SEASIDE BASIN WATERMASTER ANNUAL REPORT – 2022

PRELIMINARY DRAFT

January 5, 2023

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SEASIDE BASIN WATERMASTER

ANNUAL REPORT – 2022

Integral to the Superior Court Decision (Decision) rendered by Judge Roger D. Randall on March 27, 2006 is the requirement to file an Annual Report. This 2022 Annual Report is being filed on or before January 15, 2023, consistent with the provisions of the Decision, as amended by the Order Amending Judgment filed March 29, 2018.

This Annual Report addresses the specific Watermaster functions set forth in Section III. L. 3. x. of the Decision. In addition, this Annual Report includes sections pertaining to:

- Water quality monitoring and Basin management
- Information that the Watermaster would otherwise include within a Case Status Conference Statement, including:
    - A summary of basin conditions and important developments concerning the management of the Basin
    - Planned near- and long-term actions of the Watermaster
    - Information concerning the status of regional water supply issues
    - Management activities that may bear on the Basin's wellbeing.

A. Groundwater Extractions

The schedule summarizing the Water Year 2022 (WY 2022) groundwater production from all the producers allocated a Production Allocation in the Seaside Groundwater Basin is provided in Attachment 1, "Seaside Groundwater Basin Watermaster, Reported Quarterly and Annual Water Production from the Seaside Groundwater Basin for all Producers Included in the Seaside Basin Adjudication During Water Year 2022." Water Year 2022 is defined as beginning October 1, 2021 and ending on September 30, 2022.

B. Groundwater Storage

Monterey Peninsula Water Management District (MPWMD), in cooperation with California American Water (CAWC), operates the Seaside Basin Aquifer Storage and Recovery (ASR) program. Under the ASR program, CAWC diverts water from its Carmel River sources during periods of flow in excess of NOAA-Fisheries' bypass flow requirements, and transports the water through the existing CAWC distribution system for injection and storage in the Seaside Basin at the MPWMD's Santa Margarita ASR site and CAWC's Seaside Middle School ASR site. During WY 2022, 71acre-feet was diverted and stored in the Seaside Basin under the ASR program. Rainfall in the area was about 63% of normal, and Carmel River flow was about 34% of normal.

Based upon production reported for WY 2022, the following Standard Producers are entitled to Free and Not-Free Carryover Credits to WY 2023 in accordance with the Decision, Section III. H. 5:

Producer	Free Carryover Credit (Acre-feet)	Not-Free Carryover Credit (Acre-feet)
Granite Rock	222.49	27.12
DBO Development	410.44	38.98 (-2.31 transfer)
Calabrese (Cypress)	15.28	1.58 (-3.17 transfer)
CAWC	00.00	104.97 (+5.48 transfer)
City of Seaside Muni	00.00	00.00

C. Amount of Artificial Replenishment, If Any, Performed by Watermaster
Per the Decision, "Artificial Replenishment" means the act of the Watermaster, directly or indirectly, engaging in contracting for Non-Native Water to be added to the Groundwater supply of the Seaside Basin through Spreading or Direct Injection to offset the cumulative Over-Production from the Seaside Basin in any particular Water Year pursuant to Section III.L.3.j.iii. It also includes programs in which Producers agree to refrain, in whole or in part, from exercising their right to produce their full Production Allocation where the intent is to cause the replenishment of the Seaside Basin through forbearance in lieu of the injection or spreading of Non-Native Water (referred to herein as "In-lieu Replenishment").

During Water Year 2022 the Watermaster did not indirectly engage in In-lieu Replenishment of the Basin. No non-native water was made available to the Basin during Water Year 2022 under the April 7, 2010 Memorandum of Understanding and Agreement entered into by Watermaster with the City of Seaside for its golf course irrigation program creating in-lieu replenishment water.

As reported in the 2019 Annual Report, on September 4, 2019 the City of Seaside filed a motion with the Court seeking the Court's approval of the City's request for a Storage and Recovery Agreement for in-lieu storage and recovery of water. On October 25, 2019 the Court approved the City's request. Court documents pertaining to the City's request were contained in Attachment 15 of the 2019 Annual Report. On February 5, 2020 the Watermaster executed a Storage and Recovery Agreement with the City of Seaside, a copy of which was included in Attachment 7 of the 2020 Annual Report.

D. Leases or Sales of Production Allocation and Administrative Actions
As reported in the 2019 Annual Report, in WY2019 a transfer or assignment of water allocation was activated, as provided for in the Cypress Pacific Investors (CPI), successor to Muriel L. Calabrese 1987 Trust, front-loading delivery of water agreement that was contained in Attachment 14 of the 2019 Annual Report. Per the agreement, CPI leases to California American Water Company (CAWC) 8.0 AF of water (subject to reduction per the formulas in the Decision) for the purpose of producing such water from, or moving the production of such water to, the inland wells operated by CAWC and for delivery of such water by CAWC to one or more CPI properties. In WY 2017 CPI assigned its entire Standard Production Allocation water right to CAWC effective October 1, 2016.

As discussed in Attachment 13 of the 2018 Annual Report, in 2019 Security National Guarantee (SNG) indicated it intended to convert a portion of its Alternative Production Allocation to Standard Production. However, SNG subsequently decided not to make such a conversion.

During WY 2022 the Watermaster Board made changes to section 16.2 of the *Rules and Regulations* regarding replenishment assessment review.

During WY 2022 the Watermaster Board was comprised of the following Members and Alternates:

MEMBER	ALTERNATE	REPRESENTING
Director Paul Bruno	N/A	Coastal Subarea Landowner
Christopher Cook	Tim O'Halloran	California American Water
Wesley Leith	N/A	Laguna Seca Subarea Landowner
Director George Riley	Director Alvin Edwards	MPWMD
Mayor Mary Ann Carbone	City Manager	City of Sand City
Supervisor Wendy Askew	Supervisor Mary Adams	Monterey County (MCWRA)
Councilmember John Gaglioti	Council Member Scott Donaldson	City of Del Rey Oaks
Councilmember Dan Albert	Mayor Clyde Roberson	City of Monterey
Mayor Ian Oglesby	Council Member Jon Wizard	City of Seaside

E. Use of Imported, Reclaimed, or Desalinated Water as a Source of Water for Storage or as a Water Supply for Lands Overlying the Seaside Basin

The CAWC/MPWMD ASR Program operated in WY 2022 and 70.55 acre-feet of water was injected into the Basin as Stored Water Credits and 0 acre-feet was extracted.

As reported in the 2019 Annual Report, the Watermaster issued a Storage and Recovery Agreement to CAWC and MPWMD governing the injection and recovery of water from the Pure Water Monterey (PWM) Project. A copy of the agreement was included in Attachment 13 of the 2019 Annual Report. The quantities of water that were stored and recovered in accordance with that Agreement during WY 2022 are reported in the lower portion of the spreadsheet in Attachment 1.

F. Violations of the Decision and Any Corrective Actions Taken

Section III. D. of the Decision enjoins all Producers from any Over-Production beyond the Operating Yield in any Water Year in which the Watermaster declares that Artificial Replenishment is not available or possible. Section III. L. 3. j. iii. requires that the Watermaster declare the unavailability of Artificial Replenishment in December of each year, so that the Producers are informed of the prohibition against pumping in excess of the Operating Yield.

In WY 2021 the Watermaster implemented a final ramp-down in production to achieve the Basin's Decision-established Natural Safe Yield of 3,000 AFY. The Watermaster made its declaration regarding the availability of Artificial Replenishment Water, and the Total Usable

Storage Space of the Basin, for WY 2022 at its Board meeting of January 5, 2022. Copies of these declarations are contained in Attachment 2.

Total pumping for WY 2022 did not exceed the Operating Yield (OY) of the Basin, and did not exceed the Natural Safe Yield (NSY) of the Basin.

G. Watermaster Administrative Costs

The total estimated Administrative costs through the end of Fiscal Year 2022 amounted to $75,000 including a $25,000 dedicated reserve. Costs include the Administrative Officer salary and legal counsel fees. The "Fiscal Year 2022 Administrative Fund Report" and "Fiscal Year 2022 Operations Fund Report" are provided in Attachment 3.

H. Replenishment Assessments

At its meeting of October 5, 2022 the Watermaster Board determined that beginning with WY 2023 the Natural Safe Yield Replenishment Assessment unit cost should be updated to $3,461 per acre-foot, and the Operating Yield Replenishment Assessment unit cost should be updated to $865 per acre-foot. The Agenda transmittal which explains the basis of calculation for these new unit costs is contained in Attachment 4.

Alternative and Standard Producers report their production amounts from the Basin to the Watermaster on a quarterly basis.

Based upon the reported production for WY 2022, the City of Seaside's Replenishment Assessment for its Municipal System for Overproduction in excess of its share of the Natural Safe Yield is $38,116.08, and for overproduction in excess of its share of the Operating Yield is $9,529.02. The City of Seaside did not exceed its Alternative Production Allocation for its Golf Course System production.

Mission Memorial Park's Replenishment Assessment for Overproduction in excess of its share of the Natural Safe Yield is $9,607.87, and for overproduction in excess of its share of the Operating Yield is $2,401.97.

Based upon its reported production for WY 2021, Mission Memorial Park (Alderwoods)'s Replenishment Assessment for Overproduction in excess of its share of the Natural Safe Yield was $46,488.32, and for overproduction in excess of its share of the Operating Yield was $11,626.02. In early January 2022 Mission Memorial Park, through its attorney, filed a writ with the Court asking that its WY 2021 replenishment assessment be waived. Mission Memorial Park's attorney subsequently placed a hold on the writ and requested to appeal directly to the Watermaster to have its Replenishment Assessment either waived or reduced. At its September 7, 2022 meeting the Watermaster Board heard testimony from Mission Memorial Park's Manager Lorrie Muriel and Mission Memorial Park's Legal Counsel Steve Gurnee that provided details of what led to their inadvertent 2021 over-production, and actions now being taken to avoid any future over-production. The Board felt that the circumstances presented by Mission Memorial Park and the fact that in the past they had in every year pumped substantially less than the amount of their allocation warranted consideration. The Board then passed a motion to reduce the $58,114.34 2021 Mission Memorial Park over-production replenishment assessment to $25,000, payable over time, and required Mission Memorial Park to submit an action plan on how it would avoid future over-production.

To help avoid any future inadvertent over-production by any producer, the Watermaster will be sending to each Watermaster party on an annual basis a description of the Watermaster, the party's assigned production allocation, and the over-production fee schedule.

A summary of the calculations for Replenishment Assessments for WY 2022 is contained in Attachment 5. Credits against Replenishment Assessments are contained in Attachment 6.

I. All Components of the Watermaster Budget

The Watermaster budget has four separate funds: Administrative Fund; Monitoring & Management–Operations; Monitoring and Management–Capital Fund and; Replenishment Fund. Copies of the budgets for Fiscal Year 2023 are contained in Attachment 6.

The Watermaster Board is provided monthly financial status reports on all financial activities for each month with year-to-date totals.

J. Water Quality Monitoring and Basin Management

Water Quality Analytical Results

Groundwater quality data continued to be collected and analyzed on a quarterly basis during WY 2022 from the enhanced network of monitoring wells. The low-flow sampling method implemented in 2009 continued to be used in 2022 and is expected to continue to be used in the future to improve the efficiency of sample collection. Except as discussed below regarding Monitoring Well FO-9 Shallow and induction logging of the Sentinel Wells, no modifications to the quarterly data collection frequency from the enhanced network of monitoring wells were made during WY 2021.

It was intended to sample the Watermaster's Sentinel Well No. 5, located at Camp Huffman on the former Fort Ord, in WY 2022, based on the plan to monitor it once every five years. However, through a scheduling oversite the well was not sampled in WY 2022. It is scheduled to be sampled in WY 2023, and once every five years thereafter.

Monitoring and Management Program for the Upcoming Year

The 2023 Monitoring and Management Program (M&MP) contained in Attachment 8 includes the same types of basin management activities that have been conducted in prior years.

Most of the differences between the 2022 M&MP and the 2023 M&MP are relatively minor, with the exception of Task I. 2. b. 3 (Collect Water Quality Samples). Barium and chloride data has been collected under this Task for the past ten years. The Watermaster's hydrogeologic consultants (Montgomery & Associates) reported that barium and iodide have been used to discriminate between sources of saline water if it is observed, but not to identify incipient seawater intrusion which can be identified without barium or iodide data. Since discriminating the source of salinity may be unnecessary, as a cost-saving measure it would be satisfactory to discontinue sampling for these parameters. If increasing salinity levels are detected, and if it is important to discriminate the source of salinity, then sampling for barium and iodide could be resumed at that time.

Discontinuing analyzing for these two parameters would result in an annual cost savings of approximately $2,160. The TAC therefore recommended discontinuing the analysis for these parameters, and the language in Task I. 2. b. 3 was revised to reflect this.

In 2007 the Watermaster constructed four of what are called "Sentinel Wells" along the coast. The purpose of these wells is to serve as a means of detecting the possible intrusion of seawater into the Seaside Basin aquifers, and induction logging technology is employed at these wells for this purpose. Induction logging is a process by which changes in conductivity, an indicator of possible seawater intrusion, are measured in the soil surrounding these wells. If a trend in increasing conductivity is detected, it would be an indication that seawater intrusion is occurring.

Induction logging was initially performed on a quarterly basis, with the intent that in subsequent years it might be feasible to reduce the induction logging frequency if a good correlation between the induction logging data from year-to-year was found to exist. In 2010, after several years of induction logging that showed the same results and showed no indication of seawater intrusion, the induction logging frequency was reduced to semi-annually.

The induction logging data has been virtually identical each year since logging began in 2007, and has shown no detectable change in formation conductivity. For this reason it was felt by Martin Feeney, the Watermaster's consultant who has performed all of the induction logging, that the frequency of induction logging of these wells could be further reduced from semi-annually to annually. His recommendation was concurred with by Montgomery & Associates, the Watermaster's primary hydrogeologic consultants. This recommendation was then approved by the Watermaster's TAC and Board and is reflected in the description and cost of Task I.2.b.3 in the 2023 Monitoring and Management Program. Reducing the frequency of induction logging would result in an annual cost savings of approximately $9,500.

The 2023 Monitoring and Management Program (M&MP) Budgets contained in Attachment 8 cover the same types of basin management activities that have been conducted in prior years.

The following are the principal revisions from the 2022 M&MP Budget:

Tasks Involving MPWMD Montgomery & Associates: The scopes-of-work for both MPWMD and Montgomery & Associates are essentially unchanged from 2022. However, both will have hourly-rate increases in 2023, so the costs of the Tasks in which they are involved will all reflect somewhat higher dollar amounts in 2023 compared to 2022. MPWMD's costs are expected to be about $920 higher in 2023 and Montgomery & Associates' costs are expected to be about $1,690 higher in 2023.

Task I.2.a.1 (Conduct Ongoing Data Entry/Database Maintenance Enhancement: The costs for an outside contractor to maintain the Watermaster's website are covered in this line-item. The Watermaster's Administrative Officer asked that in 2023 the format on the website be converted from its current format to the WordPress format which reportedly is now the industry standard for websites. If at some time in the future maintenance of the website passes to a different contractor, it would be much more expensive to have the current format maintained. In addition, the graphics being developed for the Watermaster's Public Awareness Committee are better suited for WordPress than the current format. Included in the budget for this Task is $5,000 to make the format conversion, and an additional $100/month (from

$200/month in 2022 to $300/month in 2023) for the contractor to maintain the website. The contractor's $200 monthly fee has not been increased in many years.

Task I.2.b.3 (Collect Water Quality Samples): As reported earlier in this Annual Report, Task I.2.b.3 reflects the cost savings from reducing the induction logging of the Sentinel Wells from twice per year to once per year, and the cost savings from eliminating sampling for barium and iodide in the three monitoring wells where these two parameters have been historically monitored. These combined cost savings are over., $10,000.

Task I.3.a.3 (Evaluate Replenishment Scenarios and Develop Answers to Basin Management Questions): The amount budgeted for this Task is unchanged from the 2022 amount. Included in this Task is an estimated $30,000 to perform additional Flow Direction/Flow Velocity analyses, if the Board wishes to perform such work, and $30,000 for other work the Board may wish to undertake related to basin management.

Summary:

As a result of the changes described above, as indicated by the right-hand column titled "Comparative Costs from 2022 Budget" in the M&MP Operations Budget in Attachment 6, the proposed 2023 Budget is $10,052 higher ($324,930 - $314,878) than the 2022 Budget. It is anticipated that a new well to replace monitoring well FO-9 Shallow will be constructed in 2023, and the costs to install that well are included in the 2023 M&MP Capital Budget. The 2022 M&MP Capital Budget will cover the costs to plan and design that well, which is expected to be performed in late 2022.

Basin Management Database

Pertinent groundwater resource data obtained from a number of sources has been consolidated into the Watermaster's database to allow more efficient organization and data retrieval. No modifications or enhancements to the database are planned in FY 2023.

Enhanced Monitoring Well Network

The Seaside Basin M&MP uses an Enhanced Monitoring Well Network to fill in data gaps in the previous monitoring well network used by the Monterey Peninsula Water Management District (MPWMD), and others, in order to improve the basin management capabilities of the Watermaster. The Enhanced Monitoring Well Network has been described in detail in previous Watermaster Annual Reports. It continues to be used to obtain additional data that is useful to the Watermaster in managing the Basin.

As reported in the 2021 Annual Report, monitoring well FO-9 Shallow had developed a leak in its casing and had to be destroyed to prevent cross-aquifer contamination. A Capital Project for the estimated Watermaster share of the replacement cost was included in the 2022 M&MP Capital Budget. Using money from the 2022 Capital Project budget, the Watermaster issued a contract to its consultant Montgomery & Associates to perform the planning and design work for a replacement well. The 2023 M&MP Capital Budget included the cost to have the replacement well installed in 2023. Efforts were underway in late 2022 to develop a three-party cost-sharing agreement (between MPWMD, the Watermaster, and MCWD) for the costs to replace the well.

Basin Management Action Plan (BMAP)

The BMAP constitutes the basic plan for managing the Seaside Groundwater Basin. The BMAP identifies both short-term actions and long-term strategies intended to protect the groundwater resource while maximizing the beneficial use of groundwater in the basin. It provides the Watermaster a logical set of actions that can be undertaken to manage the basin to its Safe Yield.

The Watermaster's first BMAP was completed in 2009 and was approved by the Watermaster Board at its February 2009 meeting. The Executive Summary from that BMAP was contained in Attachment 9 of the 2009 Annual Report, and the complete document is posted on the Watermaster's website at: http://www.seasidebasinwatermaster.org/Other/BMAP_FINAL_5-Feb-2009.pdf.

Over the nine years since the 2009 BMAP was completed, the Watermaster collected much groundwater level and quality data, and conducted various studies to improve the understanding of the basin. This improved understanding was incorporated into a 2019 Updated BMAP to facilitate ongoing responsible management of the groundwater resource. The Watermaster Board approved the 2019 Updated BMAP at its June 5, 2019 meeting. The Executive Summary from that document was contained in Attachment 7 of the 2019 Annual Report, and the complete document is posted on the Watermaster's website at: http://www.seasidebasinwatermaster.org/Other/BMAP%20Final_07192019.pdf .

One of the findings in the Updated BMAP is that the Natural Safe Yield (NSY) of the Basin is 2,370 AFY, which is lower than the Adjudication Decision's initially-established 3,000 AFY. Another finding was that the Total Usable Storage Space of the Basin was increased from 52,030 acre-feet to 104,170 acre-feet as reported on page 52 of the Updated BMAP. This is partly due to an error in the 2009 estimate in which the deficit volume was subtracted, thereby resulting in a lower combined volume than it should have been; and partly because a different protective elevation contour map was used in this updated estimation.

Attachment 10 of the 2019 Annual Report contains a Memo titled "Seaside Groundwater Basin Natural Safe Yield Allocations to Producers." The Memo describes how the Adjudication Decision allocated water rights to each of the Producers (both Standard and Alternative Producers), and the water rights that each Producer would have after all of the Adjudication Decision-required ramp-downs in pumping have been completed. The Memo also briefly describes the water rights impacts that would result from lowering the NSY of the Basin from 3,000 AFY to 2,370 AFY.

As discussed in the Memo, the approach used to make these calculations is based on the assumption that the Adjudication Decision contemplated that all of the Basin's NSY comes from the Laguna Seca and the Coastal Subareas, and that none of it comes from the Northern Inland Subarea. Two options for arriving at the water rights for each Producer are presented in the Memo. As noted in the Memo, there are some inconsistencies in the Adjudication Decision which complicate the calculation of water rights after the Adjudication Decision-mandated ramp-downs in pumping are completed.

The Memo contains a set of ramp-down calculations for a basin-wide NSY of 3,000 AFY, because 3,000 AFY had been the ramp-down figure that was developed when CAWC was sizing its Monterey Peninsula Water Supply Project. That analysis led to the conclusion that CAWC's ultimate water right in the Basin would be 1,474 AFY, based on a basin-wide Natural

Safe Yield of 3,000 AFY. This calculation approach was approved by Judge Randall in his Order dated 9 February 2007. Therefore, it was appropriate to include the ramp-down analysis leading to CAWC's 1,474 AFY of ultimate water right. Also contained in the Memo is a set of ramp-down calculations for a basin-wide NSY of 2,913 AFY, based on a slightly different interpretation of the Adjudication Decision.

The Memo provided to the Watermaster Board all of the necessary background information and calculations for use in determining which of the two ramp-down figures (3,000 AFY or 2,913 AFY) should be used when the next (and presumably final) ramp-down was set to occur in WY 2021. At its meeting of June 5, 2019 the Watermaster Board determined that there should be a final ramp-down to 3,000 AFY in WY 2021 and that water allocations to each Producer should be assigned as shown in Table 7 of Attachment 10 in the 2019 Annual Report, after all pumping ramp-downs have been completed. The Board reached this decision in part because ramping-down to 3,000 AFY would cause less hardship on the Alternative Producers by not requiring them to ramp-down along with the Standard Producers, and because ramping down to 2,913 AFY would provide negligible additional benefit and would require both the Standard and Alternative Producers to ramp-down.

In conjunction with updating the BMAP, Montgomery & Associates and Todd Groundwater (a hydrogeologic consultant the Watermaster used to perform a peer review of a draft version of the Updated BMAP) recommended that at some point in the future the Watermaster change to a different approach (Sustainable Yield) rather than continuing to use the Natural Safe Yield approach that was used in the Adjudication Decision, for basin management purposes.

Attachment 11 in the 2019 Annual Report contains a discussion of the pros and cons of using the Sustainable Yield approach vs. the Natural Safe Yield approach. The Watermaster Board considered the information contained in that attachment at its June 5, 2019 meeting and made the following determinations:

- A Sustainable Yield analysis should not be performed at this time.
- The concept of using the Sustainable Yield approach to replace the Natural Safe Yield approach should be revisited after the Groundwater Sustainability Plans (GSP) for the subbasins within the Salinas Valley Groundwater Basin (notably the Monterey and 180/400-Foot Aquifer Subbasins) have been completed, and their impacts on the Seaside Groundwater Basin have been determined. The status of those GSPs is discussed below in the section of this Annual Report titled "Sustainable Groundwater Management Act."
- If something is learned, or events occur, that would warrant performing a Sustainable Yield analysis sooner, the Board should revisit the decision at that time.

