGENDA

1. Approve and File Authority Checks Through Sept 24, 2015 - Milton

CONSENT AGENDA ITEMS

2. Receive Letter from Cal Am President Rob Maclean in Response to Water Authority Letter on Financial Guarantee for the MPWSP Slant Wells.

AGENDA ITEMS

3. Receive, Discuss and Approve the Final Comment Letter to the California Public Utilities Commission (CPUC) on the Monterey Peninsula Water Supply Project Draft Environmental Impact Report - Cullem

4. Discuss the Status of the Cal Am Request to Resume Test Slant Well Operations and Authorize Sending a Letter of Support to the California Coastal Commission Prior to its Consideration of The Request on October 6, 2015. -Crooks

5. Approve Return of Excess Contributions for FY 14-15 and Approve a Reserve Fund for FY 15-16 of Approximately $179,000 from Year-end Balances -Cullem

ADJOURNMENT

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Agenda related writings or documents provided to the MPRWA are available for public inspection during the meeting or may be requested from the Monterey City Clerk's Office at 580 Pacific St, Room 6, Monterey, CA 93940. This agenda is posted in compliance with California Government Code Section 54954.2(a) or Section 54956.

Monterey Peninsula Regional Water Authority Agenda Report

Date: September 24, 2015

Item No: 0

FROM: Authority Clerk Milton

SUBJECT: Approval and File Authority Checks through September 18, 2015

RECOMMENDATION:

It is recommended that the Authority approve and file the accounts payable payments made during the period August 6, 2015 through September 18, 2015 with total payments for the above referenced period of $33,120.68 from the general fund account and authorize the Directors to sign for such checks.

DISCUSSION:

At its meeting on September 12, 2013, the Authority Board approved a staff recommendation to provide the Directors a listing of financial obligations since the last report for inspection and confirmation. Each invoiced expense has been reviewed and approved by the Executive Director and Finance personnel prior to payment to insure that it conforms to the approved budget.

The following checks are hereby submitted to the Authority for inspection and confirmation.

- $ 6,438.48 to Alliant for Special Liability Insurance Policy, Annual Premium
- $ 909.80 to Separation Processes Inc for DEIR Review of the MPWSP
- $20,293.90 Brownstein Hyatt Farber and Schreck
- $ 478.50 to Access Monterey Peninsula
- $ 5,000 to Perry and Freeman for Legal Counsel Services

The bank balance as of September 18, 2015 is sufficient cover the above check therefore, staff is recommending approval.

ATTACHMENTS:

- Budget to Actual Report through September 18, 2015

Monterey Peninsula Regional Water Authority
Agenda Report

Date: September 24, 2015

Item No: 2

FROM: Executive Director Cullem

SUBJECT: Receive Letter from Cal Am President Rob Maclean in Response to Water Authority Letter on Financial Guarantee for the MPWSP Slant Wells

RECOMMENDATION:

It is recommended that the Water Authority receive, and discuss if necessary, the September 1, 2015 Cal Am response letter to the Water Authority's letter of August 14, 2015 requesting Cal Am provide a financial guarantee for the slant wells.

DISCUSSION:

At its meeting of August 13,2015, the Water Authority Board approved a letter to be sent to Cal Am requesting it assume the financial risk of the slant wells in general, and the test slant well in particular. The Water Authority letter is at attachment A.

On September 1, 2015, Rob MacLean, President of Cal Am, sent a letter response which is at attachment B.

ATTACHMENTS:

A- Water Authority Letter dated August 14, 2015
B- California American Water Company Letter dated September 1, 2015

№06/12

CALIFORNIA AMERICAN WATER

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VIA EMAIL AND U.S. MAIL

September 1, 2015

Hon. Jason Burnett
President, Monterey Peninsula Regional Water Authority
580 Pacific Street, Room 6
Monterey, California 93940

Re. MPRWA Request for Financial Guarantee for the Test Slant Well

Dear President Burnett,

Thank you for your letter of August 14, regarding the rate recovery of certain costs if California American Water's (CAW) test slant well doesn't work as intended or is not permitted. To date, the test slant well has provided excellent results and information. However, I understand MPRWA's concern and I am hopeful we can come to a mutually satisfactory resolution.

As you will recall, in July 2013 sixteen parties, including Monterey Peninsula Regional Water Authority (MPRWA), entered into a settlement agreement that supported CAW's implementation of the test slant well. As part of the settlement, the parties agreed on the preferred location of the test slant well and that the costs associated with such an undertaking would be recovered by CAW in rates.

Notwithstanding the agreement of the parties in the settlement, CAW is willing to take the "physical risk" that the test slant well works and could be used as a production well. If the test slant well doesn't work, CAW is willing to bear the costs of the test slant well. If the test slant well works, CAW will seek rate recovery of all prudent test slant well-related costs and, as a condition of our willingness to accept this risk, CAW expects that MPRWA will support CAW's rate recovery efforts.

CAW's proposal in this regard should not be viewed by MPRWA or any other party as a precedent or indication of CAW's acceptance of this risk for any other component of the Monterey Peninsula Water Supply Project ("MPWSP"), or any other project it undertakes, now or in the future.

While CAW is willing to accept the physical risk of the test slant well, it is not appropriate for CAW to assume "permitting risks." Permitting for the test slant well and the entire MPWSP is complex and requires a tremendous amount of community and political cooperation and support. The MPRWA and your constituents have been instrumental in supporting CAW's permitting efforts to date and we need that support to continue. Specifically, we will need your continued assistance with educating federal, state, and local permitting agencies on the criticality and urgency of the project, and with defending litigation challenges to the test slant well and other MPWSP-related permits. We would see that continuing support as a condition to our acceptance of the physical risk of the test slant well.

I hope that the proposal above is satisfactory to the MPRWA. If you agree with our proposal, we would be happy to work with you and your staff to draft a more formal agreement, if desired.

Sincerely,

Robert G. MacLean
President

MONTEREY PENINSULA REGIONAL WATER AUTHORITY

August 14, 2015

Robert MacLean, President
California American Water
P.O. Box 951
Monterey, CA 93940

RE*: Financial Guarantee for the MPWSP Slant Wells*

Dear Mr. MacLean:

As you are aware and you and I have discussed, the public is concerned about the potential for stranded costs associated with the Monterey Peninsula Water Supply Project (MPWSP) slant wells in general, and the test slant well in particular.

In light of recent delays by Cal Am in applying for an amended California Coastal Commission Development Permit (CDP) to restart the test slant well, the Monterey Peninsula Regional Water Authority (MPRWA) asked Cal Am a number of questions about the issue at its meeting of July 29, 2015. Cal Am's responses on August 7, 2015 were timely and are much appreciated.

However, responses to those questions, as well as previous discussions on the subject, suggest that Cal Am has substantial control over the eventual success or failure of the slant wells. Although the test well results are promising, the use of slant wells as a source water supply for desalination is novel and largely untested.

As you noted in the September 16, 2014 press release on Cal Am's $1 million Prop 50 grant, “The test well project is not only important for the future of the Monterey Peninsula’s water supply; it also tests technology which is critical to the future of desalination as an alternative water source for our state.” Thus, regardless of the final outcome, results from the testing will provide invaluable information to Cal Am for future state and national water projects. Accordingly, Cal Am should guarantee the slant wells will work and agree to bear the costs if they don't.

Therefore, the MPRWA requests that Cal Am affirm that it shall not seek reimbursement for slant well costs (inclusive of the current test well) in the event that the wells are not permitted or do not meet the feed water requirements of the MPWSP desal facility. Of course, if the slant wells perform as advertised, we would expect that Cal Am would seek reimbursement for the expenses.

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Full financing by Cal Am and Am Water not only demonstrates belief and commitment to an anticipated successful outcome, but also clearly demonstrates sound fiscal judgment and responsibility to both stockholders and ratepayers. While it might be posited that such commitment has "potential risk", given the circumstances for State intervention and economic impact to the Monterey Peninsula region, such "potential risk" merits exception and appears unlikely according to Cal Am itself.

In conclusion, a positive response to this request presents an unusual opportunity for Cal Am to demonstrate to skeptical ratepayers the level of confidence it has in the successful construction and operation of slant wells for the MPWSP.

Sincerely,

Jason Burnett, President
Monterey Peninsula Regional Water Authority

Monterey Peninsula Regional Water Authority Agenda Report

Date: September 24, 2015

Item No: 3

FROM: Executive Director Cullem

SUBJECT: Receive, Discuss, and Approve the Final Comment Letter to the California Public Utilities Commission (CPUC) on The Monterey Peninsula Water Supply Project Draft Environmental Impact Report

RECOMMENDATION:

It is recommended that the Water Authority approve the final comment letter on the Monterey Peninsula Water Supply Project (MPWSP) Draft Environmental Impact Report (DEIR) and authorize the Authority President to sign it on behalf of the Water Authority.

DISCUSSION:

At the joint Water Authority/TAC meeting on June 23, 2015 the Authority Board approved sending a comment letter to the CPUC on the MPWSP DEIR.

In addition to the inclusion of the two Technical Memoranda (TM) which were prepared by Geosyntec under a contract with Separation Processes Inc., the Board approved the preparation of more extensive comments on the impact of greenhouse gas (GHG) emissions and potential growth inducements with respect to land use.

At its meeting of July 9, 2015, the Board continued consideration of the comment letter as a consequence of CPUC action delaying the deadline for public comment to September 30, 2015.

Since July 2015, additional issues related to the potential use of return water to the Salinas River basin have arisen and the comment letter has been modified accordingly.

The comment letter is at Exhibit A. Exhibits B and C are the Geosyntec Technical Memoranda presented and submitted to the Water Authority and the TAC on June 23 and which are included with the letter to the CPUC.

EXHIBITS:

A- Water Authority Comments on the MPWSP DEIR dated 25 September 2015.
B- Geosyntec TM on Subsurface Intakes
C- Geosyntec TM on Brine Disposal System

MONTEREY PENINSULA REGIONAL WATER AUTHORITY

September 15, 2015

Ken Lewis
California Public Utilities Commission
c/o Environmental Science Associates
550 Kearny Street, Suite 800
San Francisco, CA 94108

RE: Water Authority Comments on the Monterey Peninsula Water Supply Project DEIR

Dear Mr. Lewis:

The Monterey Peninsula Regional Water Authority (Water Authority) is a joint powers authority comprised of the six cities of the Monterey Peninsula with a board of directors consisting of the six respective city mayors.

The Water Authority has conducted several public meetings to discuss the originally-issued DEIR for the Monterey Peninsula Water Supply Project (Project), proposed by California American Water Company (Cal Am) in Application 04-09-019. The Water Authority supports the Project and has a goal that future decisions regarding the Project be supported by the best possible EIR. With this goal in mind, we ask that you consider the recommendations set forth in this letter in development of the prospective recirculated DEIR-DEIS with respect to the Project's greenhouse gas emissions, land use impacts, source water intake systems, brine disposal, Salinas Basin modeling, and "return water".

I. Greenhouse Gases

The Water Authority recommends that the California Public Utility Commission (Commission) reconsider its determination that greenhouse gas (GHG) emissions resulting from the Project are a significant impact under CEQA. We question whether the 2,000 metric ton (MT) threshold for determining significant impacts of GHG emissions is appropriate for the Project and suggest that GHG emissions thresholds proposed by the staff of the Monterey Bay Unified Air Pollution Control District (MBUAPCD) are more applicable. MBUAPCD staff recommends a threshold of 10,000 MT of CO2e per year for stationary source projects and a threshold of 2,000 MT CO2e per year for land-use projects or compliance with an adopted GHG Reduction Plan/Climate Action Plan. MBUAPCD is currently evaluating a percentage-based threshold option as well. MBUAPCD does not have a formal policy recommending specific thresholds, and neither of these thresholds has been adopted by the MBUAPCD. While the DEIR might utilize a proposed, though un-adopted threshold of significance, the 2,000 MT threshold may be inappropriate for the Project. The 2,000 MT threshold is proposed for residential or commercial land use projects, as noted in the DEIR at section 4.11.3.2. This Project, in contrast, is akin to a stationary source, and the 10,000 MT threshold may be more appropriate for the heavy industrial land use type associated with the Project's desalination plant. The likely source of

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primary power for the desalination plant is the PG&E grid. The Project's estimate of 6,181 MT of GHG emissions per year is well below the MBUAPCD staff recommended threshold of 10,000 MT per year for a stationary source.

Further, under CEQA Guidelines Section 15064(b)(3), the incremental contribution of GHG emissions from the Project's electricity demand would not have a significant impact because the Project's electricity source would be covered by the California Air Resources Board cap-and-trade program established by Assembly Bill 32. The electricity supplying the Project will be supplied from sources under the AB 32 cap and therefore, based on our understanding of the cap-and-trade system, the increased electricity demand would, in fact, not lead to a net increase in GHG emissions. This is contrary to the statements made in the DEIR (see Operational Emissions on page 4.11-12) and the language and the calculations of net increases in GHGs should be corrected for the recirculated DEIR-DEIS.

The Water Authority has not done a comprehensive review of GHG emission thresholds used by other lead agencies. However, we do note several agencies have pointed to AB 32 in determining that GHG emissions were not a significant impact under CEQA. See, for example, the San Joaquin Valley Air Pollution Control District (SJVAPCD) document "CEQA Determinations of Significance for Projects Subject to ARB's GHG Cap-and-Trade Regulation," APR – 2025, at page 4 (June 25, 2014).[1] SJVAPCD policy states, "The District has determined that GHG emissions increases that are covered under ARB's Cap-and-Trade regulation cannot constitute significant increases under CEQA, for two separate and distinct reasons." The two reasons are that "cap-and-trade regulation is an approved GHG emission reduction plan," and "cap-and-trade regulation requires mitigation of GHG increases." The South Coast Air Quality Management District has taken a similar position for emission increases covered by the cap-and-trade program. Certain construction-related and other sources of GHG emissions are not covered by the cap-and-trade program and therefore represent a true net increase in emissions. These sources, however, are less than 1000 metric tons per year on an amortized annual average basis (see TABLE 4.11-3 and TABLE 4.11-4).

If, despite the foregoing discussion, the Commission nonetheless determines that GHG emissions from the Project would be a significant impact, the Water Authority recommends that the Commission consider options for Cal Am to mitigate any net increase of GHGs from the Project to a less than significant level by purchasing carbon credits, renewable energy credits or other such mechanisms. The Water Authority recognizes this would add to the costs of the Project and may lead to rate increases. We do not at this point have a position as to whether such a rate increase may be justified.

II. Land Use

One purpose of the Project is to supply sufficient water to meet the needs of the currently un-served lots of record in the Cal Am service area as discussed in sections 2.32 and 8.2 of the DEIR. Existing lots of record were either created prior to the passage of CEQA or were created following appropriate CEQA review or exemptions. Under CEQA, if the development is "expected" because it was accounted for in a general plan document that underwent CEQA review already, then any growth-inducing impacts need not be analyzed in the EIR. A project is not growth-inducing when, as here, growth was planned first, and is not a consequence of the project. (*See Banning Ranch Conservancy,* 211 Cal.App.4th at 1230.) Established case law holds that an EIR need not re-analyze growth that the project may facilitate if that growth was already reviewed under CEQA as part of a separate approval process such as a land use agency's adoption of a general plan. (*See, e.g., Clover Valley Foundation v. City of Rocklin* (2011) 197 Cal.App.4th 200, 228 ["[G]rowth has already been analyzed in the City's general plan EIR and was contemplated in the general plan and the SPMUD Master Plan…CEQA did not require the City to redo that analysis…."]; *Sierra Club v. West Side Irrigation Dist.* (2005) 128

[1] See http://www.valleyair.org/policies_per/Policies/APR-2025.pdf

Cal.App.4th 690, 701–03 [upholding negative declaration of water supply contracts because water would serve growth already planned in general plan and evaluated in general plan EIR].)

III. Source Water Intake Systems and Brine Discharge

To address "Source Water Intake Systems" and "Brine Discharge," which were identified in DEIR section ES.8 "Issue to be Resolved and Areas of Controversy", the Water Authority contracted with Separation Processes, Inc. and its sub-consultant Geosyntec to conduct a technical review of the DEIR focused on the following two questions:

1. Does the DEIR address the main critical issues on source water intake systems?
2. Does the DEIR address the main critical issues on brine disposal?

Geosyntec's analysis and recommendations are attached to this letter as Exhibits A and B. Geosyntec's analysis and recommendations support the analysis in the DEIR, provide additional evidence in support of its conclusions, and should be made part of the record on this Project.

The *source water intake* systems are discussed in the DEIR at sections 4.4 and appendices E1, E2, and C3.The Geosyntec technical memorandum on the source water intake system (Exhibit A) determines that the NMGWM and CM models provide reasonable simulation of the slant well effects, that the slant wells will only draw minor quantities of inland fresh groundwater, and that the potential impact to inland wells is not significant, thus supporting the DEIR's conclusions (Exhibit A, p. 10.). Geosyntec's analysis also substantiates previous estimates that the Project's slant well pumping will actually decrease seawater intrusion into inland aquifers. This positive impact should be noted in the recirculated DEIR-DEIS as a significant project design feature that ameliorates any negative impacts of the slant wells.

Geosyntec recommends "that a sensitivity analysis be performed on influence on the model results of the location of the slant wells relative to the coastal margin." (Exhibit A, p. 9). The Water Authority respectfully requests that this sensitivity analysis be performed and that the results be incorporated into Appendix E1 of the recirculated DEIR-DEIS.

Brine disposal is discussed in the DEIR at section 4.2 and appendices D1-D4. Geosyntec's technical memorandum on brine discharge (Exhibit B) concluded that the brine disposal analysis in the DEIR at section 4.2 and appendices D1-D4 was appropriate. Geosyntec concluded that the DEIR's numerous conservative assumptions likely under-estimate the mixing and dilution that will actually occur. (Exhibit B, p.13.) Geosyntec also has a few recommendations and minor edits in section 4 of the technical memorandum, which the Water Authority respectfully requests be included in the recirculated DEIR-DEIS at Section 4.3 and in Appendix D1 and D2 to further substantiate the DEIR's conclusions. In addition to minor edits (Exhibit B, p.14), the recommendations include the following:

1. Include the additional analyses developed by Geosyntec to assess the potential for plume merging, Coanda attachment, and hypoxia;
2. Add discussion of the potential for build-up of PCBs in the sediments surrounding the sub-surface seawater;
3. Add discussion of potential of diffuser structure to trap brine plume, including consideration of current directions (from the ROM) and alignment of diffuser relative to the slope;
4. Add discussion of the effect of only tracking the brine particles for 48 hours;
5. If mitigation measures are necessary then perform additional analyses to estimate the additional near-field dilution achievable by pulsing the brine discharge, and whether the variation of the plume buoyancy (between sinking and rising) can be implemented to manage ammonia (and other concentrations); and
6. If mitigation measures are necessary then consider retrofitting the diffuser ports from a horizontal discharge to a vertical angle of up to 60° to 65°.

IV. Salinas Basin Modeling and Potential "Return Water" Alternatives

There are potentially three bases for requiring the Project to "return" desalinated product water to the Salinas Basin. The first is Section 21 of the Monterey County Water Resources Agency Act ("Agency Act"), which prohibits exports of groundwater from the Salinas Basin. The second is mitigation of any significant environmental effect under CEQA. The third is mitigation of any water rights impact pursuant to a "physical solution." The Water Authority acknowledges that compliance with the Agency Act will require some form of return water solution. However, it is not presently clear whether return water is required to satisfy only the Agency Act or to also serve as CEQA mitigation or a physical solution to mitigate water rights impacts. This is so because the modeling of groundwater impacts, performed in conjunction with the preparation of Section 4.4.3.5 of the DEIR, only modeled the Project's groundwater impacts under the assumption that the Project would return either 550 or 880 acre-feet per year (depending on Project size) to the Salinas Basin users, which would, in turn, reduce groundwater production that would otherwise occur (effectively, in lieu recharge of the Salinas Basin). We are informed that no model runs were done under an assumption that no-in-lieu-recharge occurs. Such a no-in-lieu-recharge scenario should be modeled without return water in order to determine whether the Project would cause a significant environmental impact or materially impair groundwater supplies available to users in the Salinas Basin, thus adversely affecting their water rights, and necessitating a physical solution to mitigate that impact. If the modeling demonstrates that the no-in-lieu-recharge scenario will not cause a significant environmental impact nor a water rights impact, the Project's return water requirement will only concern the Agency Act and will not be required by CEQA or as a water rights physical solution.

