STATE WATER RESOURCES CONTROL BOARD

DRAFT REVIEW OF CALIFORNIA AMERICAN WATER COMPANY'S MONTEREY PENINSULA WATER SUPPLY PROJECT

April 3, 2013

EXECUTIVE SUMMARY

Introduction

The California Public Utilities Commission (Commission) asked the State Water Resources Control Board (State Water Board) whether the California American Water Company (Cal-Am) has the legal right to extract desalination feedwater for the proposed Monterey Peninsula Water Supply Project (MPWSP). Cal-Am proposes several approaches that it claims would legally allow it to extract water from the Salinas Valley Groundwater Basin (SVGB or Basin) near or beneath Monterey Bay without violating groundwater rights or injuring other groundwater users in the Basin. The purpose of this report is to examine the available technical information and outline legal considerations which would apply to Cal-Am's proposed MPWSP.

Technical Conclusions

There are gravity and pumped well designs proposed for the MPWSP, as well as several well locations. Well design and well location will need testing to provide design/site specific information needed for complete technical and legal analysis. The conditions in the aquifer where MPWSP feedwater would be extracted could be either confined or unconfined however; there is currently not enough information to determine what type of conditions exist at the location of the MPWSP wells. Effects from confined aquifer pumping would be observed over a larger area than if extraction occurred from an unconfined aquifer. Previous studies done in the one of proposed MPWSP well locations indicate that there would be an approximate 2-mile radius zone-of-influence if groundwater was pumped from an unconfined aquifer. It is unknown what the effects would be if water was pumped from a confined aquifer with different hydrogeologic conditions.

The aquifers underlying the proposed extraction locations have been intruded with seawater since at least the 1940's. The impairment means that there is little or no beneficial use of the water in the intruded area. Groundwater quality at the site of the

proposed MPWSP wells will play an important role in determining the effects of extraction on the other users in the Basin.

The Basin is in overdraft. Groundwater extractions and outflows to the ocean needed to repel seawater intrusion exceed groundwater inflow into the Basin. The overdraft condition is important because it limits the availability of fresh water supplies to Basin users.

Legal Conclusions

To appropriate groundwater from the Basin, the burden is on Cal-Am to show no injury to other users. Key factors will be the following: (1) how much fresh water Cal-Am is extracting as a proportion of the total pumped amount, to determine the amount of treated water considered as desalinated sea water, available for export as developed water; (2) whether pumping affects the water table level in existing users wells and whether Cal-Am can mitigate any lowering of water levels through monetary compensation for increased pumping costs or upgraded wells; (3) how Cal-Am should return any fresh water it extracts to the Basin to prevent injury to others; and (4) how groundwater rights might adjust in the future if the proportion of fresh and sea water changes both in the larger Basin area and the immediate area around Cal-Am's wells.

Both near and long-term, a physical solution that protects legal users in the Basin from harm would permit Cal-Am to extract groundwater. Even if overdraft conditions continued in the Basin following imposition of the solution, Cal-Am could legally continue pumping brackish water so long as the quantity and method of extraction are not detrimental to the conditions in the Basin and other Basin users' rights, taking into account replacement water provided as part of the project. So long as overlying users are protected from injury, appropriation of water consistent with the principles discussed in this report should be possible. Cal-Am should have the opportunity to show any desalinated water it produces is surplus to the current needs of the Basin, replacement water methods are effective and feasible, and the MPWSP can operate without injury to other users.

Recommendations

Additional information is needed to accurately determine MPWSP impacts on current and future Basin conditions regardless of whether the extraction occurs from pumped or gravity wells. First, specific information is needed on the depth of the wells and aquifer conditions. Studies are needed to determine the extent of the Dune Sand Aquifer, the water quality and quantity of the Dune Sand Aquifer, the extent and thickness of the Salinas Valley Aquitard and the extent of the 180-Foot Aquifer.

Second, the effects of the MPWSP on the Basin need to be evaluated. Specifically, a series of test boring/wells would be needed to assess the hydrogeologic conditions at the site. Aquifer testing would also be needed to establish accurate baseline conditions and determine the pumping effects on both the Dune Sand Aquifer and the underlying 180-Foot Aquifer. Aquifer tests should mimic proposed pumping rates.

Third, updated groundwater modeling is needed to evaluate future impacts from the MPWSP. Specifically, modeling scenarios are necessary to predict changes in groundwater levels, groundwater flow direction, and changes in the extent and boundary of the seawater intrusion front. Additional studies are also necessary to determine how any extracted fresh water is replaced, whether through re-injection wells, percolation basins, or through existing recharge programs. The studies will form the basis for a plan that avoids injury to other groundwater users and protects beneficial uses in the Basin.

1. Introduction

In a letter dated September 26, 2012, the California Public Utilities Commission (Commission) asked the State Water Resources Control Board (State Water Board) whether the California American Water Company (Cal-Am) has the legal right to extract desalination feedwater for the proposed Monterey Peninsula Water Supply Project (MPWSP). The Commission stated it is not asking for a determination of water rights, but is instead requesting an opinion as to whether Cal-Am has a credible legal claim to extract feedwater for the proposed MPWSP, in order to inform the Commission's determination regarding the legal feasibility of the MPWSP.

In a letter dated November 16, 2012, the State Water Board informed the Commission that State Water Board staff would prepare an initial report for the Commission and for public review. On December 21, 2012, the State Water Board provided the Commission an initial draft of the report and on February 14, 2013, the Commission provided the State Water Board comments on the initial draft report. The Commission's February 14, 2013 correspondence also contained additional information for the State Water Board to evaluate, specifically, a revised design of the feedwater intake system for the MPWSP.

Cal-Am proposes several approaches it claims would legally allow it to extract water from the Salinas Valley Groundwater Basin (Basin, or SVGB) near or beneath Monterey Bay without violating groundwater rights or injuring other groundwater users in the Basin. The purpose of this report is to examine the available technical information and outline legal considerations which would apply to Cal-Am's proposed MPWSP.

This paper will (1) examine the readily available technical information and that provided by the Commission; (2) discuss the effect the proposed MPWSP could have on other users in the Basin; (3) discuss the legal constraints that will apply to any user who proposes to extract water from the Basin; and (4) outline information that will be necessary to further explore MPWSP's feasibility and impacts. Ultimately, whether a legal means exists for Cal-Am to extract water from the Basin, as described in its proposal outlined in the California Environmental Quality Act (CEQA) Notice of

Preparation[1] (NOP) document and in the additional information provided, will depend on developing key hydrogeologic information to support established principles of groundwater law.

2. Background

In 2004, Cal-Am filed Application A.04-09-019 with the Commission seeking a Certificate of Public Convenience and Necessity for the Coastal Water Project. The primary purpose of the Coastal Water Project was to replace existing water supplies that have been constrained by legal decisions affecting the Carmel River and Seaside Groundwater Basin water resources. The Coastal Water Project proposed to use existing intakes at the Moss Landing Power Plant to draw source water for a new desalinization plant at Moss Landing. In January 2009, the Commission issued a Draft Environmental Impact Report (EIR) for the Coastal Water Project and two project alternatives – the North Marina Project and the Monterey Regional Water Supply Project (Regional Project). In October 2009, the Commission issued the Final EIR[2] (FEIR) and in December 2009, it certified the FEIR. In December 2010, the Commission approved implementation of the Regional Project.

In January 2012, Cal-Am withdrew its support for the Regional Project and subsequently submitted Application A.12-04-019 to the Commission for the proposed MPWSP as described in their September 26, 2012 letter. In October 2012, the Commission issued a NOP for a Draft EIR for the proposed MPWSP. The Commission requested in their September letter that the State Water Board prepare an initial staff report in a relatively short timeframe by December 2012. The short timeframe for the initial report was necessary to inform written supplemental testimony due in January 2013 for Cal-Am and written rebuttal testimony from other parties due February 2013. The State Water Board completed and transmitted its initial draft report to the Commission on December 21, 2012.

[1] California Public Utilities Commission, Notice of Preparation, Environmental Impact Report for the Cal-Am Monterey Peninsula Water Supply Project, October 2012.
[2] Cal-Am, Coastal Water Project, FEIR, October 30, 2009.

In a memo dated February 14, 2013, the Commission expressed its appreciation to the State Water Board for the initial draft report. Additionally, the Commission included some comments and questions regarding the draft report and requested the State Water Board evaluate new and additional information in its final report. State Water Board staff reviewed the additional information to prepare this revised draft.[3]

3. Monterey Peninsula Water Supply Project Description

When the Commission requested the assistance of the State Water Board in September 2012, the most current information available on the MPWSP was the description in the NOP for a forthcoming Draft EIR. State Water Board staff analyzed the NOP and how closely the new description matched the alternatives in the December 2009 FEIR completed for the Coastal Water Project. Of the two project alternatives in the FEIR, the North Marina Project more closely resembled the proposed MPWSP described in the NOP. For this reason, State Water Board staff assumed most of the information, including the slant well construction and operation as described in the FEIR – North Marina Project Alternative[4], was applicable to the proposed MPWSP.

On February 14, 2013, the Commission provided comments on an initial draft of this report and requested that State Water Board staff respond to some questions and also consider new and additional information concerning revisions to the design and configuration of the MPWSP. The new information provided to the State Water Board includes: an updated project description, changes in the location and configuration of the extraction well system, new information about the nature of the 180-Foot Aquifer, timing of implementation for certain mitigation measures, and supplemental testimony from Richard Svindland of Cal-Am.