The Watermaster Board revisited this topic at its September 1, 2021 meeting, and concluded the following:

- Sustainable Yield (SY) is a technically superior Basin management approach compared to the Natural Safe Yield (NSY) approach used in the Decision, and an SY analysis should be performed at some point in time.
- Because of the historical over pumping from the Basin, regardless of the approach that is used for Basin management, be it NSY or SY, even reducing pumping levels to match either the NSY or SY pumping levels will not achieve protective groundwater elevations. This is because these approaches only seek to stabilize groundwater levels and do not take into account that the Basin would still be at risk of seawater intrusion at some time in the future. An additional source(s) of water (replenishment water) that can

be injected into the Basin to raise groundwater levels, and to maintain them at protective water levels, will be necessary regardless of which approach is used for Basin management.

- In view of the expense and complexity of changing to the SY approach, the Board concluded that making this change would not be justified until a source for this replenishment water has been secured.

Seawater Intrusion Response Plan

HydroMetrics LLC (now Montgomery and Associates) was hired by the Watermaster to prepare a long-term Seawater Intrusion Response Plan (SIRP), as required in the M&MP.

The Final SIRP was approved by the Watermaster Board in 2009 and a summary of the Seawater Intrusion Contingency Actions from the SIRP were contained in Attachment 10 of the 2009 Annual Report. The complete document may be viewed and downloaded from the Watermaster's website at: http://www.seasidebasinwatermaster.org/.

When water quality sampling from monitoring well FO-9 Shallow in late 2020 and again in early 2021 appeared to indicate that seawater intrusion might have been detected in the Paso Robles aquifer in the vicinity of that well, the SIRP was immediately reviewed to determine what steps should be taken in response to that finding. However, subsequent investigation of that well led to the determination that the increased chloride levels in the water quality sampling of that well were due to a casing leakage, and not from seawater intrusion in the Paso Robles aquifer as initially feared. Consequently, no actions to implement the SIRP were taken and no modifications to the SIRP were made in 2022.

Seawater Intrusion Analysis Report

The Seawater Intrusion Analysis Report (SIAR) examines the "health" of the Basin with regard to whether or not there are any indications that seawater intrusion is either occurring or is imminent. Previous SIARs have stated that depressed groundwater levels, continued pumping in excess of recharge and freshwater inflows, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion could occur in the Seaside Groundwater Basin.

The Watermaster retained Montgomery & Associates to prepare the WY 2022 SIAR required by the M&MP. The WY 2022 SIAR provided an analysis of data collected during that Water Year.

Based on an evaluation of geochemical indicators in prior years, seawater intrusion has not historically been observed in existing monitoring and production wells in the Seaside Basin. However, as noted in the previous two SIAR reports (2019 and 2020), two monitoring wells in the Watermaster's network have experienced increased chloride concentrations. One of these, monitoring well FO-10 Shallow, is north of and outside of the Seaside Basin, and the other, monitoring well FO-9 Shallow, is just inside the northern boundary of the Northern Coastal Subarea of the Seaside Basin. Induction logging of both wells was performed by Mr. Martin Feeney, a hydrogeologic consultant to the Watermaster, in March 2021 to evaluate if seawater intrusion was evident.

A structural failure (leaking casing) was identified in monitoring well FO-9 Shallow. This caused the well to act as a conduit to allow shallow intruded groundwater in the dune sands to flow into the well and potentially into underlying aquifers. To prevent further leakage of poorer quality water, Well FO-9 Shallow was destroyed in 2021.

The induction logging of Well FO-10 Shallow confirmed the presence of higher chloride concentrations in the groundwater, but was inconclusive as to whether this was a result of seawater intrusion. However, it was subsequently learned, though communications with Mr. Joe Oliver of MPWMD who documented the installation of well FO-10 in 1996, that a long section of steel tremie pipe had to be abandoned in the well during construction. Mr. Feeney explained that the presence of this steel pipe interfered with the induction logging and prevented the logging from providing accurate information about the aquifer surrounding the well. He said this explains why the 2021 induction log differs so much from the 1996 elog. Based on this information, Mr. Feeney concluded that well FO-10 Shallow might also be allowing leakage to occur from the shallower Aromas or Dunes Sands formation into the Paso Robles aquifer below. One of the actions listed in the Monterey Subbasin GSP is for MCWD to install monitoring wells near the northern boundary of the Seaside Subbasin. Although work to destroy and replace monitoring well FO-10 Shallow is not mentioned, MCWD may wish to perform such work in order to restore that well for its monitoring purposes.

Induction logs of the Sentinel Wells remained stable over the historical record.

There continue to be ongoing detrimental groundwater conditions within the Basin that pose a potential threat of seawater intrusion. Groundwater levels below sea level, the cumulative effect of pumping in excess of recharge and freshwater inflows, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion has the potential to occur in the Seaside Groundwater Basin. However, No data collected in Water Year (WY) 2022 indicate that seawater intrusion is occurring within the Seaside Groundwater Basin.

The SIAR is lengthy, but the full *Executive Summary Section* from it is provided in Attachment 7. A complete copy of the document is posted for viewing and downloading from the Watermaster's website at: http://www.seasidebasinwatermaster.org/. All recommendations contained in the SIAR are being or will be carried out and are included in the budgeted activities contained in Attachment 6 and described in Attachment 8.

Geochemical Impact Assessments

When new sources of water are introduced into an aquifer, with each source having its own unique water quality, there can be chemical reactions that may have the potential to release minerals into solution which have previously been attached to soil particles, such as arsenic or mercury, and thus into the water itself. This has been experienced in some other locations where changes in water quality occurred as a result of water being injected into an aquifer.

MPWMD's consultant (Pueblo Water Resources) has been using geochemical impact assessments to predict the effects of injecting Carmel River water into the Seaside Groundwater Basin under the ASR program. As discussed in the 2018 Annual Report under the heading titled "Monitoring and Management Program Work Plan for the Upcoming Year," in order to predict whether there will be groundwater quality changes that will result from the introduction of desalinated water, additional ASR water (under the Monterey Peninsula Water Supply Project), and advanced wastewater treatment (AWT) water under the Pure Water

Monterey Project (PWM) geochemical impact assessments have been, or will be, performed by Pueblo Water Resources for use in the areas of the Basin where injection of these new water sources will occur. A description of this work was provided in Attachment 11 of the 2018 Annual Report.

In 2019 an assessment of the geochemical impacts of injecting AWT water from the PWM was performed. A Technical Memorandum describing that work is contained in Attachment 12 of the 2019 Annual Report. The assessment found that if the quality of the PWM AWT water is maintained within the ranges set forth in the Division of Drinking Water (DDW) Operations Report, there will be no adverse geochemical impacts on the aquifers within the Seaside Basin.

In 2022 no additional geochemical impact assessments needed to be performed, since the desalination plant component of the Monterey Peninsula Water Supply Project was still in the process of obtaining the permits necessary to move forward.

Sustainable Groundwater Management Act (SGMA)

As reported in the 2015 Annual Report the Watermaster Board determined that the Watermaster should monitor the development of the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) and the State Department of Water Resources' (DWR) development of SGMA regulations with the intent to collaborate with these entities as appropriate.

At the State Level:

During 2022 DWR did not issue any new regulations, or revisions to prior regulations, that impacted the Seaside Groundwater Basin or the Watermaster. In March of 2022 the Watermaster submitted to DWR the reporting information required of it, as an adjudicated basin, under SGMA.

At the Monterey County level:

As reported in the 2018 Annual Report, the SVBGSA, the Marina Coast Water District (MCWD), and the City of Marina all submitted Notifications with DWR to serve as the GSA for overlapping portions of the Monterey and/or the 180/400-foot aquifer subbasins. The SVBGSA, MCWD, and the City of Marina embarked on processes to address and resolve these overlaps.

In its notification to DWR, the City of Marina proposed becoming the GSA for the portion of the 180/400-foot Subbasin lying within the City's jurisdictional boundaries. However, since this overlapped with the SVBGSA's proposal to be the GSA for that area, DWR concurred with the SVBGSA's proposal, as authorized by SGMA, to have the County of Monterey be the GSA for that area. The County then delegated authority to prepare the GSP for that area to the SVBGSA. The SVBGSA submitted its GSP for the 180/400-foot Subbasin to DWR in January 2020. DWR approved the plan, with additional recommended actions, later that year. This plan is being updated annually by the SVBGSA.

Development of the GSP for the Monterey Subbasin was started in 2020. A Draft version of this plan was completed jointly by the SVBGSA and the MCWD GSA and submitted to DWR for its review in early 2022. This plan breaks the Monterey Subbasin into these two Management Areas:

- Marina-Ord Area: This Management Area consists of the lands within the City of Marina and the former Fort Ord. The MCWD GSA will be the GSA for this Management Area.
- Corral de Tierra Area: This Management Area consists of the remainder of the subbasin, which is generally south of State Route 68 and includes a parcel located between the City of Marina and the former Fort Ord. The SVBGSA will be the GSA for this Management Area.

The Watermaster participated in the Monterey Subbasin GSP Committee that the SVBGSA formed to provide input pertaining to the Corral de Tierra Area during development of this GSP. In 2020 the Watermaster's Technical Program Manager, jointly with Montgomery & Associates, made a PowerPoint presentation to that Committee describing issues of mutual concern between the Corral de Tierra area and the Seaside Groundwater Basin. The presentation highlighted the impacts that pumping in the Corral de Tierra area is having on groundwater levels in the Laguna Seca Subarea of the Seaside Basin. The Watermaster also participated in the stakeholders group formed by the MCWD GSA to provide input during the development of the Marina-Ord Area portion of this plan.

In addition, the Watermaster participated in the development of the SVBGSA's other GSPs through its membership on the SVBGSA's Advisory Committee. Although these GSPs have now all been completed in draft form and submitted to DWR, the Watermaster continues to participate as a member of the SVBGSA's Advisory Committee. The Watermaster's participation in these committees and stakeholder groups helps to ensure that there is close coordination between the SVBGSA, MCWD GSA, and the Watermaster on matters of mutual interest.

K. Information that the Watermaster Would Otherwise Include within a Case Status Conference Statement

This Section was added to the Annual Report beginning in 2018 year as directed by the Court in its Order Amending Judgment filed March 29, 2018. It is formatted to contain the topic headings below, which were requested by the Court in its March 29, 2018 Order.

Summary of Basin Conditions and Important Developments Concerning the Management of the Basin

The condition of the Basin is discussed in the *Water Quality*, *Seawater Intrusion Analysis Report*, and *Basin Management Action Plan* subheadings in Section J of this Annual Report.

In summary, the *2022 Seawater Intrusion Analysis Report*, which analyzes the water quality data collected under the Watermaster's sampling program, reported that while conditions exist within the Basin that pose a risk of seawater intrusion, none of the data collected in WY 2022 indicate that seawater intrusion has actually occurred.

The 2019 updated *Basin Management Action Plan* found that in spite of recent pumping at levels less than the Decision-established Natural Safe Yield of 3,000 AFY, water levels in some portions of the Basin are continuing to drop. It is expected that once the desalination plant component of the MPWSP becomes operational, or if that plant is not constructed but an expansion of the PWM project is constructed, and CAWC is able to further reduce its pumping from the Basin by 700 AFY through its 25-year overpumping repayment program, the rate of drop in groundwater levels will be at least partially mitigated. However, unless the Basin is

replenished to raise groundwater levels to protective elevations, the Basin will remain vulnerable to seawater intrusion.

As the Groundwater Sustainability Plans (GSPs) were developed under the State's Sustainable Groundwater Management Act (SGMA), the Watermaster became more aware of the impact of adjacent groundwater basins on the Seaside Groundwater Basin. In the context of the Salinas Valley Groundwater Basin, as recognized and defined by the DWR, each basin within that larger Basin is referred to as a "subbasin". Therefore, in this section of this Annual Report the Seaside Basin is referred to as the "Seaside Subbasin." The GSP for the Monterey Subbasin (which abuts the Seaside Subbasin to the north and east) made it clear that:

- The portion of the Monterey Subbasin to the east of the Seaside Subbasin (referred to as the Corral de Tierra/Toro Subarea) will not be able to achieve sustainability as defined under the SGMA without the importation of additional sources of water supply.
- The portion of the Monterey Subbasin to the north of the Seaside Subbasin (referred to as the Marina-Ord Subarea) will not be able to achieve sustainability unless the subarea immediately to the north (the 180/400-foo Aquifer Subbasin) raises its groundwater levels high enough to stop seawater from intruding that subbasin.
- There is significant loss of groundwater from the Seaside Subbasin to the Monterey Subbasin because the groundwater levels in the Monterey Subbasin are lower than those in the Seaside Subbasin.

Planned Near and Long-term Actions of the Watermaster

Near-term actions are described in the 2023 Monitoring and Management Program discussed in Section J and Attachment 8 of this Annual Report.

Long-term actions will include:

- Continuing to carry out the duties and responsibilities assigned to the Watermaster by the Decision
- Continuing to coordinate with the Monterey County Water Resources Agency in their development of an updated hydrogeologic model of the Salinas Valley Basin, as discussed under the *Coordination of Watermaster's Seaside Groundwater Model with Salinas River Basin Model* subheading in Section J of the 2018 Annual Report (Note: In 2020 completion of this model was delayed and was still being completed as of the date of preparation of this 2022 Annual Report. The Watermaster will continue to coordinate with the Monterey County Water Resources Agency on this, once the model is completed and promulgated. However, it was found that the Salinas River Basin model did not adequately address groundwater conditions in the Monterey Subbasin, and for this reason MCWD retained a hydrogeologic consultant (EKI Environment and Water) to develop a new model for the Monterey Subbasin. This new model was used in the preparation of the GSP for that subbasin, including the Marina-Ord and Corral de Tierra subareas. As discussed above under the *Sustainable Groundwater Management Act (SGMA)* subheading in Section J, the Watermaster participated in the development of that GSP, and its hydrogeologic consultant (Montgomery & Associates) actively interfaces with EKI Environment and Water to ensure that there is hydrogeologic agreement between the new Monterey Subbasin model and the Watermaster' Seaside Basin model.

- Continuing to coordinate with the SVBGSA to develop measures to aid in groundwater management of the Laguna Seca Subarea, as discussed under the *Sustainable Groundwater Management Act* subheading in Section J of this Annual Report.
- Creating and activating a "Public Awareness Committee" of the Watermaster Board to educate decision makers and the public in general about the risk of seawater intrusion that the Seaside Basin faces, and the need to replenish the Basin to raise groundwater levels high enough to keep that from occurring, in addition to ensuring the Basin has sufficient groundwater resources to supply customer demands.

Information Concerning the Status of Regional Water Supply Issues

MPWSP

Implementation of the Monterey Peninsula Water Supply Project (MPWSP) continues to be vigorously pursued by California American Water.

In mid-November 2019 the California Coastal Commission held a hearing on CAWC's application for a Coastal Development Permit for construction of the portions of the MPWSP located within the coastal zone. The Commission received public input at that hearing but deferred taking action on the application until early 2020. That action was originally scheduled for the Commission's May 2020 meeting, but was rescheduled to a September 2020 meeting by Commission staff, who stated that they needed more time to adequately evaluate all of the documents that had been submitted. Just prior to the scheduled September 2020 Commission meeting date, CAWC decided to withdraw its application in order to see if it could negotiate modifications to the project with the opposing parties that would address their concerns and objections. On November 5, 2020 CAWC formally resubmitted its application for a Coastal Development Permit with the Coastal Commission. The Coastal Commission requested that CAWC submit additional information in order for the Commission to deem the application to be complete.

On December 3, 2020 the Coastal Commission sent a Notice of Incomplete Application, identifying certain additional information needed to consider the application complete. On March 5, 2021 CAWC submitted a partial response to the Coastal Commission's Notice of Incomplete, noting that additional information on the few remaining requested items would be submitted shortly. CAWC supplemented that response on May 19, 2021. On June 18, 2021, the Coastal Commission responded, acknowledging the responses and requesting certain additional information before the application could be considered complete. CAWC submitted the additional information, and in August of 2022 the Coastal Commission notified CAWC that is application was now complete. The Coastal Commission set a November 17, 2022 hearing date to consider approval of the application.

In early October 2022 the MPWMD Water Supply Planning Committee discussed adopting a policy position opposing construction of the MPWSP desalination plant. Instead of adopting such a position, the Committee opted to support a resolution that would cite MPWMD's authority to approve or deny CAWC's plan to introduce desalination plant water into the ground water supply. The MPWMD Board of Directors approved such a resolution (Resolution No. 2022-31) at its October 17, 2022 meeting.

Also in early October 2022 the MPWMD Board approved a contract with firm to provide public outreach services. Shortly after that, an unsolicited series of emails began being sent out from MPWMD to a large list of addressees urging recipients to voice their objection to the desalination plant at the November 17, 2022 Coastal Commission meeting.

In early October 2022 CAWC announced a phasing plan for the MPWSP. The application to the California Coastal Commission called for development of ocean slant wells to supply a 6.4 million gallon per day desalination plant. CAWC is now proposing a multi-phase plan to develop needed water supplies with the first phase of the desalination facility producing 4.8 million gallons per day.

Approval by the Coastal Commission is the last major permit needed to allow construction of the project to begin. The schedule on the MPWSP website has not been updated since CAWC anticipated getting its Coastal Development Permit approved in December 2018. If the Coastal Commission approves CAWC's resubmitted Coastal Development Permit at the November 17, 2022 hearing, and if the same time periods for implementation of the project which are shown on the last posted schedule are accurate, the MPWSP desalination plant could become operational in early 2025.

PWM

Construction work on Monterey One Water's (M1W) Pure Water Monterey (PWM) recycled water project in Marina was completed in late 2019, and the Advanced Water Treatment plant began producing water in early 2020. Water began being injected into the Seaside Groundwater Basin in February 2020. In WY 2022, during the time period of October 1, 2021 through August 31, 2022 a total of 3,318 acre-feet of water had been injected.

The Title 22 Indirect Potable Reuse (IPR) Groundwater Replenishment regulations require that the water from the PWM project be retained underground no less than two months before it reaches the closest downgradient drinking water well. This is referred to as the Response Retention Time, and is intended to provide sufficient response time to identify a treatment failure and a quick response.

Underground retention time can be determined in three ways: (1) numerical modeling, (2) an intrinsic tracer study, or (3) an added (extrinsic) tracer study. A different credit factor for removal of pathogens is applied to each of these estimation methods to reflect the accuracy of the method. The credit factor indicates the amount of pathogen log removal per month that is credited for the time the injected water is retained underground before it is extracted for supply purposes. For numerical modeling, the factor is 0.5, for an intrinsic tracer study, the factor is 0.67, and for an extrinsic tracer study, the factor is 1.0. So for example, if numerical modeling indicated it would take 4 months for injected water to reach a supply well, 2 logs of pathogen removal would be credited. But if an intrinsic tracer study indicated this same 4 months of retention time, 2.68 logs of pathogen removal would be credited, and for an extrinsic tracer study that indicated this same 4 months, 4 logs of pathogen removal would be credited.

M1W performed an extrinsic tracer study that started in October 2021 and was completed in early 2022. The study demonstrated that the PWM water was qualified to get the full credit for underground retention time (factor of 1.0). At the time of preparation of this Annual Report, M1W had submitted to DDW the findings from its extrinsic tracer study and was awaiting DDW's approval of it .

Before the intrinsic tracer study was done, the numerical modeling predicted that the underground detention time would be 10.8 months before the water would reach ASR Wells 1 and 2. Once the intrinsic tracer study was completed, and the model was calibrated with data from this tracer study, the model showed that the shortest travel time from Deep Injection Well No.1 to ASR Monitoring Well No. 1 (adjacent to ASR Wells 1 and 2) was only 2.5 months. ASR-1 had been offline since February 2021, for independent reasons.

On September 14, 2021 the State Division of Drinking Water (DDW) issued a letter to Cal-Am stating that "the drinking water source designation of ASR Well 01 (ASR-1) has been changed from active to inactive." MPWMD reported that the inactive status remains in effect today and could only be removed if available data clearly demonstrated that the recycled water reaching ASR-1 when the well is in extraction mode meets at least a12-log virus reduction, the minimum underground retention time required by the recycled water regulations of 2 months, and all other applicable recycled water regulations. MPWMD went on to say that they did not believe that the Division of Drinking Water would accept the data and analysis by the M1W team to demonstrate minimum underground retention time without significant reduction of PWM injection capacity. And further, that they did not find any substantial rationale for changing the source designation of ASR-1 to active at this time or the foreseeable future.

Discussions between CAWC, MPWMD, and M1W were initiated in 2022 to discuss CAWC's concerns that it might not have sufficient pumping capacity, with ASR-1 no longer available as a supply well, to meet its customer's demands. The Watermaster participated in those discussions to monitor the issue. In October 2022 a teleconference discussion among these parties was held and progress was reported on work being done to address this situation. It focused on getting well ASR-4 permitted for use so it could be used in place of ASR-1 as a supply well. ASR-4 has been found to high a level of concentration of mercury that is above the drinking water standard. Therefore, CAWC was in the process of installing a mercury removal treatment unit so it could be permitted for use as a supply well. Installation of the mercury removal unit was expected to occur in November 2022, and that the well would become available as a supply well shortly thereafter.

In late 2021 M1W was also applying to the Division of Drinking Water to obtain additional pathogen reduction credits for certain of the treatment processes the PWM AWT provides, but which had not been previously used in determining the AWT's reduction credits. As of the date of preparation of this Annual Report, M1W reported that they had been approved by DDW to receive additional log reduction credits for chloramine due to the residual in the pipeline and the contact time during conveyance. They went on to report that they were still working on optimizing those credits. However, they consider additional credits to be "icing on the cake," since they consistently meet the regulatory requirement of 12-logs of virus reduction with their reverse osmosis and ultraviolet advanced oxidation treatment processes and underground retention time.

Public Buyout of CAWC's Water System

Voters approved Measure J in the November 2018 general election. That Measure instructed the Monterey Peninsula Water Management District to undertake a feasibility study on the public takeover of CAWC's Monterey Water System.

The 2021 Annual Report provided background information describing MPWMD's work on this matter and the status of its application to the Local Agency Formation Commission (LAFCO). LAFCO needs to approve the activation of MPWMD's latent powers in order for MPWMD to proceed with the acquisition process. This 2022 Annual Report updates the status of MPWMD's actions on this matter.

As reported in the 2021 Annual Report, at its December 6 meeting, on a 5 to 2 vote, LAFCO passed a resolution denying MPWMD's application to activate its latent powers in order to acquire CAWC's Monterey Water System, but directed its staff to prepare a new draft resolution laying out the Commission's reasons for denying the proposed latent powers activation. On January 5, 2022, the Commission, on a 5 to 2 vote, adopted the revised resolution denying the proposed activation of MPWMD's latent powers.

On January 31, 2022 MPWMD filed a formal Application for Reconsideration of LAFCO's disapproval of MPWMD's proposed activation of latent powers. At its February 28, 2022 meeting LAFCO denied MPWMD's Application for Reconsideration.