If the return water is required by CEQA or as a physical solution, the recirculated DEIR-DEIS should state as much and explain that the return water must be substituted for groundwater pumping that would otherwise occur as in-lieu recharge. The potential scope of return water strategies is also affected by the modeled impacts. If the return water is not necessary to mitigate CEQA and/or water rights impacts, additional options may be available for the Project to comport with the Agency Act.

One such alternative would be to deliver some of the return water for use on the City of Seaside's Blackhorse and Bayonet golf courses in lieu of production of groundwater from the Seaside Groundwater Basin, which is a sub-basin of the Salinas Basin. These golf courses are located within the former Fort Ord, which Section 21 of the Agency Act expressly exempts from the act's prohibition on groundwater exports from the Salinas Basin. In fact, through a recently concluded program, the Marina Coast Water District ("MCWD") delivered a cumulative total of 2,500 acre-feet of groundwater produced from the Salinas Basin to offset groundwater production from the Seaside Basin for irrigation of these golf courses. The benefit of such a return water strategy for the Project is that it would allow for approximately 500 acre-feet a year to be returned consistent with the Agency Act while doing so would also replenish approximately 500 acre-feet per year to the Seaside Basin as in-lieu replenishment. This would offset approximately 500 acre-feet of the 700 acre-feet that Cal-Am has factored into the Project sizing as water for in-lieu recharge of the Seaside Basin. Thus, the Project operating level could be reduced by approximately 500 acre-feet per year with commensurate savings in operating expenses and reduced environmental impacts. This could result in annual operating savings of several hundreds of thousands of dollars for Cal-Am ratepayers. Again, this strategy for compliance with the Agency Act would not mitigate CEQA and/or water right impacts. Thus, it is important to first understand through groundwater modeling whether the Project would cause a significant environmental impact or a water rights impact under a no-in-lieu-recharge scenario, which will determine whether the Seaside golf courses strategy is a viable alternative.

The Water Authority also recognizes that there are several other return water strategies that may be optimal and the ultimate determination must consider the Agency Act, CEQA and/or water rights mitigation, and other stakeholder interests. The possible return water strategies include delivery of return water for use in the Castroville Seawater Intrusion Project ("CSIP") and delivery of the return water for municipal demands by the Castroville Community Services District ("CCSD"), the City of Salinas, or MCWD Each return water strategy could, if necessary, be limited to replacing existing pumping, in which case growth-inducing impacts would not need to be evaluated (see DEIR, p. 7-

181).. Each strategy should be evaluated in the recirculated DEIR-DEIS so that each could be implemented if deemed appropriate. Therefore, the Water Authority urges the Commission to evaluate CSIP, CCSD, City of Salinas, MCWD, and the City of Seaside golf courses as potential return water strategies in the recirculated DEIR-DEIS.

The Water Authority hopes these comments will be helpful in preparing a thorough recirculated DEIR-DEIS for the Project. Should the Commission or ESA staff have any questions, feel free to contact Geosyntec Consultants directly, or you can contact me at jason.burnett@gmail.com, cell phone 831-238-0009, or the Water Authority's Executive Director, Jim Cullem, at cullem@monterey.org, cell phone 831-241-8503.

Respectfully,

Jason Burnett, President
Monterey Peninsula Regional Water Authority

Enclosures: Exhibit A -Geosyntec Technical Memorandum Part 1: Subsurface Intakes
Exhibit B -Geosytec Technical Memorandum Part 1: Brine Disposal System

Geosyntec consultants

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Technical Memorandum

Date: 24 June 2015

To: Jim Cullen, Monterey Peninsula Regional Water Authority

From: Gordon Thrupp, PhD, PG, CHG, Associate Hydrogeologist

Subject: Review Monterey Peninsula Water Supply Project DEIR
Part 1: Subsurface Intakes

Geosyntec Consultants (Geosyntec) was engaged by SPI Membrane Technology Consultants, to conduct a focused review of the April 2015 Draft Environmental Impact Report (DEIR, ESA, 2015) prepared for the CalAm Monterey Peninsula Water Supply Project (MPWSP). The goal of the review was to address two specific questions related to the proposed desalination plant;

1. Does the DEIR address the main critical issues on source water intake system?
2. Does the DEIR address the main critical issues on brine disposal system?

This technical memorandum addresses the source water intake system. A separate companion memorandum addresses the brine disposal system.

The project design requires 24.1 million gallons per day (mgd) of ocean water to produce 9.6 mgd of potable water by desalination. The table below lists the design production and intake rates for full-scale project and the project variant.

	million gallons per day (mgd)	Acre feet per year (afy)	gallons per minute (gpm)
Full-Scale Project Potable Water Production Rate	9.6	10,754	6,667
Full-Scale Project Intake Rate	24.1	26,997	16,736
Project Variant Potable Water Production Rate	6.4	7,169	4,444
Project Variant Intake Rate	15.5	17,363	10,764

Subsurface Intakes

To avoid entrainment and impingement of sea life by open ocean intakes, state water policy requires subsurface intakes when feasible. The intake water would be pumped from a series of slant wells installed beneath the beach:

> Full-scale project 10 slant wells (8 pumping at ~2100 gpm, and 2 on standby).
>
> Project Variant: 7 slant wells (5 pumping at ~2150 gpm, and 2 on standby).

The slant wells are drilled at an angle of 10 to 45 degrees below horizontal beneath the beach with the objective of pumping ocean water through the sea floor. The objective of the slant well subsurface intakes is to maximize contribution to the intakes from the ocean and minimize contribution from inland coastal aquifers. **Figure 1** shows a schematic cross-section illustration of a slant well completed beneath the seafloor.

The maximum length of slant wells is dependent on the geological conditions and the diameter of the well (Missimer et al., 2013), and is estimated to be up to 1,000 feet. Typical angles for slant wells are between 15˚ and 45˚ from horizontal (Missimer et al., 2013; RBF Consulting, 2014). The test slant well installed at the CEMEX facility at Monterey Bay, which is 724 feet long and drilled at an angle of 19˚ below horizontal (Geoscience, 2015), is the longest slant well collector installed to date.

Due to concerns about coastal margin erosion and sea level rise, the test slant well at the CEMEX facility starts nearly 600 ft inland from coastline. Consequently it barely reaches coastline where it is at a depth of approximately 200 feet (**Figure 1b).** Drilling and construction of the test slant well was challenging and the drill rig was unable to retract a portion of temporary casing, which remains in the ground and limits flow into a 150-ft-length of the nearly 600-ft-long well screen (**Figure 1c**). However based on more than one month of test pumping at 2000 gpm (e.g. Figure 2-10, Geoscience, 16 June 2015), the test slant appears to be capable of producing the design flow rate of ~2100 gpm.

The proposed locations for 10 slant wells at the CEMEX facility (two clusters of 4 wells and one pair) are shown on **Figure 2.**

Overview of Monterey Bay Margin Hydrostratigraphy and Salinas Valley Groundwater Basin

Figure 3 is a schematic cross-section along the Monterey Bay Coastline illustrating the sequence of aquifers and aquitards (hydrostratigraphy). The slant wells will be screened within the Dune Sand and 180-ft-equivalent (FTE)[1] Aquifers. Based on borings in the CEMEX area and as illustrated by **Figure 3**, the Salinas Valley Aquitard does not continue between the Dune Sand and 180-FTE Aquifers in the CEMEX area. Consequently the hydraulic connection between the 180-FTE Aquifer and the Ocean is relatively unimpeded.

The 180-FTE Aquifer is underlain by the 400-ft Aquifer. A low permeability, fine-grained interval known as the 180/400 Aquitard occurs between the Aquifers. The 400-ft Aquifer is underlain by an aquitard, which is in turn is underlain by the 900-ft Aquifer. The Salinas Valley Groundwater Basin is hydraulically connected to the Monterey Bay by ocean outcrops of the 180-Foot and 400-Foot Aquifers a few miles offshore.

Many years of groundwater pumping have drawn down groundwater levels well below sea level in both the 180-ft and 400-ft Aquifers in the Salinas Valley. The overdraft of groundwater has resulted in extensive intrusion of ocean water into Salinas Valley the aquifers. **Figures 4 and 6** show contours of groundwater levels in the 180-ft and 400-ft Aquifers based on water levels measured in 2013. Arrows representing groundwater flow direction show inland flow from the ocean. **Figures 5 and 7** show historical progression of the seawater intrusion in the 180-ft and 400-ft Aquifers. Chloride levels exceeding 500 mg/L extends 8 miles and 3.5 miles from the coast in 180-ft and 400-ft aquifers, respectively.

Site-Specific Investigation and Testing

Six exploratory borings were drilled along the coastal margin near the CEMEX Facility to investigate hydrostratigraphy and make site-specific measurements of hydraulic properties. Testing at the borings included

[1] Traditionally the aquifers in the Salinas Valley are named for the average depth at which they are encountered. The Salinas Valley 180-ft Alluvial and Marine Terrace Aquifer is in a similar stratigraphic position to the Terrace Deposits Aquifer beneath the Dune Sand Aquifer in vicinity of the CEMEX facility. Because the temporal correlation is uncertain 180-ft aquifers beneath the Salinas Valley and the CEMEX facility the latter is called the 180-ft-equivalent or 180-FTE Aquifer to distinguish it from the 180-ft Aquifer beneath the Salinas Valley.

- water quality samples in 15 aquifer zone locations,
- grain-size analysis and calculations of hydraulic conductivity (K),
- laboratory testing of horizontal hydraulic conductivity (Kh) and vertical hydraulic conductivity (Kv) on core samples, and
- geophysical logs

Detailed reporting on the CEMEX borings and testing is provided in Appendix C3 of the DEIR.

Six monitoring well clusters, most of which are completed in three different depth intervals were installed to monitor response to pumping from the test slant well and proposed system of slant wells.

A long-term pumping test of the test slant well at 2000 gpm began 22 April 2015. Water levels and electrical conductivity is recorded with transducers and data loggers in six monitoring wells and reports are available from the project web-site[2].

Groundwater Modeling

Groundwater models were developed as tools to help to evaluate feasibility of slant well of coastal margin subsurface collectors at the CEMEX facility (Geoscience 2014 and 2015, Appendices E1 and E2 of DEIR, ESA, 2015). Model simulations of project pumping were used to estimate the portions of contribution to the slant wells from the ocean and from inland. Model simulations were also used to evaluate potential influence of the proposed project pumping on the coastal margin aquifers including:

- drawdown of groundwater levels,
- change in groundwater flow, and
- change of sea water intrusion rates

The analyses utilize groundwater models of three scales:

- Regional Salinas Valley Integrated Groundwater and Surface Water Model (SVIGSM, Montgomery Watson, 1994; WRIME, 2008),
- North Marina Groundwater Model (NMGWM, Geoscience 2013-2015), and the
- CEMEX Model (CM, Geoscience, 2014).

---

[2] http://www.watersupplyproject.org/testwellmonitoring

Figure 8 shows the extent of the three model domains and provides a comparison of the model layering.

The regional SVIGSM model has been used for year as water resources management tool for the Salinas Valley. The SVIGSM model domain covers 650 square miles, and typical model cell sizes are nearly half a square mile in area. The SVIGSM has 3 layers that represent the 180-ft, 400-ft, and 900-ft Aquifers.

The North Marina Groundwater Model (NMGWM) was developed to simulate pumping from the project slant wells along the coastal margin (Geoscience, 2013-15, Appendix E2 DEIR). The NMGWM utilizes widely accepted public domain groundwater modeling software MODFLOW (e.g. Harbaugh, 2005), MT3D (Zheng and Wang, 1999), and SEWAT (Guo and Langevin, 2002). The NMGWM domain covers a 149 sq mi area centered along coast and it extends approximately 5 mi offshore and 5+ miles inland. The model cell size is 200 x 200 ft and the model consists of 8 Layers that represent Benthic Zone, Dune Sand, 180-ft and 180 ft equiv, 400-ft, 900-ft aquifers and intervening aquitards. The benthic zone layer offshore is assigned constant sea level hydraulic head and constant seawater salinity (TDS, 33,500 mg/L).

Inland boundary conditions (northern, eastern, and southern) of the NMGWM include no flow boundaries and head-dependent flux boundaries (general head boundaries) for which groundwater influx depends on the groundwater level (hydraulic head) in each model cell at the boundary. The reference head values in the general head boundaries vary with time to reflect seasonal and climatic variation and are based on the regional SVIGSM. The NMGWM was calibrated for the period from 1979 to 2011 to measured water levels at 17 wells and salinity data from 21 wells (pp 28-29 Appendix E2, DEIR). Model runs were conducted simulating 63 years of time varying conditions (transient runs) to represent variable climatic conditions.

The more detailed CEMEX Model (CM) was developed to simulate pumping from the test slant well. The CM utilized SEWAT and has a four square mile domain with 20 by 20 ft model cell size and 12 layers. The much smaller discretization facilitates resolution of detailed changes in groundwater levels so the model can be used to simulate the pumping test of the test slant well. The CM uses the NMGWM for boundary conditions, and it will be calibrated to the long-term slant well pumping test currently in progress.

Model Results

As illustrated by **Figures 9 and 10**, simulation of long-term project pumping (8 slant wells at ~2100 gpm each) using the NMGWM shows drawdown (lowering) of groundwater levels exceeding 1 foot extending inland ~5 miles and ~7 miles in the Dune Sand and 180-ft Aquifers, respectively. **Figure 11** also shows model-calculated drawdown in the 180-ft Aquifer and locations of existing wells.

The DEIR reports that no local wells within the area of influence would be adversely impacted by the drawdown caused by the project pumping for the following reasons:

- Pumps and screens are deeper than the predicted drawdown,
- Shallow wells are no longer used,
- Active wells are screened in a deeper aquifer with limited hydraulic connection to the Dune Sands or the 180-FTE Aquifers.
- The nearest municipal water supply wells (Marina Wells 10, 11, and 12) are more than 2 miles to the SE and screened in the 900-Foot Aquifer.

Consequently, the DEIR concludes that the impact of the project on groundwater wells is less than significant.

As reported in the DEIR (pg 41, Appendix E2), the proportion of Ocean Water and Inland Fresh Water is calculated from the model chloride content of intake water predicted by the NMGWM as follows:

$$(X)(OWS) + (1-X)\,(IS) = FS$$

$$(X)(OWS) + IS - (X)(IS) = FS$$

$$(X)(OWS) - (X)(IS) = FS - IS$$

$$X(OWS-IS) = FS - IS$$

$$X = (FS-IS)/(OWS-IS)$$

Where,

X is Proportion of Ocean Water in Intake Water,
(1-X) is Proportion of Fresh Water,
OWS is Ocean Water Salinity = 33,500 mg/L
IS is Intake Salinity, and
FS is Fresh Water Salinity = 440 mg/L

For example, Intake Water with salinity of 32,000 mg/L consists of 95% Ocean Water and 5% Inland Fresh Groundwater.

Based on the NMGWM pumping simulations, over the long term, the average intake water consists of 94.5% ocean water, and 5.5% inland fresh groundwater, which is 1,458 AFY. The project will return fresh water to the Salinas Groundwater Basin via the Castroville Seawater Intrusion Project (CSIP) ponds at a rate that is equal to the portion of inland fresh groundwater pumped. Therefore, the DEIR concludes that the project will result in no net depletion of inland fresh groundwater.

The NMGWM was also used to evaluate potential influence of the project pumping on contaminant plumes in groundwater beneath Fort Ord. **Figure 12** shows the model calculated drawdown in the 180-ft Aquifer and the location of the contaminant plumes beneath Fort Ord. The findings reported by the DEIR are summarized below:

- OU1 TCE A-Aquifer Plume (TCE plume 2.25 mi SE): **Less than significant** because drawdown from the project pumping is much less than drawdown from local remedial pumping

- OUCTP A-Aquifer Plume (carbon tetrachloride plume 2 mi SE): bioremediation in progress. **Cal Am monitoring and mitigation if needed**.

- OUCTP Upper 180 ft Aquifer Plume (3 mi SE). **Less than significant** because drawdown from the project pumping is much less than drawdown from local remedial pumping.

Simulations of the project pumping with the NMGWM are also helpful in evaluating the influence of the project pumping on seawater intrusion of the coastal aquifers. The modeling shows a local accelerated rate of seawater intrusion in the Dune Sand and 180-FTE Aquifers in the CEMEX area. However, as is illustrated by **Figure 13**, the rate of sea water intrusion further inland is reduced because the project pumping locally reverses the existing inland flow of groundwater and draws some inland groundwater toward the coast. **Thus the project decreases seawater intrusion to the inland aquifers.**

Conservative Model Assumptions

Aspects of the model design that result in conservatively large calculations of the inland influence include the no-flow offshore boundary conditions and offshore extension of a low hydraulic conductivity layer between the Dune Sand and 180-FTE Aquifers.

The offshore portion of Model Layer 1 ("Benthic Layer") in the NMGWM and CM is specified to be constant sea level and salinity. However, the boundary conditions at the offshore margin o of the model for all the other layers are no flow boundaries rather than constant sea level elevation. The large offshore extent of the model layers provides a "reservoir" of seawater groundwater beneath the sea floor, but the no flow boundaries preclude inward horizontal flow directly from the Ocean at depth in the model. This results in a conservatively large model contribution from inland flow in response to pumping beneath the coastal margin.

The DEIR reports that borings at the CEMEX site show that low permeability clay layers between Dune Sand and 180-FTE Aquifers, which are present inland, do not extend offshore. However, as illustrated by **Figure 14** the model includes a relatively low permeability layer (Model Layer 3, Horizontal Hydraulic Conductivity, Kh = 5 ft/d) between the Dune Sand and 180 FTE Aquifers extending offshore. Consequently, as reported in the DEIR, the model may underestimate the hydraulic connection between the 180-FTE Aquifer with the Dune Sand Aquifer and the Ocean.

Potentially Nonconservative Model Assumptions

Horizontal Hydraulic Conductivity (Kh) values of 340 and 114 ft/d that are assigned to the Dune Sand and 180-FTE Aquifers at coastal margin and offshore may be optimistically high.

Vertical Hydraulic Conductivity (Kv) values of ~10 ft/d in the NMGWM (**see Figure 15**) and Kv values up to 47 ft/d in the CM assigned to some of the Dune Sand aquifer may be optimistically high and may result in the model overestimating the portion of intake water derived from the ocean and underestimating the portion of intake water derived from inland.

Thus, the models may overestimate local hydraulic connection between the 180-FTE and Dune Sand Aquifers with the Ocean. In particular the Kv values discussed above may need to be revised in the NMGWM based on calibration of the CEMEX model to the long-term pumping test of Slant Well currently in progress.

The models represent some of the slant wells extending well beneath the sea floor (**Figure 2**), but the actual slant wells may not reach that far. For example, the test well just reaches the ocean margin where the well screen is approximately 225 ft beneath the ocean floor (**see Figure 1B**). If the actual slant wells are further from the ocean than the model slant wells, the model runs that have been conducted may overestimate hydraulic connection between the slant well intakes and the Ocean. We recommend that a sensitivity analysis be performed on influence on the model results of the location of the slant wells relative to the coastal margin. **Note, however, that the portions of Ocean Water and Inland Fresh Groundwater pumped by the slant wells can ultimately be determined from actual measurements of the intake water salinity, not by modeling.**

The initial chloride content of intake water pumped by the slant well was ~24,300 mg/L, which equates to approximately 72% Ocean Water and 28% Inland Fresh Groundwater. After ~44 days of pumping the chloride content of the intake water increased to ~28,245 mg/L, which equates to approximately 84% Ocean Water and 16% Inland Fresh Groundwater. The reported test data show that the salinity content of the intake water pumped by the slant well is increasing with time as the pumping draws more ocean water into the aquifers. However, the model calculated value of 95% ocean water for the intake water may be an overestimate. The portion of Ocean Water and Inland Fresh Groundwater will continue to be evaluated during the long-term test.

<u>Test Pumping Temporarily Stopped for Permit Compliance</u>

The CEMEX slant well test was stopped on 5 June 2015 after approximately 44 days of pumping at 200 gpm because the average drop in groundwater levels in monitoring well cluster MW-4S, MW-4M, and MW-4D was more than one foot. The MW-4 monitoring well cluster is approximately 2000 feet from the test slant well. **Figure 16** shows the location of the monitoring wells instrumented to record response to the slant well test pumping. **Figure 17** shows hydrographs for the MW-4.

The permit from the California Coastal Commission requires that the slant well test pumping be temporarily curtailed if the average drop in groundwater levels at MW-4S, MW4M, and MW-4D drops more than 1.5 ft. However, the majority of the drop in water level occurred in MW-4D, which is screened from 290 to 330 feet deep—well below the 225 ft depth of the test slant well. The drop in water level in MW-4D is attributed to a seasonal increase in irrigation pumping from the 400-ft aquifer, not the slant well pumping. With approval by the California Coastal Commission the test pumping of the slant well will be resumed.