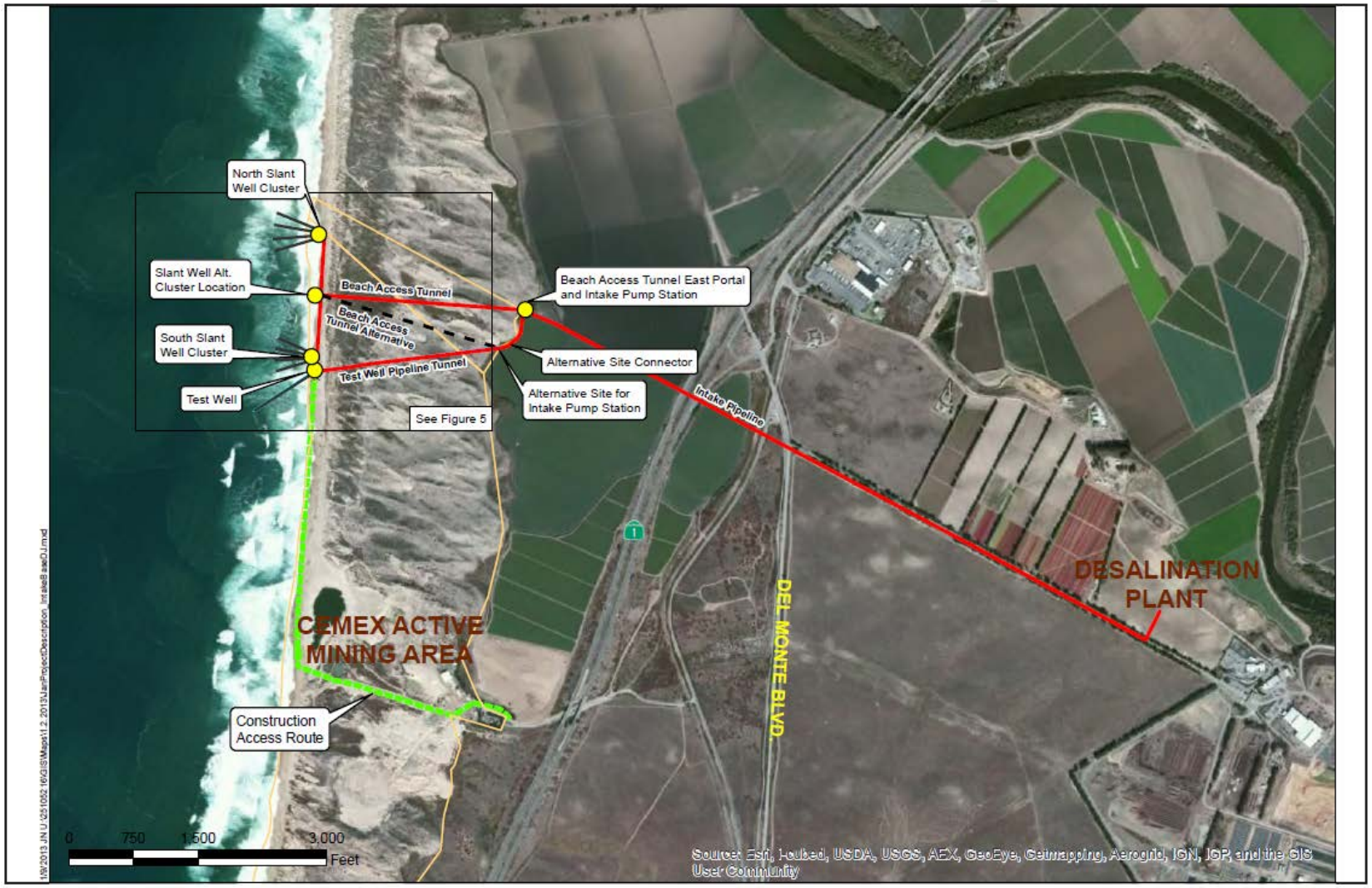
The Commission requested that the State Water Board evaluate two possible alternatives for the MPWSP; (1) the "Proposed Project" (preferred alternative) with slant wells located at a 376-acre coastal property owned by the CEMEX Corporation and illustrated by the yellow dots on Figure SWRCB 1, and; (2) "Intake Contingency Option

[3] Commission correspondence to State Water Board, February 14, 2013.
[4] FEIR, Section 3.3 – North Marina Project, October, 2009.

3” with a slant well intake system at Portrero Road north of the Salinas River as shown in the top center of Figure SWRCB 2 by the small green dots. Figure SWRCB 3 shows the approximate locations of the alternatives in the greater geographic area. The preferred alternative would consist of 7 to 9 slant wells that would draw water from under the ocean floor by way of gravity for delivery to the desalination plant. Intake Contingency Option 3 would consist of 9 wells extracting water from beneath the ocean floor by use of submersible pumps. For both alternatives, approximately 22 million gallons of water per day (mgd) would be extracted from the wells to produce 9 mgd of desalinated product water. The design of these options is further described in Section 5 of this report.

Information provided to the State Water Board to date does not allow staff to definitively address the issue of how the proposed project would affect water rights in the Basin. Currently, it is unknown which aquifer(s) the wells will extract water from and further complicating the analysis, the relationship of the aquifers in the well area to surrounding low-permeability aquitards is uncertain. Given these significant unknowns, this State Water Board report provides the Commission with a “first cut” review of the MPWSP by assuming the MPWSP hydrogeologic characteristics and effects to the SVGB would be similar to the North Marina Project alternative analyzed in the FEIR, with the changes described in the Commission’s February 2013 correspondence. The State Water Board also provides recommendations for additional work to clarify the hydrogeologic unknowns so a more definitive review can be done at a later date.

Figure SWRCB 1



CALIFORNIA AMERICAN WATER

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Monterey Peninsula Water Supply Project

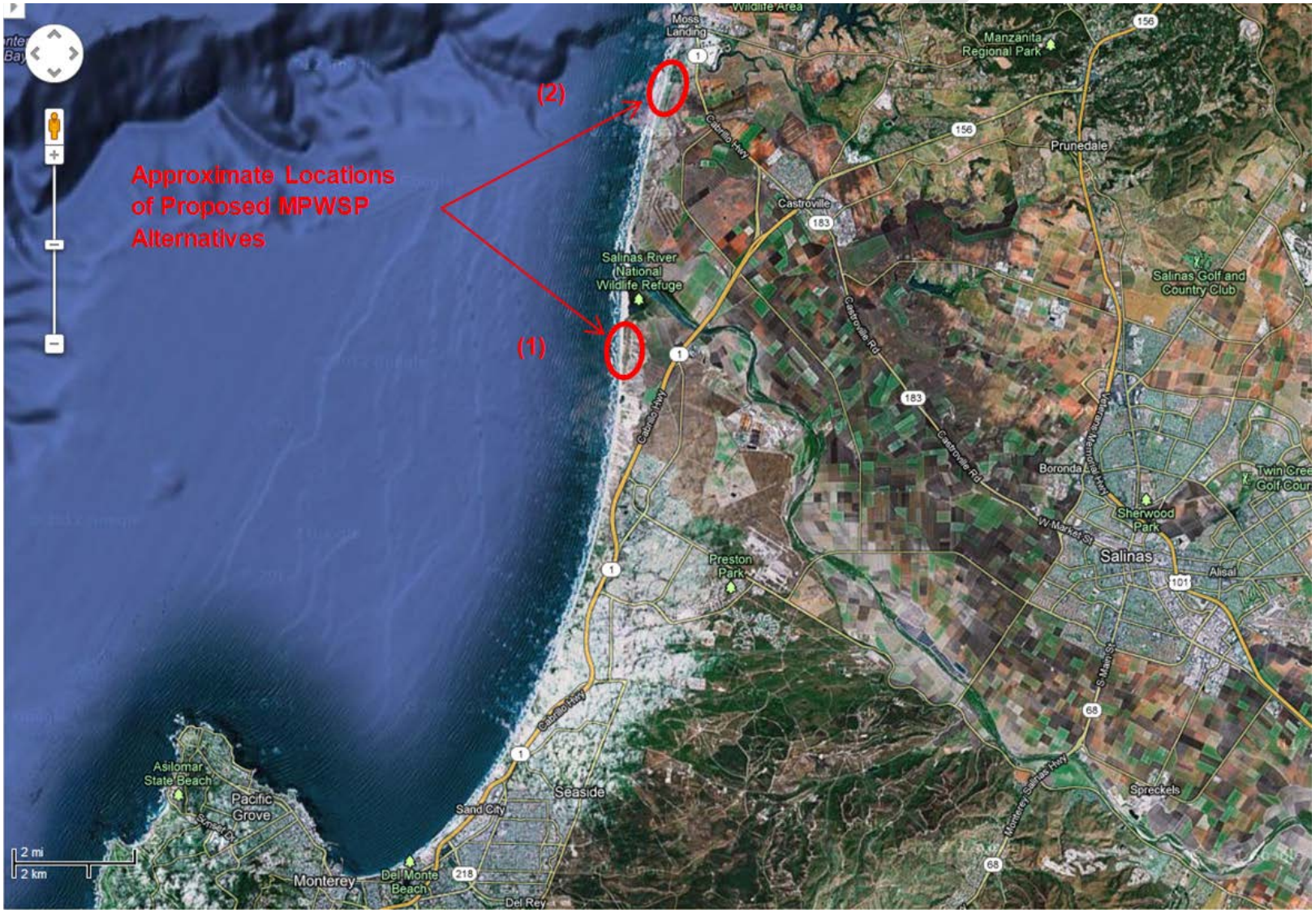
Intake Facilities

Figure 4

Figure SWCRB 2

Figure - 4 Intake Contingency Option 3

Figure SWRCB 3



4. Physical Setting

This section contains a discussion of the physical setting of the SVGB that includes a description of the hydrogeologic characteristics, groundwater quality, movement and occurrence of groundwater, and groundwater modeling results. It is important to understand the physical characteristics of the Basin to accurately determine the effects the MPWSP will have on the Basin.

4.1 Groundwater Aquifers

Knowledge of the hydrogeologic characteristics in the area of the proposed MPWSP wells is important in determining the impacts of the proposed project. As shown by the dark blue line in Figure SWRCB 4, the SVGB extends approximately 100 miles from Monterey Bay in the northwest to the headwaters of the Salinas River in the southeast. Major aquifers in the SVGB are named for the average depth at which they occur. The named aquifers from top to bottom include the 180-Foot Aquifer, the 400-Foot Aquifer and the 900-Foot or Deep Aquifer[5]. A near-surface water-bearing zone comprised of dune sands, commonly referred to as the "Dune Sand Aquifer", also exists but is considered a minor source of water due to its poor quality. The Dune Sand Aquifer is not regionally extensive and is not a recognized subbasin within the SVGB[6]. The amount of groundwater in storage in the Dune Sand Aquifer is unknown. Figure SWRCB 5 is a cross-section taken from the FEIR for the Coastal Water Project that shows the relationship of aquifers and aquitards. The estimated extent of the Dune Sand Aquifer and its relation to the 180-Foot Aquifer can be seen in the upper left hand corner of Figure SWRCB 5. Figure SWRCB 6 shows the westerly portion of the cross-section in the vicinity of the project area. The proposed slant wells will either extract water from the 180-Foot Aquifer subbasin and/or the Dune Sand Aquifer.

[5] California Department of Water Resources, California's Groundwater, Bulletin 118, Central Coast Hydrologic Region, SVGB, February 2004.
[6] FEIR, Section 4.2, Groundwater Resources, p. 4.2-5, October 2009.

The 180-Foot Aquifer is generally confined by the overlying Salinas Valley Aquitard (SVA). The SVA is a well-defined clay formation with low permeability that retards the vertical movement of water to the underlying 180-Foot Aquifer. The SVA extends vertically from the ground surface to approximately 100 to 150 feet below mean sea level (msl) and extends laterally from Monterey Bay to 10 miles south of Salinas. Based on information from logs of two wells located approximately ½ mile south and ½ mile northeast from the proposed MPWSP slant wells, the top of the SVA is between 150 to 180 feet below msl. The well logs show the top of the underlying 180-Foot Aquifer at approximately 190 to 220 feet below msl.[7]

Studies have shown that in some areas the SVA thins enough to create unconfined conditions in the 180-Foot Aquifer.[8] It is unknown if these unconfined conditions exist in the proposed MPWSP well area. Determination of the existence of the SVA, and thus the conditions of the aquifer at the location of the proposed MPWSP wells will be very important in determining the area of impact of the project as discussed at greater length in Section 5 of this report.

[7] FEIR, Section 4.2 – Groundwater Resources, Figure 4.2-3, October, 2009.
[8] Monterey County Water Resources Agency, Monterey County Groundwater Management Plan, Chapter 3 – Basin Description, pp. 3.7 & 3.8, May 2006.