MPWMD indicated it would be considering taking legal action to try to overturn LAFCO's denial, and initiated litigation against LAFCO on April 1, 2022 as set forth in Monterey County Superior Court Case No. 22CV000925. A series of documents were subsequently submitted by the involved parties, hearings were held, and the next case management conference on the litigation is scheduled for January 10, 2023.

Management Activities that May Bear on the Basin's Wellbeing

1. *Water Conservation***.** From a water conservation standpoint, customers of CAWC are doing an exceptional job. CAWC's Monterey system has one of the highest levels of voluntary conservation in the state. There has essentially been no back-off in conservation following the end of mandatory conservation that occurred after the wet winter of 2016-2017.

2. *Storm Water and Recycled Water*. Storm water and recycled water are both components of the Pure Water Monterey (PWM) project that is being implemented by Monterey One Water (M1W). CAWC has already contracted to receive 3,500 AFY of PWM recycled water for injection into, and recovery from, the Seaside Basin. M1W, in coordination with others, is pursuing the PWMX project to expand the delivery capacity of the PWM project by using additional sources of recycled water and storm water.

Work to design the PWMX project is underway. However, construction of that project is dependent on the execution of the amended Water Purchase Agreement between MPWMD, CAWC, and M1W. If that agreement is executed, construction could begin as early as 2022, with the potential for the expansion project to become operational as early as 2024.

3. *Sustainable Groundwater Management Act*. Coordination between the Watermaster and the SVBGSA and the MCWD GSA is ongoing and is discussed in more detail above under Section J of this Annual Report. That coordination will aid in groundwater management of the Laguna Seca and Corral de Tierra subareas.

4. Climate Change. Higher seawater levels could exacerbate seawater intrusion concerns, which punctuates the importance of monitoring and long-term management to avoid seawater

intrusion. From a water supply perspective, reliance on groundwater with sustainable management is ideal because the resource is a reservoir and therefore not subject to sharp fluctuations in availability resulting from year-to-year precipitation amounts as is the case with surface water supplies. Updating of the Watermaster's *Groundwater Model* in 2018 (discussed in Section J of the 2018 Annual Report) and *Basin Management Action Plan* in 2019 (discussed in Section J of the 2019 Annual Report) incorporated projected impacts from climate change and sea level rise.

5. *New Technical Issues or Activities.*
   - Stormwater Projects Being Evaluated in the Monterey Peninsula Stormwater Resource Plan (SWRP).

As reported in the 2018 Annual Report, Monterey One Water as the lead entity coordinated the development of a Stormwater Resource Plan (SWRP) for the Monterey Peninsula, Carmel Bay, and South Monterey Bay (Monterey Peninsula) Integrated Regional Water Management Plan (IRWMP) area.

The purpose of the SWRP is to identify opportunities to capture stormwater that could be utilized as new water supply sources for the Monterey Peninsula and provide additional water quality and environmental benefits. Some of those projects have the potential to minimally benefit the Seaside Basin, and are discussed in the 2019 Updated Basin Management Action Plan.

Of the seven priority projects that were identified in the SWRP, several projects have been able to receive funding and are proceeding as described below.

City of Seaside: The Del Monte Manor project in the City of Seaside received grant in the amount of approximately $560,000 to complete the project, and the project was completed in 2022. This will divert stormwater that is captured in this area into the sanitary sewer so that it can become recycled water from the M1W Regional Wastewater Treatment Plant.

City of Sand City: The City of Sand City has two green street retrofit projects. They are the West End Stormwater Improvement Projects on Contra Costa Street and Catalina Street. The Contra Costa Street project is funded by an SWRCB Proposition 1 Stormwater Grant (technical assistance and implementation) and the Catalina Street project is funded by a DWR Proposition 1 IRWMP Grant. At the time of preparation of this 2022 Annual Report, both of these projects were in design at the 30% to 90% level with construction anticipated to occur in late 2023 or early 2024. They are described in more detail below:

- West End Stormwater Improvement Project – Contra Costa Street

Project Description

The West End Stormwater Improvement Project is a retrofit of an existing major collector street, Contra Costa Street between Olympia Avenue and Redwood Avenue. The Project will integrate Low Impact Development (LID) strategies to address flood control, water quality, and meet several community objectives. The Project proposes to install bioretention facilities (i.e. urban rain gardens), trash capture, permeable pavement, landscaping, and subsurface infiltration chambers and will improve pedestrian and Americans with Disability Act (ADA) access throughout the corridor. The Project will improve urban storm water runoff quality, augment groundwater quantity, provide climate change adaptation, reduce flooding, and create urban green space. The City developed the Project with a grant from the State Water Resources

Control Board Proposition 1 Technical Assistance Funding Program for disadvantaged communities.

- West End Stormwater Improvement Project – Catalina Street

Project Description

The West End Stormwater Improvement Project is a retrofit of an existing minor collector street, Catalina Street, between Olympia Ave. and Ortiz Avenue. The Project will integrate Low Impact Development (LID) strategies to address flood control, water quality, and meet several community objectives. The Project proposes to install bioretention facilities (i.e. urban rain gardens), trash capture, permeable pavement, landscaping, and subsurface infiltration chambers and will improve pedestrian and Americans with Disability Act (ADA) access throughout the corridor. The Project will improve urban storm water runoff quality, augment groundwater quantity, provide climate change adaptation, reduce flooding, and create urban green space. The conceptual design of the Project was funded through a Proposition 1 Stormwater Technical Assistance grant which the City was previously awarded. Construction of the Project will be funded through a Proposition 1 Round 1 Integrated Regional Water Management (IRWM) Grant.

Note: Both Projects are designed to capture, treat, and infiltrate urban storm water runoff to reduce the amount of pollutants such as metals, bacteria, nutrients, and trash that are currently being discharged into the Monterey Bay. Both Projects will increase the reliability of the Seaside Groundwater Basin through infiltration of treated storm water and will incorporate City and regional objectives for economic vitality, community livability, and environmental equity. In addition, the Project will improve regional water self-reliance and strengthen collaborative efforts between local agencies to provide sustainable water resources. The City obtained community input regarding storm water management priorities which influenced the design of the Projects.

City of Monterey:

Oliver Street Stormwater Diversion Project

The City of Monterey applied to the MPWMD for a funding grant to help with the costs of development work for the Olivier Street Stormwater Diversion Project, also referred to as Lighthouse Tunnel Diversion Project and Monterey Tunnel Stormwater Diversion Project. The Project will divert urban drainage from an existing storm drain, currently discharging untreated to the Monterey Bay National Marine Sanctuary, to an existing City sanitary sewer utility for treatment at M1W's Regional Wastewater Treatment Plant. This diversion would provide 10-12 acre-feet of dry weather source water for water recycling at the time of year when source water is not abundant, and reduce a point source discharge into Monterey Bay. MPWMD approved a grant of $25,000 for costs to plan and design this project at its October 17, 2022 Board meeting. The City is now coordinating with MPWMD to submit an application for State funding to construct the project, once its design has been completed.

Lake El Estero Urban Diversion Project

The City of Monterey has received State funding for this project and is beginning to work on the design and permitting for it. Currently, storm water that flows into Lake El Estero is periodically pumped into Monterey Bay to avoid flooding. This project will divert a portion of that pumped flow into the sanitary sewer so that it can become recycled water from the M1W Regional Wastewater Treatment Plant.

6. Reduction in Pumping in the Laguna Seca Subarea
In late 2020 CAWC completed construction of an intertie pipeline that enables it to serve the customers in its Bishop and Ryan Ranch Units in the Laguna Seca Subarea with water from its Main System. With the completion of this pipeline, CAWC has been able to discontinue pumping from the Laguna Seca Subarea to serve those customers. This is expected to reduce total pumping from the Laguna Seca Subarea by about 28%.

6. Obtaining Replenishment Water. As described in Section J under the subheading "Basin Management Action Plan," portions of the Seaside Basin have groundwater levels below sea level. Therefore, even with the pumping reductions achieved to date the Basin will remain vulnerable to seawater intrusion. Replenishing the Basin by injecting water and leaving it in the Basin, rather than withdrawing it as is done in the ASR and PWM projects, could help to raise groundwater levels high enough to protect the Basin against seawater intrusion.

Replenishment water could potentially be obtained from either the MPWSP's desalination plant, or the proposed PWMX project, during their initial years of operation when projected water demands will be less than the production capacities of either of these projects. The replenishment water would be obtained by operating either of these projects at their full capacities and injecting the excess water into the Basin. Doing this would increase the operational costs of those projects, and funds to cover those costs would be needed.

Research was performed to determine if there were any State or Federal funding programs that could provide money to purchase replenishment water. It was found that all of those programs only provide funding for planning, design, and construction of projects, but not for operational costs once the projects are constructed. In view of this, efforts were initiated by the Watermaster in 2021 to see if funds to cover these costs could be generated through some form of fee mechanism. Initial meetings involving the Watermaster, MPWMD, M1W, and CAWC led to the conclusion that MPWMD had the legal authority to levy fees to help pay for replenishment of the Basin. Further meetings to pursue obtaining replenishment water were expected to be held in 2022. However, no such meetings occurred because the Watermaster was having modeling performed (as described below) to better identify the quantities of replenishment water that would be needed.

Studies performed for the Watermaster in 2022 pertaining to the need for replenishment water to raise ground water levels in the Seaside Subbasin to protect it against seawater intrusion concluded:

- Under a "best case" scenario based on future water demand projections, Aquifer Storage and Recovery (ASR) injection rates, and Pure Water Monterey Expansion (PWMX) injection rates prepared by MPWMD, 1,000 acre-feet-per-year (AFY) of water would need to be injected into the Seaside Basin <u>every year</u> to replenish it and raise groundwater levels high enough to prevent seawater intrusion from occurring.
- Under a more "conservative" scenario based on future water demand projections and the timing of start-up of CAWC's desalination plant contained in CAWC's 2020 Urban Water Management Plan, ASR and PWMX injection rates with a built-in margin of safety, and revised water demands for the City of Seaside's golf courses proposed by Cal Am and the City of Seaside, the amount needed would be 3,600 AFY <u>every year</u>.
- Unless replenishment water in these quantities is added annually, the Seaside Basin will be at risk of seawater intrusion, and that risk will increase each year that groundwater levels continue to fall and remain below sea level.

- Implementation of the PWMX project does not accomplish this, and an additional source of replenishment water will be needed. The only other potential source of replenishment water will be from desalination.

The entire Technical Memorandum describing the work that led to these conclusions is posted on the Watermaster's website at this link: http://www.seasidebasinwatermaster.org/Other/ExcecSummary_and%20TMs_Replenishment_Modeling_WaterBudget_and_AlternateScenario_Analysis%20_BOARD_DRAFT_20220901pdf.pdf.

A summary of this Technical Memo is contained in Attachment 9.

Studies performed for the Watermaster in 2022 pertaining to the directions and inland velocities that seawater intrusion into the Seaside Subbasin would move, if intrusion should occur, concluded:

- Under current conditions inland seawater intrusion encroachment of 250 ft/yr could occur.
- Periods of prolonged drought with no ASR injection increases inland travel rates and the risk of seawater intrusion.
- The number of critically dry rainfall years has greatly increased in the last 50 years compared to the prior 50 years of data. Critically dry years now exceed the number of "normal rainfall" years thus becoming the "new norm".

These studies highlight the vulnerability of the Seaside Subbasin to seawater intrusion, and the need for replenishment water to raise groundwater levels within the Seaside Subbasin to prevent that from occurring.

The entire Technical Memorandum describing the work that led to these conclusions is posted on the Watermaster's website at this link: http://www.seasidebasinwatermaster.org/Other/Flow%20Direction-Flow%20Velocity%20Tech%20Memo%20Final%20Version%202-25-22.pdf

Information and graphics from this Technical Memo are contained in Attachment 10.

L. Conclusions and Recommendations

The Seaside Basin Watermaster Board has worked diligently to meet all of the Court's established deadline dates. All of the Phase 1 Scope of Work activities, which are described in the "Implementation Plan for the Seaside Basin Monitoring and Management Program" dated March 7, 2007, have been completed. At the Watermaster Board meeting held on October 5, 2022 the Board adopted the FY 2023 budgets contained in Attachment 6, which support carrying out all elements of the 2023 Seaside Groundwater Basin Monitoring and Management Program (M&MP). The M&MP is contained in Attachment 8 and describes the activities that the Watermaster plans to conduct during Fiscal Year 2023.

As described in Section J above, information from the Enhanced Monitoring Well Network is being utilized to detect seawater intrusion. The response actions described in the Watermaster's Seawater Intrusion Response Plan, which was contained in the 2009 Annual Report, will be implemented if seawater intrusion is detected within the Basin.

As of the date of preparation of this 2022 Annual Report, no future status conferences with the Court have been scheduled.

LISTING OF ACRONYMS USED IN THIS ANNUAL REPORT

AF - acre-feet
ASR - Seaside Basin Aquifer Storage and Recovery program
Basin - The adjudicated Seaside Groundwater Basin
BLM - Bureau of Land Management
BMAP - Basin Management Action Plan
CASGEM - California Statewide Groundwater Elevation Monitoring
CAWC - California American Water Company
DDW – State Water Resources Control Board Division of Drinking Water
Decision - Decision filed February 9, 2007 by the Superior Court in Monterey County under Case No. M66343 - California American Water v. City of Seaside et al.
DWR - California State Department of Water Resources
GSA - Groundwater Sustainability Agency
GSP - Groundwater Sustainability Plan
LSSA - Laguna Seca Subarea
M1W - Monterey One Water (formerly Monterey Regional Water Pollution Control Agency)
MCWD - Marina Coast Water District
MPWMD - Monterey Peninsula Water Management District
MPWSP - Monterey Peninsula Water Supply Project
M&MP - Monitoring and Management Program
NSY - Natural Safe Yield
PWM - Pure Water Monterey Project
PWMX – Pure Water Monterey Expansion Project
SGMA - Sustainable Groundwater Management Act
SIAR - Seawater Intrusion Analysis Report
SIRP - Seawater Intrusion Response Plan
SVBGSA - Salinas Valley Basin Groundwater Sustainability Agency
SWRCB - State Water Resources Control Board
TAC - Technical Advisory Committee
USGS - United States Geological Survey
WY - Water Year

ATTACHMENT 1

GROUNDWATER EXTRACTIONS

SEASIDE GROUNDWATER BASIN WATERMASTER

Reported Quarterly and Annual Water Production From the Seaside Groundwater Basin
For All Producers Included in the Seaside Basin Adjudication -- Water Year 2022

(All Values in Acre-Feet [AF])

	Type	Oct	Nov	Dec	Oct-Dec	Jan	Feb	Mar	Jan-Mar	Apr	May	Jun	Apr-Jun	Jul	Aug	Sep	Jul-Sep	Reported Total	Yield Allocation	from WY 2021	for WY 2022
Coastal Subareas																					
CAW - Coastal Subareas	SPA	373.37	267.89	196.91	**838.17**	336.11	456.67	483.60	**1,276.38**	474.44	527.94	526.22	**1,528.60**	546.50	530.29	474.04	**1,550.83**	**1,510.69**	1,466.02	165.15	1,631.18
Luzern		26.16	0.33	0.00	**26.49**	0.00	50.18	53.88	**104.06**	51.27	52.25	50.06	**153.58**	50.74	50.40	38.00	**139.14**	**423.26**			
Ord Grove		109.59	48.86	38.68	**197.13**	72.51	95.23	106.91	**274.65**	102.12	104.55	96.53	**303.20**	106.05	111.60	103.48	**321.13**	**1,096.11**			
Paralta		75.83	92.49	107.42	**275.73**	113.66	111.53	96.00	**321.19**	103.07	132.66	131.90	**367.64**	139.62	122.06	113.40	**375.08**	**1,339.65**			
Playa		0.00	0.00	0.00	**0.00**	0.00	0.00	0.14	**0.14**	0.00	13.98	32.33	**46.32**	33.33	33.07	31.74	**98.14**	**144.60**			
Plumas		18.98	0.00	0.00	**18.98**	0.00	14.47	29.35	**43.82**	28.04	28.88	27.46	**84.39**	28.43	27.78	27.42	**83.62**	**230.81**			
Santa Margarita		142.81	126.22	50.81	**319.84**	149.94	185.27	197.33	**532.53**	189.93	195.61	187.93	**573.47**	188.34	185.37	160.01	**533.71**	**1,959.56**			
ASR Recovery		0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	**0.00**			
PWM Recovery		(343.61)	(233.66)	(162.10)	**(739.37)**	(301.21)	(418.82)	(400.00)	**(1,120.03)**	(400.00)	(350.00)	(249.07)	**(999.07)**	(273.96)	(287.16)	(263.70)	**(824.82)**	**(3,683.29)**			
City of Seaside (Municipal)	SPA	14.61	13.21	12.59	**40.41**	11.66	13.07	15.87	**40.61**	14.19	16.66	14.78	**45.63**	0.15	13.98	14.34	**28.47**	**155.12**	120.28	0.00	120.28
Granite Rock Company	SPA	--	--	--	**0.00**	--	--	--	**0.00**	--	--	--	**0.00**	--	--	--	**0.00**	**0.00**	11.35	236.07	247.42
DBO Development No. 30	SPA	--	--	--	**0.00**	--	--	--	**0.00**	--	--	--	**0.00**	--	--	--	**0.00**	**0.00**	20.59	424.88	445.47
Calabrese (Cypress Pacific Inv.)	SPA	--	--	--	**0.00**	--	--	--	**0.00**	--	--	--	**0.00**	--	--	--	**0.00**	**0.00**	2.76	13.57	16.33
City of Seaside (Golf Courses)	APA	27.41	7.17	5.14	**39.72**	5.45	30.92	43.83	**80.20**	44.89	74.47	88.67	**208.04**	57.13	80.54	45.56	**183.23**	**511.19**	540.00		540.00
Sand City	APA	0.12	0.03	0.11	**0.26**	0.09	0.10	0.20	**0.39**	0.14	0.19	0.17	**0.50**	0.15	0.19	0.16	**0.50**	**1.65**	9.00		9.00
SNG (Security National Guaranty)	APA	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	**0.00**	149.00		149.00
Calabrese (Cypress Pacific Inv.)	APA	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	**0.00**	6.00		6.00
Mission Memorial (Alderwoods)	APA	4.45	3.94	1.78	**10.16**	1.58	1.43	3.52	**6.53**	3.16	2.98	2.47	**8.61**	2.56	3.27	2.82	**8.65**	**33.95**	31.00		31.00
Coastal Subareas Totals					**189.35**				**284.08**				**792.31**				**946.86**	**2,212.60**	**2,356.00**	**839.68**	**3,195.67**
Laguna Seca Subarea																					
CAW - Laguna Seca Subarea	SPA	10.58	9.56	9.11	**29.24**	8.85	9.67	9.94	**28.46**	10.82	12.90	15.38	**39.10**	13.47	14.08	13.65	**41.21**	**138.02**	0.00		0.00
Ryan Ranch Unit		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00			
Hidden Hills Unit		10.58	9.56	9.11	29.24	8.85	9.67	9.94	28.46	10.82	12.90	15.38	**39.10**	13.47	14.08	13.65	41.21	138.02			
Bishop Unit 3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00			
Bishop Unit 1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00			
The Club at Pasadera	APA	32.00	7.00	8.00	**47.00**	0.00	26.00	12.00	**38.00**	27.00	41.00	36.00	**104.00**	28.00	24.00	10.00	**62.00**	**251.00**	251.00		251.00
Laguna Seca Golf Resort (Bishop)	APA	17.51	5.83	0.00	**23.34**	0.00	7.07	9.69	**16.76**	14.87	32.55	36.24	**83.66**	37.66	41.08	22.80	**101.54**	**225.31**	320.00		320.00
York School	APA	1.13	0.29	0.04	**1.46**	0.18	0.62	1.52	**2.32**	2.14	2.88	1.81	**6.83**	2.15	3.42	2.50	**8.07**	**18.68**	32.00		32.00
Laguna Seca County Park	APA	1.55	1.73	1.41	**4.68**	1.04	1.28	1.02	**3.34**	2.40	1.87	1.99	**6.26**	3.61	4.23	3.11	**10.94**	**25.22**	41.00		41.00
Laguna Seca Subarea Totals					**105.72**				**88.89**				**239.85**				**223.77**	**658.23**	**644.00**	**0.00**	**644.00**
Total Production by WM Producers					**295.08**				**372.96**				**1,032.16**				**1,170.63**	**2,870.83**	**3,000.00**	**839.68**	**3,839.67**
									Annual Production from APA Producers									1,067.00			1,379.00
									Annual Production from SPA Producers									1,803.83			2,460.67

																			Previous Balance	*Total*
CAW / MPWMD ASR (Carmel River Basin source water)																				
Injection	0.00	0.00	61.69	**61.69**	8.86	0.00	0.00	**8.86**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**70.55**		
(Recovery)	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	**0.00**		
Net ASR	0.00	0.00	61.69	**61.69**	8.86	0.00	0.00	**8.86**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	**70.55**	**801.55**	**872.10**
Pure Water Monterey (PWM) Injection and Cal-Am Recovery																			
Injection Operating Reserve	0.00	0.00	0.00	**0.00**				**0.00**				**0.00**				**0.00**	**0.00**	**1,200.48**	**1200.48**
Injection Drought Reserve	0.00	0.00	0.00	**0.00**				**0.00**				**0.00**				**0.00**	**0.00**	**0.0**	**0.00**
Delivery to Basin	298.20	289.97	312.27	**900.44**	320.51	282.22	341.92	**944.65**	362.09	295.58	264.55	**922.22**	273.96	287.16	318.90	**880.02**	**3647.33**	**0.0**	**3647.33**
CAW	(343.61)	(233.66)	(162.10)	**(739.37)**	(301.21)	(418.82)	(400.00)	**(1120.03)**	(400.00)	(350.00)	(249.07)	**(999.07)**	(273.96)	(287.16)	(263.70)	**(824.82)**	**(3683.29)**	**0.0**	**(3683.29)**

Notes:

1. The Water Year (WY) begins October 1 and ends September 30 of the following calendar year. For example, WY 2022 begins on October 1, 2021, and ends on September 30, 2022.
2. "Type" refers to water right as described in Seaside Basin Adjudication decision as amended, signed February 9, 2007 (Monterey County Superior Court Case No. M66343).
3. Values shown in the table are based on reports to the Watermaster received by October 15, 2022.
4. All values are rounded to the nearest hundredth of an acre-foot. Where required, reported data were converted to acre-feet utilizing the relationships: 325,851 gallons = 43,560 cubic feet = 1 acre-foot.
5. "Base Operating Yield Allocation" values are based on Seaside Basin Adjudication decision. These values are consistent with the *Watermaster Producer Allocations Water Year 2022* (see Item VIII.B. in 1/5/2022 Board packet).
6. Any minor discrepancies in totals are attributable to rounding.
7. APA = Alternative Producer Allocation; SPA = Standard Producer Allocation; CAW = California American Water.
8. It should be noted that CAW/MPWMD ASR "Injection" and "Recovery" amounts are not expected to "balance" within each Water Year. This is due to the injection recovery "rules" that are part of SWRCB water rights permits and/or separate agreements with state and federal resources agencies that are associated with the water rights permits.