Conclusions

Based on our review, the DEIR addresses the main critical issues on the source water intake system including

- potential impact to inland production wells due to drawdown of groundwater levels by the project pumping,
- potential interference with remedial measures for contaminant plumes in groundwater beneath Fort Ord,
- portions of project pumping derived from the ocean and from inland fresh groundwater, and
- influence of project pumping on sea water intrusion of Salinas Valley Aquifers.

The NMGWM and CM models provide reasonable simulations of the project pumping from the subsurface intakes. Updates to the model predictions can be made based on the long-term pump testing currently in progress at the slant well. Based on the modeling results the potential impact of the project pumping to inland wells is not significant. And, the project pumping would ***decrease*** sea water intrusion to inland aquifers because the project pumping locally reverses the existing inland flow of groundwater and draws some inland groundwater toward the coast.

The modeling indicates that the contribution of inland fresh groundwater to the proposed pumping beneath the coastal margin is minor and can realistically be returned to the Salinas Basin. However, the precision of the model predicted portions of ocean and inland fresh groundwater is not critical because actual portions of ocean water and inland fresh groundwater pumped by the slant wells can ultimately be determined from actual measurements of the intake water salinity, not by modeling.

* * * * *

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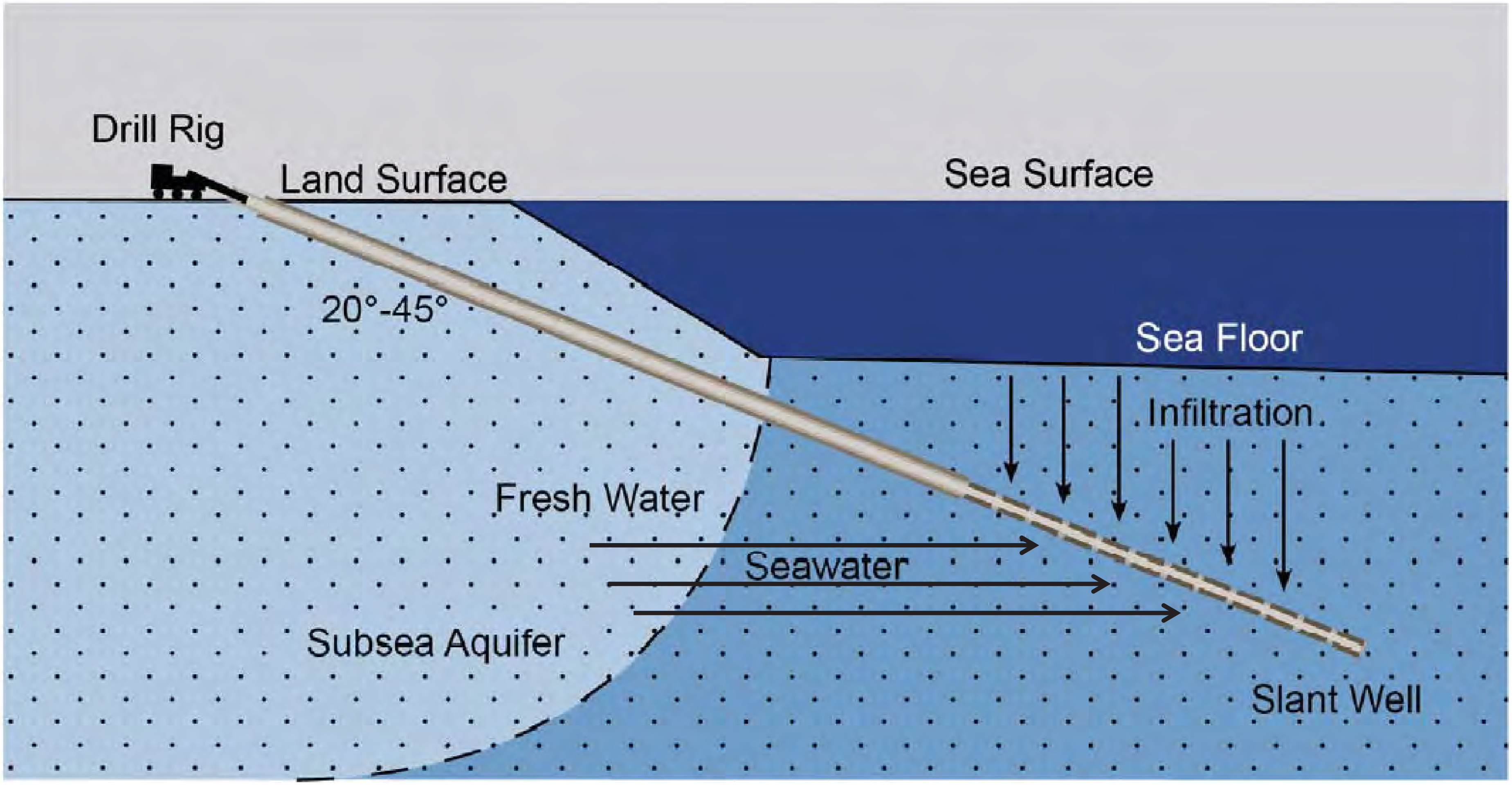

Notes

- Adapted from Figure 4 of Missimer et al. (2013)

Schematic Example of a Slant Well

CalAm Monterey Peninsula Water Supply Project
Monterey, CA

Geosyntec consultants

Figure 1

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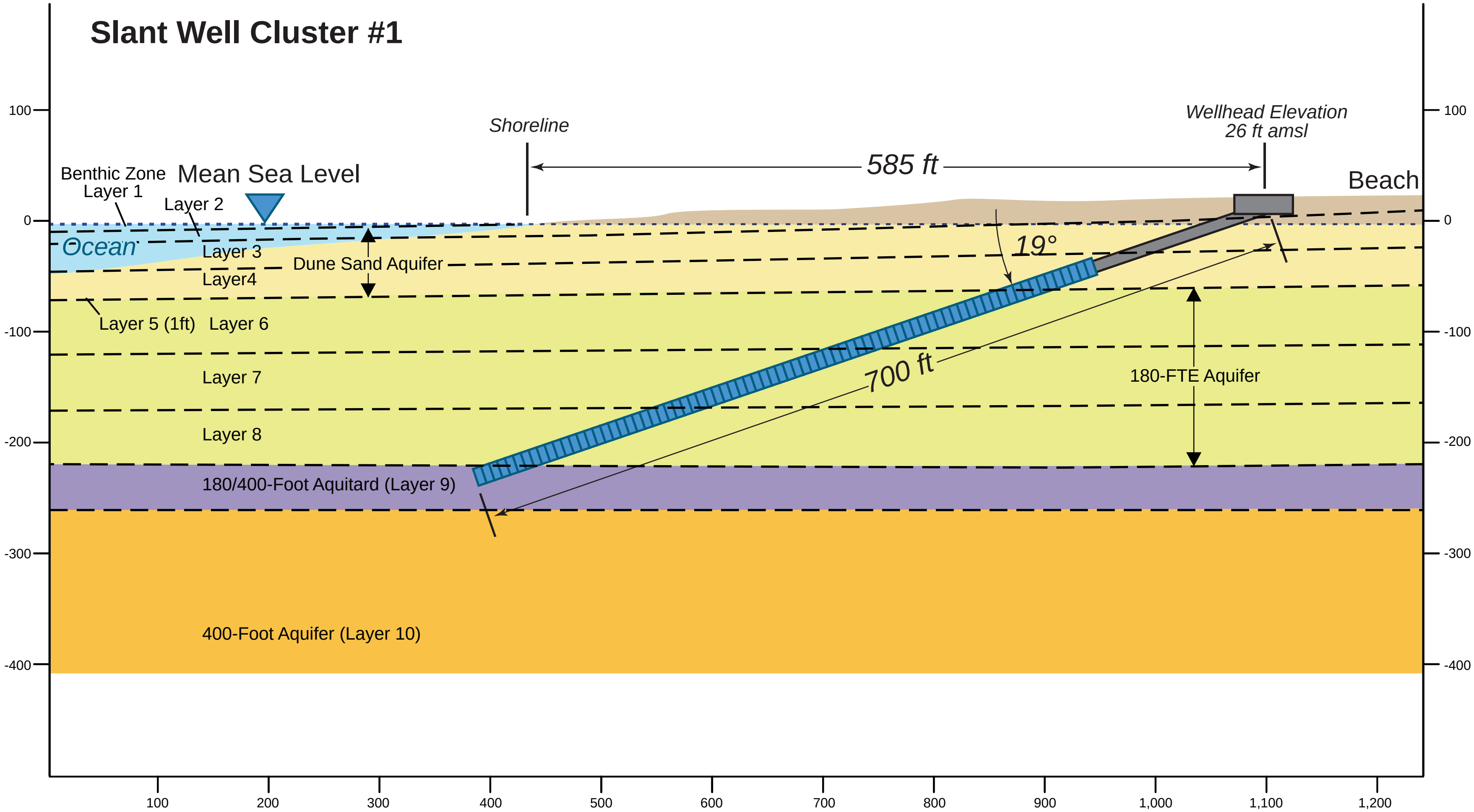

Adapted from Fig 4c, Appendix E2, DEIR

Cross-Section of Test Slant Well

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Figure

1B

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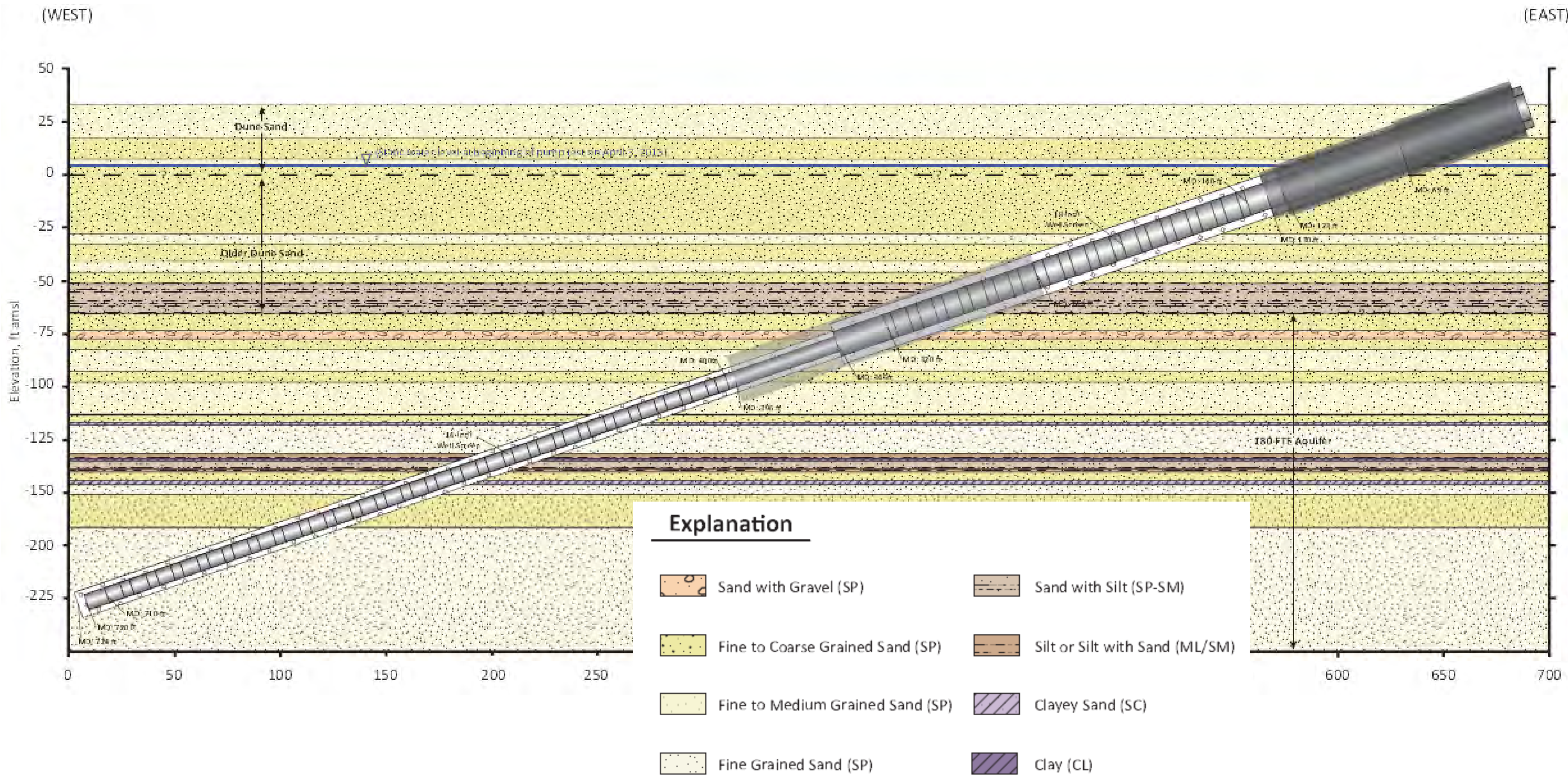

Notes

- Adapted from Fig 4c, Appendix E2, DEIR
- Actual geometry of installed slant well.

As-built drawing of CEMEX Test Slant Well with Lithology
CalAm Monterey Peninsula Water Supply Project
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Figure 1C

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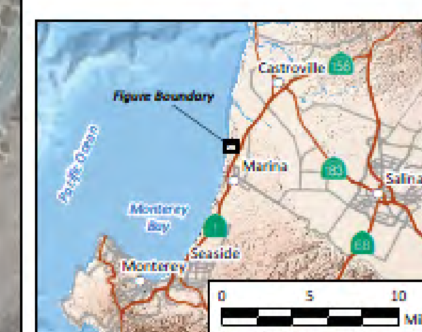

Legend

Test Slant Wellhead
Blank Casing
Well Screen

Mean High Tide
(DOC, NOAA et al., 2011)

Notes

-Adapted from Figure 47 of the 2015 Draft Environmental Impact Report

N

0 100 200 300 400 500 1,000 Feet

Proposed Slant Well Locations at CEMEX Site

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Monterey, California

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Figure 2

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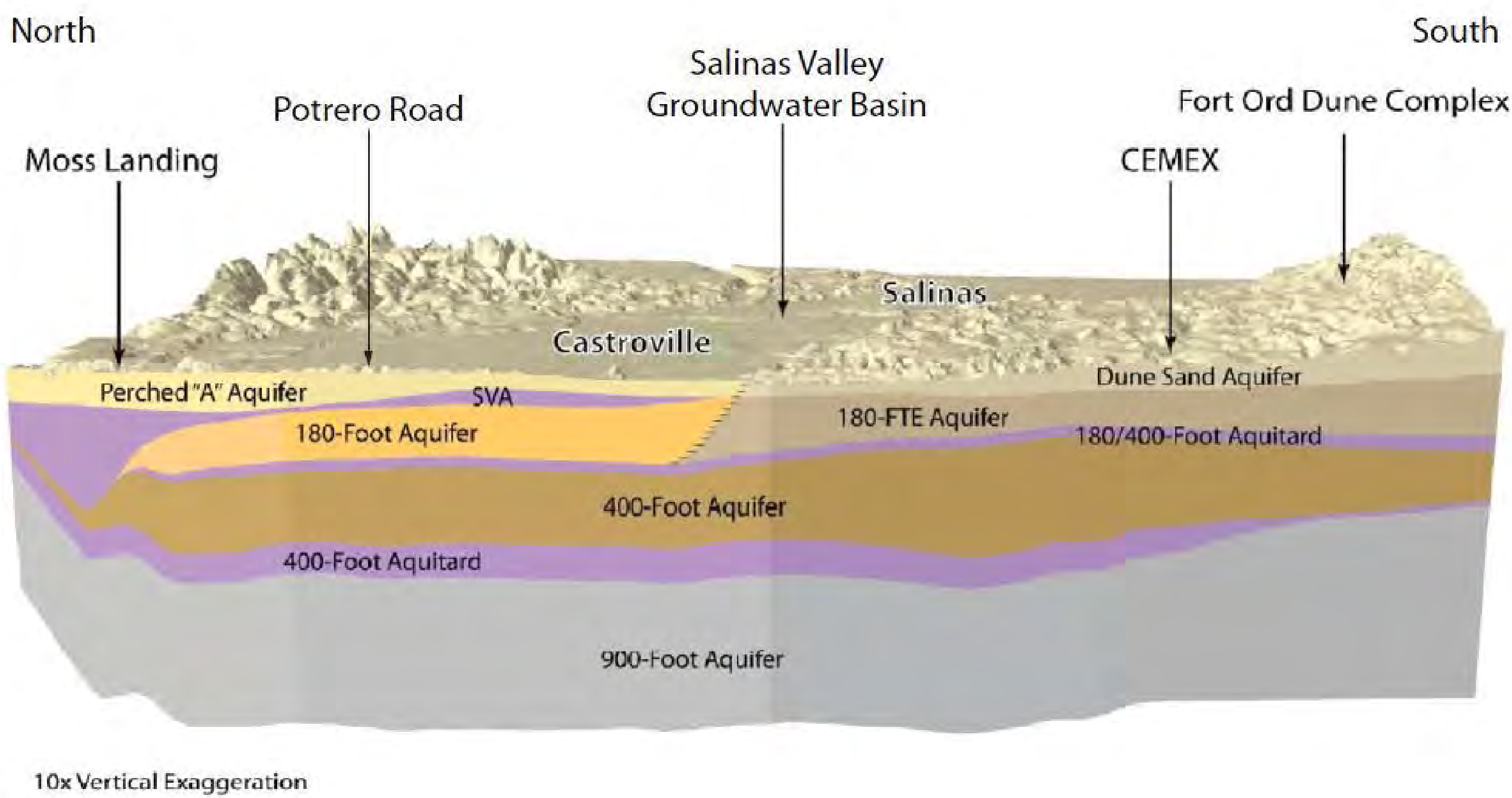

Notes

- Adapted from Figure 4.4-2 of the 2015 Draft Environmental Impact Report.

N

Coastal Aquifer Hydrostratigraphic Units

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Figure 3

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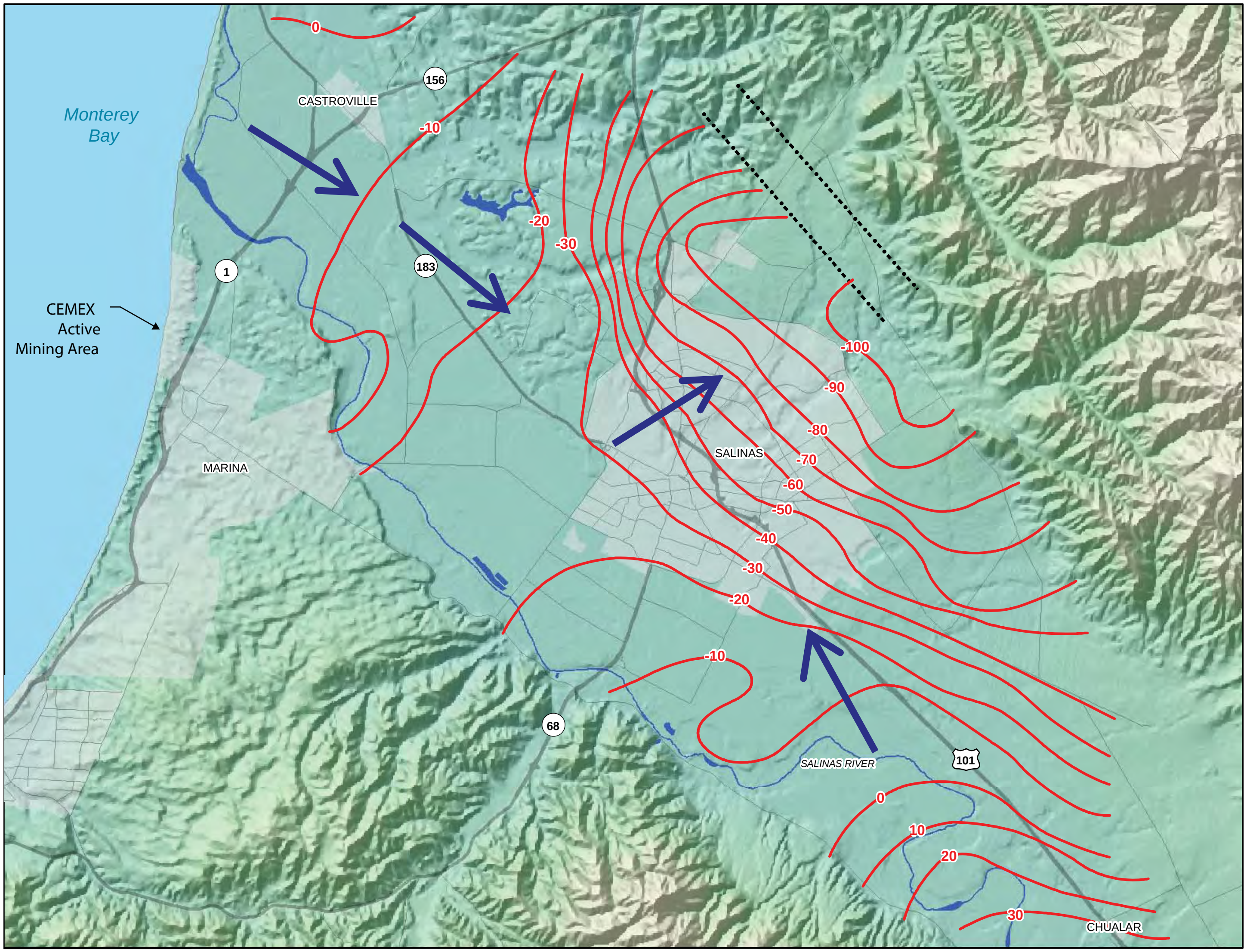

Legend

- 10 Foot Elevation Contours, Mean Sea Level
- Potential Fault Zone

Notes

- Groundwater levels well below sea level several miles inland due to overdraft of aquifers.
- Adapted from Figure 4.4-5 of the 2015 Draft Environmental Impact Report.