Figure SWRCB 4

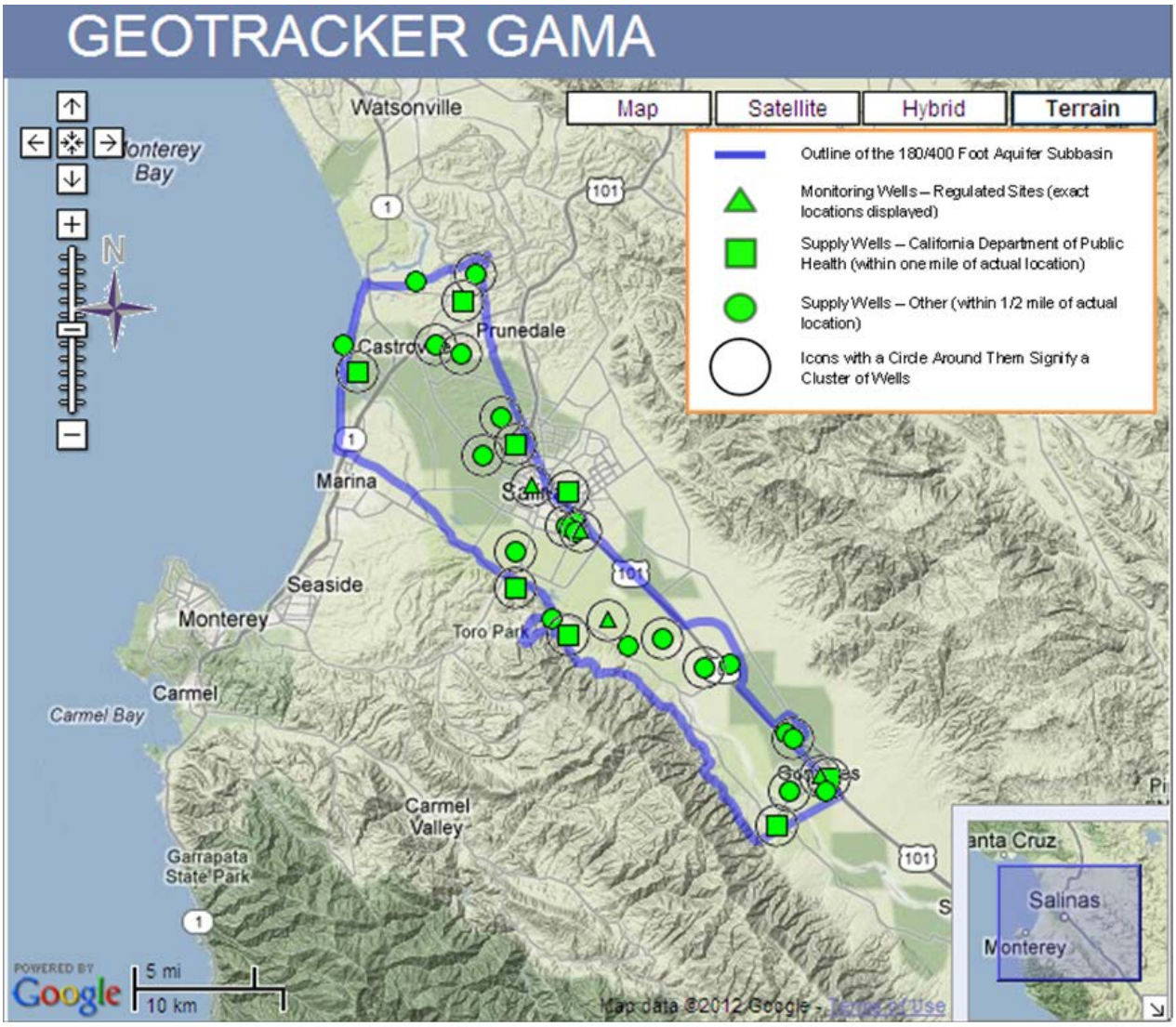
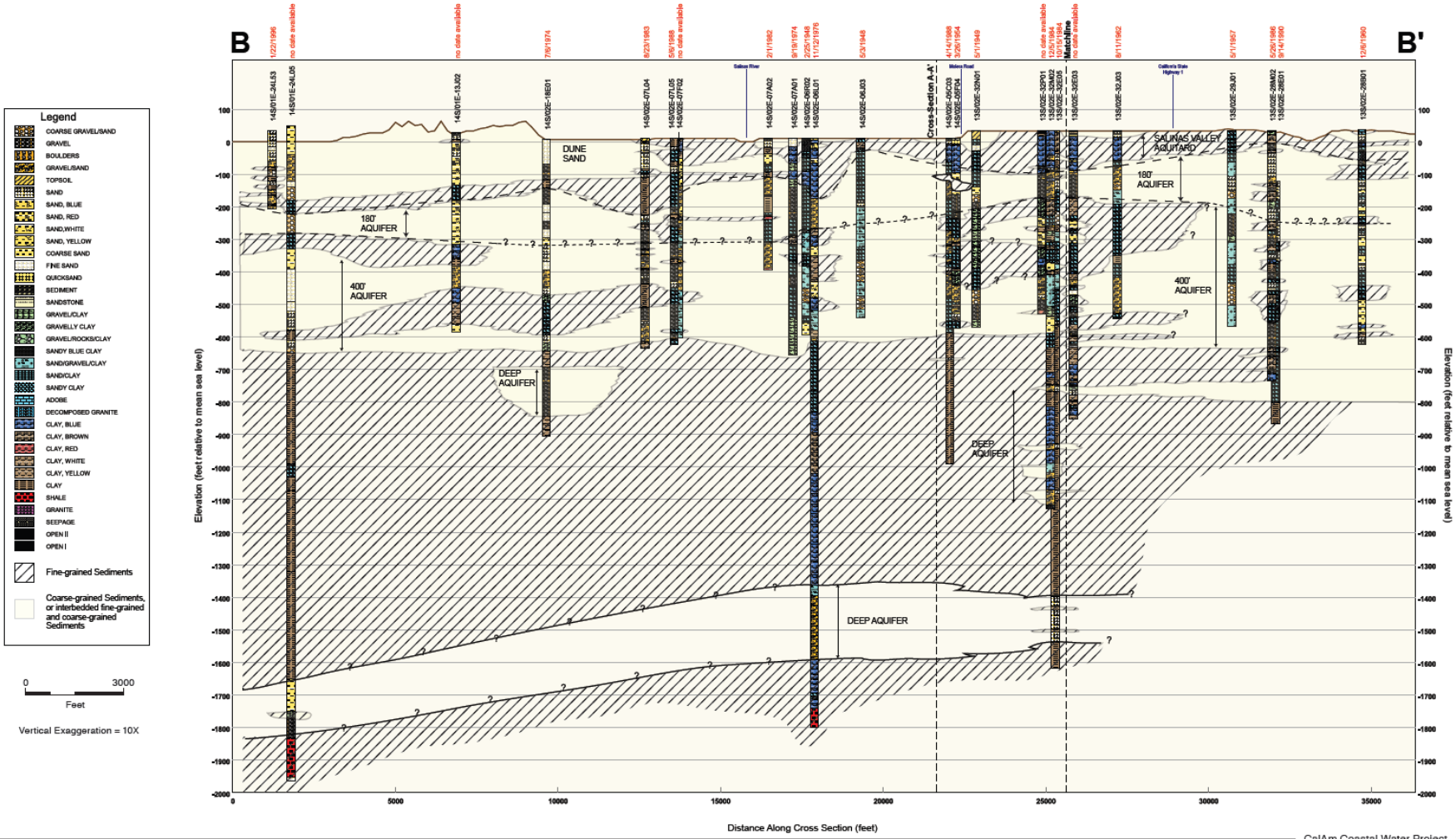


Figure SWRCB 5



SOURCE: Kennedy/Jenks, 2004

CalAm Coastal Water Project . 205335

Figure 4.2-3
Cross-Section B-B'

Figure SWRCB 6

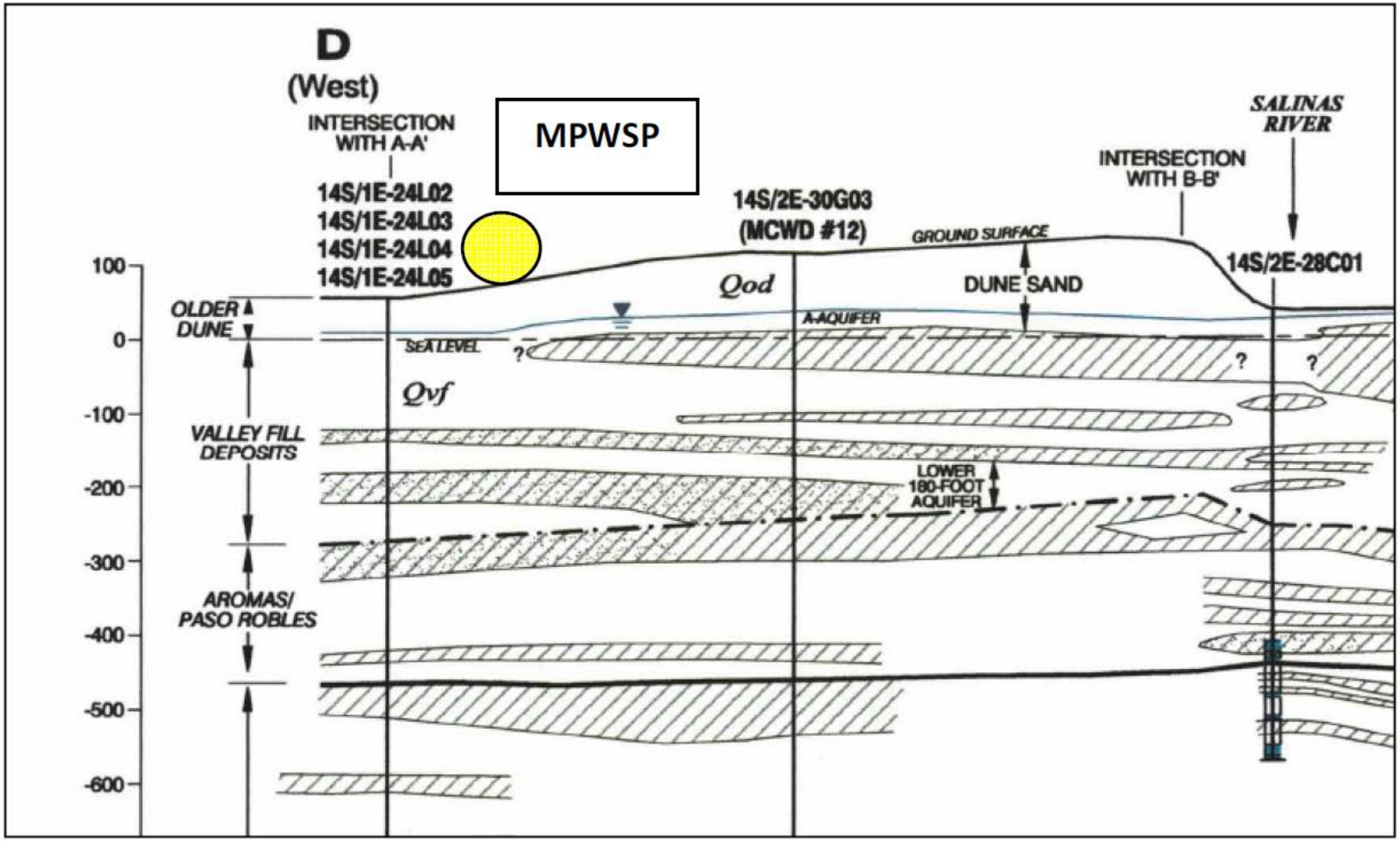


Figure 13. Geologic Cross-Section (Portion of Plate 6 from HLA, 2001)