ATTACHMENT 2

WATERMASTER DECLARATION
OF
NON-AVAILABILITY
OF
ARTIFICIAL REPLENISHMENT WATER

ITEM IX.B.
1/5/2022

NOTICE TO ALL SEASIDE GROUNDWATER PRODUCERS:

Case No. M66343 Amended Decision Section III.B.2.

Commencing with the fourth Water Year, and triennially thereafter, the Operating Yield for both Subareas will be decreased by ten percent (10%) until Operating Yield is the equivalent of the Natural Safe Yield unless:

a. *The Watermaster has secured and is adding an equivalent amount of Non-Native water to the Basin on an annual basis; or*
b. *The Watermaster has secured reclaimed water in an equivalent amount and has contracted with one or more of the Producers to utilize said water in lieu of their Production Allocation, with the Producer agreeing to forego their right to claim a Stored Water Credit for such forbearance; or*
c. *Any combination of a and b above which results in the decrease in Production of Native Water required by this Decision; or*
d. *The Watermaster has determined that Groundwater levels within the Santa Margarita and Paso Robles aquifers are at sufficient levels to ensure a positive offshore gradient to prevent seawater intrusion.*

The Watermaster has determined that the conditions necessary to avoid the ten percent Operating Yield reduction have not been met as follows:

1. Watermaster has not secured water for adding an equivalent amount of Non-Native water to the Basin on an annual basis.
2. The Watermaster has not secured reclaimed water in an equivalent amount.
3. The Watermaster has not secured Non-Native water or reclaimed water that results in the decrease in Production of Native Water required by the Decision.
4. The firm contracted by Watermaster for technical analyses continued to report in 2019 that Groundwater levels within the Santa Margarita and Paso Robles aquifers are not at sufficient levels to ensure a positive offshore gradient to prevent seawater intrusion, so the requirement for this item continues to not be met.

Section III.L.3.j.iii: Watermaster declares that for Water Year 2022 Artificial Replenishment Water is not available to offset Operating Yield Over-Production and producers are limited in production to the following quantities of water:

Coastal Subarea Alternative Producers:

Seaside (Golf)	540.00 acre-feet
SNG	149.00 acre-feet
Cypress (Calabrese)	6.00 acre-feet
Mission Memorial (Alderwood)	31.00 acre-feet
Sand City	9.00 acre-feet

Laguna Seca Subarea Alternative Producers:

The Club at Pasadera	251.00 acre-feet
Bishop	320.00 acre-feet
York School	32.00 acre-feet
Laguna Seca County Park	41.00 acre-feet

Coastal Subarea Standard Producers:

California American Water.....	1,631.18 acre-feet*
Seaside (Municipal).....	120.28 acre-feet**
Granite Rock	247.42 acre-feet***
D.B.O. Development 30	445.47 acre-feet****
Cypress (Calabrese).....	16.33 acre-feet*****

Laguna Seca Subarea Standard Producers:

California American Water.....	0.0 acre-feet

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* Total is the 2022 base allocation of 1,466.03 acre-feet, plus transferred credits of 3.17 & 2.31 acre-feet plus 159.67 of "not free" carryover. California American Water has a positive balance of 2003.24 acre-feet of stored water credit at WY-end 2021 from Basin injections exceeding extractions since WY 2010 under the CAW/MPWMD ASR Program, formalized through a Storage Agreement in 2012; and under the CAW/M1W Pure Water Monterey Program formalized through a storage agreement in 2019.

** Total is the 2022 base allocation of 120.28 acre-feet.

*** Total includes 208.96 acre-feet of "free" carryover and 27.12 acre-feet of "not-free" carryover credit from previous water years, plus the 2022 base allocation of 11.35 acre-feet.

**** Total includes 388.20 acre-feet of "free" carryover plus 38.98 acre-feet of "not-free" carryover credit from previous water years, minus 2.31 in transferred water rights, plus the 2022 base allocation of 20.59 acre-feet.

***** Total includes 15.16 acre-feet of "free" carryover and 1.58 acre-feet of "not-free" carryover credit from previous water years, minus 3.17 acre-feet in transferred water rights, plus the 2022 base allocation of 2.76 acre-feet.

Note: Carryover is not capped for D.B.O. Development 30 and Granite Rock beginning in Water Year 2021 due to recalculation of *Total Useable Storage Space* in the *2018 Basin Management Action Plan* update finalized in 2019. (See allocation of recalculated total useable storage space next page.)

NOTICE TO ALL SEASIDE GROUNDWATER PRODUCERS

Pursuant to Section III.3.L.3.j.xix of the Amended Decision Filed February 2, 2007 in the Superior Court of the State of California, in and for the County of Monterey, Case No. M66343 (the "Decision"), the Seaside Basin Watermaster hereby Declares that the Total Usable Storage Space in the Seaside Groundwater Basin ("Basin") is as follows:

Total Usable Storage Space in the Coastal and Northern Inland Subareas is 75,610 acre-feet.
Total Usable Storage Space in the Laguna Seca Subarea is 28,560 acre-feet.
Total Usable Storage Space in the entire Seaside Groundwater Basin is 104,170 acre-feet.

Pursuant to Section III.B.3.b of the Decision, Alternative Producers do not receive a storage allocation, only Standard Producers receive such an allocation. Pursuant to Section III.H.2 of the Decision, the Seaside Basin Watermaster further Declares that the Total Usable Storage Space in the Basin shall be allocated to the Standard Producers, who are identified in the Decision, as follows:

	Current Allocation (Using Table 1 of the Decision)		
Producer	**Operating Yield Allocation Percentage (1)**	**Usable Storage Allocation Percentage (2)**	**Useable Storage Allocation Acre-Feet**
Coastal and Northern Inland Subareas			
California American Water (3)	77.55%	90.44%	68,382
City of Seaside (Municipal)	6.36%	7.42%	5,610
Granite Rock Company	0.60%	0.70%	529
DBO Development No. 27	1.09%	1.27%	960
Calabrese (Cypress Pacific Investors LLC)	0.15%	0.17%	129
SUBAREAS TOTAL	**85.75%**	**100.00%**	**75,610**
Laguna Seca Subarea			
California American Water (3)	45.13%	100.00%	28,560
SUBAREA TOTAL	**45.13%**	**100%**	**28,560**
BASIN TOTAL		**100%**	**104,170**

Footnotes:
(1) From Table 1 on page 19 of the Decision.
(2) Calculated as each Standard Producer's percentage of the total Standard Producers' operating yield allocation percentages within each subarea.
(3) CAW's Usable Storage Allocation is subject to the provisions and requirements of Section III.H.3 of the Decision.

Pursuant to Section III.H.6 of the Decision, no Producer may store water in the Basin without first executing with the Watermaster a Storage and Recovery Agreement.

Nov 2, 2019

ATTACHMENT 3

WATERMASTER ADMINISTRATIVE AND OPERATIONS COSTS FOR WY 2022

Note: These will be on the Board's December 7, 2022 meeting agenda for approval

Seaside Groundwater Basin Watermaster

Budget vs. Actual Administrative Fund

Fiscal Year (January 1 - December 31, 2022)
Balance through October 31, 2022

	2022 Adopted Budget	Contract Amount	Year to Date Revenue / Expenses
Available Balances & Assessments			
Other Assessments	-		8,500.00
FY (Rollover)	34,500.00		52,000.00
Admin Assessments	65,500.00		65,500.00
Available	**100,000.00**		**126,000.00**
Expenses			
Contract Staff	55,000.00	55,000.00	48,147.50
Legal counsel	20,000.00	20,000.00	8,283.10
Filing fees and postage			-
Total Expenses	**75,000.00**	**75,000.00**	**56,430.60**
Total Available	25,000.00		
Dedicated Reserve	25,000.00		25,000.00
Net Available	**-**		**44,569.40**

Seaside Groundwater Basin Watermaster

Budget vs. Actual Monitoring & Management - Operations Fund

Fiscal Year (January 1 - December 31, 2022)

Balance through October 31, 2022

	2022 Adopted Budget	Contract Encumbrance	Year to Date Revenue/Expenses
Available Balances & Assessments			
Operations Fund Assessment	$ 232,878.00	$ -	$ 232,878.00
Pass Through		-	3,342.00
FY 2021 Rollover	38,000.00	-	50,950.00
Total Available	**$ 270,878.00**	**$ -**	**$ 287,170.00**
Appropriations & Expenses			
GENERAL			
Technical Project Manager*	$ 75,000.00	$ 75,000.00	$ 58,125.00
Contingency @ 10% (not including TPM)	17,807.00	-	
Total General	**$ 92,807.00**	**$ 75,000.00**	**$ 58,125.00**
CONSULTANTS (Montgomery; Web Site Database)			
Program Administration	$ 21,940.00	$ 92,731.00	$ 76,061.50
Production/Lvl/Qlty Monitoring	2,400.00		
Basin Management	30,000.00		
Seawater Intrusion Analysis Report	26,290.00	26,290.00	-
Total Consultants	**$ 80,630.00**	**$ 119,021.00**	**$ 76,061.50**
MPWMD			
Production/Lvl/Qlty Monitoring	$ 68,876.00	68,876.00	6,524.00
Pass Through 2021		-	5,304.00
Basin Management	-		-
Seawater Intrusion	-	-	-
Direct Costs	-	-	-
Total MPWMD	**$ 68,876.00**	**$ 68,876.00**	**$ 11,828.00**
CONTRACTOR (Martin Feeney)			
Hydrogeologic Consulting Services	$ 4,000.00	4,000.00	-
Production/Lvl/Qlty Monitoring	20,565.00	20,565.00	9,251.37
	$ 24,565.00	**$ 24,565.00**	**$ 9,251.37**
CONTRACTOR (Todd Groundwater)			
Hydrogeologic Consulting Services	**$ 4,000.00**	**$ 4,000.00**	-
Total Appropriations & Expenses	**$ 270,878.00**	**$ 291,462.00**	**$ 155,265.87**
Total Available	-		**131,904.13**

ATTACHMENT 4

UPDATED REPLENISHMENT ASSESSMENT UNIT COSTS

SEASIDE GROUNDWATER BASIN WATERMASTER

TO: Watermaster Board of Directors
FROM: Laura Paxton, Administrative Officer
DATE: October 5, 2022
SUBJECT: Consider Approval of Unit Costs for Water Year 2022/23 Over Production Replenishment Assessment

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RECOMMENDATION:
Recommend to the Watermaster board at its October 5, 2022 board meeting to adopt a Replenishment Assessment Unit Cost of $3,461/AF and $865/AF for Natural Safe Yield and Operating Yield Overproduction, respectively, for Water Year 2023.

BACKGROUND:
Per page 33 of the Decision, "The per acre-foot (AF) amount of the Replenishment Assessments shall be determined and declared by Watermaster in October of each Water Year in order to provide Parties with advance knowledge of the cost of Over-Production in that Water Year." Thus, the per acre-foot amount determined by the Board on or before October of 2022 will be used to calculate Replenishment Assessments for pumping that occurs during Water Year 2023 (October 1, 2022 through September 30, 2023).

For Water Years 2014, 2015, and 2016 the Board adopted a Replenishment Assessment Unit Cost of $2,702/AF for Natural Safe Yield Overproduction. This unit cost was developed starting with Water Year 2014 by taking the average of the Base Unit Cost ($/AF) of the four potential water supply projects that the Board felt were the most likely to be implemented. For Water Year 2017 the Board adopted a revised Replenishment Assessment Unit Cost of $2,872. This revised Unit Cost was calculated using updated unit cost data for the three projects which the Board at that time felt were the most likely to be implemented. The number of projects was reduced from four to three, because when the WY 2017 Unit Cost was being calculated, it was determined that two of the previous four projects (Regional Desalination and the Pure Water Monterey Groundwater Replenishment Projects) would be part of a combined project referred to as the Monterey Peninsula Water Supply Project (MPWSP). The unit cost for Water Year 2017 was carried over to the three subsequent Water Years because no updated cost data was available for those projects, and no other viable projects could be identified. In 2020, a blended unit cost value was provided for the Monterey Peninsula Water Supply Project based on a reduced size desalination plant offset by water to be provided by the Pure Water Monterey Project. Based on the updated Pure Water Monterey Project's unit cost, the blended unit cost for that combined project was updated from $4,591/AF to $4,817/AF, resulting in a Water Year 2021 Replenishment Assessment Unit Cost of $2,947/AF. In 2022, a blended unit cost value was calculated for the MPWSP based on an updated PWM unit cost. The blended unit cost for that combined project was updated from $4,817/AF to $4,948/AF. For purposes of the 2022 Replenishment Assess Unit Cost calculation, $2,808 was used as the RUWAP cost/AF. Monterey Peninsula Water Management District had not yet provided updated costs for Aquifer Storage and Recovery expansion.

DISCUSSION:
The attached Table includes updated cost data for the Pure Water Monterey Project (PWM) and its expansion (PWMX) as the expected delivery from both projects is 5,750AFY, up from 3,500AFY. In the attached Table, a blended unit cost value is provided for the MPWSP based on the updated PWM/PWMX unit cost. The blended unit cost for that combined project was updated from $$4,948/AF to $4,872/AF. For purposes of the 2023 Replenishment Assess Unit Cost calculation, $3,486 was used as the RUWAP cost/AF.

The updated Unit Cost would therefore be $3,461/AF, calculated as: ($4,872+$2,025+$3,486)/3. These are the three **bold-faced** unit costs in the attached Table. The Operating Yield Over Production Replenishment Assessment Unit Cost is 25% of that amount, or $865.

ATTACHMENTS: Updated Unit Cost Data Table 2023; Water Year 2022 Unit Cost Data

WATER YEAR 2023 (October 1, 2022-September 30, 2023)

ANTICIPATED UNIT COSTS OF WATER THAT COULD POTENTIALLY BE USED FOR REPLENISHMENT OF THE SEASIDE BASIN

POTENTIAL SOURCE OF REPLENISHMENT WATER	POTENTIAL DATE REPLENISHMENT WATER COULD BECOME AVAILABLE	POTENTIAL VOLUME OF WATER THAT COULD BE SUPPLIED BY THE PROJECT (AFY) [1]	BASE UNIT COST ($/AF)	BASE UNIT COST YEAR
Regional Desalination [2]	2024	6,250	$6,147	2021
Pure Water Monterey & PWMX [6]	2020	5,750	3,486	2021
Monterey Peninsula Water Supply Project (Combined Regional Desalination with Groundwater Replenishment Project)	PWM in 2020; Regional Desalination in 2024	12,000	**$4,872**[3]	2022
Seaside Basin ASR Expansion [4]	2021	1,000	**$2,025**	2016
Regional Urban Water Augmentation Project [5]	2021	1,400-1,700	**$3,486**	2021

($4,872 + $2,025 + $3,486) / 3 =

$3,461 = 2023 Replenishment Assessment Unit Cost for NSY Overproduction

$3,461/4 = $865 Replenishment Assessment Unit Cost for OY Overproduction

FOOTNOTES:

(1) For the Regional Desalination Project this is the total amount of water from this source which could potentially come to the Cal Am distribution system, based on the sesalination plant having a 6.4 MGD capacity equivalent to 7,169 AFY. Only a portion of this amount might be available as initially unused capacity that could be used to help replenish the Seaside Basin For the RUWAP this is the total amount of non-potable water from this source. Only a portion of this amount might be used for in-lieu replenishment of the Seaside Basin. For the ASR Expansion Project this is the additional amount of water that could potentially be provided by this project (see footnote 4). For the PWM & PWMX this is the quantity of water that is being planned at this time by CAW for inclusion in its Monterey Peninsula Water Supply Project.

(2) Base unit cost data based on PUC filing documents and provided by Dave Stoldt of MPWMD. This unit cost was confirmed in August 2021 by Ian Crooks of Cal Am as being the latest unit cost available for this project.

(3) Flow-weighted average unit cost of the combined desalination and groundwater replenishment projects, calculated as:
(6,250x$6,147 + 5,750x$3,486)/12,000 = $4,872

(4) Base unit cost data provided by MPWMD in 2016. No updated unit cost was provided for this project. The 1,000 AFY of potential water that this project could supply would be in addition to the 1,300 AFY included as part of the Monterey Peninsula Water Supply Project, and would be an annual average taking into account river flow and hydrologic conditions that change from year to year.

(5) Project data updated in 2022. Patrick Breen of MCWD noted that to determine total cost per acre-foot, use the $3,486-acre foot cost from Pure Water Monterey (which would be RUWAP cost as well) and add MCWD O&M and Financing costs to be determined.

(6) Base unit cost effective September 19, 2022 based on information provided by Ian Crook of Cal Am.

WATER YEAR 2022 (October 1, 2021-September 30, 2022)

ANTICIPATED UNIT COSTS OF WATER THAT COULD POTENTIALLY BE USED FOR REPLENISHMENT OF THE SEASIDE BASIN

POTENTIAL SOURCE OF REPLENISHMENT WATER	POTENTIAL DATE REPLENISHMENT WATER COULD BECOME AVAILABLE	POTENTIAL VOLUME OF WATER THAT COULD BE SUPPLIED BY THE PROJECT (AFY) (1)	BASE UNIT COST ($/AF)	BASE UNIT COST YEAR
Regional Desalination (2)	2024	6,250	$6,147	2021
Groundwater Replenishment Project (Pure Water Monterey) (6)	2020	3,500	2,808	2021
Monterey Peninsula Water Supply Project (Combined Regional Desalination with Groundwater Replenishment Project)	GWRP in 2020; Regional Desalination in 2024	9,750	**$4,948(3)**	2021
Seaside Basin ASR Expansion (4)	2021	1,000	**$2,025**	2016
Regional Urban Water Augmentation Project (5)	2021	1,400-1,700	**$2,808+TBD**	2021

($4,948 + $2,025 + $2,808) / 3 =
$3,260 = 2022 Replenishment Assessment Unit Cost for NSY Overproduction
$3,260/4 = $815 Replenishment Assessment Unit Cost for OY Overproduction

FOOTNOTES:

(1) For the Regional Desalination Project this is the total amount of water from this source which could potentially come to the Cal Am distribution system, based on the desalination plant having a 6.4 MGD capacity equivalent to 7,169 AFY. Only a portion of this amount might be available as initially unused capacity that could be used to help replenish the Seaside Basin for the RUWAP this is the total amount of non-potable water from this source. Only a portion of this amount might be used for in-lieu replenishment of the Seaside Basin. For the ASR Expansion Project this is the additional amount of water that could potentially be provided by this project (see footnote 4). For the GWRP this is the quantity of water that is being planned at this time by CAW for inclusion in its Monterey Peninsula Water Supply Project.

(2) Base unit cost data based on PUC filing documents and provided by Dave Stoldt of MPWMD. This unit cost was confirmed in August 2021 by Ian Crooks of Cal Am as being the latest unit cost available for this project.

(3) Flow-weighted average unit cost of the combined desalination and groundwater replenishment projects, calculated as: (6,250x$6,147 + 3,500x$2,808)/9,750 = $4,948

(4) Base unit cost data provided by MPWMD in 2016. No updated unit cost was provided for this project. The 1,000 AFY of potential water that this project could supply would be in addition to the 1,300 AFY included as part of the Monterey Peninsula Water Supply Project, and would be an annual average taking into account river flow and hydrologic conditions that change from year to year.

(5) Project data updated by MCWD in 2021. Patrick Breen of MCWD noted that to determine total cost per acre-foot, use the $2,808-acre foot cost from Pure Water Monterey (which would be RUWAP cost as well) and add MCWD O&M and Financing costs to be determined fall of 2021.

(6) Base unit cost effective July 1, 2021 based on information provided by Ian Crook of Cal Am.

ATTACHMENT 5

REPLENISHMENT ASSESSMENT CALCULATIONS FOR WY 2022

WATERMASTER PRODUCER ALLOCATIONS WATER YEAR 2022 IN ACRE-FEET (AF)

INCLUDING A 10% TRIENNIEL REDUCTION FOR 100% OF THIS WATER YEAR

Initial Basin-Wide Operating Yield[2]	3000.00	Coastal Operating Yield[1]	2356.00
Natural Safe Yield (NSY)[9]	3000.00	Laguna Seca Operating Yield[2]	644.00

ALTERNATIVE PRODUCER ALLOCATIONS

Coastal Subarea [3]	AF	Laguna Seca Subarea [3]	AF
Seaside (Golf)	540.00	Nicklaus Club Monterey	251.00
SNG	149.00	Bishop	320.00
Calabrese	6.00	York School	32.00
Mission Memorial (Alderwood)	31.00	Laguna Seca County Park	41.00
Sand City	9.00		
Total[3]	735.00	Total[3]	644.00

ALTERNATIVE PRODUCER AMOUNT PUMPED WY 2022

Coastal Subarea [3]	AF	Laguna Seca Subarea [3]	AF	Total Alternative Producer WY 2022 Production
Seaside (Golf)	511.19	The Club at Pasadera	251.00	
SNG	0.00	Bishop	225.31	
Calabrese	0.00	York School	18.68	
Mission Memorial (Alderwood)	33.95	Laguna Seca County Park	25.22	
Sand City	1.65			
Total[3]	546.79	Total[3]	520.21	1067.00

STANDARD PRODUCER ALLOCATIONS

Coastal Operating Yield Available to Standard Producers (AF)			1621.00	Laguna Seca Operating Yield Available to Standard Producers (AF)			0.00
	Standard Producer Allocations				Standard Producer Allocations		
Coastal Subarea	Base Water Right %[4]	Weighted %. [5]	AF Available to This Producer	Laguna Seca Subarea	Base Water Right %[4]	Weighted %. [5]	AF Available to This Producer
California American Water (CAW)	77.55%	90.44%	1466.03	CAW	45.13%	100.00%	0.00
Seaside (Municipal)	6.36%	7.42%	120.28				
Granite Rock	0.60%	0.70%	11.35				
D.B.O. Development No. 30	1.09%	1.27%	20.59				
Calabrese (Cypress Pacific Investors LLC)	0.15%	0.17%	2.76				
Total	85.75%	100.0%	1621.00	Total	45.13%	100.0%	0.00

Allocation of Available Operating Yield Among Standard Producers	Base Water Right Available to this Producer (AF)	% NSY to SPA (Base Water Right ./. Total Water Right)	NSY Available to Producers (AF) Current Water Year	Free Carryover Credits from Prior Water Year	Not-Free Carryover Credits from Prior Water Year	Water Rights Transferred / Sold DBO to CAW 710 Amador (0.16) DBO to CAW 2 Upper Ragsdale (2.15)	Water Rights Transferred / Sold Calabrese to CAW Ryan Ranch CHOMP	Total Producer NSY (AF) (NSY Available + Free Carryover Credits)	Total Authorized Production Current WY (Base Water Right + APA non production[7] + All Carryover[6])	Actual AF Pumped by Producer in WY 2022	Free Carry over Credits to WY 2023	Not-Free Carry over Credits to WY 2023	Stored Water Credits to WY 2023
		NSY 3000 - 1067 AF =	WY 2022 APA Pumped 1067 AF 1,933.00					NSY 3000 - 1067 AF =	WY 2022 APA Pumped 1067 AF 1,933.00				
California American Water	1466.03	90.44%	1748.20	0.00	0.00	2.31	3.17	1753.68	1753.68	1648.71	0.00	104.97	872.10
Seaside (Municipal)	120.28	7.42%	143.43	0.00	0.00	0.00	0.00	143.43	143.43	155.12	0.00	0.00	0.00
Granite Rock	11.35	0.70%	13.53	208.96	27.12	0.00	0.00	222.49	249.60	0.00	222.49	27.12	0.00
D.B.O. Development No. 30	20.59	1.27%	24.55	388.20	38.98	(2.31)	0.00	410.44	449.43	0.00	410.44	38.98	0.00
Calabrese (Cypress Pacific Investors LLC)	2.76	0.17%	3.29	15.16	1.58	0.00	(3.17)	15.28	16.86	0.00	15.28	1.58	0.00
Total	1621.01	100.00%	1933.00	612.32	67.69	0.00	0.00	2545.32	2613.00	1803.83	648.21	172.65	872.10

Footnotes:

(1) From page 17 of Exhibit A (Amended Decision)of Court Order filed February 9, 2007.
(2) From page 14 of Exhibit A (Amended Decision)of Court Order filed February 9, 2007.
(3) From page 21 of Exhibit A (Amended Decision)of Court Order filed February 9, 2007.
(4) From Table 1 on page 19 of Exhibit A (Amended Decision) of Court Order filed February 9, 2007.
(5) Calculated from the Base Water Right percentages in the adjacent column. Any discrepancy in totals is due to rounding.
(6) Base Water Right plus Free and Not Free Carryover Credit = 2019 Production Allocation no longer capped due to increase in storage allocation (see 2020 Declaration of Usable Storage Space)
(7) Commencing Water Year 2021 Natural Safe Yield = Operating Yield of 3,000AF. Therefore, the remainder of 3,000AF - APA production is applied to both NSY & OY Standard Producer allocations
Note: Calabrese (Cypress Pacific Investors LLC) opted to convert 8AF of its 14AF Alternative Production Allocation to Standard Production Allocation on January 22, 2015 (notice filed by Cypress with Superior Court).
Producers carryover is capped at their storage capacity.