N

0 2.0 Miles

Groundwater Elevations in Salinas Valley 180-ft Aquifer
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Monterey, California

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Figure 4

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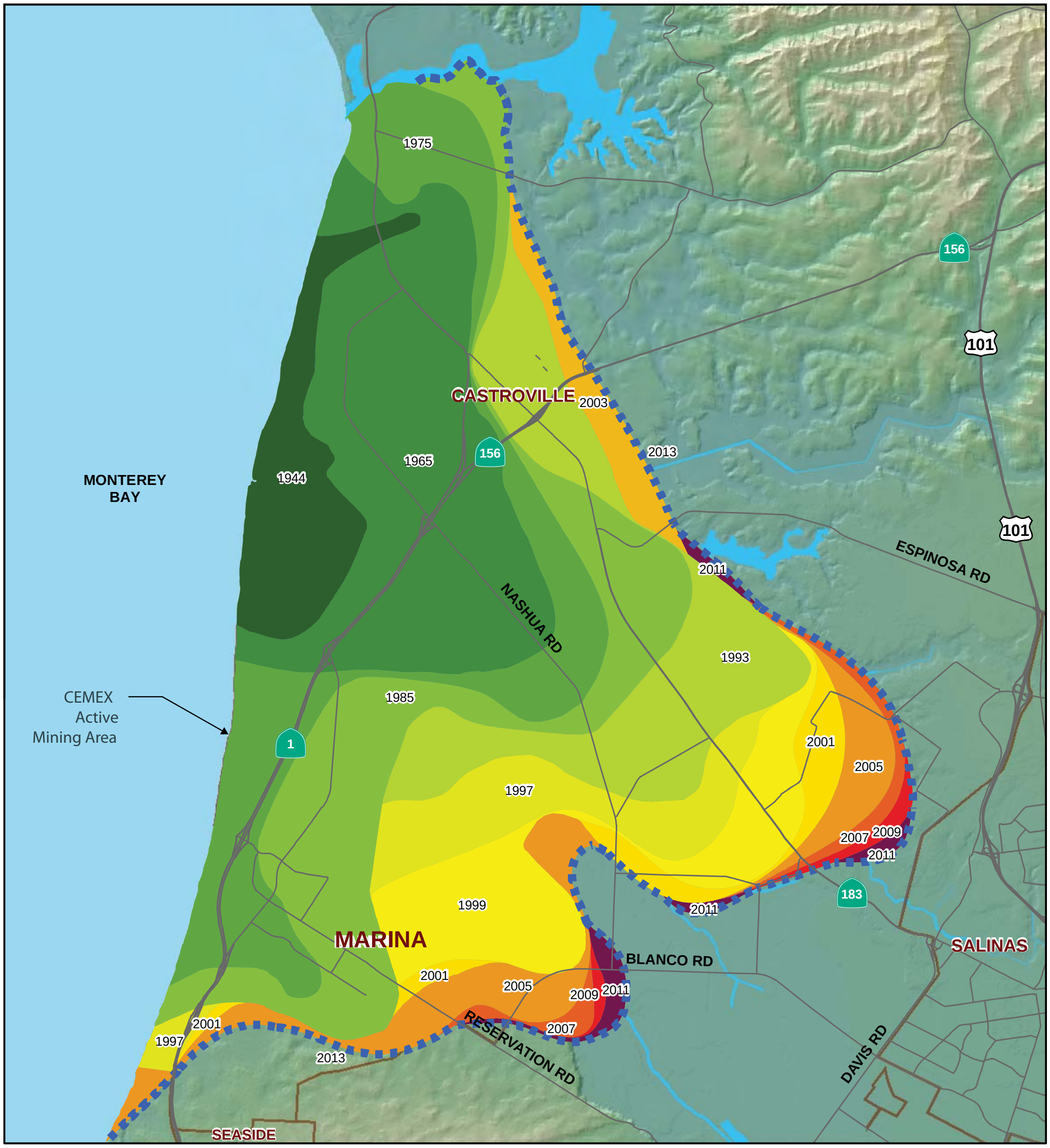

Legend

Cities	1993	2005
1944	1997	2007
1965	1999	2009
1975	2001	2011
1985	2003	

*** Seawater Intruded Areas By Year**

Notes

- Chloride > 500 mg/L extends 8 miles from the coast (2013).
- The SVGB is hydrologically connected to the Monterey Bay by ocean outcroups of the 180-Foot and 400-Foot awuifers that outcrop a few miles offshore.
- Adapted from Figure 4.4-9 of the 2015 Draft Environmental Impact Report.

N

0 0.5 1 1.5 2 Miles

Extent of Seawater Intrusion in Salinas Valley 180-ft Aquifer

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Monterey, California

Geosyntec consultants

Figure 5

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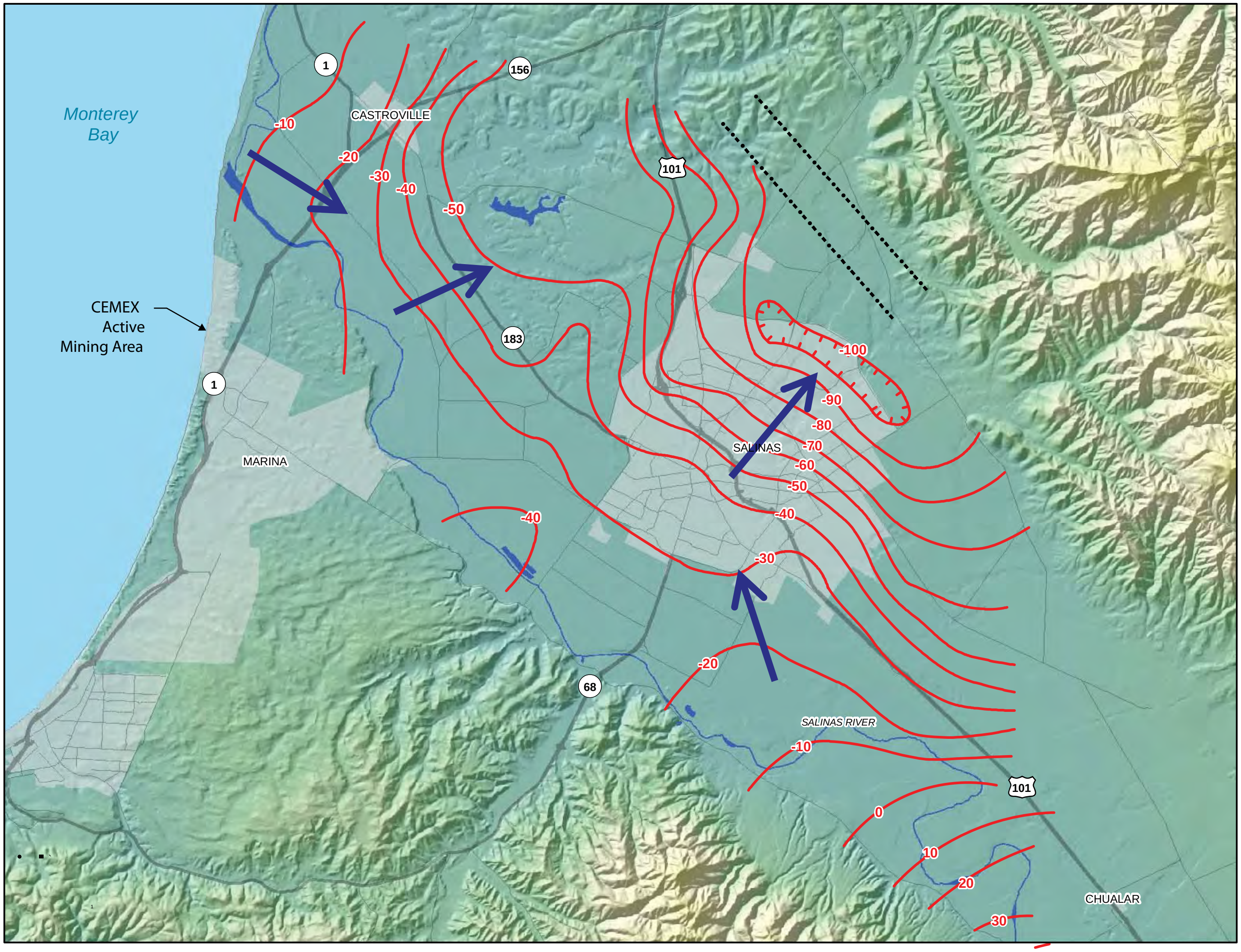

Notes

- 10 Foot Elevation Contours, Mean Sea Level
- Potential Fault Zone

- Groundwater levels well below sea level several miles inland.
- Adapted from Figure 4.4-6 of the 2015 Draft Environmental Impact Report.

0 2.0 Miles

N

Groundwater Elevations in Salinas Valley 400-ft Aquifer

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Monterey, California

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Figure 6

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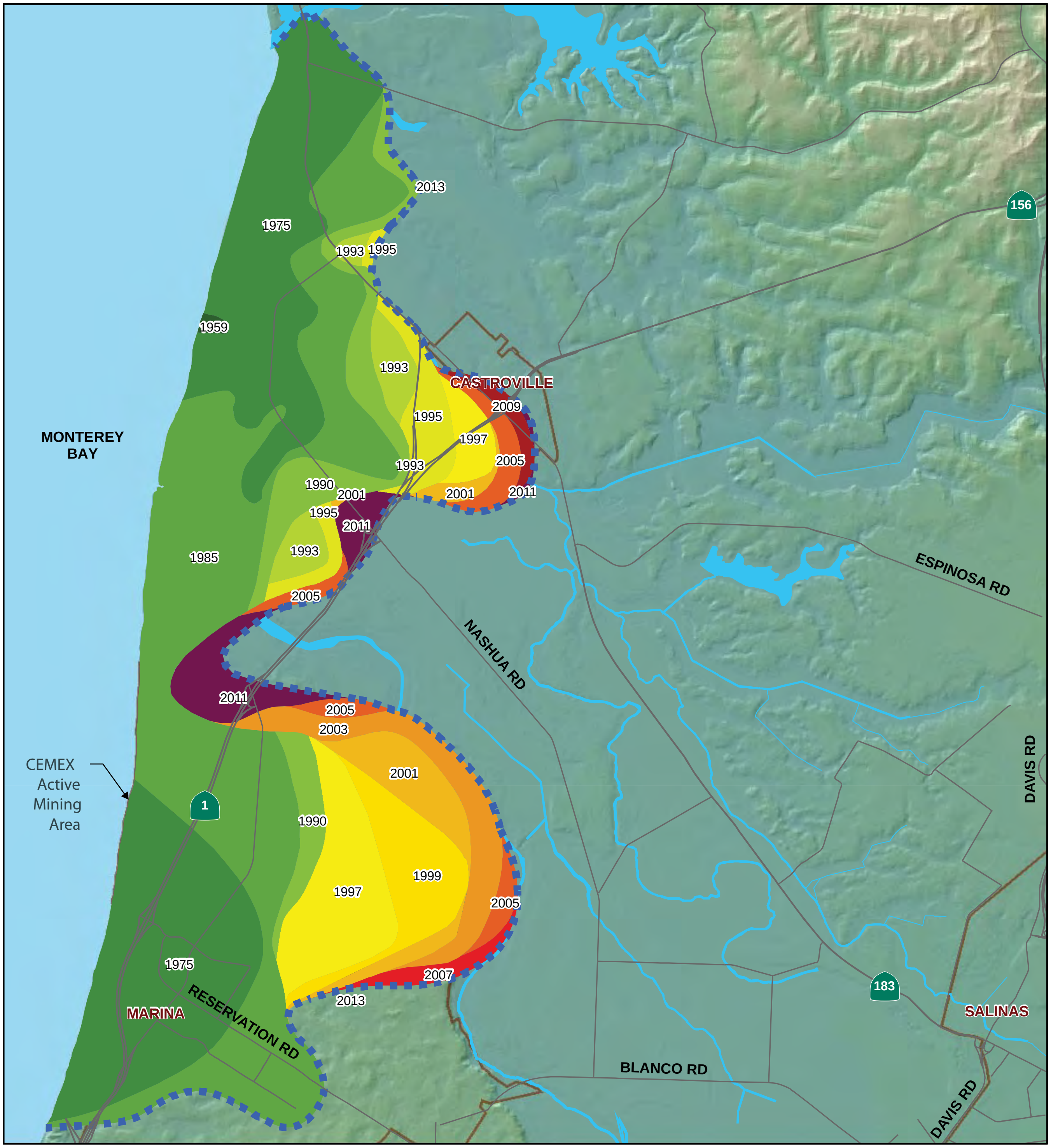

Legend

Cities	1999
1959	2001
1975	2003
1985	2005
1990	2007
1993	2009
1995	2011
1997	2013

*** Seawater Intruded Areas By Year**

Notes

- Chloride > 500 mg/L extends 3.5 miles from the coast (2013).
- Adapted from Figure 4.4-9 of the 2015 Draft Environmental Impact Report.

N

0 0.5 1 1.5 2 Miles

Extent of Seawater Intrusion in Salinas Valley 400-ft Aquifer

CalAm Monterey Peninsula Water Supply Project
Monterey, California

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Figure 7

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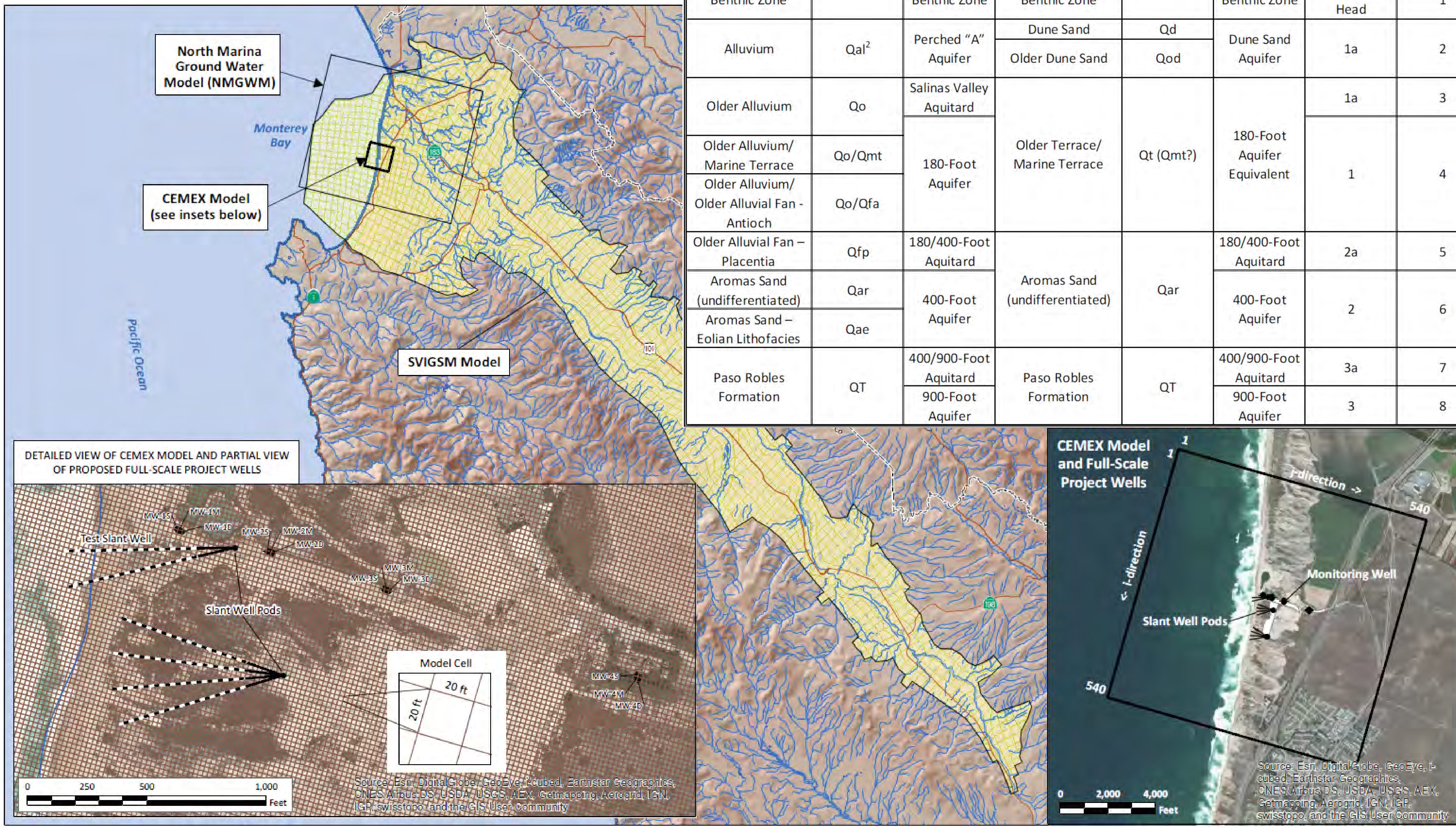
180/400-Foot Aquifer Subbasin			CEMEX Area			SVIGSM Layer[1]	NMGWM Layer	CEMEX Model Layer
Geologic Unit	Geologic Unit Map Symbol	Hydro-stratigraphic Unit	Geologic Unit	Geologic Unit Map Symbol	Hydro-stratigraphic Unit			
Benthic Zone		Benthic Zone	Benthic Zone		Benthic Zone	Constant Head	1	1
Alluvium	Qal[2]	Perched "A" Aquifer	Dune Sand	Qd	Dune Sand Aquifer	1a	2	2
			Older Dune Sand	Qod				3
								4
Older Alluvium	Qo	Salinas Valley Aquitard	Older Terrace/ Marine Terrace	Qt (Qmt?)	180-Foot Aquifer Equivalent	1a	3	5
Older Alluvium/ Marine Terrace	Qo/Qmt	180-Foot Aquifer				1	4	6
								7
Older Alluvium/ Older Alluvial Fan - Antioch	Qo/Qfa							8
Older Alluvial Fan – Placentia	Qfp	180/400-Foot Aquitard	Aromas Sand (undifferentiated)	Qar	180/400-Foot Aquitard	2a	5	9
Aromas Sand (undifferentiated)	Qar	400-Foot Aquifer			400-Foot Aquifer	2	6	10
Aromas Sand – Eolian Lithofacies	Qae							
Paso Robles Formation	QT	400/900-Foot Aquitard	Paso Robles Formation	QT	400/900-Foot Aquitard	3a	7	11
		900-Foot Aquifer			900-Foot Aquifer	3	8	12