4.2 Groundwater Quality

Groundwater quality at the site of the proposed MPWSP wells will play an important role in determining the effects of extraction on the other users in the Basin. Historic and current pumping of the 180-Foot Aquifer has caused significant seawater intrusion, which was first documented in the 1930s.[9] The Monterey County Water Resources Agency (MCWRA) uses the Secondary Drinking Water Standard upper limit of 500 milligrams per liter (mg/L) concentration for chloride to determine the seawater intrusion front. The MCWRA also uses the Secondary Drinking Water Standard to determine impairment to a source of water. Standards are maintained to protect the public welfare and to ensure a supply of pure potable water. MCWRA currently estimates seawater has intruded into the 180-Foot Aquifer approximately 5 miles inland as shown on Figure SWRCB 7. The increasing trend of inland movement of seawater intrusion is also important and provides qualitative data on future trends in the Basin. This seawater intrusion has resulted in the degradation of groundwater supplies, requiring numerous urban and agricultural supply wells to be abandoned or destroyed. In MCWRA's latest groundwater management plan (2006), an estimated 25,000 acres of land overlies water that has degraded to 500 mg/L chloride. The amount of 500 mg/L chloride water that enters the Basin was reported to be as high as 14,000 acre-feet per annum (afa) or 4.5 billion gallons.[10]

The Central Coast Regional Water Quality Control Board's Basin Plan lists designated beneficial uses and describe the water quality which must be attained to fully support those uses.[11] The Basin Plan states that water for agricultural supply shall not contain concentration of chemical constituents in amounts which adversely affect the agricultural beneficial use. Table 3-3 of the Basin Plan

[9] California Department of Water Resources, California's Groundwater, Bulletin 118, Central Coast Hydrologic Region, SVGB, 180/400 Foot Aquifer subbasin, February 2004.
[10] MCWRA, Monterey County Groundwater Management Plan, Chapter 3 – Basin Description, pages 3.14 & 3.15, May 2006.
[11] Water Quality Control Plan for the Central Basin, June 2011, Regional Water Quality Control Board, Central Coast Region. Page I-1.

provides guidelines for interpretation of the narrative water quality objective and indicates that application of irrigation water with chloride levels above 355 mg/L may cause severe problems to crops and/or soils with increasing problems occurring within the range of 142-355 mg/L.[12]

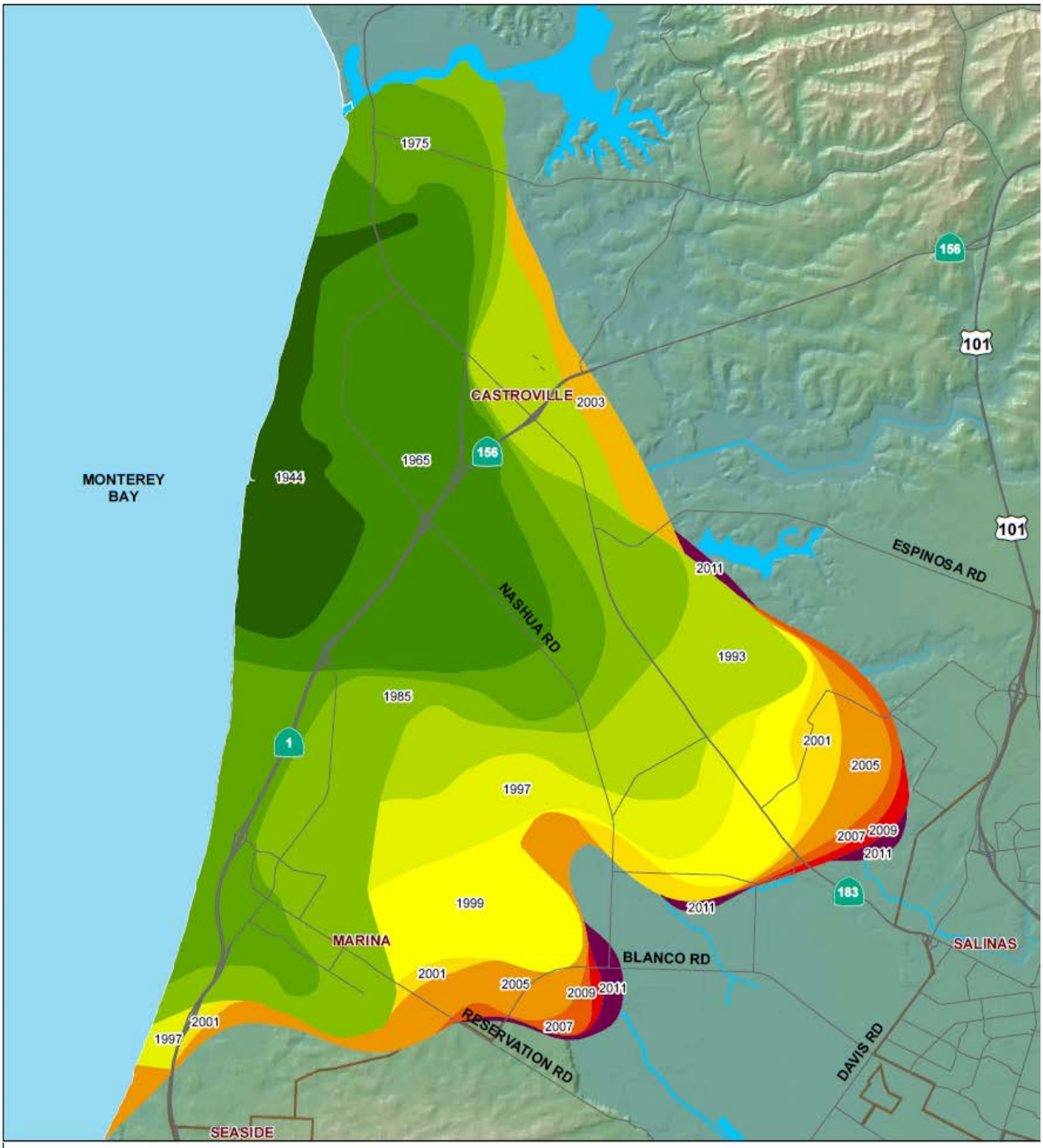
The MRWRA and the Central Coast Regional Water Quality Control Board show impairment to the water in the intruded area for drinking and agricultural uses. Since this groundwater is impaired, it is unlikely that this water is or will be put to beneficial use.

Local agencies have taken steps to reduce the rate of seawater intrusion and enhance groundwater recharge in the SVGB. To address the seawater intrusion problem, the MCWRA passed and adopted Ordinance No. 3709 in September 1993.[13] Ordinance No. 3709 prohibits groundwater extractions and installation of new groundwater extraction facilities in certain areas within the seawater intrusion zone. To enhance groundwater recharge, efforts have also been made to increase fresh water percolation through the Castroville Seawater Intrusion Project (CSIP) which was completed in 1998.[14] The CSIP is a program operated by the Monterey County Water Pollution Control Agency that reduces groundwater pumping from seawater intruded areas and distributes recycled water to agricultural users within the SVGB. The program provides a form of groundwater recharge by effectively reducing groundwater extraction in those areas of the Basin that are part of the CSIP area. Despite these and other efforts, seawater intrusion continues its inland trend into the Basin.

The groundwater quality in the Basin, and more specifically the ratio of seawater to freshwater composition, will play a key role in determining the effects the MPWSP extraction has on other users in the Basin. Additionally the past data provides insight into future conditions which could be expected absent the MPWSP.

[12] CCRWQCB, Basin Plan, Pages III-5 and III-8.
[13] MCWRA, Ordinance No. 3709, September 14, 1993.
[14] FEIR 4.2-17.

Figure SWRCB 7



4.3 Groundwater Recharge and Discharge

An understanding of the groundwater recharge and discharge in a groundwater basin is important since it can determine whether a basin is in overdraft or not. Basins that have overdraft (i.e. more discharge than recharge) experience a reduction in the amount of available groundwater. This shortage may lead to a reduction to the amount of water a legal user may extract under their water right.

Groundwater recharge in the lower portion of the Salinas Valley is largely by infiltration along the channel of the Salinas River and its tributaries. This accounts for approximately 50 percent of the total recharge within the SVGB. Approximately 40 percent of the total recharge is from irrigation return water with the remaining 10 percent due to precipitation, subsurface inflow and seawater intrusion. [15]

Approximately 95 percent of outflow from the Basin is from pumping with the remaining 5 percent due to riparian vegetation evapotranspiration. Groundwater withdrawal outpaces groundwater recharge of fresh water, which results in overdraft conditions.[16]

Historically, groundwater flowed seaward to discharge zones in the walls of the submarine canyon in Monterey Bay.[17] This seaward flow of groundwater prevented seawater from intruding landward into the SVGB. In much of the area, groundwater in the 180-Foot Aquifer and 400-Foot Aquifer is confined beneath extensive clay layers, and the hydraulic head in the aquifers is influenced by the elevation of the water table in the upgradient recharge areas where the aquifer materials are near the surface. When a well is drilled through these confining layers, this hydraulic head, or pressure head, forces water in wells to rise above the top of the aquifer; such aquifers are called confined aquifers. With increased pumping, groundwater head elevations in the 180-Foot and 400-Foot Aquifers have declined creating large pumping depressions in the aquifer pressure

[15] MCWRA, County Groundwater Management Plan, Chapter 3 – Basin Description, pp. 3-10, May 2006
[16] Ibid
[17] DWR, Bulletin 118.

surface. These cause the groundwater gradient to slope landward, reversing the historic seaward direction of groundwater flow. The pressure surface for the water in these aquifers is now below sea level in much of the inland area and flow is now dominantly northeastward from the ocean toward the pumping depressions.[18] This northeastward flow gradient has allowed seawater to intrude into the SVGB, thereby degrading groundwater quality in the 180-Foot and 400-Foot Aquifers.

The Department of Water Resources calculated that total water inflow into the 180-Foot and 400-Foot Aquifers is approximately 117,000 afa. Urban and agriculture extractions were estimated at 130,000 afa and subsurface outflow was estimated at 8,000 afa.[19] Therefore, there is currently a net loss or overdraft of approximately 21,000 afa in the 180-Foot and 400-Foot Aquifers. Basin overdraft has averaged approximately 19,000 afa during the 1949 to 1994 hydrologic period with an average annual seawater intrusion rate of 11,000 af. [20] The overdraft condition is important because it limits the availability of fresh water supplies to Basin users.

4.4 Groundwater Gradient

Based on the occurrence of large pumping depressions in inland areas, it can be reasonably assumed that there is a strong landward gradient (slope) of groundwater flow, at least within the 180-Foot Aquifer. However, because the degree of confinement of the 180-Foot Aquifer and the degree of connection between this aquifer and the overlying Dune Sand Aquifer are not known it is not possible to accurately predict what the effects of the landward gradient of groundwater flow will be for various extraction scenarios. However, if present, this landward gradient in the 180-Foot Aquifer would be a factor in determining the effects of the groundwater extraction, regardless of whether the aquifer is confined or unconfined in this area. It is important to understand the groundwater gradient in the area of the proposed MPWSP because it will

[18] FEIR, Section 4.2, p. 4.2-9.
[19] DWR, Bulletin 118.
[20] Monterey County Groundwater Manage Plan, p. 3-10, May 2006

influence the amount of water extracted from the landward side versus the seaward side of the basin. More investigation will be needed to verify the degree of the gradient and determine its effects on the MPWSP.