CALCULATION OF REPLENISHMENT ASSESSMENTS WATER YEAR 2022

Using the Basin-wide methodology approved by the Court on January 12, 2007, and as shown in detail on the spreadsheet contained in this attachement, Watermaster calculated the Water Year (WY) (October 1st through September 30th) 2022 Replenisment Assessments as follows:

	2022 Replenishment Assessment NSYO Unit Charge =					$3,260.00			
	2022 Replenishment Assessment OSYO Unit Charge =					$815.00			
2022 Natural Safe Yield (NSY) Available to Standard Producers =						1,933.00	AF (3,000 AF NSY - 1067.00 Alternative Producers 2022 Production)		
Standard Producers	**WY 2022 Production (AF)**	**% of NSY Available**	**Volume of NSY Available (AF)**	**NSY Overproduction (AF)**	**NSY Overproduction Assessment**	**Operating Yield Available (AF)**	**Operating Yield Overproduction (AF)**	**Operating Yield Overproduction Assessment**	**Total Assessment**
California American Water	1,648.71	90.44%	1,748.20	-	$ -	1,753.68	-	$ -	$ -
Seaside (Municipal)	155.12	7.42%	143.43	11.69	38,116.08	143.43	11.69	9,529.02	47,645.11
Granite Rock	-	0.70%	13.53	-	-	249.60	-	-	-
D.B.O. Development No. 30	-	1.27%	24.55	-	-	449.43	-	-	-
Calabrese (Cypress Pacific Inv.)	-	0.17%	3.29	-	-	16.86	-	-	-
Total Production	**1,803.83**	**100.00%**	1,933.00	**11.69**	**$ 38,116.08**	**2,613.00**	**11.69**	**$ 9,529.02**	**$ 47,645.11**
Alternative Producers	**WY 2021 Production (AF)**	**% of NSY Available**	**Volume of NSY Available (AF)**	**NSY Overproduction (AF)**	**NSY Overproduction Assessment**	**Operating Yield Available (AF)**	**Operating Yield Overproduction (AF)**	**Operating Yield Overproduction Assessment**	**Total Assessment**
City of Seaside (Golf Courses)	511.19	N/A	540.00	0.00	$ -	540.00	0.00	$ -	$0
Security National Guaranty	-	N/A	149.00	0.00	-	149.00	0.00	-	-
Calabrese (Cypress Pacific Inv.)	-	N/A	6.00	0.00	-	6.00	0.00	-	-
Mission Memorial (Alderwoods)	33.95	N/A	31.00	2.95	9,607.87	31.00	2.95	2,401.97	12,009.84
City of Sand City	1.65	N/A	9.00	0.00	-	9.00	0.00	-	-
Nicklaus Club Monterey	251.00	N/A	251.00	0.00	-	251.00	0.00	-	-
Laguna Seca Golf Resort (Bisho	225.31	N/A	320.00	0.00	-	320.00	0.00	-	-
York School	18.68	N/A	32.00	0.00	-	32.00	0.00	-	-
Laguna Seca County Park	25.22	N/A	41.00	0.00	-	41.00	0.00	-	-
Total Production	**1,067.00**	**N/A**	**1,379.00**	**2.95**	**$ 9,607.87**	**1,379.00**	**2.95**	**$ 2,401.97**	**$12,010**

ATTACHMENT 6

WATERMASTER BUDGETS FOR 2023

Seaside Groundwater Basin Watermaster
Administrative Fund Budget
Proposed Budget September 19, 2022
Administrative Year 2023

	2022 Adopted Adjusted Budget 5/4/2022	2022 Estimated Total	2023 Adopted Budget
Assessment Income			
Reserve/Rollover*	$ 34,500	$ 52,000	$ 39,500
Administrative Assessment	65,500	65,500	60,500
Mission Memorial Legal Costs		8,500	
Totals	100,000	126,000	100,000
Expenditures			
Contractual Services - Administrative	55,000	55,000	60,000
Legal Services	20,000	6,500	12,000
Public Awareness Committee	3,000	3,000	3,000
Total Expenses	78,000	61,500	75,000
Total Available	22,000	64,500	25,000
Less Reserve	22,000	25,000	25,000
Net Available	$ -	$ 39,500	$ -

** Note: The reserve/rollover balance of $39,500 was determined upon completion by Watermaster staff of a detailed reconciliation from 2006 through August 2022 of the Administrative Fund financial records held at the Watermaster office.*

Monitoring and Management Program Operations Budget For Tasks to be Undertaken in 2023								Comparative Costs from 2022 Budget
Task	Subtask	Sub-Subtask	Cost Description	CONSULTANTS & CONTRACTORS[3] MPWMD	Private Consultants	Contractors	Total	
			Labor					
			Technical Project Manager	$0	$75,000	$0	$75,000	$75,000
M.1 Program Administration								
	M.1.a		Project Budget and Controls	$0	$0	$0	$0	$0
	M.1.b		Assist with Board and TAC Agendas	$0	$0	$0	$0	$0
	M.1.c, M.1.d, & M.1.e		Preparation for and Attendance at Meetings and Peer Review of Documents and Reports[8]	$0	$28,280	$0	$28,280	$27,560
	M.1.f		QA/QC	$0	$0	$0	$0	$0
	M.1.g		SGMA Documentation Preparation	$0	$2,464	$0	$2,464	$2,380
I.1 Initial Phase 1 Monitoring Well Construction (Task Completed in Phase 1)								
I.2 Production, Water Level and Quality Monitoring								
	I. 2. a.		Database Management					
		I. 2. a. 1.	Conduct Ongoing Data Entry/ Database Maintenance/Enhancement[15]	$23,638	$8,600	$0	$32,238	$23,176
		I. 2. a. 2.	Verify Accuracy of Production Well Meters	$0	$0	$0	$0	$0
	I. 2. b.		Data Collection Program					
		I. 2. b. 1.	Site Representation and Selection[7]	$0	$0	$0	$0	$0
		I. 2. b. 2.	Collect Water Levels[6]	$20,042	$0	$0	$20,042	$21,490
		I. 2. b. 3.	Collect Water Quality Samples and Perform Sentinel Well Induction Logging[1][5]	$17,196	$0	$11,014	$28,210	$39,335
		I. 2. b. 4.	Update Program Schedule and Standard Operating Procedures.	$0	$0	$0	$0	$0
		I. 2. b. 5.	Monitor Well Construction[7]	$0	$0	$0	$0	$0
		I. 2. b. 6.	Reports	$3,568	$0	$0	$3,568	$3,136
		I. 2. b. 7.	CASGEM Data Submittal for Watermaster's Voluntary Wells	$5,352	$0	$0	$5,352	$4,704
I.3 Basin Management								
	I. 3. a.		Enhanced Seaside Basin Groundwater Model	(Costs Shown in Subtasks Below)				
		I. 3. a. 1	Update the Existing Model[11]	$0	$0	$0	$0	$0
		I. 3. a. 2	Develop Protective Water Levels[12]	$0	$0	$0	$0	$0
		I. 3. a. 3	Evaluate Replenishment Scenarios and Develop Answers to Basin Management Questions[10]	$0	$60,000	$0	$60,000	$60,000
	I. 3. b.		Complete Preparation of Basin Management Action Plan	$0	$0	$0	$0	$0
	I. 3. c.		Refine and/or Update the Basin Management Action Plan	$0	$0	$0	$0	$0
	I. 3. d		Evaluate Coastal Wells for Cross-Aquifer Contamination Potential	$0	$0	$0	$0	$0
	I. 3. e		Seaside Basin Geochemical Model[13]	$0	$10,000	$0	$10,000	$10,000
I.4 Seawater Intrusion Contingency Plan								
	I. 4. a.		Oversight of Seawater Intrusion Detection and Tracking[17]	$0	$0	$0	$0	$0
	I. 4. c.		Annual Report- Seawater Intrusion Analysis[16]	$0	$27,176	$0	$27,176	$26,290
	I. 4. e.		Refine and/or Update the Seawater Intrusion Response Plan[2][9]	$0	$0	$0	$0	$0
	I. 4. f.		If Seawater Intrusion is Determined to be Occurring, Implement Contingency Response Plan[2]	(No Costs are Included for This Task, as This Task Will Likely Not be Necessary During 2021. If it Does Become Necessary, Use of Contingency Funds or a Budget Modification Will Likely be Necessary)				
		TOTALS CONSULTANTS & CONTRACTORS		**$69,796**	**$211,520**	**$11,014**		
			SUBTOTAL not including Technical Program Manager =				$217,330	$218,071
			Contingency (not including Technical Program Manager) @ 15%[4]=				$32,600	$21,807
			Technical Program Manager =				$75,000	$75,000
			TOTAL=				**$324,930**	**$314,878**

Footnotes:

(1) Under this Subtask the Watermaster will directly contract with an outside contractor to perform the Sentinel Well induction logging work, and to also collect water level data in conjunction with doing the induction logging. MPWMD will perform the other portions of the work of this Subtask. As reported in the 2022 Annual Report, starting in WY 2023 the Sentinel Wells will be induction logged once per year (in September) rather than twice per year as had been the practice in preceding years.

(2) The response plan would only be implemented in the event sea water intrusion is determined to be occurring.

(3) Within the context of this document the term "Consultant" refers either to a Private Consultant providing professional engineering or other types of technical services, or to the Monterey Peninsula Water Management District (MPWMD). The term "Contractor" refers to a firm providing construction or field services such as well drilling, induction logging, or meter calibration.

(4) Due to the uncertainties of the exact scopes of some of the larger Tasks listed above at the time of preparation of this Budget it is recommended that a Contingency of approximately 15% be included in the Budget.

(5) The MPWMD portion of this Task includes: (1) $900 to purchase a new sampling pump if an existing one needs to be replaced, (2) $476 for vehicle mileage costs for both this Task and Task I.2.b.2, (3) $6,200 for laboratory analytical costs, (4) $150 for CO2 bottles to run the sample pumps, and (5) $712 of administrative support costs for preparing billings and processing invoices from the water quality laboratory.

(6) Does not include costs for MPWMD to collect water level data or water quality samples from wells other than those that are part of the basic monitoring well network, i.e. for private well owners who have requested that the Watermaster obtain this data for them. Costs to obtain that data are to be reimbursed to the Watermaster by those well owners, so there should be no net cost to the Watermaster for that portion of the work under these Tasks. Includes the purchase and installation of one new replacement datalogger at a price of $850 including installation parts, or to keep in inventory as a spare if needed,

(7) A replacement for monitoring well FO-9 Shallow is expected to be constructed in 2023, but the planning and design of the well is expected to be performed in 2022. All of the costs for this work were contained in the Capital Budget for 2022, but only the planning and design work is expected to be charged to the 2022 Capital Budget. The costs for installation of the well have been included in the Capital Budget for 2023. No costs for any work on this well are included in the Operations Budget, all costs are included in the Capital Budgets.

(8) This cost is for Montgomery and Associates, Todd Groundwater, and Martin Feeney to provide hydrogeologic consulting assistance to the Watermaster, beyond that associated with performing other specified Tasks, when requested to do so by the Technical Program Manager. This work may include, but not be limited to, participation in conference calls and reviewing documents prepared by others.

(9) If work under this Task is found to be necessary, it will be funded through the Contingency line item in this Budget.

(10) This Task is included to provide funds for the Watermaster to perform modeling and other investigative work to aid in making Basin management decisions. The line-item budget for this Task includes an estimated $30,000 to perform additional modeling to refine the evaluation performed in 2022 regarding the flow direction and flow velocity of seawater intrusion, if it were to occur. It includes an additional $30,000 for other work that the Board may wish to perform in 2023.

(11) The Model was updated and recalibrated in 2018, so no costs for this Task are anticipated in 2023.

(12) The protective water levels developed in 2009 were examined in 2013 to see if they needed to be updated. It was concluded that the 2009 protective levels were still satisfactory for Basin management purposes, and that no revisions were needed. No work under this Task is anticipated in 2023.

(13) This was a new Task that was started in 2018, and was completed for the PWM AWT water in 2019. Funds allocated for this Task in 2023 would only be used if geochemical modeling is performed in 2023 for the MPWSP desalination plant water, and if that modeling indicates the need to have Montgomery and Associates use the Seaside Basin groundwater model to provide additional information needed by the geochemical model to develop miitgation measures for any adverse water quality impacts the geochemical model predicts could occur from introducing desalinated water into the Basin.

(14) Not used.

(15) Includes $300/month for an outside consultant to maintain the Watermaster's website and post documents on it, and a one-time amount of $5,000 for him to reformat it into the WordPress format, which is now is the industry standard.. Also includes $2,230 for MPWMD to respond to requests from consultants and others for data from the database.

(16) MPWMD's costs to assist in this Task are included in its costs under Task I.2.b.6.

(17) MPWMD's and Montgomery & Associates' costs to provide oversight in this Task are included under their other Tasks.

Monitoring and Management Program Capital Budget For Tasks to be Undertaken in 2023

A replacement for monitoring well FO-9 Shallow was initially expected to be installed in 2022, but is now not expected to be installed until 2023. The consultant is expected to plan and design the well in 2022 and for those costs to be paid out of the 2022 Capital Budget. However, the actual installation of the well is not expected to be performed until 2023, and for the installation work to be paid for out of the 2023 M&MP Capital Budget. The estimated cost for the well drilling contractor to install the well, and consultant costs to oversee that work, are included in this 2023 Capital Budget. It is hoped that there will be a 3-way cost sharing agreement between the Watermaster, MPWMD, and MCWD for that work. However, the Watermaster will likely have to pay the largest share of the cost. A scope and cost proposal provided to the Watermaster by its consultant, Montgomery & Associates, indicates that the well installation costs that are expected to be incurred in 2023 will be approximately $240K. This figure includes the well driller's costs, consultant costs for construction management, preparation and filing of the necessary Well Installation Report, and a small allowance for miscellaneous costs such as providing a source of water to the drilling site, permits, and approvals, etc. To ensure that the well can be installed in 2023, the amount budgeted for this Task is the full $240K. Assuming that a 3-way cost-sharing agreement can be achieved, the Watermaster's actual costs would be lower than this by some amount, depending on the agreement for allocating costs between the three parties.

Monitoring and Management Program Capital Budget For Tasks to be Undertaken in 2024

No Capital projects are anticipated to be undertaken in 2024, so this budget is $0.

Seaside Groundwater Basin Watermaster

Replenishment Fund

10/5/22

Page 1

Water Year 2023 (October 1 - September 30) / Fiscal Year (January 1 - December 31, 2023)

Proposed 2023 Budget

Replenishment Fund		**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Assessment Water Year		WY 05/06	WY 06/07	WY 07/08	WY 08/09	WY 09/10	WY 10/11	WY 11/12	WY 12/13	WY 13/14	WY 14/15	WY 15/16
Unit Cost:	a	$1,132 / $283	$1,132 / $283	$2,485 / 621.25	$3,040 / $760	$2,780 / $695	$2,780 / $695	$2,780 / $695	$2,780 / $695	$2,702/$675.50	$2,702/$675.50	$2,702/$675.50
Cal-Am Water Balance Forward	b	**$ -**	**$ 1,641,004**	**$ 4,226,710**	**$ (2,871,690)**	**$ (2,839,939)**	**$ (3,822,219)**	**$ (6,060,164)**	**$ (8,735,671)**	**$ (6,173,771)**	**$ (3,102,221)**	**$ (676,704)**
Cal-Am Water Production (AF)	c	*3,710.00*	*4,059.90*	*3,862.90*	*2,966.02*	*3,713.52*	*3,416.04*	*3,070.90*	*3,076.61*	*3,232.10*	*2,764.73*	*1,879.21*
Cal-Am Water NSY Over-Production (AF)	d	*1,862.69*	*2,266.32*	*2,092.16*	*1,241.27*	*1,479.47*	*1,146.71*	*820.48*	*856.42*	*1,032.77*	*782.17*	-
Exceeding Natural Safe Yield Considering Alternative Producers	e	$ 2,106,652	$ 2,565,471	$ 5,199,014	$ 3,773,464	$ 4,112,933	$ 3,187,854	$ 2,280,943	$ 2,380,842	$ 2,790,539	$ 2,113,414	$ -
Operating Yield Overproduction Replenishment	f	**$ -**	$ 20,235	$ 8,511	$ -	$ -	$ -	$ 154,963	$ 181,057	$ 281,012	$ 312,103	$ -
Total California American	g	**$ 2,106,652**	**$ 2,585,706**	**$ 5,207,525**	**$ 3,773,464**	**$ 4,112,933**	**$ 3,187,854**	**$ 2,435,907**	**$ 2,561,899**	**$ 3,071,550**	**$ 2,425,516**	
CAW Credit Against Assessment	h	$ (465,648)		$ (12,305,924)	$ (3,741,714)	$ (5,095,213)	$ (5,425,799)	$ (5,111,413)				
CAW Unpaid Balance	i	***$ 1,641,004***	***$ 4,226,710***	***(2,871,690)***	***$ (2,839,939)***	***$ (3,822,219)***	***$ (6,060,164)***	***$ (8,735,671)***	***$ (6,173,771)***	***$ (3,102,221)***	***$ (676,704)***	***$ (676,704)***
City of Seaside Balance Forward	j	**$ -**	**$ 243,294**	**$ 426,165**	**$ 1,024,272**	**$ 1,619,973**	**$ 891,509**	**$ (110,014)**	**$ (773,813)**	**$ (1,575,876)**	**$ (2,889,325)**	**$ (3,346,548)**
City of Seaside Municipal Production (AF)	k	*332.00*	*287.70*	*294.20*	*293.44*	*282.87*	*240.68*	*233.72*	*257.73*	*223.64*	*185.01*	*195.16*
City of Seaside NSY Over-Production (AF)	l	*194.07*	*153.78*	*161.99*	*153.06*	*113.21*	*50.84*	*58.82*	*85.17*	*52.71*	*25.77*	*37.87*
Exceeding Natural Safe Yield Considering Alternative Producers	m	$ 219,689	$ 174,082	$ 402,540	$ 465,300	$ 314,721	$ 141,335	$ 163,509	$ 236,782	$ 142,410	$ 69,630	$ 102,330
Operating Yield Overproduction Replenishment	n	$ 12,622	$ 85	$ 4,225	$ 16,522	$ 20,690	$ -	$ 1,689	$ 27,007	$ 3,222	$ 38	$ 11,959
Total Municipal	o	$ 232,310	$ 174,167	$ 406,764	$ 481,823	$ 335,412	$ 141,335	$ 165,198	$ 263,788	$ 145,631	$ 69,667	$ 114,290
City of Seaside - Golf Courses (APA - 540 AFY)												
Exceeding Natural Safe Yield - Alternative Producer	p	$ -	$ -	$ 131,705	$ 69,701	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Operating Yield Overproduction Replenishment	q	$ -	$ -	$ 32,926	$ 17,427	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Golf Courses	r	$ -	$ -	$ 164,631	$ 87,128	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total City of Seaside*	s	**$ 232,310**	**$ 174,167**	**$ 571,395**	**$ 568,951**	**$ 335,412**	**$ 141,335**	**$ 165,198**	**$ 263,788**	**$ 145,631**	**$ 69,667**	**$ 114,290**
City of Seaside Late Payment 5%	t	$ 10,984	$ 8,704	$ 26,712	$ 26,750	$ 15,737						
In-lieu Credit Against Assessment	u					$ (1,079,613)	$ (1,142,858)	$ (828,996)	$ (1,065,852)	$ (1,459,080)	$ (526,890)	$ (162)
City of Seaside Unpaid Balance	v	***$ 243,294***	***$ 426,165***	***$ 1,024,272***	***$ 1,619,973***	***$ 891,509***	***$ (110,014)***	***$ (773,813)***	***$ (1,575,876)***	***$ (2,889,325)***	***$ (3,346,548)***	***$ (3,232,420)***
Mission Memorial Park												
Mission Memorial Park Production (AF)	w			*20.80*	*26.40*	*12.80*	*22.40*	*27.00*	*24.95*	*24.89*	*17.97*	*13.67*
Mission Memorial Park NSY Over-Production (AF)	x	-	-	-	-	-	-	-	-	-	-	-
Exceeding Natural Safe Yield - Alternative Producer	y	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Operating Yield Overproduction Replenishment	z	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Mission Memorial Park	aa	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Replenishment Fund Balance	bb	**$ 1,884,298**	**$ 4,652,874**	**$ (1,847,417)**	**$ (1,219,966)**	**$ (2,930,710)**	**$ (6,170,178)**	**$ (9,509,483)**	**$ (7,749,648)**	**$ (5,991,546)**	**$ (4,023,252)**	**$ (3,909,125)**
Replenishment Fund Balance Forward	cc	$ -	**$ 1,884,298**	**$ 4,652,874**	**$ (1,847,417)**	**$ (1,219,966)**	**$ (2,930,710)**	**$ (6,170,178)**	**$ (9,509,483)**	**$ (7,749,648)**	**$ (5,991,546)**	**$ (4,023,252)**
Total Replenishment Assessments	dd	$ 2,349,946	$ 2,768,576	$ 5,805,632	$ 4,369,165	$ 4,464,082	$ 3,329,189	$ 2,601,104	$ 2,825,688	$ 3,217,182	$ 2,495,183	$ 114,290
Total Paid and/or Credited	ee	$ (465,648)	$ -	$ (12,305,924)	$ (3,741,714)	$ (6,174,826)	$ (6,568,657)	$ (5,940,409)	$ (1,065,852)	$ (1,459,080)	$ (526,890)	$ (162)
Grand Total Fund Balance	ff	**$ 1,884,298**	**$ 4,652,874**	**$ (1,847,417)**	**$ (1,219,966)**	**$ (2,930,710)**	**$ (6,170,178)**	**$ (9,509,483)**	**$ (7,749,648)**	**$ (5,991,546)**	**$ (4,023,252)**	**$ (3,909,125)**