Notes

-Adapted from Figure 1 of Appendix E1 of the DEIR

Groundwater Model Domains

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Monterey, California

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Figure 8

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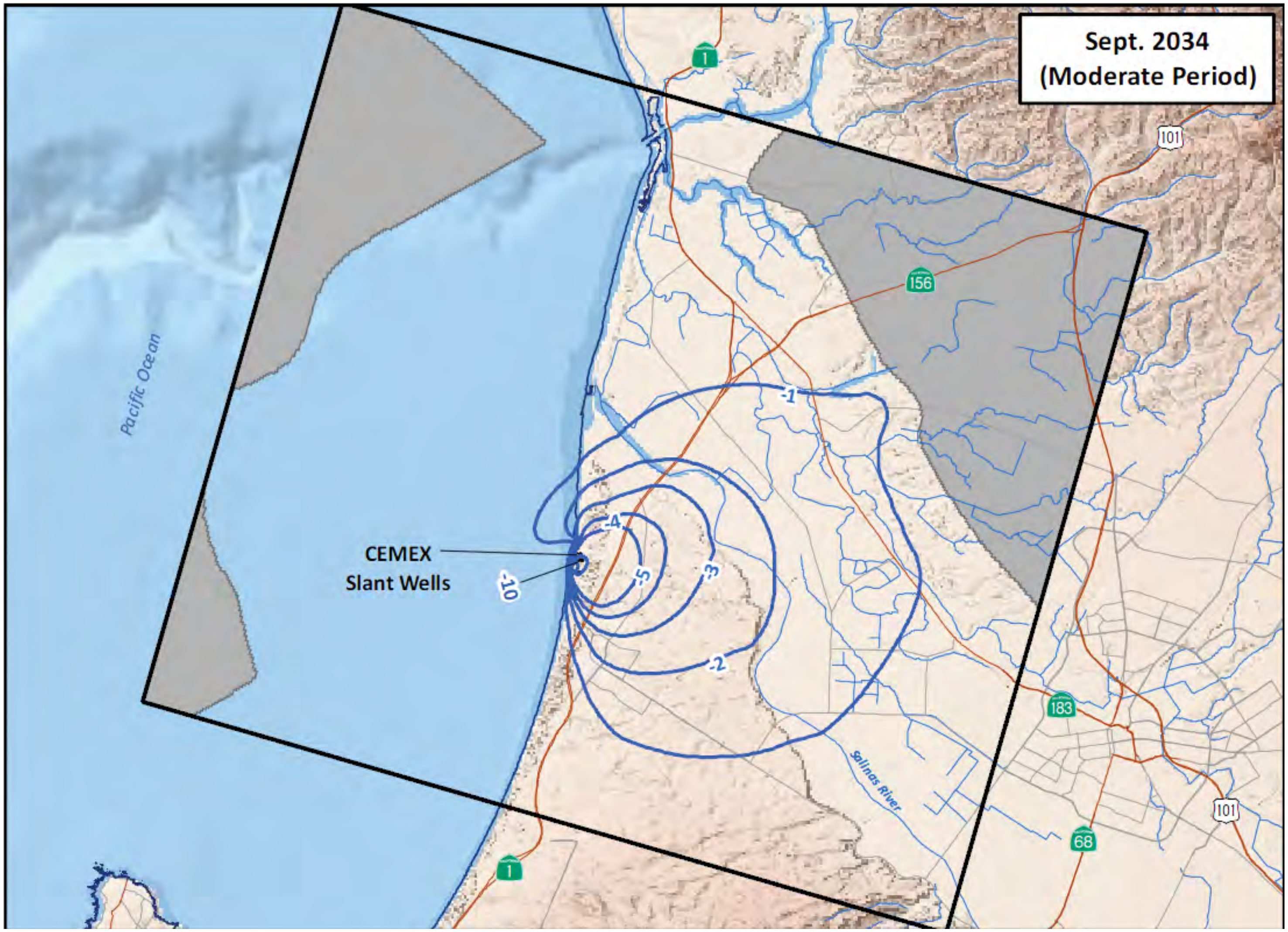

Notes

North Marina Groundwater Model Boundary

No Flow Cell

Mean High Tide (DOC, NOAA et al., 2011)

-5- Change in Groundwater Elevation (ft)

CEMEX Slant Wells - Configuration A (Feedwater Supply of 24.1 MGD) (See Figure 47 for Detailed Slant Well Layout)

- Model-calculated maximum inland extent of 1 ft lowering (drawdown) of groundwater due to project pumping is ~5 miles.
- (1 ft contours of drawdown).
- Adapted from Figure 97 of the 2015 Draft Environmental Impact Report.

N

0 2 4 8 Miles

Model Drawdown in Dune Sand Aquifer

CalAm Monterey Peninsula Water Supply Project
Monterey, California

Geosyntec consultants

LA0342	June 2015	**Figure 9**

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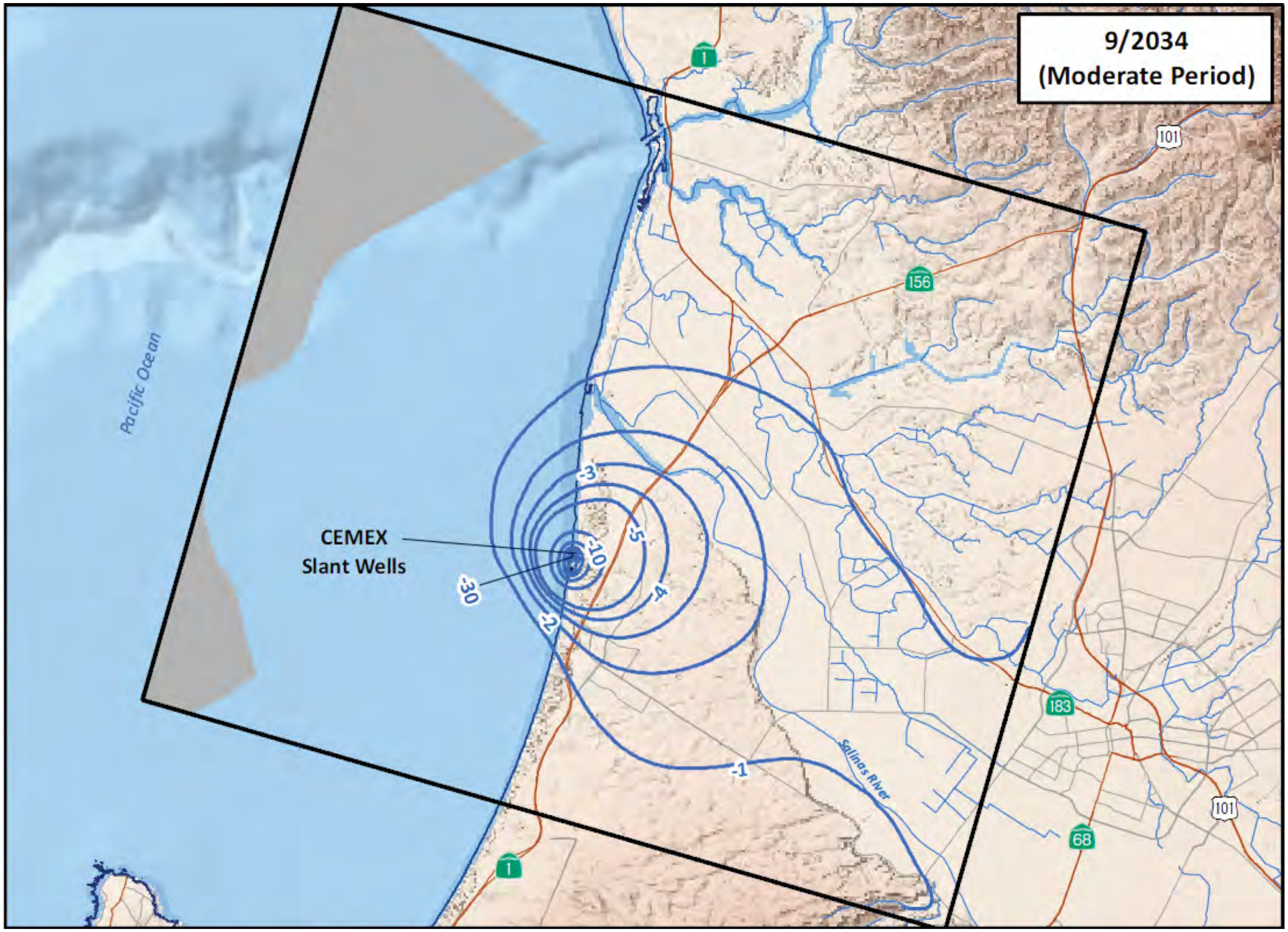

Notes

North Marina Groundwater Model Boundary

No Flow Cell

Mean High Tide (DOC, NOAA et al., 2011)

-5- Change in Groundwater Elevation (ft)

CEMEX Slant Wells - Configuration A (Feedwater Supply of 24.1 MGD) (See Figure 47 for Detailed Slant Well Layout)

- Model-calculated maximum inland extent of 1 ft lowering (drawdown) of groundwater due to project pumping is ~7 miles.
- (1 ft contours of drawdown).
- Adapted from Figure 98 of the 2015 Draf Environmental Impact Report.

0 2 4 8 Miles

N

Model Drawdown in 180-ft Aquifer

CalAm Monterey Peninsula Water Supply Project

Monterey, California

Geosyntec consultants

LA0342 | June 2015

Figure 10

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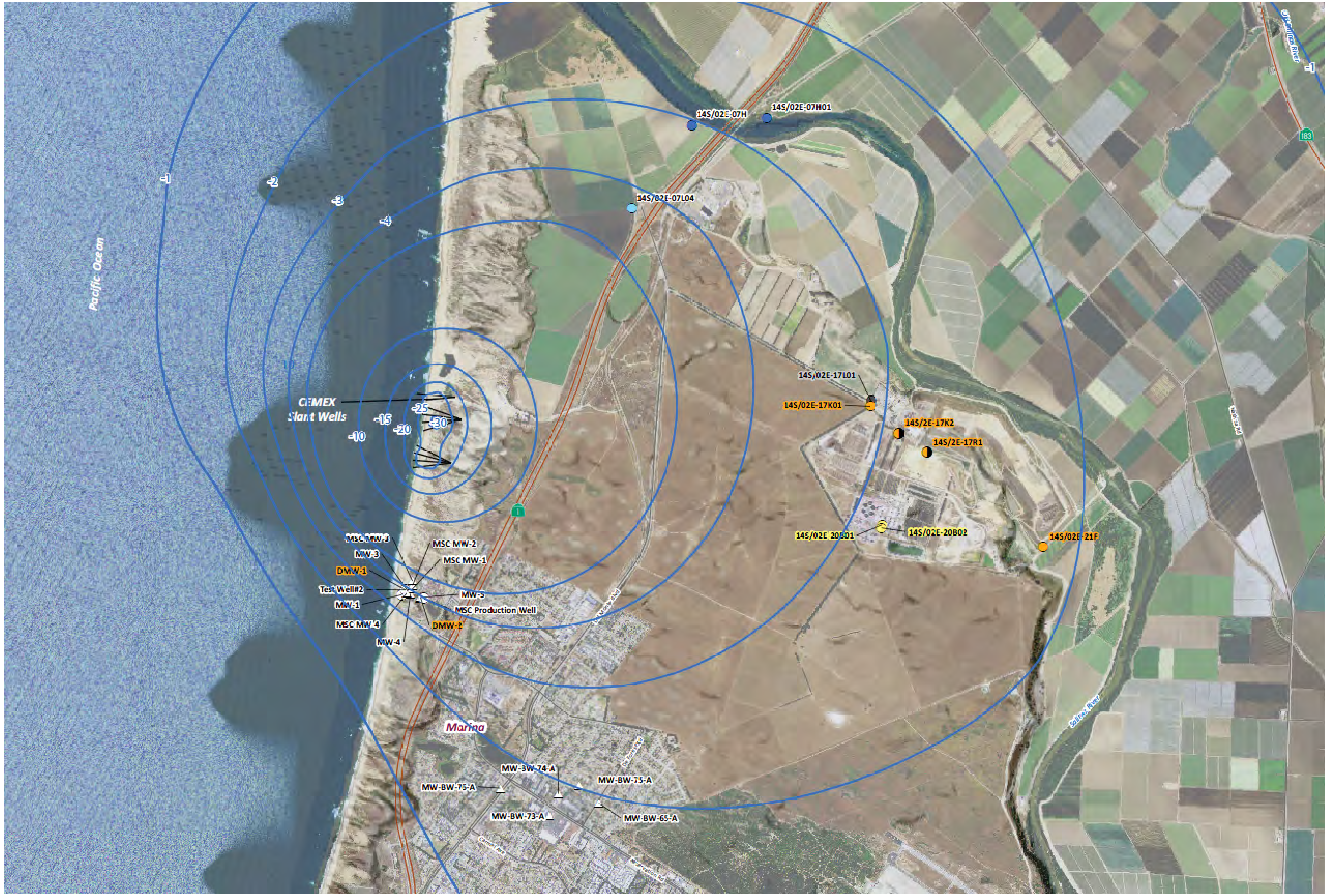

Notes

Dune Sand Aquifer (Type of Well)	180-FTE Aquifer (Type of Well)	400-FT Aquifer (Type of Well)	
Monitoring	Monitoring (DMW-1 and DMW-2)	Active	CEMEX Slant Wells (Feedwater Supply of 24.1 MGD)
Unknown	Active	Potentially Active	Change in groundwater elevation in feet based on drawdown in the 180 Equivalent Aquifer, (September 2034, Moderate Period)
	Inactive	Unknown	
	Well Screened in Dune Sand and 180-FTE Aquifer		

Notes

- Adapted from Figure 4.4-15 of the 2015 Draft Environmental Impact Report.

N

0 2,500 5,000 Feet

Model Drawdown in 180-ft Aquifer and Locations of Wells

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Monterey, California

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Figure 11

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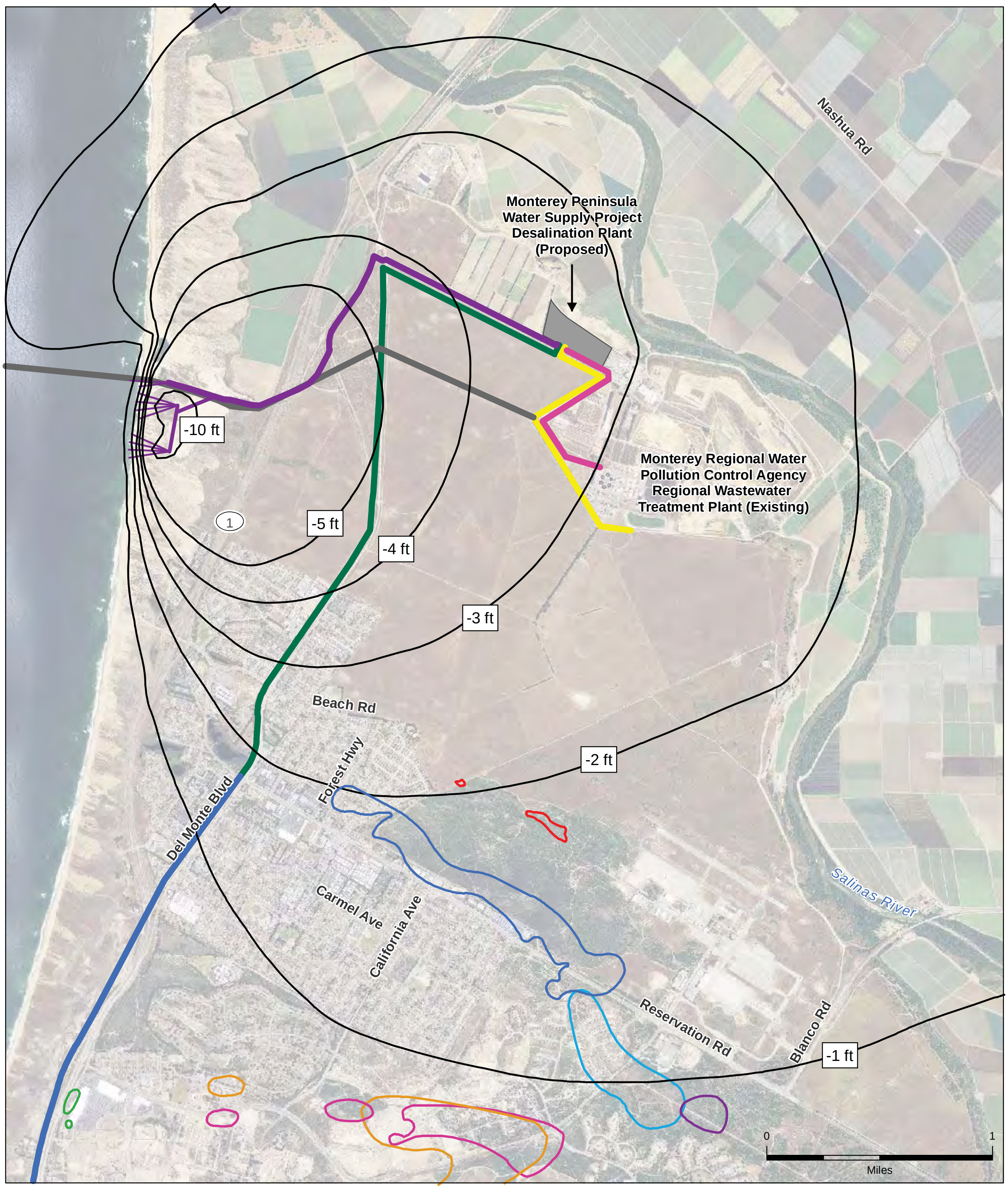

-Adapted from Figure 4.4-18 Drawdown in 180 and Ft Ord Plumes

Legend

- Simulated Changes in Dune Sand Aquifer Groundwater Elevation Contours: Sept. 2034

Proposed Pipelines

- Subsurface Slant Wells
- Source Water Pipeline (Proposed)
- Brine Discharge Pipeline (Proposed)
- MRWPCA Ocean Outfall and Diffuser (Existing)
- Desalinated Water Pipeline (Proposed)
- Transmission Main (Proposed)
- Salinas Valley Return PL (Proposed)

Fort Ord Groundwater Plumes (Sept. to Dec. 2014)

- 2-12 TCE Upper 180-foot Aquifer
- OU1 TCE A-Aquifer
- OU2 TCE A-Aquifer
- OU2 TCE Upper 180-foot Aquifer
- OUCTP A-Aquifer
- OUCTP Lower 180-foot Aquifer
- OUCTP Upper 180-foot Aquifer

N

Potential Influence on Contaminant Plumes at Ford Ord

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Monterey, California

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Existing Conditions (No Project)
Inland flow directino in Coastal Aquifers

24.1 MGD Pumping
Local Reversal of Flow toward Ocean

Legend

white line	Particle Travel Path
white arrow	Direction of Particle Travel and Travel Time (1 Year Increments)

Slant Wellhead
Blank Casing
Well Screen

CEMEX Slant Wells (Feedwater Supply of 24.1 MGD)