4.5 Groundwater Modeling

A groundwater model that accurately reflects the hydrogeologic characteristics of the Basin is critical in providing insight to the effects the MPWSP would have on the Basin. As part of the FEIR for the Coastal Water Project, a local groundwater flow and solute transport model (Model) was developed to determine the effects that pumping would have on groundwater levels and seawater intrusion in the area. [21] This Model was constructed using aquifer parameters, recharge and discharge terms, boundary conditions and predictive scenarios developed for a regional groundwater model called the Salinas Valley Integrated Groundwater and Surface Model (SVIGSM). The Model was developed to specifically focus on the North Marina area and has a much finer cell size than the SVIGSM, allowing for improved resolution in the vicinity of the proposed MPWSP. The Model can model seawater intrusion, a capability that the SVIGSM does not have.

The Model consists of six layers. The layers represented from top to bottom are the following: (1) a layer directly beneath the ocean that allows direct connection from the ocean to the aquifers; (2) the 180-Foot Aquifer; (3) an unnamed aquitard; (4) the 400-Foot Aquifer; (5) an unnamed aquitard; and (6) the Deep Aquifer. It should be noted the Model does not include a layer that represents the SVA. [22] Therefore, the Model assumes that the 180-Foot Aquifer is unconfined.

The Model's aquifer parameters such as depth, hydraulic conductivity, storativity, and effective porosity were obtained from the SVIGSM. In addition, monthly data for recharge and discharge values were obtained from the SVIGSM. The North

[21] FEIR, Appendix E, Geoscience, North Marina Groundwater Model Evaluation of Projects, July 2008.
[22] FEIR, Appendix E, Geoscience, North Marina Groundwater Model Evaluation of Projects, p. 19, July 2008.

Marina predictive scenario was run for a 56-year period from October 1948 through September 2004. This is the same period used in the SVIGSM predictive scenarios.

Two potential projects were evaluated with the Model: (1) the North Marina Project; and (2) the Regional Project. In both of these alternatives, the 180-Foot Aquifer was modeled as an unconfined aquifer. It is not known if the MPWSP wells would indeed be in unconfined conditions. Consequently, the alternative's results discussed below may or may not be predictive of the MPWSP. In addition, the groundwater model did not include the Portrero Road alternative. Therefore, an updated groundwater model that accurately reflects the local hydrogeologic conditions for all alternatives is needed in order to estimate the effects the MPWSP would have on the Basin and groundwater users.

5. Proposed Monterey Peninsula Water Supply Project

On March 8, 2013, the Commission requested that the State Water Board evaluate two possible alternatives for the MPWSP; a preferred alternative consisting of gravity well design and a secondary alternative consisting of a pumping well design. This section contains a discussion on the intake design of both alternatives and potential effects each would have on the SVGB. .

5.1 Gravity Well Design

The preferred alternative has two options for the feedwater intake system: a 6.4 mgd system consisting of seven slant wells and a 9.6 mgd system consisting of nine slant wells. This report focuses on the 9.6 mgd system since it has the potential to have a greater effect on the groundwater basin. The 9.6 mgd system will consist of eight slant wells and one test slant well. Results of the test well will dictate final well design and will determine whether the wells would extract water from the Dune Sand Aquifer and/or the 180-Foot Aquifer. The proposed location of the gravity intake system is adjacent to the 376-acre parcel of land owned by the CEMEX Corporation (Figure SWRCB 1). The wells system would consist of two four- well clusters (North Cluster and South Cluster) plus the test well. Each

well will be thirty inches in diameter and will be up to approximately 630 feet in length and will have up to 470 feet of screen. The wells will be designed as gravity wells such that they will not require submersible well pumps. The output of each slant well is estimated at approximately 1,800 gpm. Each slant well will have an 8-foot diameter vertical cassion, which will be connected to a 36-inch diameter beach connector pipeline via an 18-inch diameter gravity connector. Feedwater will flow by gravity from the slant well to the gravity connector and to the beach connector pipeline where it will enter a 23 mgd intake pump station. The intake pump system will pump the feedwater to the desalination plant using four 250-horsepower pumps. The total well capacity required is approximately 23 mgd to meet the feedwater requirement for a 9.6 mgd desalination plant operating at an overall recovery of 42 percent.

The gravity well design is a new alternative presented to the State Water Board for evaluation at the CEMEX owned property. State Water Board staff previously evaluated a pumping well alternative at the CEMEX site and found that the pumped wells would have an impact to groundwater users within a 2–mile radius of the wells. Since modeling has not been done for the gravity well alternative, State Water Board staff is unable to accurately predict impact to existing users from the gravity wells.

5.2 Pumping Well Design

As described in the Commission's February 14, 2013 correspondence, the secondary alternative (Intake Contingency Option 3) would include a feedwater intake system consisting of nine pumped slant wells extending offshore into the Monterey Bay. The slant wells would extract 23 mgd of water from the Dune Sand Aquifer and convey the water via a 36-inch diameter connector pipeline to a 23 mgd intake pump station and finally to the desalination plant. The slant wells would be installed at the parking lot on the west end of Portrero Road along the roadway that parallels the beach north of the parking lot (Figure SWRCB 2).

The potential impacts from the pumping wells at this site cannot be yet be determined since groundwater modeling has not been done. Until an accurate

groundwater model is developed for this area, State Water Board staff is unable to determine the extent of impacts to existing water users.

5.3 Groundwater Capture Zone Delineation

For aquifers with a substantial gradient (slope) in the direction of groundwater flow, there is an important distinction between the cone of depression around the pumping well (area where the water surface or pressure head is lowered) and the capture zone for water that flows to the pumping well. Where there is an existing slope to the water table or pressure surface of the groundwater system, not all the water in the cone of depression flows to the pumping well, and much of the water the pumping well intercepts is far outside the cone of depression in the upgradient direction. The practical effect of this situation is that, with an landward gradient of groundwater flow, more of the water captured by the pumping well comes from the upgradient direction (in this case from the seaward direction) and a much smaller proportion of the water captured by the pumping well is from downgradient (inland) direction. Water captured from the seaward direction would likely be seawater. Water captured from the landward side could potentially have a greater likelihood of capturing some portion of freshwater. Therefore, because the gradient means more water will be captured from the seaward direction there is a reduced possibility that the wells will capture freshwater.

An individual might assume the extraction wells would draw water equally from seaward and landward areas. While this may be true in a system that has no gradient of flow, it would not be true in the proposed MPWSP area because there is a significant gradient of groundwater flow from the seaward areas toward the inland pumping depressions. In this situation, the extraction well system would draw most of its water from the upgradient (seaward) direction, and very little of the “fresh” water from inland areas would be captured. In the long-term, the situation would be altered and the source of the water drawn from the extraction well system would need to be reevaluated under the following conditions: (1) if pumping of fresh water from inland areas is reduced to the point that the

groundwater system is in equilibrium, and (2) the pumping depressions are eliminated such that there is no longer a landward gradient flow.

The FEIR groundwater modeling studies conducted for the proposed extraction of groundwater from the 180-Foot Aquifer included an evaluation of groundwater elevations and gradients. The modeling evaluated the effects the landward gradient of groundwater flow could have in determining the source of water that would be captured by the extraction well system. As more information about the groundwater system becomes available, a more detailed evaluation of the capture zone for the extraction system will be possible. This type of capture zone analysis will be important in evaluating the long-term effects of the extraction well system and any potential impacts on existing water users.

5.4 Extraction Scenarios

There are three likely scenarios in which Cal-Am would extract groundwater for its MPWSP: (1) extraction from gravity wells from an unconfined aquifer and/or a confined aquifer; (2) pumping from an unconfined aquifer; and (3) pumping from a confined aquifer.

5.4.1 Extraction of Feedwater by Gravity Wells

Cal-Am has proposed to construct a slant test well and collect data that will determine if the gravity well alternative is feasible. If water is extracted using gravity wells, the hydraulic effects on the aquifer would be the same for either pumped wells or the proposed gravity wells as long as the amount of drawdown in the wells is the same. Likewise, if the wells were completed in either a confined or an unconfined aquifer, the effects on those aquifers would be the same if the level of drawdown in the wells were the same. However, if a pumping well had a greater drawdown than a gravity well, there would be more of an effect to the aquifer from the pumping well. The important factor is not what mechanism induces flow from the wells but the actual drawdown produced in the groundwater system.

The gravity well system would limit the maximum amount of drawdown from the extraction wells to the head differential between sea level and the depth of the intake pump station that the gravity wells would drain into. This would add a level of protection against drawing more water from the shoreward side because it would preclude the larger drawdowns that could be obtained with submersible pumps in the wells. The cone of depression (zone of influence) for the extraction well system would be limited by the fixed head differential established by the depth of the intake pump station. This configuration will also likely prevent the operator from being able to maintain maximum flow rates from the extraction well system because there is no ability to increase pumping rates should tidal effects become a factor. The obvious potential problem with the gravity well scenario is that if the flow to the wells is limited by lower permeability zones or well efficiency problems, the operator cannot increase pumping rates to obtain the quantities of water the system is designed to achieve.

5.4.2 Pumping from Unconfined Conditions

If pumping were to occur under unconfined conditions, water would be extracted either from the Dune Sand Aquifer or from the 180-Foot Aquifer (if the SVA is not present at the proposed well-site). In general, when water is pumped from an unconfined aquifer, water is removed from the aquifer and the water table in the aquifer is lowered as water drains by gravity from the pore spaces in the aquifer. This lowering or drawdown of the water table causes a cone of depression that is greatest close to the well and gets smaller in all directions as the distance from the well increases.[23] Modeling results of the North Marina Project show that pumping would cause a decline in groundwater elevations at the slant wells of approximately 15 feet. There would be about a 2-foot decline in groundwater levels approximately one mile from the slant wells decreasing

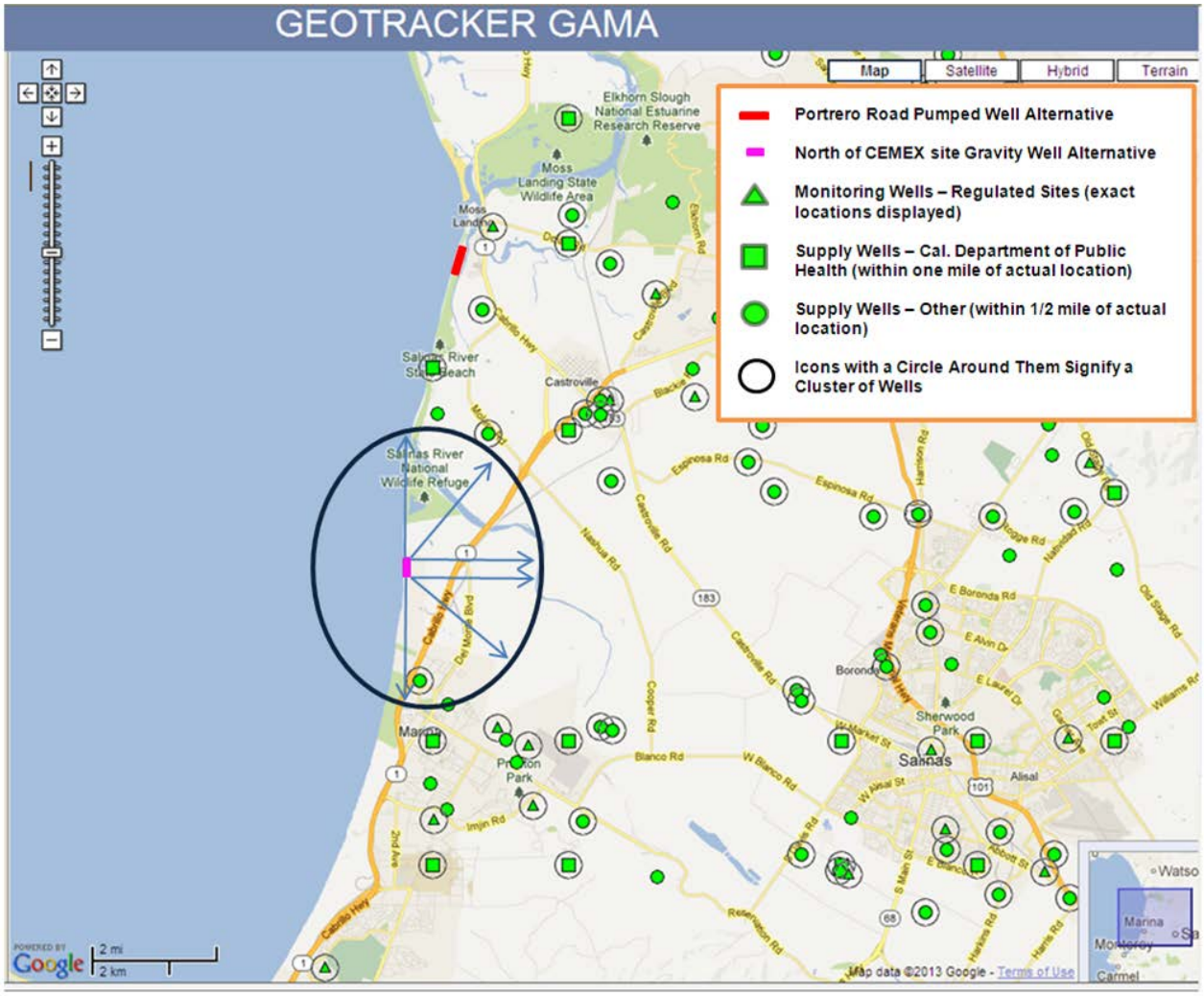
[23] Driscoll, 1986, Groundwater and Wells, p. 63-64.