** 2010 = 319.55 AF golf course in-lieu replenishment and 68.8 AF 4-party agmt in-lieu replenishment*

2011 = 411.1 AF golf course in-lieu replenishment

2012 = 298.2 AF golf course in-lieu replenishment

2013 = 383.4 AF golf course in-lieu replenishment

2014 = 552.4 AF golf course in-lieu capped at 540 AF

2015 = 195.0 AF golf course in-lieu

2016 = 00.06 AF golf course in-lieu

2017 = 00.00 AF golf course in-lieu

Seaside Groundwater Basin Watermaster
Replenishment Fund
Water Year 2023 (October 1 - September 30) / Fiscal Year (January 1 - December 31, 2023)
Proposed 2023 Budget

Replenishment Fund		2017	2018	2019	2020	WY 2021	Budget WY 2022	Totals WY 2006 Through 2022	Budget WY 2023	Projected Totals Through WY 2022
Assessment Water Year		WY 16/17	WY 17/18	WY 18/19	WY 19/20	WY 20/21	WY 21/22		WY 22/23	
Unit Cost:	a	$2,872 / $718	$2,872 / $718	$2,872 / $718	$2,872 / $718	$2,947 / $737	$3,260/ $815		$3,461/ $865	
Cal-Am Water Balance Forward	b	**$ (676,704)**	**$ (491,747)**	**$ (48,797,949)**	**$ (47,979,852)**	**$ (46,855,121)**	**$ (46,855,121)**		**$ (46,735,121)**	
Cal-Am Water Production (AF)	c	*2,029.51*	*2,229.45*	*2,120.22*	*2,245.88*	*1,664.04*		*46,041.03*		
Cal-Am Water NSY Over-Production (AF)	d	*64.40*	*374.65*	*284.85*	*334.21*	-		*14,638.57*		
Exceeding Natural Safe Yield Considering Alternative Producers	e	$ 184,957	$ 1,075,995	$ 818,097	$ 959,859	$ -	$ 100,000	$ 33,650,034	$ 100,000	$ 33,750,034
Operating Yield Overproduction Replenishment	f				$ 164,872	$ -	$ 20,000	$ 1,142,753	$ 20,000	$ 1,162,753
Total California American	g	**$ 184,957**	**$ 1,075,995**	**$ 818,097**	**$ 1,124,731**	**$ -**	**$ 120,000**	**$ 34,792,786**	**$ 120,000**	**$ 34,912,786**
CAW Credit Against Assessment	h		$ (49,382,196)	$ -	$ -	$ -	$ -	$ (81,527,907)	$ -	$ (81,527,907)
CAW Unpaid Balance	i	***$ (491,747)***	***$ (48,797,949)***	***$ (47,979,852)***	***$ (46,855,121)***	***$ (46,855,121)***	***$ (46,735,121)***	***$ (46,735,121)***	***$ (46,615,121)***	***$ (46,615,121)***
City of Seaside Balance Forward	j	**$ (3,232,420)**	**$ (3,142,500)**	**$ (3,022,249)**	**$ (2,919,806)**	**$ (2,802,831)**	**$ (2,708,828)**		**$ (2,598,828)**	
City of Seaside Municipal Production (AF)	k	*188.31*	*184.63*	*178.40*	*181.65*	*174.69*		*3,733.83*		
City of Seaside NSY Over-Production (AF)	l	*30.47*	*32.46*	*27.82*	*32.06*	*25.52*		*1,235.62*		
Exceeding Natural Safe Yield Considering Alternative Producers	m	$ 87,512	$ 93,225	$ 79,893	$ 92,089	$ 75,197	$ 100,000	$ 2,960,242	$ 100,000	$ 3,060,242
Operating Yield Overproduction Replenishment	n	$ 2,409	$ 27,026	$ 22,550	$ 24,886	$ 18,806	$ 10,000	$ 203,734	$ 10,000	$ 213,734
Total Municipal	o	$ 89,920	$ 120,251	$ 102,443	$ 116,975	$ 94,003	$ 110,000	$ 3,163,977	$ 110,000	$ 3,273,977
City of Seaside - Golf Courses (APA - 540 AFY)										
Exceeding Natural Safe Yield - Alternative Producer	p	$ -	$ -	$ -	$ -	$ -		$ 201,406		$ 201,406
Operating Yield Overproduction Replenishment	q	$ -	$ -	$ -	$ -	$ -		$ 50,353		$ 50,353
Total Golf Courses	r	$ -		$ -	$ -	$ -		$ 251,759		$ 251,759
Total City of Seaside*	s	**$ 89,920**	**$ 120,251**	**$ 102,443**	**$ 116,975**	**$ 94,003**	**$ 110,000**	**$ 3,415,736**	**$ 110,000**	**$ 3,525,736**
City of Seaside Late Payment 5%	t							$ 88,887		$ 88,887
In-lieu Credit Against Assessment	u					-	-	$ (6,103,451)	-	$ (6,103,451)
City of Seaside Unpaid Balance	v	***$ (3,142,500)***	***$ (3,022,249)***	***$ (2,919,806)***	***$ (2,802,831)***	***$ (2,708,828)***	***$ (2,598,828)***	***$ (2,598,828)***	***$ (2,488,828)***	***$ (2,488,828)***
Mission Memorial Park (APA - 31 AFY)										
Mission Memorial Park Production (AF)	w	*13.74*	*14.43*	*16.07*	*20.00*	*46.77*	*31.00*	*332.89*		
Mission Memorial Park NSY Over-Production (AF)	x	-	-	-	-	*15.77*	-	*15.77*		
Exceeding Natural Safe Yield - Alternative Producer	y	$ -	$ -	$ -	$ -	$ 46,488	$ -	$ 46,488		$ 46,488
Operating Yield Overproduction Replenishment	z	$ -	$ -	$ -	$ -	$ 11,626	$ -	$ 11,626		$ 11,626
Board Approved (5/4/22) Credit Against Assessment						(33,114)		$ (33,114)	-	$ (33,114)
Mission Memorial Park Unpaid Balance	aa	$ -		$ -	$ -	**$ -**	$ -	$ -		$ -
Total Replenishment Fund Balance	bb	**$ (3,634,247)**	**$ (51,820,198)**	**$ (50,899,658)**	**$ (49,657,952)**	**$ (49,563,949)**	**$ (49,333,949)**	**$ (49,333,949)**	**$ (49,103,949)**	**$ (49,103,949)**
Replenishment Fund Balance Forward	cc	**$ (3,909,125)**	**$ (3,634,247)**	**$ (51,820,198)**	**$ (50,899,658)**	**$ (49,657,952)**	**$ (49,588,949)**		**$ (49,358,949)**	
Total Replenishment Assessments	dd	$ 274,877	$ 1,196,246	$ 920,540	$ 1,241,706	$ 94,003	$ 230,000	$ 38,297,410	$ 230,000	**$ 38,527,410**
Total Paid and/or Credited	ee		$ (49,382,196)			$ (25,000)	$ -	$ (87,656,358)	$ -	**$ (87,656,358)**
Grand Total Fund Balance	ff	**$ (3,634,247)**	**$ (51,820,198)**	**$ (50,899,658)**	**$ (49,657,952)**	**$ (49,588,949)**	**$ (49,358,949)**	**$ (49,358,949)**	**$ (49,128,949)**	**$ (49,128,949)**

ATTACHMENT 7

EXECUTIVE SUMMARY
FROM THE
WY 2022 SEAWATER INTRUSION ANALYSIS REPORT

MONTGOMERY & ASSOCIATES

EXECUTIVE SUMMARY

This report fulfills part of the annual reporting requirements contained in the Seaside Groundwater Basin Adjudication (California American Water v. City of Seaside, Monterey County Superior Court, Case Number M66343). The annual report addresses the potential for, and extent of, seawater intrusion in the Seaside Groundwater Basin (Basin).

Seawater intrusion may occur under basic hydrogeologic conditions as a wedge beneath fresh groundwater, or in more complex hydrogeology with various intrusion interfaces among the different aquifers. Continued pumping in excess of recharge and freshwater inflows, coastal groundwater levels well below sea level, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion could occur in the Basin.

Seawater intrusion is typically identified through regular chemical analyses of groundwater which can identify geochemical changes in response to seawater intrusion. No single analysis definitively identifies seawater intrusion, however by examining various analyses it is possible to ascertain when fresh groundwater mixes with seawater. At low chloride concentrations, it is often difficult to identify incipient seawater intrusion. This is due to the natural variation in fresh water chemistry at chloride concentrations below 1,000 milligrams per liter (mg/L). Mixing trends between groundwater and seawater are more easily defined when chloride concentrations exceed 1,000 mg/L. Common geochemical indicators of seawater intrusion are cation and anion ratios, chloride trends, sodium/chloride ratios, and electric induction logging.

As noted in the previous 3 Seawater Intrusion Analysis Reports (SIARs) (M&A, 2019; M&A, 2020; M&A, 2021), monitoring well FO-10 Shallow, located outside and just north of the Basin, has experienced sustained chloride increases and currently has a sodium/chloride molar ratio below 0.86, which may suggest a seawater chloride source. Induction logging of this well took place in March 2021 and confirmed chloride concentrations in groundwater but was inconclusive as to whether this results from seawater intrusion (Feeney, 2021). Following this development, analysis of historical records conducted in February 2022 discovered that a 1,300 foot long 2-inch diameter steel tremie pipe had been stuck in the FO-10 borehole since its construction in 1997 (Feeney, 2022). The presence of this steel pipe, which conducts electricity through the borehole and may be allowing water to travel between upper and lower zones, explains the inconclusive results from the March 2021 induction logging. It is suggested that FO-10 Shallow and FO-10 Deep be destroyed and replaced to maintain robust water quality monitoring in the area. Sentinel Well induction logs, now performed annually, remain stable over the historical record. No data collected in Water Year (WY) 2022 indicate that seawater intrusion is occurring within the Basin.

Based on the findings of this report, ongoing detrimental groundwater conditions that pose a direct threat of seawater intrusion are:

- Both the Paso Robles and Santa Margarita aquifers in the Seaside Groundwater Basin are susceptible to seawater intrusion. The Paso Robles aquifer is in direct hydrogeologic connection with Monterey Bay, and seawater will eventually flow into it if inland groundwater levels continue to be below sea level. The Santa Margarita aquifer may not be in direct connection with Monterey Bay. If that is the case, then seawater intrusion will take longer to appear because the pathway for seawater into that aquifer will be longer as seawater would need to move through the clay rich deposits overlying that aquifer before entering the aquifer itself and thereafter make its way into the Santa Margarita aquifer. It is not if, but when, seawater intrusion into these aquifers will occur if protective water elevations are not achieved.

- Santa Margarita aquifer groundwater levels in the Northern Coastal subarea continue to be below sea level. WY2022 second quarter (winter/spring) coastal groundwater levels in that aquifer are more than 40 feet below sea level, and the fourth quarter (summer/fall) levels are more than 60 feet below sea level. Pumping depressions expanded both vertically and spatially from the previous year in both the Paso Robles and Santa Margarita aquifer systems.

- Groundwater levels remain below protective elevations in all Santa Margarita protective elevation monitoring wells (MSC deep, PCA-W Deep, and sentinel well SBWM-3), and 2 of 3 Paso Robles protective elevation monitoring wells (MSC Shallow and PCA-W Shallow). All 3 Santa Margarita monitoring wells' groundwater elevations are at the lowest in their historical records. Monitoring Elevations at PCA-W shallow were above protective elevations in early WY2020 but have since dropped below. Besides CDM-MW4, all wells for which protective elevations have been established declined in elevation from the previous year.

Data that indicate that seawater intrusion is not occurring are described in the bulleted items below:

- Most groundwater samples for WY2022 from depth-discreet monitoring wells generally plot in a single cluster on Piper diagrams, with no water chemistry changes towards seawater. Increased chloride in recent measurements at FO-10 Shallow, north of the Basin, has shifted how this wells plots on Piper diagrams over the past 3 years. Currently, it appears to be shifting towards a chlorinated water type. As described above, induction logging of this well was inconclusive as to whether seawater intrusion is causing this change in water quality due to the presence of an abandoned steel pipe in the borehole

since the well's construction. This steel pipe may also be serving as a conduit to allow groundwater flow between aquifer zones. Groundwater quality in FO-10 Shallow should continue to be monitored closely to identify if further increases occur, and it is suggested that both FO-10 Shallow and FO-10 Deep be destroyed and replaced to maintain a water quality record in the area.

- In some production wells, groundwater quality plots differently on Piper diagrams compared to monitoring wells. This may be a result of mixed water quality from both the Paso Robles and Santa Margarita aquifers in which these wells are perforated. None of the production wells' groundwater qualities are indicative of seawater intrusion.
- None of the Stiff diagrams for monitoring and production wells show the characteristic chloride spike that typically indicates seawater intrusion in Stiff diagrams. The Stiff diagram for monitoring well FO-10 Shallow shows a slightly different shape than other Paso Robles aquifer wells because of increased chloride.
- Chloride concentration trends are stable for most monitoring wells, except FO-10 Shallow which experienced a 48 mg/L increase in chloride concentrations in WY2020 and has risen by another 8 mg/L since then. However, the sustained elevated concentrations in themselves do not indicate seawater intrusion. As noted above, recent induction logging of the well was unable to provide data with regard to whether seawater intrusion is the source of the elevated chloride level, and the well's integrity for water quality sampling may be compromised by a steel tremie pipe stuck in the borehole since 1997.
- Sodium/chloride molar ratios in most monitoring wells remained constant or increased over the past year. The sodium chloride ratio in 2 of the 3 samples taken at FO-10 Shallow in WY2022 were lower than what has been seen historically at the location. The ratio from 5 of the 7 samples tested since September 2020 are below 0.86. A sodium/chloride ratio less than 0.86 signifies a potential seawater chloride source. It is likely the groundwater quality changes in FO-10 Shallow are permanent and the well should continue to be monitored consistently to track if chloride concentrations increase further. If the well is destroyed and replaced due to the stuck steel pipe mentioned above, water quality from the replacement well should similarly be closely monitored to evaluate changes in chloride over time.
- Maps of chloride concentrations for the Paso Robles aquifer do not show chlorides increasing towards the coast. Santa Margarita aquifer chloride concentration maps show that the highest chloride concentrations are limited to coastal monitoring wells PCA-West Deep and MSC Deep, but these are not indicative of seawater intrusion since their concentrations are less than 155 mg/L and they do not have increasing trends. Two wells, Pasadera Golf- Paddock and Ord Terrace Shallow, sustained a >20 mg/L chloride

increase from WY2021, but as evidenced by their distance from the coast this is not a result of seawater intrusion.

- Induction logging data at the coastal Sentinel Wells do not show historical or recent changes over time that are indicative of seawater intrusion.

Other important findings from the analysis contained in this report are:

- Due to its distance from the coast, seawater intrusion is not an issue of concern in the Laguna Seca subarea. However, groundwater levels in the eastern Laguna Seca subarea have historically declined at rates of 0.6 feet per year in the Paso Robles aquifer, and up to 4 feet per year in the Santa Margarita aquifer. These declines have occurred since 2001, despite triennial reductions in allowable pumping. The cause of the declines is due in part to the Natural Safe Yield of the subarea being too high and in part due to the influence of wells east of the Seaside Basin. In WY2022, groundwater elevations in the area appeared to experience some stabilization and recovery, potentially correlated with a cessation of pumping from CAWC's Laguna Seca Subarea wells. This recovery has continued in WY2022.
- Native groundwater production in the Seaside Groundwater Basin for WY2022 was 2,870 acre-feet, which is 43 acre-feet more than WY2021 but 129 acre-feet less than the Decision-ordered Operating Yield for WY2022 of 3,000 acre-feet. Despite WY2022 being a very dry year, recovery of 3,683 acre-feet of recycled water from PWM helped offset pumping. Native groundwater production was below the Decision-estimated Natural Safe Yield of 3,000 acre-feet for the third year in the historical record, largely due to increased injection of highly treated recycled water.

The following recommendations should be implemented to monitor and track seawater intrusion.

1. Following identification of a compromised well casing, monitoring well FO-9 Shallow was destroyed to prevent leakage of higher chloride water into the underlying aquifer. In accordance with current plans, a similarly constructed monitoring well will replace the destroyed well to ensure continuity of groundwater level measurements from this location. It is anticipated that a new well will be constructed in 2023.
2. The discovery of a 1,300-foot steel tremie pipe in the FO-10 borehole complicates evaluation of water quality at the location and may act as a conduit allowing groundwater to flow between overlying sediments and the underlying aquifers. These wells are outside of the Basin, yet still provide critical information regarding the extent of seawater intrusion north of the Basin in the Monterey Subbasin. Therefore, it is recommended that MPWMD develop plans to destroy both FO-10 Shallow and FO-10 Deep, and that MCWD install similarly constructed monitoring wells to maintain a continuous water quality record at the location. Because seawater intrusion cannot be

excluded as the source of increasing chloride concentrations at FO-10 Shallow over the past several years, groundwater quality sampling at this well should continue at the increased quarterly frequency until the well is destroyed. When the well is replaced, the replacement well should likewise be sampled at a quarterly frequency. As detailed in the Monterey Subbasin GSP (MCWDGSA and SVBGSA, 2022) Section 9.4.7, additional monitoring wells may be installed in both the Lower 180-Foot and 400-Foot Aquifer and the Deep aquifers of the Monterey Subbasin. The proposed location for these wells is in an identified data gap area northeast of FO-10 Shallow (see Monterey Subbasin GSP Figures 7-7 and 7-8). When these wells are installed, they may provide additional insight into potential seawater intrusion in the area.

3. Seawater intrusion is a threat to the Basin, and data must be collected and analyzed regularly to identify incipient intrusion. Maps, graphs, and analyses like those found in this report should continue to be developed every year.

4. It is important to remain vigilant and to closely monitor groundwater quality even though seawater intrusion has not yet been observed in monitoring or production wells in the Basin. As outlined in the most recent Basin Management Action Plan (M&A, 2018a), it is important that the Watermaster continues to promote projects to obtain replenishment water for the Basin that is not extracted out as water supply.

5. Based on the WY2020's SIAR recommendation, groundwater elevation data from the Carmel River water Aquifer Storage and Recovery project (ASR) and PWM monitoring wells are now incorporated into the analysis of groundwater elevations. Although the Watermaster asked for this data to be provided, data from the PWM monitoring wells was not provided for this year's analysis. As these and any future projects are implemented, groundwater levels, groundwater flow directions, and potentially groundwater quality will change. It is important that data from monitoring wells associated with these projects be evaluated in future SIARs.

ATTACHMENT 8

SEASIDE GROUNDWATER BASIN
2023 MONITORING AND MANAGEMENT PROGRAM

Seaside Groundwater Basin
2023 Monitoring and Management Program

The tasks outlined below are those that are anticipated to be performed during 2023. Some Tasks listed below are specific to 2023, while other Tasks are recurring such as data collection, database entry, and Program Administration Tasks.

Within the context of this document the term "Consultant" refers either to a firm providing professional engineering or other types of technical services, or to the Monterey Peninsula Water Management District (MPWMD). The term "Contractor" refers to a firm providing construction or field services such as well drilling, induction logging, or meter calibration.

M.1 Program Administration

M. 1. a **Project Budget and Controls** **($0)**	Consultants will provide monthly or bimonthly invoices to the Watermaster for work performed under their contracts with the Watermaster. Consultants will perform maintenance of their internal budgets and schedules, and management of their subconsultants. The Watermaster will perform management of its Consultants.
M. 1. b **Assist with Board and TAC Agendas** **($0)**	Watermaster staff will prepare Board and TAC meeting agenda materials. No assistance from Consultants is expected to be necessary to accomplish this Task.
M. 1. c., M. 1. d, & M.1.e **Preparation for and Attendance at Meetings, and Peer Review of Documents and Reports** **($28,280)**	The Consultants' work will require internal meetings and possibly meetings with outside governmental agencies and the public. For meetings with outside agencies, other Consultants, or any other parties which are necessary for the conduct of the work of their contracts, the Consultants will set up the meetings and prepare agendas and meeting minutes to facilitate the meetings. These may include planning and review meetings with Watermaster staff. The costs for these meetings will be included in their contracts, under the specific Tasks and/or subtasks to which the meetings relate. The only meeting costs that will be incurred under Tasks M.1.c, M.1.d, and M.1.e will be: • Those associated with attendance at TAC meetings (either in person or by videoconference connection), including providing periodic progress reports to the Watermaster for inclusion in the agenda packets for the TAC meetings, when requested by the Watermaster to do so. These progress reports will typically include project progress that has been made, problem identification and resolution, and planned upcoming work. • From time-to-time when Watermaster staff asks Consultants to make special presentations to the Watermaster Board and/or the TAC, and which are not included in the Consultant's contracts for other tasks. Appropriate Consultant representatives will attend TAC meetings (either in person or by videoconference connection) when requested to do so by Watermaster Staff, but will not be asked to prepare agendas or meeting minutes. As necessary, Consultants may provide oral updates to their progress reports (prepared under Task M.1.d) at the TAC meetings. When requested by the Watermaster staff, Consultants may be asked to

	assist the TAC and the Watermaster staff with peer reviews of documents and reports prepared by various other Watermaster Consultants and/or entities.
M. 1. f **QA/QC** **($0)**	A Consultant (MPWMD) will provide general QA/QC support over the Seaside Basin Monitoring and Management Program. These costs are included in the other tasks.
M.1.g **Prepare Documents for SGMA Reporting** **($2,464)**	Section 10720.8 of the Sustainable Groundwater Management Act (SGMA) requires adjudicated basins to submit annual reports. Most of the documentation that needs to be reported is already generated by the Watermaster in conjunction with preparing its own Annual Reports. However, some information such as changes in basin storage is not currently generated and will require consultant assistance to do so. This task will be used to obtain this consultant assistance, as needed.

I. 2 Comprehensive Basin Production, Water Level and Water Quality Monitoring Program

I. 2. a. Database Management	
I. 2. a. 1 **Conduct Ongoing Data Entry and Database Maintenance/ Enhancement** **($32,238)**	The database will be maintained by a Consultant (MPWMD) performing this work for the Watermaster. MPWMD will enter new data into the consolidated database, including water production volumes, water quality and water level data, and such other data as may be appropriate. Other than an annual reporting of data to another Watermaster Consultant at the end of the Water Year, as mentioned in Task I.4.c below, no reporting of water level or water quality data during the Water Year is required. However, MPWMD will promptly notify the Watermaster of any missing data or data collection irregularities that were encountered. Under this Task, when requested MPWMD will also respond to requests from consultants and others for data from the database. At the end of the Water Year MPWMD will prepare an annual water production, water level, and water quality tabulation in Access format and will provide the tabulation to another Watermaster Consultant who will use that data in the preparation of the SIAR under Task No. I.4.c of the Monitoring and Management Program. No enhancements to the database are anticipated during 2023. A separate consultant will maintain the Watermaster's website.
I. 2. a. 2 **Verify Accuracy of Production Well Meters** **($0)**	To ensure that water production data is accurate, the well meters of the major producers were verified for accuracy during 2009 and again during 2015. No additional work of this type is anticipated during 2023.
I. 2. b. Data Collection Program	
I. 2. b. 1 **Site Representation and Selection** **($0)**	The monitoring well network review that was started in 2008 has been completed, and sites have been identified where future monitoring well(s) could be installed, if it is deemed necessary to do so in order to fill in data gaps. No further work of this type is anticipated in 2023.