Note: 180-FTE = 180-Foot Equivalent Aquifer

N

0 2,500 5,000 Feet

- Adapted from Figure 4.4-16 of the 2015 Draft Environmental Impact Report\

Project Reduces Inland Extent of Sea Water Intrusion

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Figure 13

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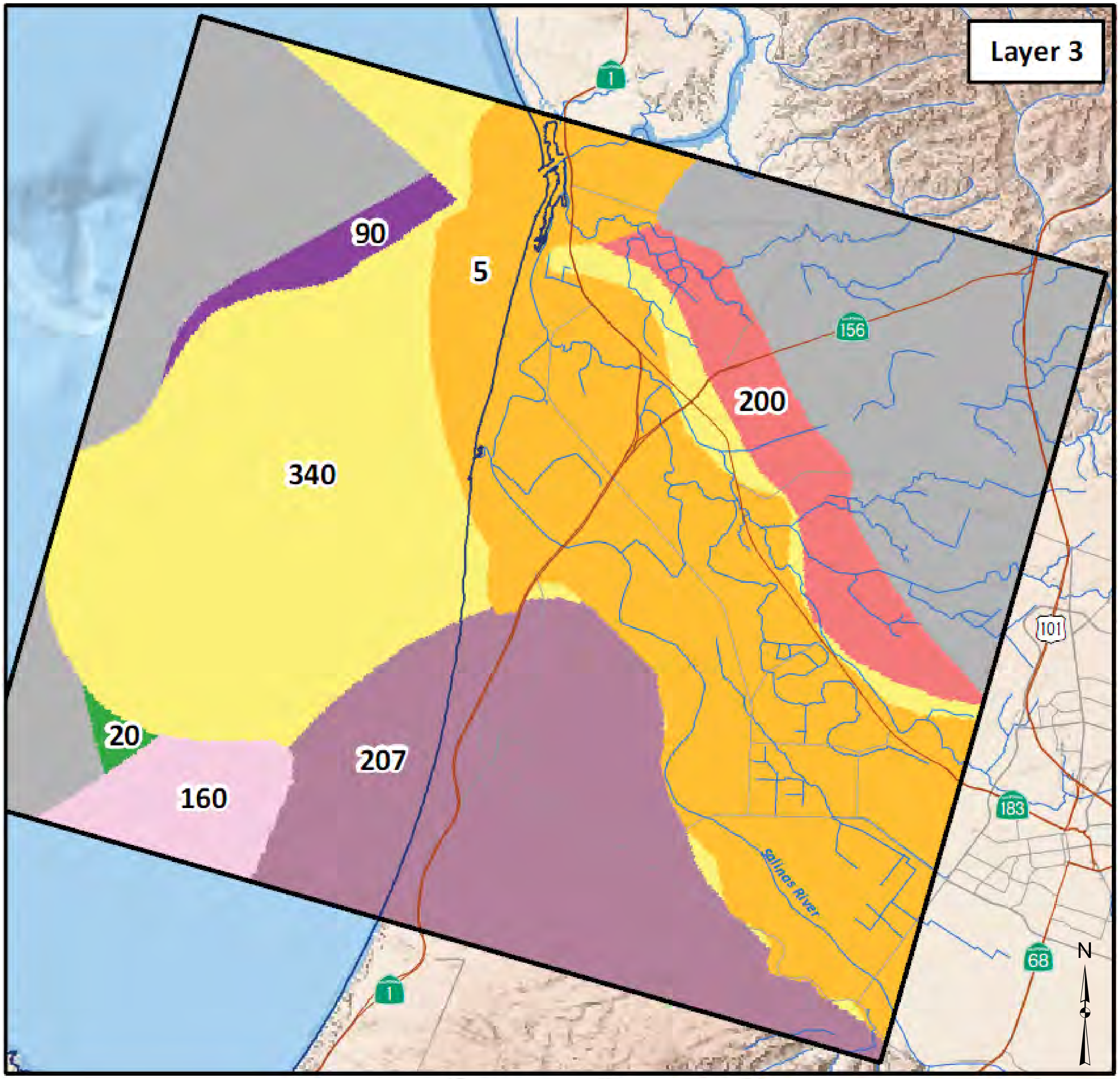
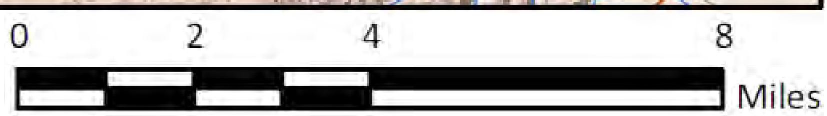
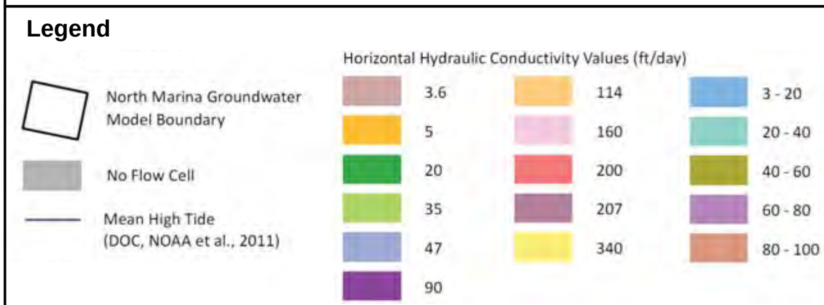


- Conservatively low Kh (5 ft/d) between Dune sand and 180-FTE Aquifers at Coastline (Model Layer 3).

- Adapted from Figure 31, Appendix E2, DEIR





Kh in NMGWM Layer 3

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Figure 14

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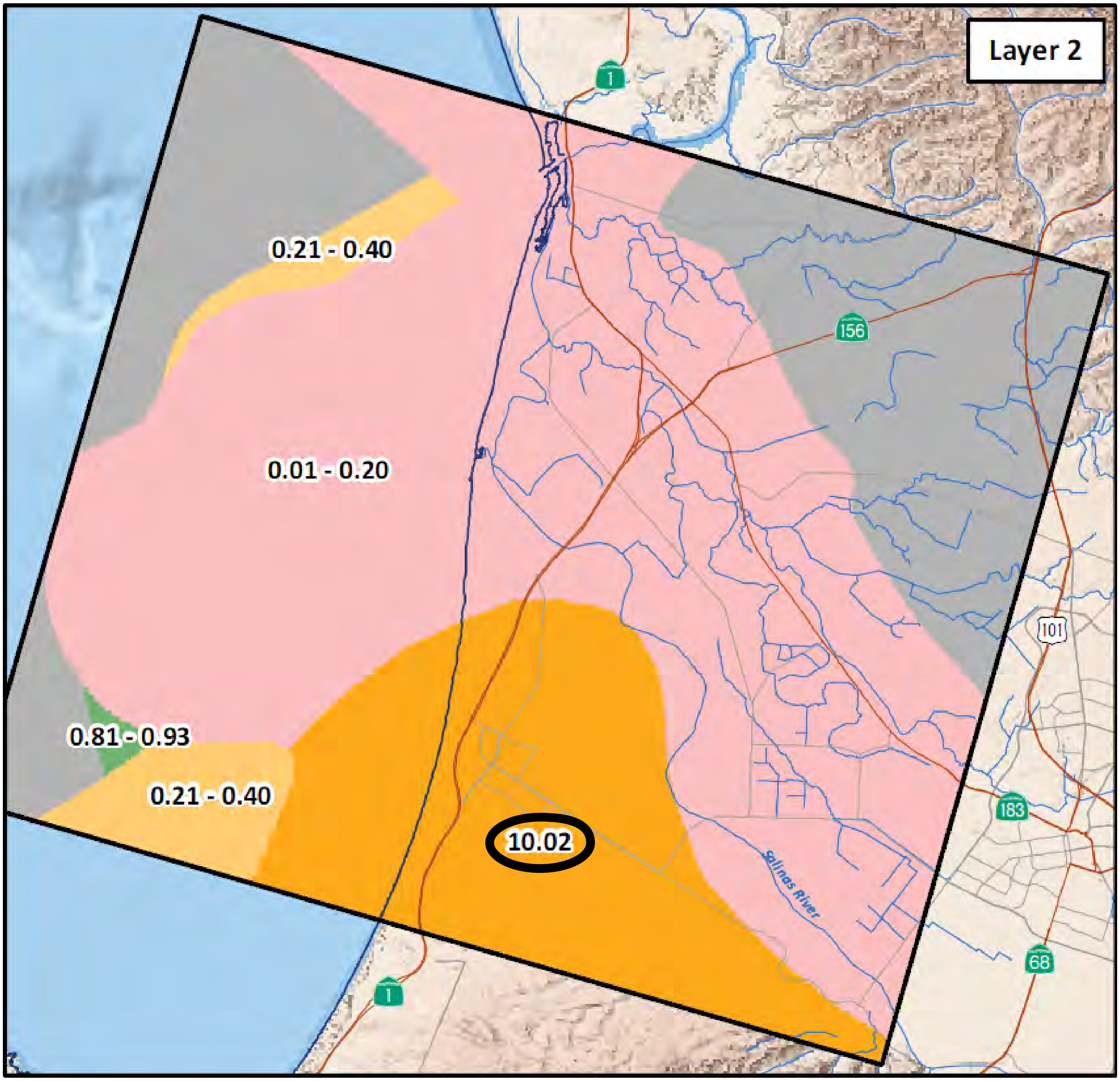

0 2 4 8 Miles

- Hi Kv (10 ft/d) for Dune Sand Aquifer (Model Layer 2) may overestimate hydraulic connection to the Ocean.

- Adapted from Figure 32, Appendix E2, DEIR

Legend

North Marina Groundwater Model Boundary

No Flow Cell

Mean High Tide (DOC, NOAA et al., 2011)

Vertical Hydraulic Conductivity Values (ft/day)

0.01 - 0.20
0.21 - 0.40
0.41 - 0.60
0.61 - 0.80
0.81 - 0.93
10.02

N

Kv in NMGWM Layer 2v

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Figure 15

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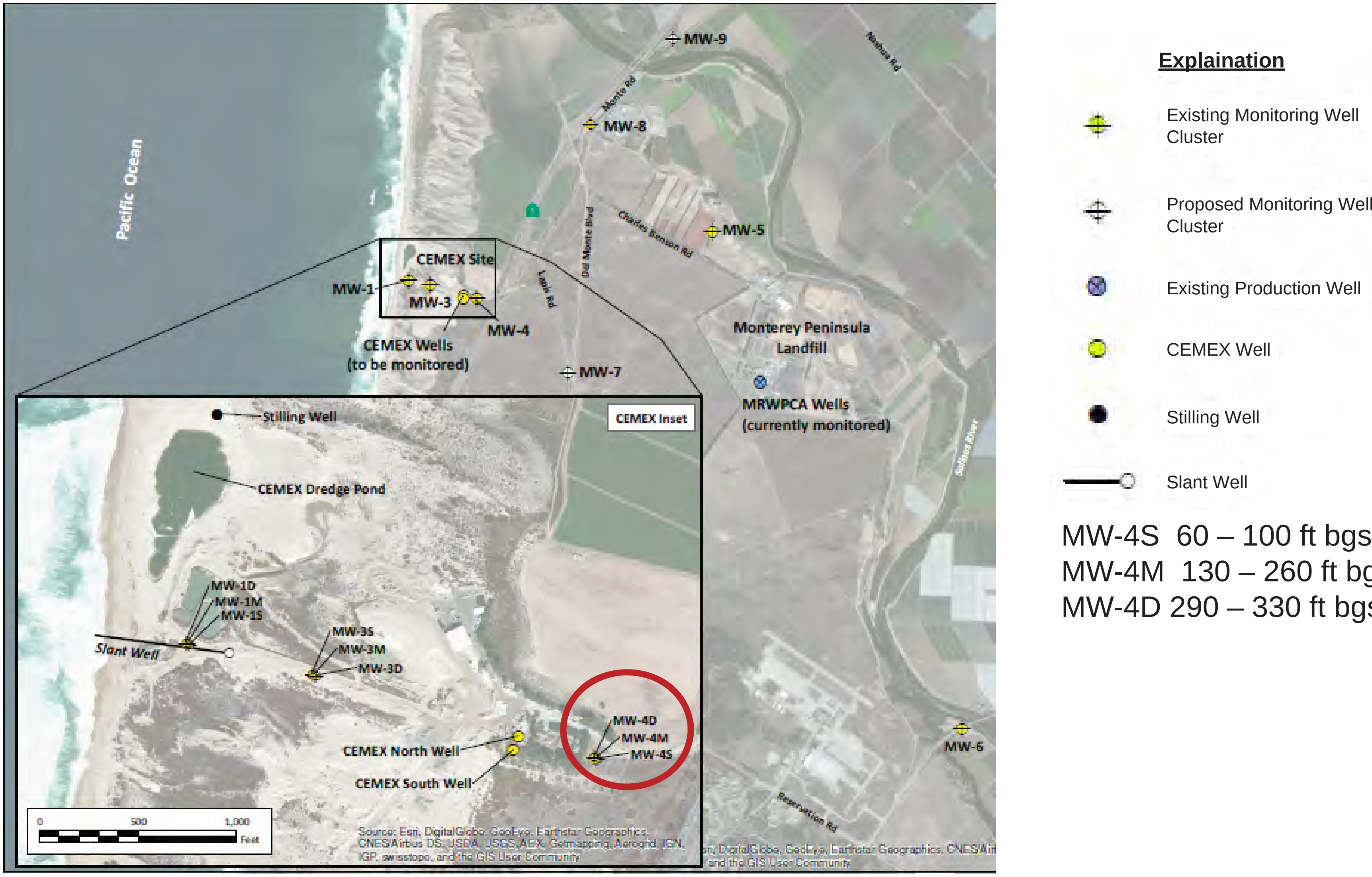
CALIFORNIA AMERICAN WATER



MW-4S 60 – 100 ft bgs
MW-4M 130 – 260 ft bgs
MW-4D 290 – 330 ft bgs

Notes

- Adapted from Figure 1.1 of Longterm Pumping Report 7 (16 Jun 2015).

Locations of Wells Monitored for Permit Compliance

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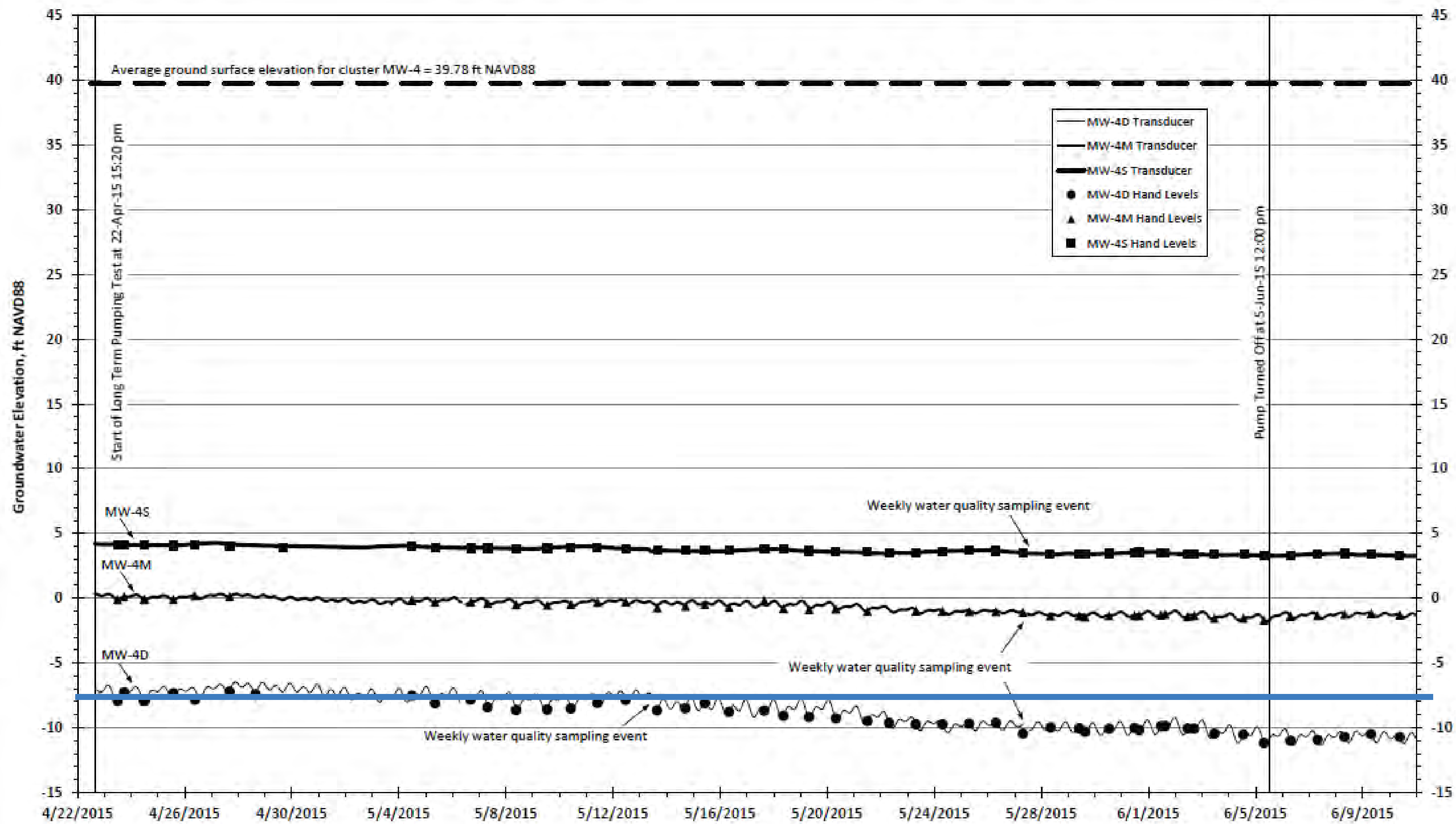
LA0342	June 2015	**Figure 16**

\\Oakland-01\data\GIS\MontereyDesal\Project\06_2015\AI\Slide_16_ComplianceWells.ai



Legend

adapted from Fig 2-3 Geoscience 16 Jun 2015
MW-4S 60 – 100 ft bgs
MW-4M 130 – 260 ft bgs
MW-4D 290 – 330 ft bgs

Hydrographs for MW-4

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Monterey, CA

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Figure 17

LA0342 | June 2015

\\Oakland-01\data\GIS\MontereyDesal\Project\06_2015\AI\Slide_17_Hydrograph_MW-4.ai

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Memorandum

Date: 23 June 2015

To: Jim Cullem, Monterey Peninsula Region Water Authority

From: Al Preston, Ph.D., P.E., Mark Hanna, Ph.D., P.E.

Subject: Review of Monterey Peninsula Water Supply Project DEIR
Part 2: Brine Disposal System
Geosyntec Project Number: LA0342

Geosyntec Consultants, Inc. (Geosyntec) was engaged by SPI Membrane Technology Consultants on behalf of the Monterey Peninsula Region Water Authority (MPRWA) to conduct a focused review of the April 2015 Draft Environmental Impact Report (DEIR) prepared for the CalAm Monterey Peninsula Water Supply Project (MPWSP). The goal of the review was to address two specific questions related to the proposed desalination plant;

1. Does the DEIR address the main critical issues on source water intake system?

2. Does the DEIR address the main critical issues on brine disposal system?

This summary memorandum addresses the critical issues pertaining to the brine disposal system. A separate companion memorandum addresses the source water intake system.

In general the DEIR was found to make reasonable and conservative assumptions for the analyses of the brine disposal system, and thus the results of the analyses are appropriate. The numerous conservative assumptions made in the analyses imply that the predicted mixing and dilutions are likely under-estimated, and as such actual salinities and constituent concentrations within the brine plume are likely to be lower than indicated in the DEIR. Some potential weaknesses in the analyses were identified, but these were either minor or able to be readily addressed by including additional analyses developed by Geosyntec (provided in Appendix A).

1. OVERVIEW OF BRINE DISPOSAL SYSTEM

The waste brine from the desalination plant will be discharged through the existing Monterey Regional Water Pollution Control Agency (MRWPCA) diffuser that presently discharges treated wastewater. The diffuser is located at a depth of 90 to 110 feet in Monterey Bay, approximately two miles north of Marina, CA. The diffuser structure is 1,100 feet long with 172 two-inch ports on alternating sides. The alternating ports are spaced at 8 feet, resulting in a port spacing of 16 feet on the same side of the diffuser (Figure 1). Only 130 of the ports are open and these are fitted with duckbill check valves[1]. The remaining 42 ports are blocked off. The ports discharge horizontally, approximately 3.5 to 4 feet above the sea-floor.

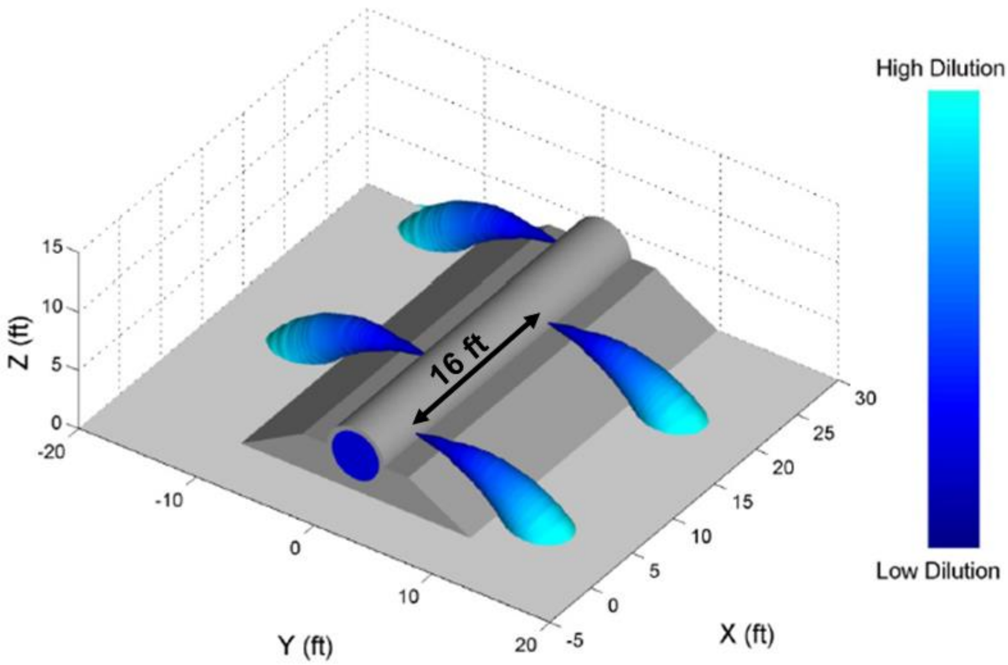

Figure 1. Schematic of MRWPCA diffuser with brine discharge (source: DEIR, Appendix D2)

The DEIR analyzes a variety of discharges through the diffuser, consisting primarily of blends of fresh wastewater and hyper-saline brine, and with smaller amounts of hauled brine and groundwater replenishment (GWR) concentrate. Depending upon the blend ratios of wastewater to brine and the resulting salinity, the discharge plume may either rise (positively buoyant, dominated by the fresh wastewater) or sink (negatively buoyant, dominated by the hyper-saline brine). Rising plumes have high dilution capabilities, whereas the dilution of sinking plumes is typically lower. Thus, most of the focus of this review is on the more critical sinking plumes.