to less than 0.5 feet about 1.5 miles away.[24] The lowering of groundwater levels approximately 2 miles from the slant wells likely would be negligible. If the final design calls for gravity wells at the north Marina site, then modeling would be needed to estimate the effects from the gravity wells. Since modeling was not done for the Portrero Road site the effects from pumping at that location are unknown. Once the zone of influence is estimated for each location and each pumping scenario then any wells within the zone of influence would be affected by project pumping and possibly cause injury.

According to information from the State Water Board's GAMA database, approximately 14 wells are within 2 miles of the proposed MPWSP (Figure SWRCB 8). All of these wells are within the seawater-intruded portion of the Basin. The MPWSP drawdown would change the groundwater gradient within the zone of influence causing a radial flow of groundwater toward the extraction wells.[25] Currently, the predominant groundwater flow direction in the 180-Foot Aquifer is toward the northeast. Project pumping would likely change the flow direction to more of a southwest to westerly direction within the zone of influence. Outside the zone of influence there would be little if any change to groundwater flow direction; however, the rate of flow in the original direction (northeast) would be reduced. Therefore, the MPWSP would slow the rate of seawater intrusion in a landward direction from the wells.

[24] FEIR, Appendix E, p. 21 (E-28).
[25] Driscoll, 1986, Groundwater and Wells, 63-64.

Figure SWRCB 8



As mentioned above, groundwater flow to the MPWSP extraction wells would initially be from all directions in a radial pattern. Because the ocean provides a constant source of nearby recharge to the extraction wells, the zone of influence for the extraction wells cannot expand much farther than the distance between the extraction wells and the ocean, or in the case of confined aquifer conditions, the distance between the extraction wells and the undersea outcrop of the confined aquifer. While a portion of the water flowing to the well does come from the less saline water on the shoreward side, the relative percentage of water drawn from the shoreward side of the wells will depend on various factors, including the gradient of groundwater flow toward inland pumping depressions. If the North Marina Project model is applicable, then approximately 87 percent of the water pumped (approximately 21,400 afa) would come from the ocean side of the wells and approximately 13 percent of the water (approximately 3,250 afa) would come from the landward side of the wells.[26] It is unlikely that pumping from an unconfined aquifer would extract fresh groundwater since the seawater intrusion front is approximately 5 miles landward from the proposed pumps. Because the Model shows that the seawater intrusion front remains basically the same with or without the North Marina Project, it is likely that the amount of water (3,250 afa) extracted from the eastern portion of the aquifer will be brackish (intruded) water. Although this brackish water is of substantially better quality than seawater, it is likely degraded to the point that it is not suitable for any beneficial use other than feedwater for desalination purposes.

5.4.3 Pumping from Confined Conditions

If pumping were to occur under confined conditions, water would be extracted from the confined 180-Foot Aquifer. When a confined aquifer is pumped, the loss of hydraulic head occurs rapidly because the release of

[26] FEIR, Appendix E, Geoscience, North Marina Groundwater Model Evaluation of Projects p. 22 (E-29), July 2008.

the water from storage is entirely due to the compressibility of the aquifer material and the water.[27] This zone of influence in a confined aquifer is commonly several thousand times larger than in an unconfined aquifer.[28] Therefore, the effects from MPWSP pumping on the groundwater pressure head would occur more rapidly and over a much larger area than the effects seen in an unconfined aquifer. Modeling in the FEIR did not predict the effects of pumping from a confined condition, so there are no estimates on the extent of potential impacts. Generally speaking, the pressure head would be lowered in wells much further inland and the long-term effects on groundwater flow direction would be felt over a wider area. Since pumping from a confined condition would affect a much larger area, there would be a greater likelihood of the MPWSP affecting groundwater users at greater distances from the project location.

5.5 Summary of Impacts

There are two types of potential impacts the proposed extraction wells could have on inland water users. First, the inland groundwater users may experience a reduction in groundwater levels in their wells, with associated increases in pumping costs. This type of effect could be reasonably evaluated with groundwater modeling. Until the degree of confinement and connection between the Dune Sand Aquifer and the 180-Foot Aquifer has been more thoroughly studied, the potential for injury to inland water users due to reduced groundwater elevations and diversion of fresh water from the aquifer cannot be determined.

The second type of effect the extraction well system could have on in-Basin groundwater users is a reduction in the quantity of fresh water that is available for their future use. This effect would not be felt immediately and would depend on a variety of factors. Since the capture zone for the extraction well system will likely be limited to areas already heavily impacted by seawater intrusion, it would not be appropriate to inject or percolate desalinated water in this intruded area, as

[27] Driscoll, 1986, Groundwater and Wells, p. 64-65.
[28] United States Geologic Survey, Sustainability of Groundwater Resources, Circular 1186. Section A, p. 2.

the water would essentially be wasted. Another alternative would be to supply replacement water to the existing CSIP system for delivery to groundwater users in the affected area. The reduction in the availability of fresh water would not be felt immediately; thus, replacement water could be provided after the MPWSP has been in operation and modeling information becomes available to evaluate the actual quantity of fresh water that needs to be returned to the system.

6. Legal Discussion of Proposed Extraction Wells in Basin

Although the Basin is in a condition of overdraft, the Basin has not been adjudicated and water withdrawals by the Basin's users are not quantified by court decree. Water users state the Basin's water is managed through cooperative agreements reached by the Basin's groundwater users.[29] Users claim that Cal-Am's proposed Project would disrupt the Basin's agreements, lead to a costly adjudication, and are barred by principles of groundwater law.[30]

Cal-Am needs no groundwater right or other water right to extract seawater from Monterey Bay. Based on the information provided, however, the proposed MPWSP could extract some fresh water from within the Basin. An appropriative groundwater right is needed to extract water from the Basin for use outside the parcel where the wells are located.[31] To appropriate groundwater from the Basin, Cal-Am will have to demonstrate that the MPWSP will extract water that is surplus to the needs of groundwater users in the Basin and injury to those users will not result. Because the Basin is in a condition of overdraft, to appropriate water for non-overlying uses, any fresh water that Cal-Am pumps will have to be replaced. [32]

[29] *Salinas Valley Water Coalition*, Letter to State Water Board Chair, Charles Hoppin, (December 3, 2012).
[30] See generally, Application 12-04-019 before the California Public Utilities Commission, *Opening Brief of LandWatch Monterey County Regarding Groundwater Rights and Public Ownership*, July 10, 2012; *Opening Brief of Various Legal Issues of Monterey County Farm Bureau*, July 10, 2012, available at: www.cpuc.ca.gov.
[31] An appropriative groundwater right is not necessary to recover water injected or otherwise used to recharge the aquifer, where the water used for recharge would not recharge the aquifer naturally.
[32] Additionally, the Monterey County Water Resources Act, (Stats. 1990 ch.52 § 21. West's Ann. Cal. Water Code App.) prohibits water from being exported outside the Salinas Valley Groundwater Basin.

6.1 General Principles of Groundwater Law

Groundwater rights may generally be classified as overlying, prescriptive or appropriative.[33] Overlying users of groundwater have correlative rights which are rights similar to riparian users' rights, and an overlying user can pump as much water as the user can apply to reasonable and beneficial use on the overlying parcel so long as other overlying users are not injured. (*City of Barstow v. Mojave Water Agency* (2000) 23 Cal.4th 1224, 1240 (*Mojave*).) In times of shortage, pumping must be curtailed correlatively, to provide each overlying user a reasonable share of the available supply. (*Id.* at 1241.)

Prescriptive rights are acquired through the taking of water that is not surplus or excess to the needs of other groundwater users. Similar to other prescriptive property rights, if the elements of prescriptive use are met—the use is actual, open, notorious, hostile, adverse to the original owner, continuous and uninterrupted for the statutory period of five years—a user may acquire a prescriptive right. (*California Water Service Co. v. Edward Sidebotham & Son* (1964) 224 Cal.App.2d 715, 726.)

Appropriative groundwater rights apply to users who extract groundwater other than those described above. (*Mojave, supra,* 23 Cal.4th at p.1241.) Appropriative groundwater rights are not to be confused with appropriative rights that apply to surface waters or subterranean streams administered by the State Water Board. Unlike appropriative water rights that are permitted by the State Water Board, appropriative groundwater rights are any rights to pump groundwater that do not fall into either the overlying or prescriptive category.[34] No permit is required by the State Water Board to acquire or utilize appropriative groundwater rights.

Because Cal-Am proposes to export water from the Basin to non-overlying parcels in the Monterey Region, an appropriative groundwater right is required.

[33] Groundwater rights referenced in this report apply to percolating groundwater only.
[34] This is generally true. There are other types of rights, including pueblo rights, federal reserved rights, and rights to recover water stored underground pursuant to surface water rights. These other types of rights are not discussed in detail in this report.

To appropriate groundwater, a user must show the water is "surplus" to existing uses or does not exceed the "safe yield" of the affected basin. (*City of Los Angeles v. City of San Fernando* (1975) 14 Cal.3d 199, 214.) The appropriator must show the use will not harm or cause injury to any other legal user of water. The burden is on the appropriator to demonstrate a surplus exists. (*Allen v. California Water and Tel. Co.* (1946) 29 Cal.2d 466, 481.) But if, after excluding all present and potential reasonable beneficial uses,[35] there is water wasted or unused or not put to any beneficial uses, "the supply… may be said to be ample for all, a surplus or excess exists… and the appropriator may take the surplus or excess…" (*Peabody v. City of Vallejo* (1935) 2 Cal.2d 351, 368-369 (*Peabody*).) As discussed previously, because groundwater in the Basin is in a condition of overdraft, the only way to show there is surplus water available for export to non-overlying parcels is for a user to develop a new water source.