I. 2 b. 2
Collect Water Levels
($20,042)

Each of the monitoring wells will be visited on a regular basis. Water levels will be determined by either taking manual water levels using an electric sounder, or by dataloggers. The wells where the use of dataloggers is feasible or appropriate have been equipped with dataloggers. All of the other wells will be manually measured.

This Task includes the purchase of one datalogger and parts for the datalogger to keep in inventory as a spare if needed

I. 2. b. 3
Collect Water Quality Samples.
($28,210)

Water quality data will be collected quarterly from certain of the monitoring wells, but will no longer be collected from the four coastal Sentinel Wells. Discontinuing water quality sampling in those wells is the result of the finding made in 2018 that the water quality samples being extracted from those wells are not representative of the aquifer. Those wells were designed for the purpose of electric induction logging, and have historically been logged twice a year. Because many years of logging data have shown essentially no change in aquifer water quality, beginning in WY2023 the frequency of induction logging of the Sentinel Wells will be reduced to once per year.

In 2012 water quality analyses were expanded to include barium and iodide ions, to determine the potential benefit of performing these additional analyses. These two parameters have been useful in analyzing seawater intrusion potential in other vulnerable coastal groundwater basins, and are briefly mentioned in the Watermaster's annual Seawater Intrusion Analysis Reports. These parameters were added to the annual water quality sampling list for the 3 most coastal MPWMD monitoring wells (MSC, PCA, and FO-09). Since these analyses have now created 10 years of data, the analyses will no longer be performed starting in WY 2023, and will only be resumed if the other water quality parameters are indicative of seawater intrusion.

As discussed in the 2013 Annual Report, the Watermaster reduced the frequency of water quality sampling at monitoring well SBWM-5 (the Camp Huffman well) to once every 3 years beginning in WY 2014. This was based on the January 2010 well construction report in which the well installation hydrogeologic consultant (Martin Feeney) recommended doing initial sampling annually for several years, then reducing the frequency of sampling once it was felt that the water chemistry had been established. Mr. Feeney suggested going to once every five years after initial water quality had been established. Starting with WY 2014 the Watermaster elected to go to once every three years as a more conservative approach. The results from water quality sampling that has performed to date on these wells shows there has been little change in water quality at these wells. Therefore, the sampling frequency was reduced to once every five years beginning in 2022.

Water quality data may come from water quality samples that are taken from these wells and submitted to a State Certified analytic laboratory for general mineral and physical suite of analyses, or the data may come from induction logging of these wells and/or other data gathering techniques.

	The Consultant or Contractor selected to perform this work will make this judgment based on consideration of costs and other factors. Under this Task in 2013 retrofitting to use the low-flow purge approach for getting water quality samples was completed on all of the wells that are sampled. This sampling equipment sits in the water column and may periodically need to be replaced or repaired. Accordingly, an allowance to perform maintenance on previously installed equipment has been included in this Task. Also, in the event a sampling pump fails or is found to be no longer adequate due to declining groundwater levels, an allowance of $900 to purchase a replacement sampling pump has been included in this Task. Improvements to the QA/QC program for the water quality sampling work were adopted in mid-2017 and will be included in this work in 2023.
I. 2. b. 4 Update Program Schedule and Standard Operating Procedures. ($0)	All recommendations from prior reviews of the data collection program have been implemented. No additional work of this type is anticipated in 2023.
I. 2. b. 5 Monitor Well Construction ($0)	A well to replace Monitoring Well FO-9 Shallow, which in 2021 was found to have a leaking casing, is expected to be installed in 2023. The costs for this work were included in the 2022 M&MP Capital Budget, and funds from that Budget will be used to perform the planning, design, and permitting for this work in 2022. The cost to install the is included in the 2023 M&MP Capital Budget. No costs for this work are included in the 2023 Operations Budget.
I. 2. b. 6 Reports ($3,568)	This task was essentially eliminated starting in 2020 by having the data collected by MPWMD under tasks I.2.b.1, I.2.b.2, and I.2.b.3 reported in the SIAR under Task I.4.c. The work remaining under this task is for MPWMD to prepare and provide the data appendix to the Consultant that prepares the SIAR. No formalized reporting on a quarterly basis is required. However, MPWMD will promptly notify the Watermaster and the Consultant that prepares the SIAR of any missing data or data collection irregularities in the water quality and water level data collected under Tasks I.2.b.2 and I.2.b.3.
I.2.b.7 CASGEM Data Submittal ($5,352)	On the Watermaster's behalf MPWMD will compile and submit data on the Watermaster's "Voluntary Wells" into the State's CASGEM groundwater management database. The term "Voluntary Well" refers to a well that is not currently having its data reported into the CASGEM system, but for which the Watermaster obtains data. This will be done in the format and on the schedule required by the Department of Water Resources under the Sustainable Groundwater Management Act.

I. 3 Basin Management

I. 3. a. Enhanced Seaside Basin Groundwater Model (Costs listed in subtasks below)	The Watermaster and its consultants use a Groundwater Model for basin management purposes.
I.3.a.1 Update the Existing Model ($0)	The Model, described in the report titled "Groundwater Flow and Transport Model" dated October 1, 2007, was updated in 2009 in order to develop protective water levels, and to evaluate replenishment scenarios and develop answers to Basin management questions. The Model was again updated in 2014. In 2018 the Model was recalibrated and updated. No further work of this type is anticipated in 2023.
I. 3. a. 2 Develop Protective Water Levels ($0)	A series of cross-sectional models was created in 2009 in order to develop protective water levels for selected production wells, as well as for the Basin as a whole. This work is discussed in Hydrometrics' "Seaside Groundwater Basin Protective Water Elevations Technical Memorandum." In 2013 further work was started to refine these protective water levels, but it was found that the previously developed protective water levels were reasonable. Protective water levels will be updated, if appropriate, as part of the work of Task I.3.c.
I. 3. a. 3 Evaluate Replenishment Scenarios and Develop Answers to Basin Management Questions ($60,000)	In 2009 the updated Model was used to evaluate different scenarios to determine such things as the most effective methods of using supplemental water sources to replenish the Basin and/or to assess the impacts of pumping redistribution. This work is described in HydroMetrics' "Seaside Groundwater Basin Groundwater Model Report." In 2010, 2013, and again in 2022, the updated Model was used to develop answers to some questions associated with Basin management. Modeling performed to date indicates that the solution to the problem of water levels in the Seaside Basin being below Protective Water Levels will be to inject replenishment water. Within the next few years there may be the ability of either or both of two projects to provide additional water for Basin replenishment. One of these is the Monterey Peninsula Water Supply Project's (MPWSP) desalination plant. The other is the Pure Water Monterey (PWM) Expansion Project. Growth is built into each of these projects' plant capacity, and the full capacity of these plants will likely not all be needed for some years into the future. During the time period that these projects would have excess capacity, they could potentially provide water for Basin replenishment.

	Montgomery & Associates agrees that injection is the quickest way to bring groundwater levels up in the Seaside Basin. The original 3,500 AFY PWM Project is already in operation, and construction of the PWM Expansion Project and/or the MPWSP desalination plant is expected to begin within the next few years. Modeling to determine the additional amount of replenishment water needed to achieve protective groundwater level elevations throughout the Basin, after either or both of those projects are constructed, was performed in 2022 to aid the Watermaster in pursuing approaches to obtain that additional water for Basin replenishment. Modeling performed in 2014, 2015, and 2016 led to the conclusion that groundwater levels in parts of the Laguna Seca Subarea will continue to fall, even if all pumping within that subarea is discontinued, because of the influence of pumping from areas near to, but outside of, the Basin boundary. Additional modeling or other work may be performed in 2023 to update the previous work. This Task includes a $60,000 allowance to perform further modeling or analyses pertaining to Basin management issues if so directed by the Watermaster Board.
I. 3. b. **Complete Preparation of Basin Management Action Plan** **($0)**	The Watermaster's Consultant completed preparation of the Basin Management Action Plan (BMAP) in February 2009. The BMAP serves as the Watermaster's long-term seawater intrusion prevention plan. The Sections that are included in the BMAP are: Executive Summary Section 1 – Background and Purpose Section 2 – State of the Seaside Groundwater Basin Section 3 – Supplemental Water Supplies Section 4 –Groundwater Management Actions Section 5 – Recommended Management Strategies Section 6 – References
I. 3. c. **Refine and/or Update the Basin Management Action Plan** **($0)**	In 2019 the BMAP was updated based on new data and knowledge that has been gained since it was prepared in 2009. No further work of this type is anticipated in 2023. However, although no funds are budgeted for this Task in 2023, since the Groundwater Sustainability Plan (GSP) for the adjacent Monterey Subbasin of the Salinas Valley Groundwater Basin was completed in early 2022, at some point it may be appropriate to further update the BMAP to reflect the impacts of implementing that GSP.
I. 3. d. **Evaluate Coastal Wells for Cross-Aquifer Contamination Potential** **($0)**	If seawater intrusion were to reach any of the coastal wells in any aquifer, and if a well was constructed without proper seals to prevent cross-aquifer communication, or if deterioration of the well led to casing leakage, it would be possible for the intrusion to flow from one aquifer to another. An evaluation of this was completed in 2012 and is described in MPWMD's Memorandum titled "Summary of Seaside Groundwater Basin Cross-Aquifer Contamination Wells Investigation Process and Conclusions" dated August 8, 2012. This Memorandum did not recommend performing any further work on this matter, other than to incorporate into the Watermaster's Database data from wells that were

newly identified by the work performed in 2012. That data has now been incorporated into the Database. In 2021 the Watermaster TAC examined the feasibility of performing conductivity profiling of certain of the near-coastal wells that were evaluated in the 2012 Memorandum, as a method of determining if any of those wells was allowing downward migration of intruded water from the shallow dunes aquifer to enter the Paso Robles aquifer. However, it was concluded that conditions in those wells would make it infeasible to perform such work.

In late 2017 a request was made to MPWMD to destroy one of its no-longer-used monitoring wells that is perforated in multiple aquifers (Well PCA-East Multiple). MPWMD performed this work in 2018.

No further work of this type is anticipated in 2023.

I.3. e.
Seaside Basin Geochemical Model
($10,000)

When new sources of water are introduced into an aquifer, with each source having its own unique water quality, there can be chemical reactions that may have the potential to release minerals which have previously been attached to soil particles, such as arsenic or mercury, into solution and thus into the water itself. This has been experienced in some other locations where changes occurred in the quality of the water being injected into an aquifer. MPWMD's consultants have been using geochemical modeling to predict the effects of injecting Carmel River water into the Seaside Groundwater Basin under the ASR program.

In order to predict whether there will be groundwater quality changes that will result from the introduction of desalinated water and additional ASR water (under the Monterey Peninsula Water Supply Project) and advance-treated water (under the Pure Water Monterey Project) geochemical evaluations, and potentially modeling, will be performed in the areas of the Basin where injection of these new water sources will occur.

In 2019 a geochemical evaluation of introducing advance-treated water from the Pure Water Monterey Project was performed. That evaluation concluded that there would be no adverse geochemical impacts as a result of introducing that water into the Basin. A similar evaluation of the impact of introducing ASR water also concluded that there would be no adverse geochemical impacts. An evaluation of introducing desalinated water will be performed, if the Monterey Peninsula Water Supply Project's desalination plant proceeds into the construction phase.

If the geochemical evaluation of injecting desalinated water indicates the potential for problems to occur, then Montgomery and Associates may use the Watermaster's updated groundwater model, and information about injection locations and quantities, injection scheduling, etc. provided by MPWMD for each of these projects, to develop model scenarios to see if the problem(s) can be averted by changing delivery schedules and delivery quantities. This Task includes an allowance of $10,000 to have Montgomery and Associates perform such modeling, if necessary.

	If the modeling predicts that there may be adverse impacts from introducing these new sources of water, measures to mitigate those impacts will be developed under a separate task that will be created for that purpose when and if necessary.

I. 4 Seawater Intrusion Response Plan (formerly referred to as the Seawater Intrusion Contingency Plan)

I. 4. a. **Oversight of Seawater Intrusion Detection and Tracking** **($0)**	Consultants will provide general oversight over the Seawater Intrusion detection program under the other Tasks in this Work Plan.
I. 4. c. **Annual Report- Seawater Intrusion Analysis** **($27,176)**	At the end of each water year, a Consultant will reanalyze all water quality data. Water level and water quality data will be provided to the Consultant in MS Access format. The Consultant will put this data into a report format and will include it as an attachment to the Seawater Intrusion Analysis Report. If possible, semi-annual chloride concentration maps will be produced for each aquifer in the basin. Time series graphs, trilinear graphs, and stiff diagram comparisons will be updated with new data. The induction logs will be analyzed to identify changes in seawater wedge locations. All analyses will be incorporated into an annual report that follows the format of the initial, historical data report. Potential seawater intrusion will be highlighted in the report, and if necessary, recommendations will be included. The annual report will be submitted for review by the TAC and the Board. Modifications to the report will be incorporated based on input from these bodies, as well as Watermaster staff.
I. 4. e. **Refine and/or Update the Seawater Intrusion Response Plan** **($0)**	At the beginning of 2009, and again in 2021, it was thought that it might be beneficial or necessary to perform work to refine the SIRP and/or to update it based on new data or knowledge that was gained subsequent to the preparation of the SIRP. However, this did not prove to be necessary, and no further work of this type is anticipated in 2023.
I. 4. f. **If Seawater Intrusion is Determined to be Occurring, Implement Contingency Response Plan** **($0)**	The SIRP will be implemented if seawater intrusion, as defined in the Plan, is determined by the Watermaster to be occurring.

ATTACHMENT 9

SUMMARY OF UPDATED REPLENISHMENT WATER ANALYSES

SUMMARY OF UPDATED REPLENISHMENT WATER ANALYSES

Prepared by Robert Jaques, P.E., Technical Program Manager, Seaside Basin Watermaster
October 10, 2022

Executive Summary

Two sets of assumptions were used in these analyses. One was a "best case" scenario based on future water demand projections, Aquifer Storage and Recovery (ASR) injection rates, and Pure Water Monterey Expansion (PWMX) injection rates prepared by the Monterey Peninsula Water Management District (MPWMD). The other was a more "conservative" scenario based on future water demand projections and the timing of start-up of Cal Am's desalination plant contained in Cal Am's 2020 Urban Water Management Plan, ASR and PWMX injection rates with a built-in margin of safety, and revised water demands for the City of Seaside's golf courses proposed by Cal Am and the City of Seaside.

Under the "best case" scenario 1,000 acre-feet-per-year (AFY) of water would need to be injected into the Seaside Basin every year to replenish it and raise groundwater levels high enough to prevent seawater intrusion from occurring. Under the "conservative" scenario the amount needed would be 3,600 AFY every year.

Unless replenishment water in these quantities is added annually, the Seaside Basin will be at risk of seawater intrusion, and that risk will increase each year that groundwater levels continue to fall and remain below sea level. Implementation of the PWMX project does not accomplish this, and an additional source of replenishment water will be needed. The only other potential source of replenishment water will be from desalination.

Background

In April 2013, HydroMetrics Water Resources Inc. (now acquired by Montgomery & Associates) performed groundwater modeling to estimate the amount of replenishment water that would be needed to achieve protective groundwater levels in the Basin. In 2022 the 2013 work was updated to account for new assumptions and information gained since the 2013 work was performed, and to incorporate the impacts of projects that have been implemented since the 2013 work was performed, or are expected to be implemented in the next few years. This Summary provides a condensed version of this updated analysis.

In 2009 HydroMetrics Water Resources Inc. performed groundwater modeling to establish "protective elevations" at six wells located along the coastline. The term "protective elevation" refers to an elevation that is sufficiently above sea level such that seawater cannot move inland into the well.

Updated Analysis

The updated analysis simulated groundwater conditions in the Seaside Basin from 2018 through 2050. It focused on the groundwater conditions in the Northern Coastal Subarea of the Basin, within which are located all of the ASR and PWM injection and extraction wells, and the majority of the water supply production wells. This subarea is the one in which all but one (CDM-MW4) of the six protective elevation monitoring wells are located, is the only subarea that sees notable response to the simulated replenishment operations, and is the subarea at greatest risk from seawater intrusion

In this Summary the term "*Baseline Scenario*" refers to the simulation of future conditions assuming only operation of currently planned projects with no additional replenishment added. The *Baseline Scenario* represents recent conditions from Water Year (WY) 2018 through 2021 based on actual measured pumping, injection, and hydrology. The projected potential future conditions from WY 2022 through WY 2050 are based on pumping to meet the water demands projected by MPWMD, currently operational or planned projects (but not including a desalination plant), and repeating the historical hydrology cycle into the future. That assumes that the same rainfall and drought pattern that has been experienced in recent years (the period 1988 through 2016) will repeat itself beginning in 2022 and up to the end of the analysis period in 2050.

The term "*Baseline Scenario with Replenishment Water Added*" refers to the simulations in which replenishment water in varying amounts was added to the *Baseline Scenario* in order to see how much replenishment water would be needed to achieve protective groundwater elevations in the Basin.

The term "*Alternate Scenario*" refers to the simulation of future conditions with the following different assumptions than those used in the *Baseline Scenario*, as requested by the City of Seaside and Cal Am:

- Revised City of Seaside Golf Course water demand
- Applying a factor of safety on the amount of water that will be supplied by ASR by using a lower daily ASR injection rate of 15 Acre-feet-per-day (AFD) compared to the 20 AFD used in the *Baseline Scenario*
- Use of the water demand figures and the start-up date for the desalination plant in Cal Am's 2020 Urban Water Management Plan
- Starting Cal Am's over-pumping repayment program of 700 Acre-feet-per-year (AFY) coinciding with the start-up of the desalination plant
- Applying a factor of safety on the amount of water that will be supplied by the PWM Expansion project by reducing its projected supply from the 5,750 AFY used in the *Baseline Scenario* to 4,600 AFY

The term "Shallow Aquifers" refers collectively to the Aromas Sands & Older Dune Deposits and the Paso Robles Aquifer. The term "Deep Aquifer" refers to the Santa Margarita Aquifer.

All of the Scenarios take into account:

- The City of Seaside's replacement of groundwater with recycled water for golf course irrigation and the construction of the Security National Guaranty (SNG) and Campus Town developments in the City of Seaside
- The assumption that no proposed Groundwater Sustainability Plan (GSP) projects are implemented in the neighboring Monterey and 180/400 Foot Subbasins, and that groundwater levels along the northern boundary of the Model (located close to the boundary between those two subbasins) remain unchanged as currently represented in the Model boundary conditions
- A projected mean sea level rise of up to 1.3 feet by 2050
- Cal Am's overpumping repayment program assumed at 700 AFY for a period of 25 years

Comparisons of the events and assumptions under the *Baseline Scenario* and the *Alternate Scenario* are shown in Tables 1 and 2. The hydrologic cycle used in each Scenario is shown in Figure 1.

Figure 2 shows the annual net flows going into and out of the Basin's shallow and deep aquifers in the Northern Coastal Subarea under the *Baseline Scenario*. There are a number of flow components that are accounted for in determining the net flows each year, including:

- Inflows consisting of percolation from rainfall and PWM and ASR injected water.
- Outflows consisting of pumping from extraction wells (production wells, ASR wells, and PWM wells).
- Flows into and out of the adjacent subareas and the offshore area, and between the Shallow and Deep aquifers. These can be either flows into or out of the aquifers, depending on the hydraulic gradients between the aquifers and the adjacent subareas or aquifers. Changes in those gradients can change the flow directions as groundwater levels change.

In Figure 2 positive values of net flow mean that inflows were greater than outflows in that Water Year. Negative values mean that outflows were greater than inflows in that Water Year. Figure 3 shows the cumulative change in storage in the aquifers over the simulation period. In years when there is a positive net flow, storage increases and groundwater levels rise. In years when there is a negative net flow, storage decreases and groundwater levels fall.

Figure 4 shows the locations of the six protective elevation wells. Figures 5 through 10 compare the groundwater elevations achieved at each of the protective elevation wells under the *Baseline* and *Baseline with Replenishment Water Added Scenarios*. Those Figures show that without replenishment water being added, protective groundwater elevations cannot be achieved and the Seaside Subbasin will be at risk of seawater intrusion.

Figure 11 shows the magnitude of groundwater loss from the Seaside Subbasin to the adjacent Monterey Subbasin under the *Baseline Scenario*. The losses under all of the scenarios in which replenishment water is added to the Subbasin will be greater than the amounts shown in Figure 11.

Figure 12 shows the amount of additional replenishment needed each year under the *Alternate Scenario* to achieve the same water level increases as in the *Baseline Scenario* (green bars), and to achieve the same level of protective elevations as in the *Baseline Scenario with Replenishment Water Added* (blue line with circle markers). Since the *Baseline Scenario* did not achieve protective elevations, only the amount of water needed under the *Baseline Scenario with Replenishment Water Added* is of significance.