[1] https://en.wikipedia.org/wiki/Duckbill_valve

2. CRITICAL ISSUES

The critical issues pertinent to the brine disposal system are generally related to the initial dilution achieved in the near-field, and the subsequent movement and dispersion of the brine in the far-field. The near-field refers to the region close to the diffuser ports where the flow and mixing is dominated by the jets (Figure 2). It is characterized by time scales on the order of seconds to minutes, and length scales on the order of feet to tens of feet. By contrast, in the far-field the mixing is dominated by ocean processes, including large scale currents (particularly generating shear flow near the sea floor) and wave action. It is characterized by time scales on the order of hours to days, and length scales on the order of hundreds of feet to miles (Figure 3).

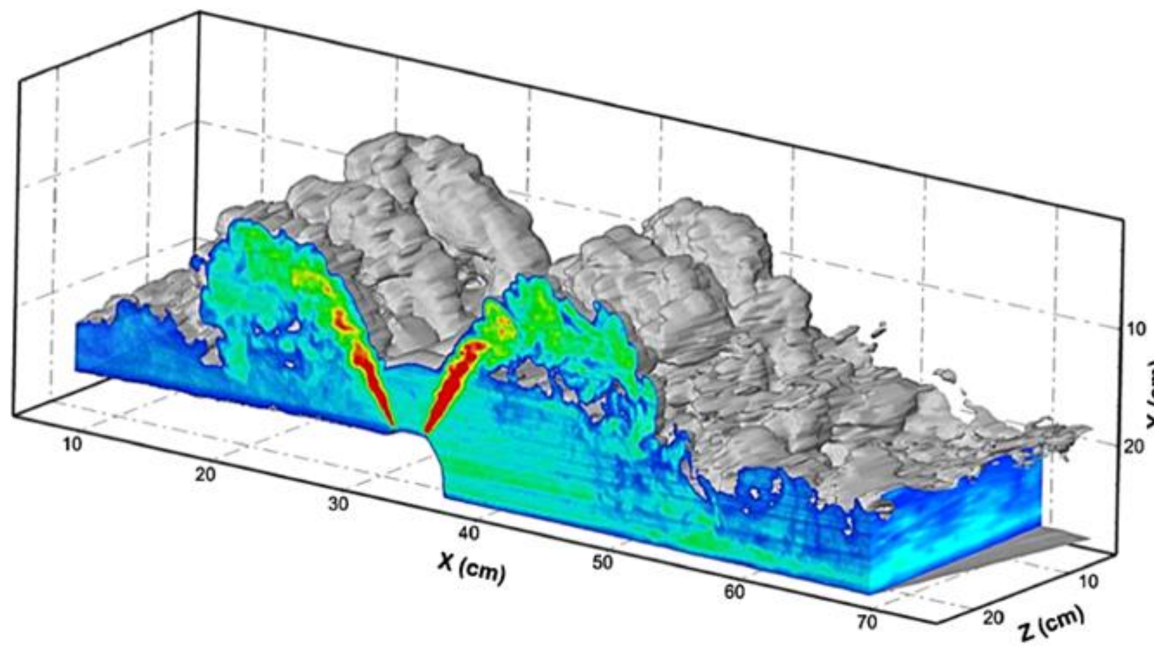

Figure 2. Image of flow from a multiport diffuser illustrating the near-field (source: Abessi & Roberts, 2014)

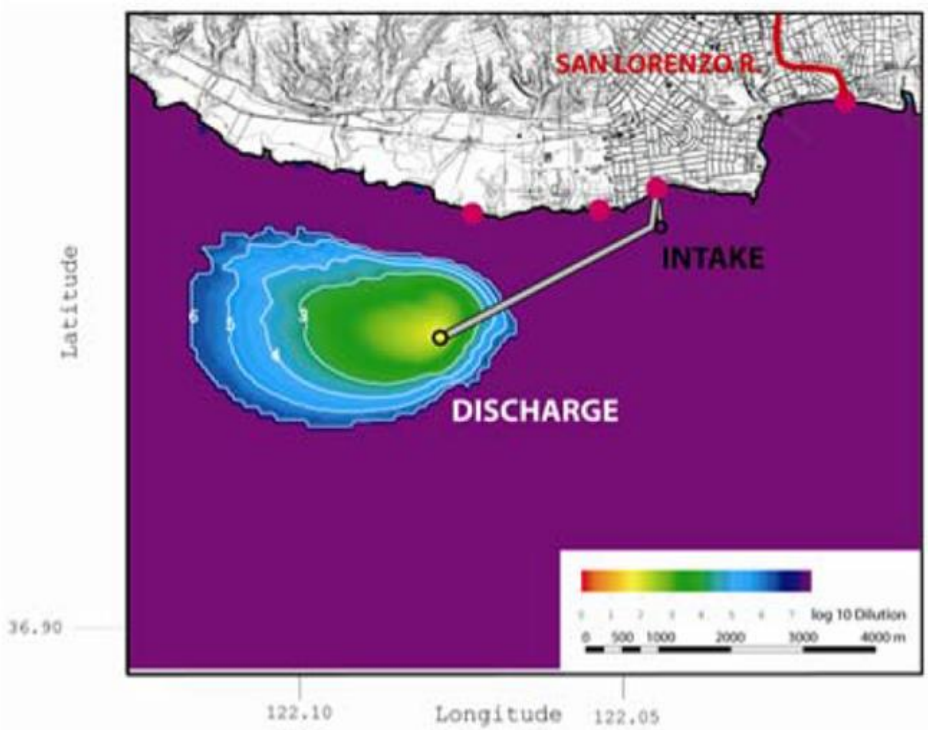

Figure 3. Simulated dilution of brine discharge in the far-field (source: Jenkins & Wasyl, 2009)

2.1 Near-field Issues

The critical issue in the near-field is to meet the target change in salinity of 2.0 ppt at the edge of the brine mixing zone, as recommended by the SWRCB in May 2015 (SWRCB 2015). The brine mixing zone is "based on the distance of 100 m (328 feet) or initial dilution, whichever is smaller". The zone within the initial dilution distance is customarily referred to as the zone of initial dilution (ZID). For the critical case of a negatively buoyant (sinking) plume the ZID is considerably smaller than 100 m, and as such the dilution at the edge of the ZID governs.

In addition to the salinity target, the California Ocean Plan (SWRCB 2012) specifies limits on concentrations for numerous constituents that must be met at the edge of the ZID.

Thus, the fundamental issue in analyzing the near-field is to make sure appropriate assumptions, models, and calculations are used to estimate the dilution at the edge of the ZID.

2.2 Far-field Issues

The critical issue in the far-field is primarily to ensure that the dense brine plume is able to mix and disperse away from the diffuser, and not pool in any local depressions in the bathymetry or around the diffuser structure. Thus, the analyses of the far-field requires appropriate methods that are able to model the advection (due to ocean currents), dispersion and mixing of the brine plume, while taking into account the effects of variations in bathymetry. Additionally, the potential for hypoxia (low dissolved oxygen concentrations) to occur within the brine plume (due to oxygen demand from the sediments and limited mixing) should be assessed.

3. APPROACH USED IN THE DEIR

As is standard practice in the analyses of brine discharges the DEIR performed analyses of the near-field to assess dilution at the edge of the ZID, and then used these results to provide information to the far-field modeling.

3.1 Near-field Approach

The DEIR used the Visual Plumes[2] model to analyze the near-field dilution for positively-buoyant rising plumes. The DEIR used appropriate ambient temperature and salinity conditions for each of the three different oceanic seasons, and also conservatively assumed zero ambient cross-flow current. Visual Plumes is well accepted and has been used for several decades to analyze rising plumes, and as such its use in the DEIR is entirely appropriate (for rising plumes).

By contrast, Visual Plumes has only more recently been adapted for use for negatively-buoyant sinking plumes, and a systematic study has indicated that Visual Plumes (and other models including CORMIX, CORJET and JetLag) substantially underestimate the dilution for negatively-buoyant discharges in quiescent conditions (Palomar et al., 2012). Thus, the DEIR instead developed and used a semi-empirical analysis to analyze the discharges of the sinking plumes.

It is noted that sinking plumes have substantially lower initial dilutions than rising plumes[3] and as such are a primary determining factor in the evaluation of the effects of the discharge. Thus, the remainder of this review will focus on the analyses of the sinking plumes (i.e., those plumes

---

[2] Visual Plumes is a Windows-based computer application that simulates single and merging submerged aquatic plumes in arbitrarily stratified ambient flow.
[3] Modeling results in the DEIR indicate dilutions as low as 16 for sinking plumes, compared to ≥ 68 for rising plumes.

dominated by the brine), including the semi-empirical analysis of the near-field (Section 3.1.1) and the far-field analysis (Section 3.2).

3.1.1 Semi-Empirical Analysis

The semi-empirical analysis used in the DEIR was based on the work of Kikkert et al. (2007), who derived expressions to characterize the trajectory, size, and dilution of sinking plumes. These expressions were validated through comparison to comprehensive experiments over a range of conditions (i.e., a range of vertical discharge angles and a range of densimetric Froude numbers[4]).

The analysis in the DEIR used these expressions to calculate the trajectory of the sinking plumes for the horizontal (zero vertical angle) discharge from the ports of the MRWPCA diffuser for a range of different conditions (i.e., different discharge rates, different oceanic conditions, and different ratios of brine, wastewater, GWR concentrate, and hauled brine). The calculated plume trajectories had horizontal travel distances ranging from 10 to 12 feet, while falling 3.5 to 4 feet in the vertical direction before impacting the sea-floor (e.g., Figure 4).

The DEIR assumed that the edge of the ZID was at the impact point, and thus an estimate of dilution at this location was required to determine compliance with the California Ocean Plan (see Section 2.1). Since the analysis of Kikkert et al. (2007) does not have a closed-form expression for the dilution at this specific location, the well-established equations for dilution of a non-buoyant jet (Fischer et al., 1979) were used to estimate the dilution. These equations required the path length of the plume, which was calculated from the plume trajectory. Using equations for a non-buoyant plume (rather than for a negatively-buoyant sinking plume) to estimate dilutions is reasonable in this application, due to the relatively flat trajectory of the plume (i.e., 3.5 feet is substantially less than 12 feet in Figure 4) which implies that the jet behavior (i.e., horizontal momentum) dominates buoyancy in this region.

Thus, the semi-empirical analysis used to estimate the near-field dilution is appropriate. However, it is noted that the semi-empirical analysis discussed above strictly applies to a single plume with the assumption that there is sufficient water surrounding the plume to enable maximum dilution and entrainment. There are potential weaknesses in the analysis related to the effect of multiple plumes and the proximity to the sea-floor. These are discussed and resolved in Section 3.1.3.

---

[4] See Appendix D2 of DEIR for additional information and definition of densimetric Froude number.

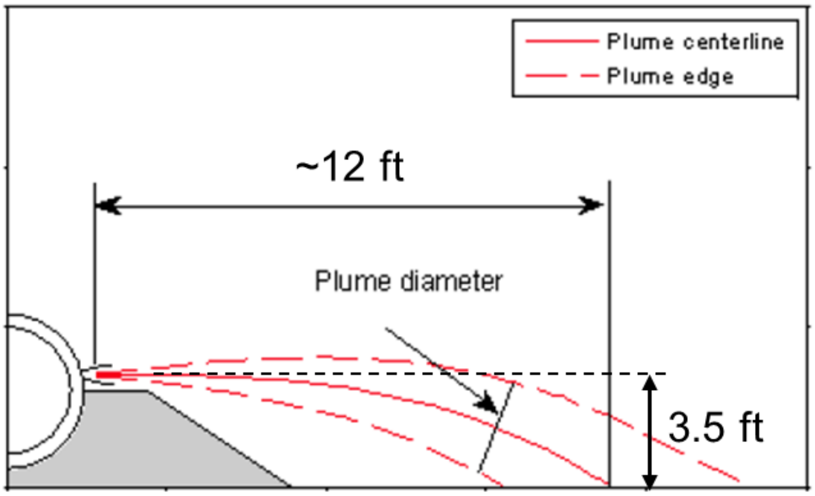

Figure 4. Schematic of sinking plume trajectory (source: DEIR, Appendix D2)

3.1.2 Conservative Assumptions

Several conservative assumptions were made in the semi-empirical near-field analysis implying that the predicted dilutions are likely under-estimated. Specifically, these assumptions were:

1. Dilution calculation assumed a circular port, whereas the duckbill valves are oval shaped. The oval shape has a higher perimeter-to-area ratio than a circle, and will therefore result in additional dilution since the entrainment of the diluting water occurs at the perimeter.
2. The minimum height above the sea-floor of 3.5 feet was assumed for all ports, whereas only 19 ports are at this height with most ports having a height nearer to 4 feet. A larger height would result in a slightly longer trajectory path and additional dilution.
3. The ZID was assumed to occur at the point that the plume impacts the sea-floor. However, at the impact point mixing is still dominated by jet processes (i.e., there is still substantial momentum and turbulence related to the discharge) and additional dilution occurs beyond this point within the near-field. Thus, the ZID extends further from the diffuser than assumed, which will result in additional dilution[5].

[5] It is noted that for inclined jets additional dilutions of approximately 60% (i.e., dilution increases by a factor of 1.6) have been observed from the impact point to the edge of the near-field (Abessi & Roberts, 2014). It is difficult to directly interpret these results for the present case of horizontal discharges, but since the horizontal jets have more

3.1.3 Potential Weaknesses

The semi-empirical analysis discussed in Section 3.1.1 strictly applies to a single plume with the assumption that there is sufficient water surrounding the plume to enable maximum dilution and entrainment. However, the diffuser consists of multiple ports and if these ports are spaced too closely the plumes will merge and the achieved dilution will be reduced. Appendix D2 of the DEIR provides some analysis of this, where the volume of water entrained in 10 seconds was compared to the volume of water available surrounding each port. The analysis concluded that there was sufficient water to provide for maximum dilution for each port.

However, the analysis was ad-hoc with limited rationale provided for the choice of time-scale and size of the "box" surrounding each port, nor any consideration as to whether the water within the "box" could be realistically be replaced within the time-scale.

Geosyntec performed additional port spacing analysis (Appendix A) based on the results of the experiments of Abessi & Roberts (2014) to determine whether the jets will merge. The new analysis indicated that the spacing of the ports was more than sufficient to prevent merging of the jets and thereby allow for maximum dilution at each port. While the conclusions were the same as made in the DEIR, the new methodology is more robust and defensible, and should be included in the Final EIR.

Additionally, the DEIR did not consider the proximity of the jets to the sea-floor and the associated Coanda effect, which is the tendency of a fluid jet to be attracted to a nearby surface. If the distance of the port above the sea-floor is not large enough this can result in the jet deviating towards and attaching to the sea-floor (Coanda attachment), resulting in decreased dilution.

To address this potential weakness, Geosyntec performed a Coanda analysis (Appendix A) based upon the results of experiments of Shao & Law (2011). The analysis indicates that the diffuser ports are located at a large enough distance above the sea-floor to prevent Coanda attachment. This analysis and result should be included in the Final EIR.

3.2 Far-field Approach

The far-field modeling used time-series of horizontal velocity components at the diffuser location that were obtained from the regional ocean model (ROM) to advect and diffuse the brine plume in

horizontal momentum at the impact point than the inclined jets it is likely that the additional dilution factor may be greater for horizontal discharges than for inclined discharges.

two-dimensions from the edge of the near-field to and throughout the far-field. The approach assumed the velocity field was spatially homogeneous (i.e., was the same at all locations). This assumption neglects the effects that local variations in the bathymetry have on the velocity field, which is a reasonable approximation due to the bathymetry in the vicinity of the diffuser being generally flat (i.e., no depressions or ridges) and sloping to sea. The effects of larger scale bathymetric variations (e.g., those of the entire Monterey Bay) and different seasonal patterns (i.e., oceanic, Davidson, and upwelling) on the velocity are taken into account through the use of the velocities extracted from the ROM.

3.2.1 Conservative Assumptions

Several conservative assumptions were made in the far-field analysis implying that the predicted mixing and dilution beyond the near-field are likely under-estimated. Specifically, these assumptions were:

1. The vertical mixing of the brine was neglected in the solution of the advection-diffusion throughout the far-field. Stability analysis (via computing a Richardson number) indicated that the diluted[6] brine layer would tend to resist vertical mixing. However, during some higher velocity events (e.g., storms and/or large swells) the brine layer may experience vertical mixing that could substantially increase the dilution in the far-field.
2. The far-field analysis neglected the direct effects of wave actions on the mixing of the brine. Currents at the ocean bottom induced by wave action would tend to increase both the horizontal and vertical mixing, resulting in additional dilution in the far-field.
3. The far-field analysis did not directly include the effects of the gravity currents that would tend to move brine away from the diffuser (downslope) resulting in additional dilution.
4. The far-field analysis used a constant horizontal lateral diffusion coefficient of 1.37 m^2/s. This is lower than the field measurements of ~2 m^2/s by Ledwell et al. (1998). Using a higher diffusion coefficient will result in additional horizontal mixing and increased dilution.

3.2.2 Potential Weaknesses

The far-field analysis used in the DEIR is appropriate for the application and makes conservative assumptions that will result in mixing and dilution being under-estimated. Nevertheless, there are some potential weaknesses that may be raised, as discussed in the following.

---

[6] Here the dilution is referring primarily to that occurring in the near-field.

The analysis in the DEIR used the velocity components from the ROM to “drive” a two-dimensional solution to the advection-diffusion equation. The two-dimensional approach was developed primarily in the 1970s and 1980s, when analysis efforts were limited by computational power. A more modern and thorough approach would be to use the currents from the ROM to specify boundary conditions for a fully three-dimensional model that would more accurately simulate all the mixing processes (i.e., vertical mixing, wave action, local bathymetry, spatially varying velocity fields, and gravity currents) in the far-field. As pointed out in the DEIR, and summarized in Section 3.2.1, the two-dimensional approach made a number of conservative assumptions, and a more comprehensive three-dimensional model would likely result in additional dilution. Nonetheless, assessing the effects of some of the assumptions made is not always straightforward and are worthy of additional discussion.

The neglect of gravity currents in the far-field modeling may preclude the prediction of the brine pooling in local bathymetric depressions. However, since the bathymetry is flat in the region where the brine plume has been shown to extend, this approach is entirely reasonable. It is noted that Monterey Canyon is located approximately 3.5 miles to the north of the diffuser, and may provide an opportunity for brine pooling and accumulation. However, the extent of the brine plume has been shown by the modeling to be limited to approximately one to two miles from the diffuser, and as such it will not reach the canyon. Furthermore, and as pointed out in the DEIR, if the brine plume did reach the edge of the canyon the relatively steep slope of the canyon would likely result in the acceleration of the gravity current down the canyon slope, which would enhance the mixing and provide additional dilution.

While the local bathymetry in the vicinity of the diffuser is flat, the diffuser structure and the ballast used to raise the diffuser approximately 4 feet above the sea-floor may potentially act to trap the brine, and provide locally higher salinities and brine concentrations. However, this effect is minimized by the diffuser alignment being perpendicular to the shore line, thereby allowing the off-shore slope and gravity current to naturally carry the brine away from the diffuser. Additional calculations could be developed to assess the rate at which the gravity current moves the brine away from the diffuser, and included in the EIR. Furthermore, the ambient current directions would likely provide additional brine transport and mixing, particularly if the currents reverse with changes in the tides. The EIR could include additional and more detailed discussion of the diffuser alignment and effect of slope and tidal currents, including qualitative analyses using current patterns obtained from the ROM, on preventing the accumulation of brine around the diffuser.