Cal-Am's proposed MPWSP would pump brackish water. The exact composition is yet to be determined, but the proposed source water is substantially degraded by seawater intrusion and other natural factors. Estimates based on the North Marina Project description are that 13 percent of the total water pumped through the proposed wells could be attributed to the landward portion of the Basin and 87 percent could come from the seaward direction relative to the pump locations. Based on data currently available, the State Water Board is unable to estimate what percentage or proportion of water extracted from the Basin landward of the proposed well location could be attributed to fresh water sources. It is known, however, that the Basin's waters are degraded some distance landward from the proposed wells. MCWRA currently estimates that seawater has intruded into the 180-Foot Aquifer approximately 5 miles inland. It is unknown whether seawater has intruded the Dune Sand Aquifer, but the reported poor water quality of the Dune Sand Aquifer likely limits beneficial uses of its water.

[35] Potential overlying uses are often inherently implicated in determining whether a long-term surplus actually exists. Where a basin is not in overdraft, however, there may be temporary surplus where probable future overlying uses have not yet been developed.

6.2 Developed Water

Water an appropriator pumps that was not previously available to other legal users can be classified as developed or salvaged water.[36] "[I]f the driving of tunnels or making of cuts is the development of water, as it must be conceded it is, we perceive no good reason why the installation of a pump or pumping-plant is not equally such development." (*Garvey Water Co. v. Huntington Land & Imp. Co.* (1908) 154 Cal. 232, 241.) Further, it is generally accepted that whoever creates a new source of water should be rewarded by their efforts. (See generally *Hoffman v. Stone* (1857) 7 Cal. 46, 49-50.)

If Cal-Am shows it is extracting water that no Basin user would put to beneficial use, Cal-Am could show its proposed desalination MPWSP develops new water in the Basin, water that could not have been used absent Cal-Am's efforts to make it potable. Of course, this does not apply to any source water that is considered fresh or non-brackish and would not be considered developed water.

Making use of water before it becomes unsuitable to support beneficial uses or is "wasted," is supported both by statute, case law and the California Constitution, which in part states: "the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable…and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof." (Cal. Const., art. X, § 2; see also *City of Lodi v. East Bay Municipal Utility District* (1936) 7 Cal.2d 316, 339-341 (*Lodi*); [salvaged water that would otherwise be wasted should be put to beneficial use].)

The key principle of developed waters is if no lawful water user is injured, the effort of an individual to capture water that would otherwise be unused should be legally recognized. As the court determined in *Cohen v. La Canada Land and Water Co.* (1907) 151 Cal. 680 (*La Canada*), if water would never reach or be

[36] The concepts of developed and salvaged waters are closely related and the legal concepts are the same. Technically, salvaged waters usually refers to waters that are part of a water supply and are saved from loss whereas developed waters are new waters that are brought to an area by means of artificial works. (See Hutchins, The California Law of Water Rights (1956) p. 383.) For purposes of this report, the distinction is largely irrelevant and the term developed waters will be used throughout for consistency.

used by others there can be no injury. (*Id.* at p. 691.) In *La Canada*, waters which were secured by the construction of tunnels could be considered developed waters as the waters were determined to trend away from the direction of the natural watershed and would never have reached it and would be lost if left to percolate in their natural flow. (*Ibid.*)

> Under these circumstances, as the waters developed by the tunnels were not waters which would have trended towards or supported or affected any stream flowing by the land of appellant,…she was not injured as an adjoining proprietor or as an appropriator, and hence could not complain or insist upon the application of the rule announced in the cases cited to prevent the respondents from taking such developed waters to any lands to which they might see fit to conduct them.

(*La Canada, supra,* 151 Cal. at p. 692.)

"[F]ull recognition is accorded of the right to water of one who saves as well as of one who develops it." (*Pomona Land and Water Co. v. San Antonio Water Co.* (1908) 152 Cal. 618, 623-624 (*Pomona*) citing *Wiggins v. Muscupaibe Land & Water Co.* (1896) 113 Cal. 182, 195 (*Wiggins*).)

> [I]f plaintiffs get the one half of the natural flow to which they are entitled delivered, unimpaired in quantity and quality, through a pipe-line, they are not injured by the fact that other water, which otherwise would go to waste…was rescued. Nor can they lay claim to any of the water so saved.

(*Pomona*, *supra,* 152 Cal. at p. 631.)

In summary, if there is no injury, a user should be able to develop all water available:

> The plaintiff could under no circumstances be entitled to the use of more water than would reach his land by the natural flow of the stream, and, if he receives this flow upon his land, it is immaterial to him whether it is received by means of the natural course of the stream or by artificial means. On the other hand, if the defendant is enabled by artificial means to give to the plaintiff all of the water he is entitled to receive, no reason can be assigned why it should not be permitted to divert from the stream…and preserve and utilize the one hundred inches which would otherwise be lost by absorption and evaporation.

(*Wiggins*, *supra,* 113 Cal. at p. 196.)

As discussed above, in developing a new water source Cal-Am must establish no other legal user of water is injured in the process. Even if Cal-Am pumps water unsuitable to support beneficial uses, the water could not be considered developed water unless users who pump from areas that could be affected by Cal-Am's MPWSP are protected from harm.

Cal-Am proposes a replacement program for the MPWSP water that can be attributed to fresh water supplies or sources in the Basin. If Cal-Am can show all users are uninjured because they are made whole by the replacement water supply and method of replacement, export of the desalinated source water would be permissible and qualify as developed water. In the future, this developed water, under the above described conditions, would continue to be available for export even if there are additional users in the Basin. Developed waters are available for use by the party who develops them, subject to the "no injury" standard discussed previously.

Cal-Am could use one or more of several possible methods to replace any fresh water it extracts from the Basin. Cal-Am could return the water to the aquifer through injection wells, percolation basins, or through the CSIP. Cal-Am would need to determine which of those methods would be the most feasible, and would in fact, ensure no harm to existing legal users. The feasibility analysis would depend on site-specific geologic conditions at reinjection well locations and at the percolation areas. These studies need to be described and supported in detail before Cal-Am can claim an appropriative right to export surplus developed water from the Basin.

6.3 Physical Solution Discussion

To operate the MPWSP, Cal-Am must ensure the MPWSP will not injure other legal users in the Basin. This could require implementation of a "physical solution."

A physical solution is one that assures all water right holders have their rights protected without unnecessarily reducing the diversions of others. “The phrase ’physical solution’ is used in water-rights cases to describe an agreed upon or judicially imposed resolution of conflicting claims in a manner that advances the constitutional rule of reasonable and beneficial use of the state's water supply.” (*City of Santa Maria v. Adam* (2012) 211 Cal. App. 4th 266, 286 (*City of Santa Maria*).) A physical solution may be imposed by a court in connection with an adjudication of a groundwater basin where rights of all parties are quantified, as part of a groundwater management program, or as part of a water development project.[37] One important characteristic of a physical solution is that it may not adversely impact a party’s existing water right. (*Mojave*, *supra,* 23 Cal.4th 1224, 1251.) Physical solutions are frequently used in groundwater basins to protect existing users’ rights, maintain groundwater quality, allow for future development, and implement the constitutional mandate against waste and unreasonable use. (See *California American Water v. City of Seaside* (2010) 183 Cal.App.4th 471, 480.)

From the standpoint of applying the State’s waters to maximum beneficial use, and to implement Article X, section 2 of the California Constitution, physical solutions can and should be imposed to reduce waste.[38] (See, e.g., *Lodi, supra,* 7 Cal.2d 316, 339-341, 344-345; *Hillside Memorial Park and Mortuary v. Golden State Water Co.* (2011) 205 Cal.App.4th 534, 549-550.) In *Lodi*, a physical solution was imposed to limit the wasting of water to the sea. The defendant appropriator was required to keep water levels above levels that would injure the senior user or to supply equivalent water to the plaintiff. (*Lodi, supra,* 7 Cal.2d 316, 339-341, 344-345.)

[37] Sawyer, *State Regulation of Groundwater Pollution Caused by Changes in Groundwater Quantity or Flow* (1998) 19 Pacific. L.J.1267, 1297.

[38] Additionally, Water Code section 12947 states the general policy of promoting saline water conversion to freshwater in the State.

Agreement of all parties is not necessary for a physical solution to be imposed. (See *Lodi, supra,* at p.341, citing *Tulare Irrigation District v. Lindsay Strathmore Irrigation District* (1935) 3 Cal.2d 489, 574.) In addition, a basin need not be determined to be in a condition of overdraft for a physical solution to be instituted. "Although we may use physical solutions to alleviate an overdraft situation, there is no requirement that there be an overdraft before the court may impose a physical solution." (*City of Santa Maria, supra,* 211 Cal.App.4th, 266, 288.) Likewise, a physical solution can also be imposed in a basin that is determined to be in a condition of overdraft. (See generally *Pasadena v. Alhambra* (1949) 33 Cal.2d 908 [in a situation of continued overdraft, the court imposed limits on all users].)

Under the physical solution doctrine, although the Basin continues to be in a condition of overdraft, to maximize beneficial use of the state's waters Cal-Am may be allowed to pump a mixture of seawater and fresh water and export the desalinated water to non-overlying parcels. To avoid injury to other users and protect beneficial uses of the Basin's waters, Cal-Am would be required to return its fresh water component to the Basin in such a way that existing users are not harmed and foreseeable uses of the Basin water are protected.

Modeling of the North Marina Project, which may be similar to the MPWSP, indicates that approximately 3,250 afa could be extracted from the landward direction of the slant wells, or approximately 13 percent of the total water extracted could be water that is contained or sourced from the Basin rather than seawater derived from Monterey Bay. The percentage of this water that is fresh or potable would have to be determined and the proportion of fresh water that is extracted for the desalination facility would have to be replaced. The exact method for replacing the fresh water extracted will be a key component of any legally supportable project. Replacement methods such as fresh water injection to recharge wells, fresh water delivery to recharge basins, or applying additional fresh water through the CSIP program would need to be further examined to implement a physical solution that ensures no injury to other legal users. Cal-Am

would need to determine which of those methods would be the most feasible and result in returning the Basin to pre-project conditions.

One possibility raised by the parties is that Basin conditions may change in the future, and if the seawater intrusion front shifts seaward, Cal-Am may extract a higher proportion of freshwater from its wells and reach a limit where it will be infeasible for it to return a like amount of fresh water back to the Basin and still deliver the amount of desalinated water needed for off-site uses. Based on the current project design and location of the extraction wells, it is highly unlikely that in the foreseeable future Cal-Am will draw an increased percentage of freshwater from wells located several hundred feet offshore. If pumping within the Basin remains unchanged, it is projected that the MPWSP would not pump fresh water within a 56-year period if pumping occurred in an unconfined aquifer. Since modeling has not been done simulating confined conditions, the extent of the impact on fresh water supply or wells is unknown in this situation. If, however, Basin conditions do change and Cal-Am's freshwater extractions increase, several scenarios could develop. [39]

One possible scenario is that Cal-Am could show that (1) but-for the MPWSP, new fresh water would not be available in the Basin, and (2) as it continues to operate the MPWSP, the increased amount of fresh water available is developed water that would have previously been unavailable both to it and to other users. If this increased freshwater available to Basin users alleviates seawater intrusion issues, as well as provides for a new supply in excess of what would otherwise be available in the Basin, a physical solution could be imposed that would apportion the new water supply and allow continued pumping.