The DEIR did not address the potential for areas of hypoxia to form beneath the brine plume due to sediment oxygen demand and the potentially limited mixing restricting oxygen supply. A comprehensive approach to addressing this problem would be to include sediment oxygen demand

and oxygen cycling in the far-field modeling. However, this is likely unnecessary in this instance and instead Geosyntec performed a simple mass balance analysis to demonstrate that hypoxia is unlikely (Appendix A). Specifically, it was demonstrated that the amount of oxygen supplied to the brine plume by the entrained ambient water is more than 30 times greater than that consumed by the sediments. This analysis and result should be included in the Final EIR.

Finally, the far-field modeling used in the DIER tracked the brine particles for a 48-hour period within a simulation period of 90 days. Additional discussion and explanation of the rationale behind using a 48-hour period, as well as what happens to the particles after that period should be provided in the EIR. If the particles are removed from the computation after 48 hours then the effect of this on the results, and in particular whether the extent of the plume may be under-predicted, should be discussed in the EIR.

3.3 Mitigation Measures

The near-field analysis predicted that there will be some exceedances of the Ocean Plan criteria at the edge of the ZID for copper, ammonia, chlordane, DDT, PCBs, TCDD equivalents, and toxaphene. Which of the above parameters is in exceedance depends upon the different discharge blends considered, and as such any potential exceedances may vary with seasonal operations. This variation should be considered when developing the monitoring plan.

Numerous conservative assumptions were made in the near-field analysis (Section 3.1.2) and therefore the actual near-field dilution will likely be greater than predicted, and it is probable that many of the potential exceedances will not occur. The exceptions are ammonia (primarily originating in the wastewater) and PCBs (primarily originating in the source water) for which the required additional dilution to avoid exceedance is too great.

The origin of the PCBs is the ocean water in Monterey Bay that is subsequently concentrated by the desalination process and returned via the brine discharge. The DEIR points out that it is possible that some of the PCBs may naturally be removed from the source water through the filtering out of PCBs in colloidal and particulate form as the source water is drawn through the sand of the subsurface sea intake. This statement may be true, but it also does raise the question as to whether these PCBs may then accumulate in the sediments surrounding the intakes, in potential violation of the Ocean Plan. The EIR should address this possibility.

If the monitoring plan implemented during operation indicates exceedances of the Ocean Plan, then there are three potential mitigation measures suggested in the DEIR[7]. The first two measures involve treatment of the source water (pre-treatment) and the discharge, respectively, to remove the constituents of concern. These seem like feasible approaches, although treatment options were not considered in this review of the DEIR.

The third option involves providing temporary storage and release of the brine from a 3 million gallon brine storage basin. The idea here is two-fold: (1) increase initial dilution by discharging at a high rate (thereby increasing jet velocity and mixing), and (2) alternate between rising plumes (lots of dilution) and sinking plumes (lower ammonia concentrations due to less wastewater). This approach seems plausible, but there was no analysis provided in the DEIR to demonstrate that it could work, and that the three million gallon storage basin would be large enough. If this mitigation strategy is deemed necessary, then it is recommended that additional analyses is conducted to estimate the increased dilution due to pulsing, and that the switching between rising and falling plumes can be achieved in such a way as to manage ammonia (and other) concentrations at the ZID. It is also noted that this proposed approach would provide a potentially unique opportunity to actively manage the brine and wastewater plume in real-time.

Another potential mitigation strategy not considered in the DEIR is to retrofit the diffuser ports to incline them up at an angle (rather than horizontal). A vertical angle of 60° to 65° is optimal for negatively-buoyant sinking plumes. However, it is noted that this will reduce the dilution for the positively-buoyant rising plumes, so this retrofit would involve some trade-off. In addition, the retrofit would require the cooperation of the MRWPCA who owns and operate the diffuser.

[7] Proposed Mitigation Measure 4.3-4.

4. SUMMARY

The analyses of the brine disposal system in the DEIR were appropriate and made reasonable and conservative assumptions. The numerous conservative assumptions made in the analyses (Sections 3.1.2 and 3.2.1) imply that the predicted mixing and dilutions are likely under-estimated, and as such actual salinities and constituent concentrations within the brine plume are likely to be lower than indicated in the DEIR.

4.1 Recommendations

During the course of the review some potential issues were identified that should be addressed in the Final EIR. These recommendations are summarized here:

1. Include the additional analyses developed by Geosyntec to assess the potential for plume merging, Coanda attachment, and hypoxia.

2. Add discussion of the potential for build-up of PCBs in the sediments surrounding the sub-surface seawater intake.

3. Add discussion of potential of diffuser structure to trap brine plume, including consideration of current directions (from the ROM) and alignment of diffuser relative to the slope.

4. Add discussion of the effect of only tracking the brine particles for 48 hours.

5. If mitigation measures are necessary then perform additional analyses to estimate the additional near-field dilution achievable by pulsing the brine discharge, and whether the variation of the plume buoyancy (between sinking and rising) can be implemented to manage ammonia (and other concentrations).

6. If mitigation measures are necessary then consider retrofitting the diffuser ports from a horizontal discharge to a vertical angle of up to 60° to 65°.

4.2 Recommended Minor Edits

In addition to the recommendations described above there are a number of minor recommended edits that should be made to clarify and/or strengthen the EIR. These are summarized in Table 1.

Table 1: Recommended Minor Edits

Issue	Description	Page	Comments / Recommendations
Incorrect interpretation of SWRCB 2012a	SWRCB 2012a states that increase in salinity should be limited to < 5% of background, corresponding to 1.7 ppt in California waters. The DEIR then rounds this to 2.0 ppt, but this is an incorrect interpretation of the 2012 document (i.e., it should be 1.7 ppt).	4.3-27	The phrase, "(rounded to 2.0 ppt)" should be removed from the EIR. Note that SWRCB 2015 refers directly to 2.0 ppt (it does not refer to 5% or 1.7 ppt). That is, 2.0 ppt is the correct target per SWRCB 2015, but not per SCWRCB 2012a.
Different number of ports	The correct number of open ports (130) is first mentioned in Section 4.3. This is late in the report to mention the change (from 120) and surprises the reader.	4.3-72	The incorrect number of ports should be mentioned earlier in the EIR, including in the Executive Summary. It should also be re-iterated that using 130 instead of 120 provides additional dilution (as demonstrated in Addendum to Appendix D4).
Misleading statement overstates the extent of the plume	The DEIR states, "where the plume extended from near the Monterey Submarine Canyon rim to the center of the southern half of Monterey Bay". This statement overstates the extent of the plume, and is perhaps mistakenly based on the inset figure.	4.3-88	Revise wording to better indicate that the plume extent is several miles from the Monterey Submarine Canyon rim.
Unnecessary footnote in table	See Comments / Recommendations	Table 4.3-11	Footnote 'a' should be removed and the column header changed from "Average Dilution" to "Centerline Dilution".
Equation for centerline dilution not provided	Equation (7) presented in Appendix D2 is for average dilution, whereas calculations provide centerline dilution (which is ~1.4 times lower (Fischer et al., 1979)).	App D2, pages 10 and C-13	EIR should be modified to include the relation between average and centerline dilution.
Apparent discrepancy in port and duckbill size	4 inch duckbill valves are specified, but the port size is given as 2 inch.	App D2	This discrepancy should be corrected or explained.

5. REFERENCES

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SWRCB 2012a, "Management of Brine Discharge to Coastal Waters, Recommendations of a Science Advisory Panel", Technical Report 694, March 2012.

SWRCB 2015, "May 5, 2015 Draft Final Desalination Amendment to the Ocean Plan"

* * * * *

APPENDIX: ADDITIONAL ANALYSES BY GEOSYNTEC

During the course of the DEIR review Geosyntec performed some additional analyses to assess the potential impacts of specific issues that were not fully addressed in the DEIR. These specific analyses were:

1. Port spacing analysis (to show that plumes do not merge),

2. Coanda analysis (to show Coanda attachment will not occur),

3. Hypoxia analysis (to show that hypoxia is unlikely).

It is recommended that these analyses are included in the Final EIR.

These results are not fully written up in this TM, and instead the relevant slides from the presentation to MPWRA on 23 June 2015 are excerpted here.

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Port Spacing Analysis

- Based on experiments Abessi & Roberts (2014) recommend the following to avoid merging of jets;
  - s >~2.d.F
    where s = spacing, d = port diameter, and F = densimetric Froude number
  - d = 1.86 inches (Appendix D2, Table 3)
    F ≈ 26 (Appendix D1, Table 5)
    → s > ~ 8 ft
  - Port spacing on diffuser is 16 ft (alternating sides)
  - Jets will not merge
    - Same conclusion as in DEIR, but this analysis is more robust

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Coanda Analysis

- Based on experiments Shao & Law (2011) recommend the following minimum clearance above the sea-floor to prevent Coanda attachment;
  - $z_0 > 0.12\ (\pi/4)^{0.25}\ d.F = 0.11\ d.F$
    where, d = port diameter, and F = densimetric Froude number
  - d = 1.86 inches (Appendix D2, Table 3)
    F ≈ 26 (Appendix D1, Table 5)
    → z_0 > ~ 0.5 ft
  - Ports are 3.5 ft above sea-floor
  - Coanda attachment will not occur
    - Include this analysis in EIR

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Hypoxia Analysis

- Potential for hypoxia can be addressed using simple mass balance approach;
  - Estimate oxygen demand from sediments
  - Estimate oxygen supplied by brine plume (including entrained flow)

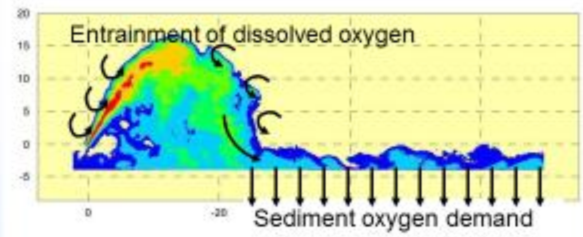

Figure 8-4. Laser-induced fluorescence animation image of a brine plume discharge from a diffuser. (From Roberts 2013)

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Hypoxia Analysis

- Sediment oxygen demand (SOD) in Monterey Bay
  - 5.0 to 13.5 mmol/m^2/day (Berelson et al., 2003)
  - 0.16 to 0.43 g/m^2/day
- Areal extent of plume
  - ~3,000 ft x 1,500 ft = 4,500,000 ft^2
  - ~420,000 m^2
- Mass flux consumed;
  - 70 to 180 kg/day

Figure 4.3-5

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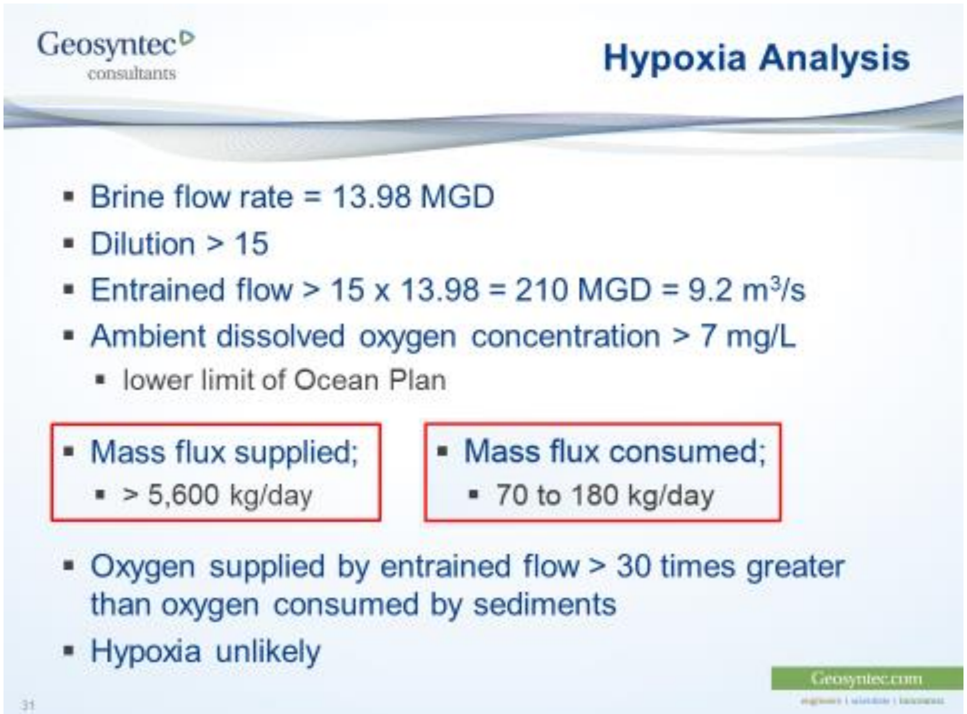
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Hypoxia Analysis
Brine flow rate = 13.98 MGD
Dilution > 15
Entrained flow > 15 x 13.98 = 210 MGD = 9.2 m³/s
Ambient dissolved oxygen concentration > 7 mg/L
lower limit of Ocean Plan
Mass flux supplied;
> 5,600 kg/day
Mass flux consumed;
70 to 180 kg/day
Oxygen supplied by entrained flow > 30 times greater than oxygen consumed by sediments
Hypoxia unlikely
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Monterey Peninsula Regional Water Authority
Agenda Report

Date: September 24, 2015

Item No: 4

FROM: Executive Director Cullem

SUBJECT: Discuss the Status of the Cal Am Request to Resume Test Slant Well Operations and Authorize Sending a Letter of Support to the California Coastal Commission Prior to its Consideration of The Request on October 6, 2015

RECOMMENDATION:

It is recommended that the Water Authority Board authorize the President to send a letter of support to the California Coastal Commission (CCC) in support of Cal Am's request to amend the slant test well coastal development permit (CDP) and restart the test well operation.

DISCUSSION:

Due to higher than expected drawdown of the aquifers, Cal Am ceased operation of the test slant well in early June 2015.

Following an analysis of the situation by the Hydrogeological Working Group (HWG), it was concluded by Cal Am and the HWG that the drawdown in the 400 foot aquifer was due to seasonal irrigation pumping by farmers in the Castroville area rather than due to the test well operation.

Though test well impacts to the sand dunes and 180 foot aquifers appear likely, these two aquifers are already salt water intruded and unused by the agricultural community.

Accordingly, as directed by CCC staff, Cal Am has requested a modification to its test well CDP in order to resume the pumping test. The Commission will hear Cal Am's request at its meeting of October 6-8.

Staff recommends that the Water Authority Board authorize the preparation and submission of a letter of support for the Cal Am request in sufficient time for the CCC to consider the Authority's recommendation.

ATTACHMENTS:

None - draft letter to be provided at the meeting

MONTEREY PENINSULA REGIONAL WATER AUTHORITY

September 25, 2015

Hon. Steve Kinsey, Chair, and
Commissioners
California Coastal Commission
Attn: Mike Watson
725 Front Street, Suite 300
Santa Cruz, CA 95060

RE*:* MPRWA Support of Cal Am Application for Modification of Test Slant Well CDP

Dear Commissioners:

The Board of the Monterey Peninsula Regional Water Authority (MPRWA) requests that the California Coastal Commission approve the California American Water (Cal Am) request to modify the Coastal Development Permit (CDP) for the Monterey Peninsula Water Supply Project (MPWSP) Test Slant Well at its meeting of October 6, 2015.

In conformance with the current CDP, Cal Am ceased operation of the slant test well at the CEMEX site in Marina in early June (other than minimal maintenance pumping) when monitoring wells indicated a unexpected drawdown in the 400-foot level Salinas River Basin aquifer approaching the CDP limit. Reductions in the dunes and 180-foot aquifers were also observed, but these were anticipated and both are seawater intruded with no agricultural value.

As the Commissioners well know, the test slant well results are invaluable in calibrating the hydrogeological models used to ascertain the groundwater and environmental impacts as well as in determining the technical feasibility of utilizing slant well technology to provide source water for the MPWSP desalination (desal) facility. The sooner the test can be resumed, the sooner real data will be available to the Hydrogeological Working Group (HWG) as well as to the other stakeholders and the general public.

The Authority considers the modification to the CDP to be time sensitive, warranting the Commission to consider the Cal Am request at its October meeting. Although the test slant well is clear of the Snowy Plover nesting areas, it would be desirable to get field work in the vicinity of the dunes, which work might be necessary to restart the test well, completed as soon as possible.

Should the Commission desire more information from the MPRWA, please do not hesitate to contact me at jason.burnett@gmail.com, or by phone 831-238-009 (cell).

Sincerely,

Jason Burnett, President
Monterey Peninsula Regional Water Authority

Monterey Peninsula Regional Water Authority
Agenda Report

Date: September 24, 2015

Item No: 5

FROM: Executive Director Cullem

SUBJECT: Approve Return of Excess Contributions for FY 14-15 and Approve a Reserve Fund for FY 15-16 of Approximately $179,000 from Year-end Balances

RECOMMENDATION:

It is recommended that the Authority Board approve a return to member Cities of excess contributions for FY 14-15 and approve a reserve fund in the approximate amount of $170,000 from unexpended balances from the FY 14-15 Budget.

DISCUSSION:

At a meeting on May 4, the County committed to paying the balance of its $153,000 FY 14-15 fair-share which would allow reimbursement to the cities for covering the County's fair-share earlier in the year. Since the County has now made its contribution for FY 14-15, the staff requests approval to return $153,000 in city overpayments as an credit towards FY 15-16 contributions in accordance with paragraph 13.3 of the First Amended and Restated Joint Exercise of Powers Agreement.

In addition, due to a slowdown in anticipated legal and staff support to facilitate California and Federal approvals of the Monterey Peninsula Water Supply Project (MPWSP), the Water Authority expended approximately $170,000 less than was budgeted. The final savings will be determined at the annual audit.

This represents the second year in a row that we have finished with a budget surplus of $100,000 or more. Accordingly, and in anticipation of savings continuing into the new year, the Executive Director recommended a FY 15-16 budget of $390,000. However, County representatives requested the new budget be further reduced, especially for expenses related to contract services, and have suggested Authority members utilize in-house staff to provide those services where possible.

By eliminating the Public Outreach Contract ($10,000) and Contract Services & Studies ($30,000), reducing the Contingency by $10,000, and reducing Legal Services by $50,000, the FY 15-16 budget was reduced to $ 290,000. The Water Authority approved this amended budget on May 14, 2015.

Since the amended budget for FY 15-16 is bare bones with little room for unanticipated expenses, the Authority staff noted at the May 14 meeting that supplemental contributions throughout the year may be required if services cannot be provided by City or County in-house staffs. To date, no City or County staff resources have been identified to perform services in support of the Water Authority.

At this point it looks likely to staff that a supplemental request will be needed to fund additional special counsel services as we return to the CPUC hearings on the MPWSP and GWR and for possible late year contractual review of the recirculated MPWSP DEIR/DEIS, similar to the $40,000 Geosyntec study commissioned in June 2015.

Accordingly, to avoid possible mid-year budget requests, staff recommends that the Authority place the estimated year-end balance of approximately $170,000 in a reserve fund for emergencies or extenuating circumstances, as authorized by paragraph 6.6 of the JPA Bylaws. Disbursements from the reserve fund requires a 70% supermajority of the Board. If not required throughout the remainder of the fiscal year, the reserve funds would be returned to member agencies as a credit against future contributions.

FISCAL IMPACT:

At attachment A are the estimated fair-share member contributions under the amended budget of $290,000 inclusive of the return of overpayments from FY 14-15 and assuming approval of depositing the FY 14-15 year-end balance of approximately $170,000 in a reserve fund.

ATTACHMENTS:

A- FY 2015-2016 Estimated Fair-Share Contributions dated 24 Sept 2015

ATTACHMENT B

9/24/15 Estimated **Jurisdiction (Contributions Wi**

Member Jurisdiction	**New FY 15-16 Percent * Contribution**	**Old FY 14-15 Percent ** Contribution**	**Est FY 15-16 Contributions before credits ***
County of Monterey	30.40%	34.00%	$88,160
Carmel By the Sea	6.50%	6.14%	$18,850
Sand City	0.80%	0.86%	$2,320
City of Pacific Grove	13.10%	12.40%	$37,990
City of Seaside	14.80%	14.50%	$42,920
City of Monterey	33.00%	30.70%	$95,700
City of Del Rey Oaks	1.40%	1.40%	$4,060
Total Income/Budget	100%	100%	$290,000

* Computed from water years 2012-2014
** Computed based on water years 2010-2011

ith County Partic

Credit for Over-payment of fair-share FY 14-15	Budget Surplus Credit @ Yr-end FY 14-15 **	Est FY 15-16 Contributions Request
$0	$57,800	$88,160
$14,229	$10,438	$4,621
$1,989	$1,462	$331
$28,764	$21,080	$9,226
$33,660	$24,650	$9,260
$71,145	$52,190	$24,555
$3,213	$2,380	$847
$153,000	$170,000	$137,000