Another possibility is that Basin conditions could improve independent of MPWSP operation. If increased freshwater availability in the Basin could not be attributed to the MPWSP and Cal-Am's freshwater extractions exceed what it can

[39] North Marina Project modeling showed that if pumping occurred in an unconfined aquifer over a 56 year period, then pumping would have little to no effect on the movement of the seawater intrusion front.

return to the Basin, Cal-Am may have to limit its export diversions to ensure that other legal users are not injured.

Based on historical uses of water in the Basin and despite efforts to reduce groundwater pumping in seawater intruded areas through enactment of Ordinance 3709 and efforts to increase recharge through the CSIP, there is no evidence to suggest that Basin conditions will improve independent of the MPWSP without a comprehensive solution to the overdraft conditions.

There is expected to be minimal impact to freshwater sources at start-up and for the first several years of operation as water will certainly be sourced from the intruded portion of the aquifer. The magnitude and timing of the effect on other users would have to be determined to allow for a design solution to mitigate the impact of continued operation. (See *Lodi*, 7 Cal.2d 316, 342; ["the fact that there is no immediate danger to the City of Lodi's water right is an element to be considered in working out a proper solution."] The physical solution doctrine could allow for an adjustment of rights, so long as others legal rights are not infringed upon or injured. "[I]f a physical solution be ascertainable, the court has the power to make and should make reasonable regulations for the use of the water by the respective parties…and in this connection the court has the power to and should reserve unto itself the right to change and modify its orders…" (*Peabody, supra,* 2 Cal.2d at pp. 383-384.)

If and when impacts to freshwater resources in the Basin are observed, freshwater injection wells would have to be designed to ensure water is injected in areas not already degraded. Alternatively, or in conjunction with injection wells, Cal-Am could ensure an adequate supply of replacement water is maintained within the CSIP program. Initial studies would be needed to determine the most suitable location based on soil permeability for additional percolation basins, if necessary. As with injection wells, percolation basins would need to be located where the underlying aquifer does not contain degraded water.

Based on the information provided in the FEIR, North Marina Project modeling suggests a zone of influence of approximately 2 miles from the proposed extraction wells.[40] Within this zone, there are approximately 14 known water wells. These 14 wells are within the seawater intruded portion of the Basin. The current use of these wells is unknown; however, it is unlikely the MPWSP would injure users of these wells as the wells are within a zone where water quality is significantly impacted from seawater intrusion. Within this 2-mile radial zone, the two foreseeable injuries that overlying users could experience are: (1) a reduction in the overall availability of fresh water due to possible incidental extraction by the MPWSP; and, (2) a reduction in groundwater elevations requiring users to expend additional pumping energy to extract water from the Basin. Monetary compensation for increased pumping costs is one possible mitigation approach for any lowering of the water table caused by the MPWSP.

If the MPWSP wells are located where unconfined aquifer conditions exist, Project pumping likely would extract brackish groundwater. The majority of the source water would be from within the seawater-intruded portion of the Basin as the seawater intrusion front extends approximately 5 miles landward from the proposed well locations. If the MPWSP receives source water from a confined aquifer it would affect a much larger area in the Basin, but without test wells and data showing operations under confined aquifer conditions, it is not possible to determine what percentage of fresh water would be pumped under confined conditions. Staff concludes, however, that the potential for injury is greater if the source water is pumped under confined conditions.

6.4 Summary of Legal Analysis

In summary, to appropriate groundwater from the Basin, the burden is on Cal-Am to show no injury to other users. Key factors will be the following: (1) how much fresh water Cal-Am is extracting as a proportion of the total pumped amount and how much desalinated sea water is thus available for export as developed water; (2) whether pumping affects the water table level in existing users' wells and

[40] FEIR, Appendix E, Page 21 (E-28).

whether Cal-Am can mitigate any lowering of water levels through monetary compensation or paying for upgraded wells; (3) how Cal Am should return any fresh water it extracts to the Basin to prevent injury to others; and (4) how groundwater rights might adjust in the future if the proportion of fresh and sea water changes, both in the larger Basin area and the immediate area around Cal-Am's wells.

As discussed in this report, additional data will be necessary to ensure that continued operation of the MPWSP, under different source water extraction scenarios, will not injure other legal groundwater users.

Both near- and long-term, a physical solution could ensure an adequate water supply for all legal water users in the Basin and provide an assured supply of groundwater to the Basin's users.[41] Even if overdraft conditions continued in the Basin following imposition of the solution, Cal-Am possibly could continue pumping brackish water legally so long as the quantity was not detrimental to the conditions in the Basin and other Basin users' rights. "When the supply is limited public interest requires that there be the greatest number of beneficial uses which the supply can yield." (*Peabody, supra*, 2 Cal.2d at p. 368.)

So long as overlying users are protected from injury, appropriation of water consistent with the principles previously discussed in this report should be possible. (See generally *Burr v. MacClay Rancho Water Co*. (1908) 154 Cal. 428, 430-31, 438-39 [if an appropriator does not exceed average annual

[41] Some parties argue an adjudication of the Basin's rights would be needed for the MPWSP to proceed. While adjudication could provide some benefits to the Basin's users it is not necessary for a physical solution to be imposed. For reference, there are three general procedures by which an adjudication or rights to use groundwater in the Basin could be quantified and conditioned: 1) civil action with no state participation; 2) civil action where a reference is made to the State Water Board pursuant to Water Code section 2000; or 3) a State Water Board determination, pursuant to the outlined statutory procedure that groundwater must be adjudicated in order to restrict pumping or a physical solution is necessary to preserve the quality of the groundwater and to avoid injury to users. (Wat. Code, § 2100 et seq.) Whether Cal-Am could force an adjudication of water rights is beyond the scope of this report but will be briefly discussed. As applied in *Corona Foothill Lemon Co. v. Lillibridge*, (1937) 8 Cal. 2d 522, 531-32, "an exporter cannot force an apportionment where it is conclusively shown that no surplus water exists and there is no controversy among overlying owners." But a conclusive showing that there is no water available for export does not appear to be the case here. Water that is currently unusable, both due to its location in the Basin and corresponding quality, could be rendered usable if desalinated and would thus be surplus to current water supplies in the Basin.

replenishment of groundwater supply, lower users' water levels in wells or restrict future pumping, the appropriator's use is not adverse to other users].). Additional support is found in *City of San Bernardino v. City of Riverside* (1921) 186 Cal. 7, 20; "No injunction should issue against the taking of water while the supply is ample for all. But the respective priorities of each water right should be adjudged, so that if in the future the supply falls below the quantity necessary for all, he who has the prior right may have his preferred right protected."

Cal-Am should have the opportunity to show any desalinated water it produces is surplus to the current needs of the Basin, replacement water methods are effective and feasible, and the MPWSP can operate without injury to other users. As discussed earlier, if the MPWSP pumps source water from an unconfined aquifer, there may be no injury to other users outside of a 2-mile radius, with the exception of possibly slightly lower groundwater levels in the seawater-intruded area. Based on current information we do not know the exact effects on other users if source water is pumped from a confined aquifer, but the effects in general will be amplified.

7. Conclusion

The key determination in whether Cal-Am may extract water from beneath the SVGB is whether injury will result to other users or the Basin. If the MPWSP is constructed with gravity wells or pumping wells the effects on the aquifer would be the same as long as the amount of drawdown in the wells is the same. But in the case of a pumped well, the operator has the ability to induce greater drawdown than they would in the gravity wells. In this case, there would be a greater effect to the aquifer. Since modeling has not been completed for the gravity well scenario, it is unknown at this time the total effect the gravity wells would have on the Basin and other groundwater users.

If the MPWSP is constructed as described in the FEIR for the North Marina Project, the slant wells would pump from the unconfined Dune Sand Aquifer. If groundwater is pumped from an unconfined aquifer and the modeling assumptions in the FEIR for the North Marina Project are accurate, there will be lowering of groundwater levels within an approximate 2-mile radius. Since seawater intrusion occurs in this area, this water

developed through desalination is likely “surplus” to the needs of other users in the Basin. Based on the information available, it is unlikely any injury would occur by the lowering of the groundwater levels in this region. Nevertheless, Cal-Am would be required to show there was no injury and that any fresh water it extracts is returned to the Basin.

If the proposed slant wells are determined to be infeasible, and the project is instead designed to extract groundwater with conventional pumping wells, the potential impacts could be greater, but they would not necessarily result in injury that could not be compensated through appropriate mitigation measures. Impacts on other water users in the form of increased groundwater pumping costs could be mitigated through financial compensation within a reasonable time frame from when the costs are incurred. Impacts on the availability of fresh water could be determined through modeling and any replacement of freshwater would have to be returned in an area that is not already degraded by seawater intrusion.

Modeling for the North Marina Project does not predict that Basin users’ fresh water supplies would be affected if its wells pump from an unconfined aquifer, which we assume to also be true for the MPWSP. If however, further exploratory testing shows water is removed from a confined aquifer, water levels would be lowered in a larger area and the effect on groundwater flow direction would be greater. Although pumping from a confined condition affects a much larger area of the Basin, the quantity of fresh water extracted from the aquifer would not necessarily be greater because the capture zone for the extraction wells would be greatly influenced by existing groundwater gradients. Additional studies are needed to determine whether the revised MPWSP configuration would cause injury to other groundwater users in the Basin which would require additional mitigation measures.

If no injury results–this would have to be shown through modeling, mitigation, project design or other means–Cal-Am could legally pump from the Basin by developing a new water supply through desalination and showing the developed water is surplus to the existing supply. If Cal-Am’s extractions are limited to water derived from brackish or saline sources or areas of the Basin, and it returns all incidental fresh water to the Basin

in a method that avoids injury to other users, the MPWSP could proceed without violating other users' groundwater rights.

A physical solution could be implemented to ensure all rights are protected while maximizing the beneficial uses of the Basin's waters.[42] Such an approach is consistent with the general policy in the California Constitution article X section 2, and case law provides guidance on solutions to address complex groundwater issues where supply is constrained. The ongoing development of solutions tailored to the specific conditions that apply to a given groundwater basin, reflects the understanding that California waters are too valuable not to be utilized to the maximum extent possible if beneficial uses and other legal users' rights are maintained.

8. Recommendations

Additional information is needed to accurately determine MPWSP impacts on current and future Basin conditions regardless of whether the extraction occurs from pumped or gravity wells. First, specific information is needed on the depth of the wells and aquifer conditions. Specifically, studies are needed to determine the extent of the Dune Sand Aquifer, the water quality and quantity of the Dune Sand Aquifer, the extent and thickness of the SVA and the extent of the 180-Foot Aquifer.

Second, the effects of the MPWSP on the Basin need to be evaluated. Specifically, a series of test boring/wells would be needed to assess the hydrogeologic conditions at the site. Aquifer testing also would be needed to establish accurate baseline conditions and determine the pumping effects on both the Dune Sand Aquifer and the underlying 180-Foot Aquifer. Aquifer tests should mimic proposed pumping rates.

Third, updated groundwater modeling will be needed to evaluate future impacts from the MPWSP. Specifically, modeling scenarios will need to be run to predict changes in groundwater levels, groundwater flow direction, and changes in the extent and boundary of the seawater intrusion front. Additional studies also will be necessary to

[42] At some point, an adjudication of Basin rights could be initiated, this would in no way impact the imposition of a physical solution that could account for the MPWSP and all other users' needs in the Basin.

determine how any extracted fresh water is replaced, whether through re-injection wells, percolation basins, or through existing recharge programs. The studies will form the basis for a plan that avoids injury to other groundwater users and protects beneficial uses in the Basin.