Table 1. Timeline Comparison of the Baseline and Alternate Scenarios

Sim Year	Water Year	Hydrology Source WY	Pumping & Injection	Major Projects Timeline (Does not show the Campus Town and SNG development projects, but the water demands of those projects are accounted for in the analyses)	
				Baseline Scenario	*Alternate Scenario*
1	2018	Actual	Actual		
2	2019	Actual	Actual		
3	2020	Actual	Actual	PWM Base Project Begins (3,500 AFY)	PWM Base Project Begins (3,500 AFY)
4	2021	Actual	Actual	Cal-Am ceases pumping in Laguna Seca	Cal-Am ceases pumping in Laguna Seca
5	2022	1988	Projected	PWM ramps up to 4,100 AFY	PWM ramps up to 4,100 AFY
6	2023	1989	Projected	Seaside Golf Courses shift to PWM water	Seaside Golf Courses shift to PWM water
7	2024	1990	Projected	PWM Expansion Begins (5,750 AFY) & Cal Am Overpumping Repayment of 700 AFY Begins	PWM Expansion Begins (4,600 AFY)
8	2025	1991	Projected		
9	2026	1992	Projected		
10	2027	1993	Projected		
11	2028	1994	Projected		
12	2029	1995	Projected		
13	2030	1996	Projected		Cal Am Desalination Plant Goes On-line & Overpumping Repayment of 700 AFY Begins
14	2031	1997	Projected		
15	2032	1998	Projected		
16	2033	1999	Projected		
17	2034	2000	Projected		
18	2035	2001	Projected		
19	2036	2002	Projected		
20	2037	2003	Projected		
21	2038	2004	Projected		
22	2039	2005	Projected		
23	2040	2006	Projected		
24	2041	2007	Projected		
25	2042	2008	Projected		
26	2043	2009	Projected		
27	2044	2010	Projected		
28	2045	2011	Projected		
29	2046	2012	Projected		
30	2047	2013	Projected		
31	2048	2014	Projected	Potential Final Year of Cal-Am Repayment Period	
32	2049	2015	Projected		
33	2050	2016	Projected		Cal-Am Repayment Period Does Not End Before the End of the Simulation Period

Table 2. Differences in Golf Course Demand and ASR Injection Rates Between the Baseline and Alternate Scenarios

Supply or Demand Source	*Baseline Scenario*	*Alternate Scenario*
City of Seaside Golf Course Water Demand, AFY	301	514
ASR Daily Injection Rate, AFD	20	15

Figure 1. Hydrologic Cycle Used in all of the Scenarios

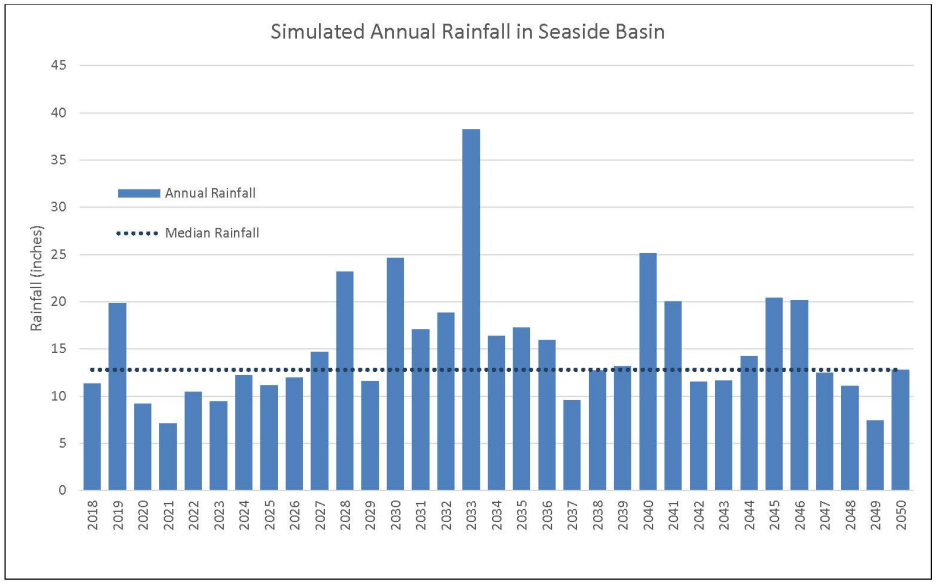


Figure 2. Yearly Flows Into and Out of the Aquifers in the *Baseline Scenario*

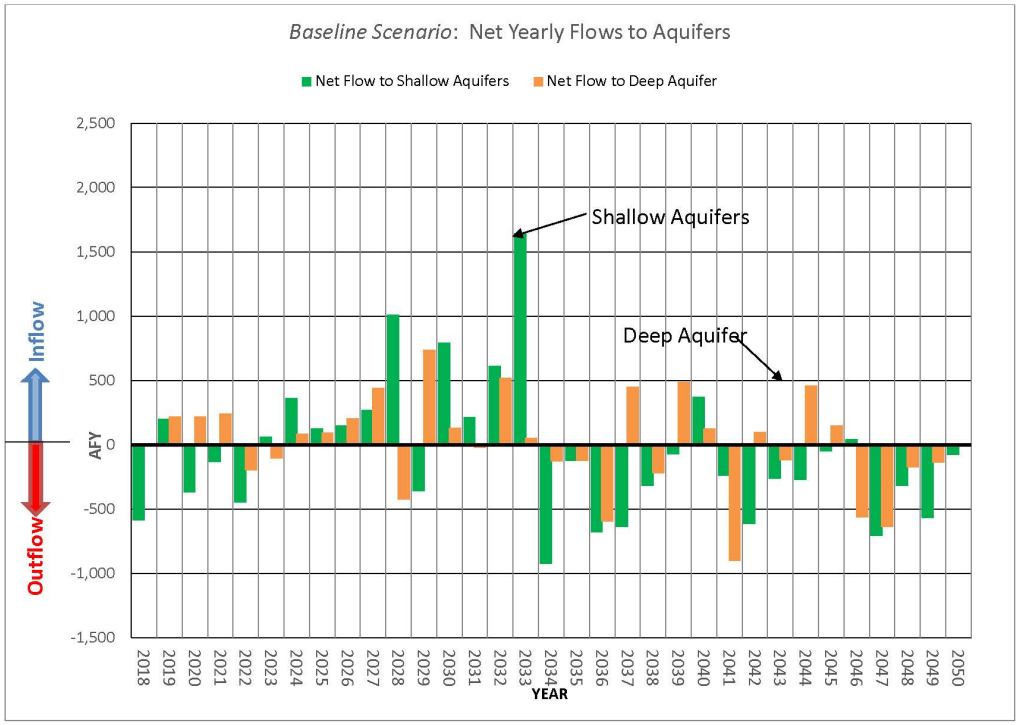


Figure 3. Cumulative Change in Storage in the *Baseline Scenario*

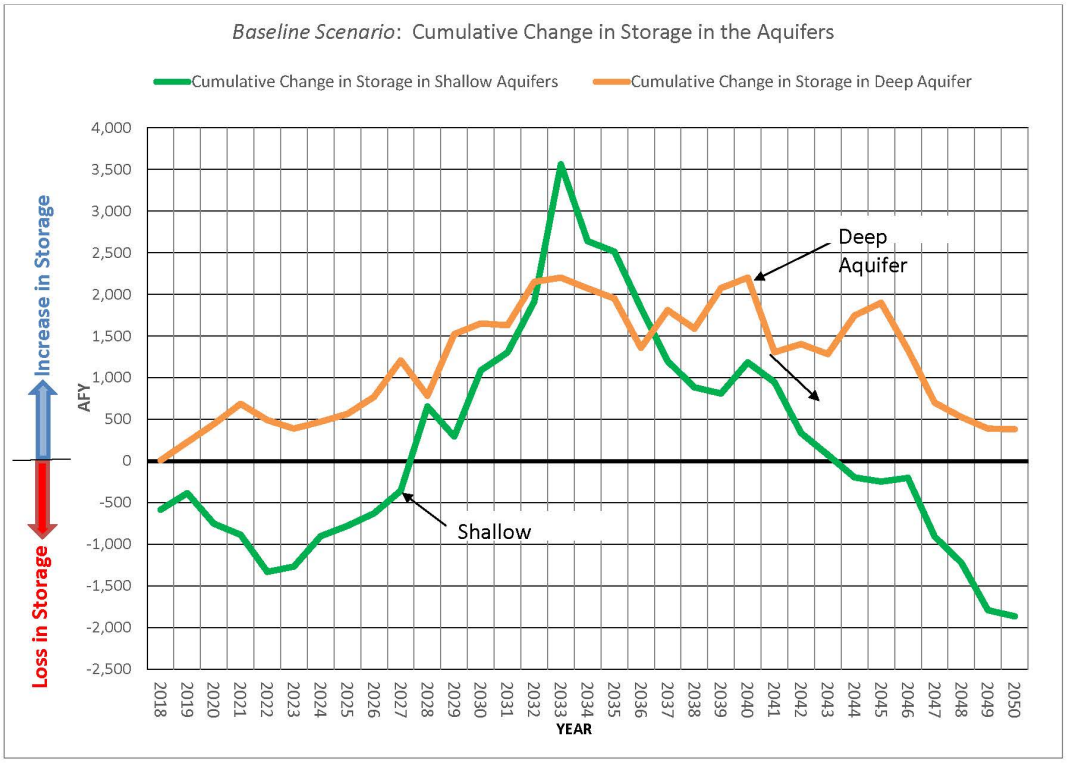


Figure 4. Locations of Protective Elevation Wells

Figure 5. Groundwater Elevations Compared to the Protective Elevation at Sentinel Well #3 Under the *Baseline and Replenishment Water Added Scenarios*

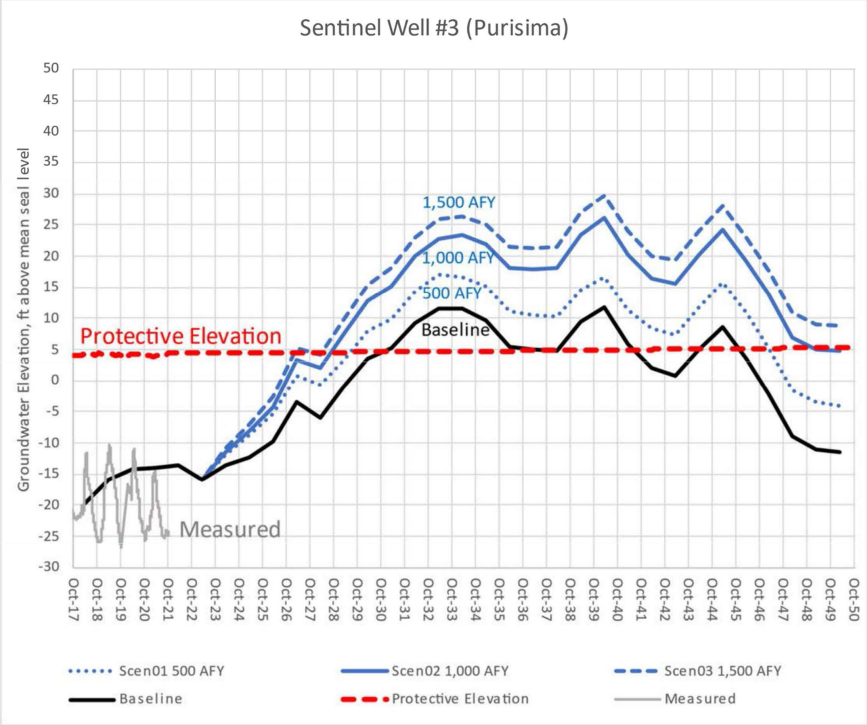


Figure 6. Groundwater Elevations Compared to the Protective Elevation at Well PCA-A West Deep Under the *Baseline and Replenishment Water Added Scenarios*

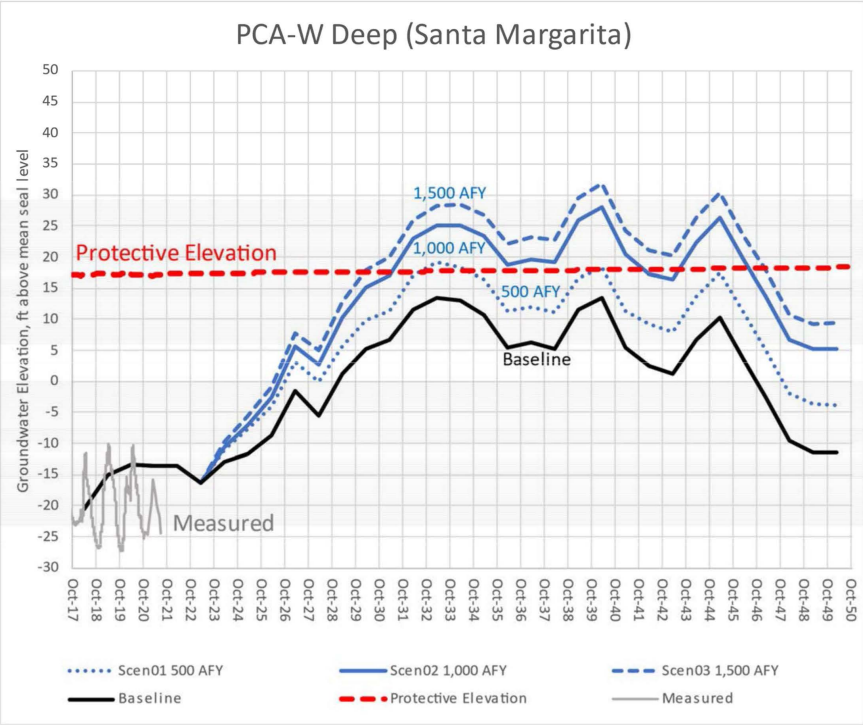


Figure 7. Groundwater Elevations Compared to the Protective Elevation at Well PCA-A West Shallow Under the *Baseline and Replenishment Water Added Scenarios*

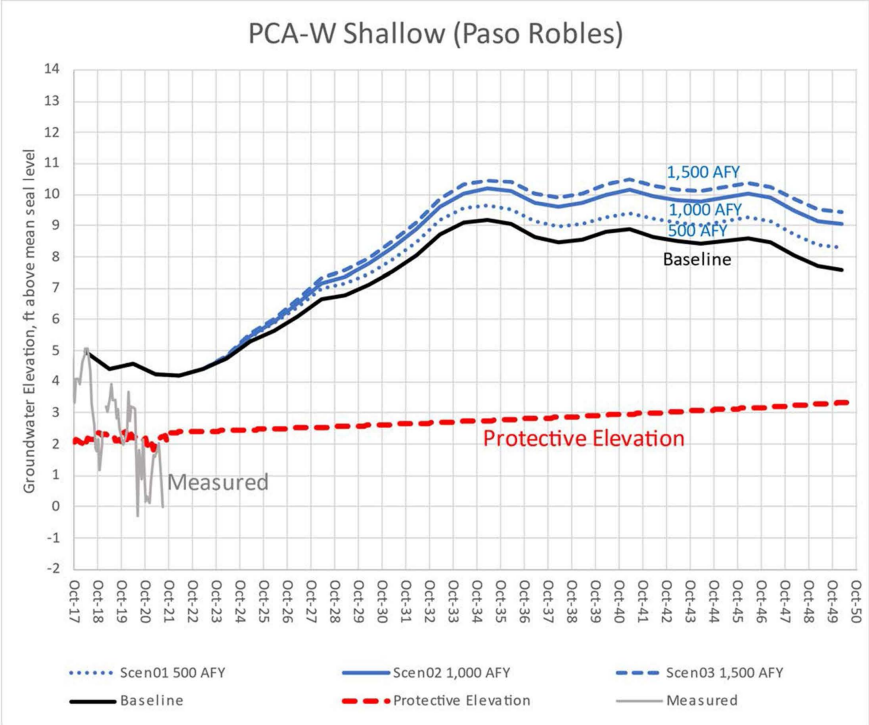


Figure 8. Groundwater Elevations Compared to the Protective Elevation at Well MSC Shallow Under the *Baseline and Replenishment Water Added Scenarios*

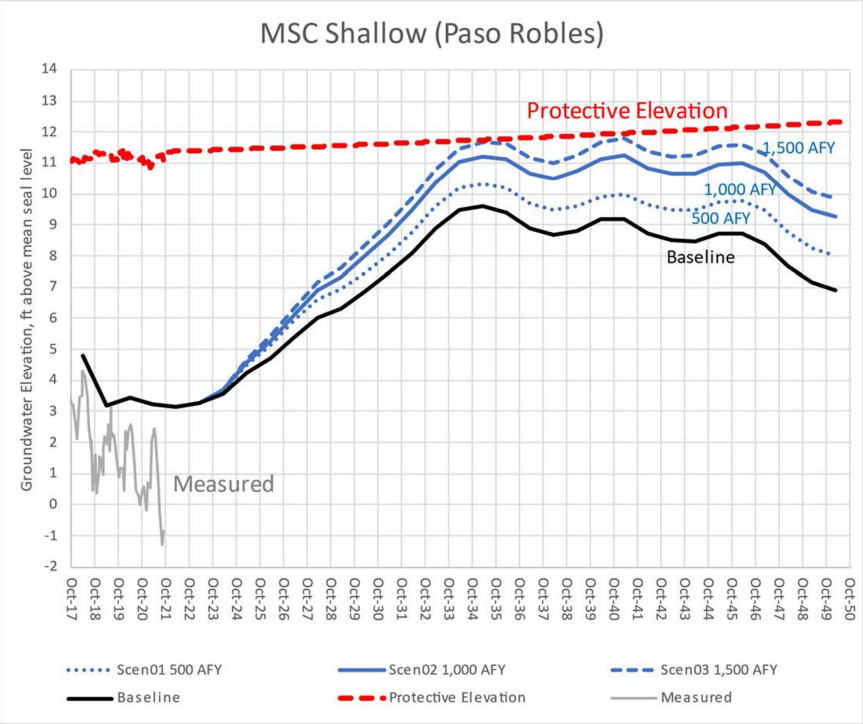


Figure 9. Groundwater Elevations Compared to the Protective Elevation at Well MSC Deep Under the *Baseline and Replenishment Water Added Scenarios*

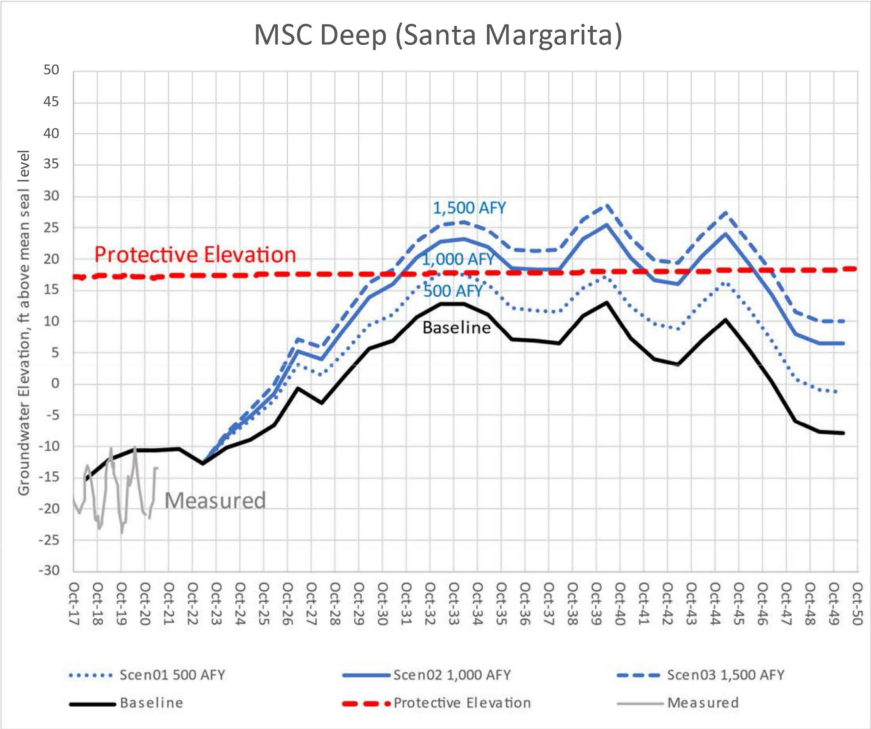


Figure 10. Groundwater Elevations Compared to the Protective Elevation at Well CDM MW-4 Under the *Baseline and Replenishment Water Added Scenarios*

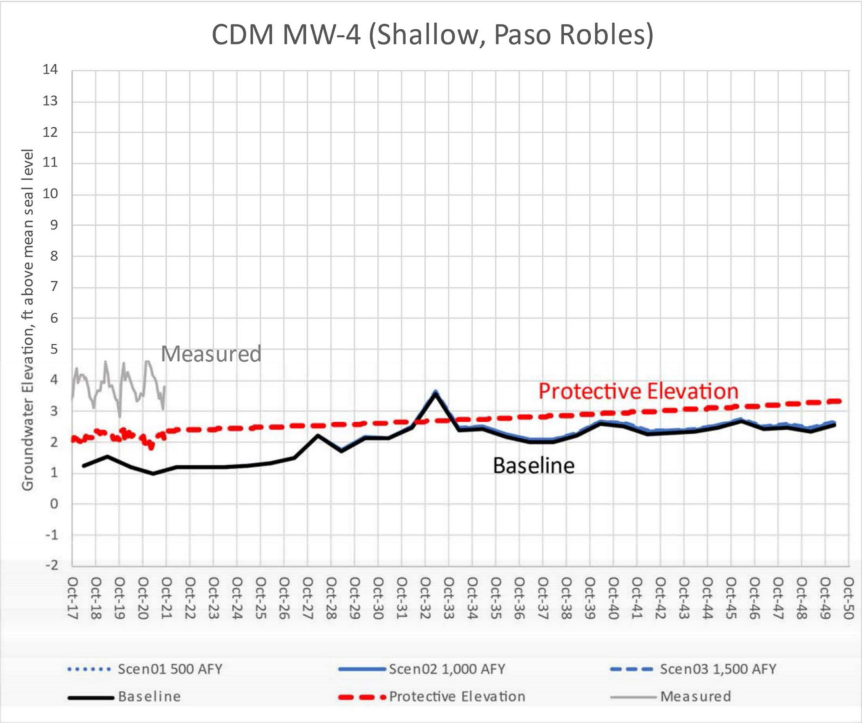


Figure 11 Annual Groundwater Losses from the Seaside Subbasin to the Monterey Subbasin under the *Baseline Scenario*

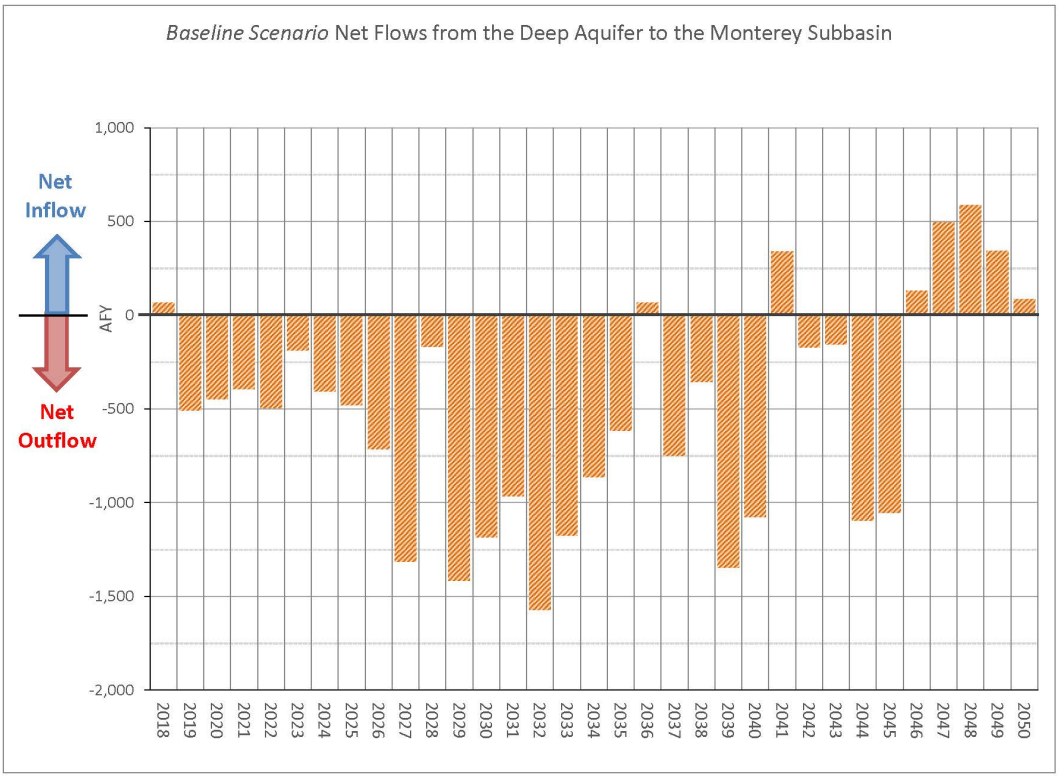
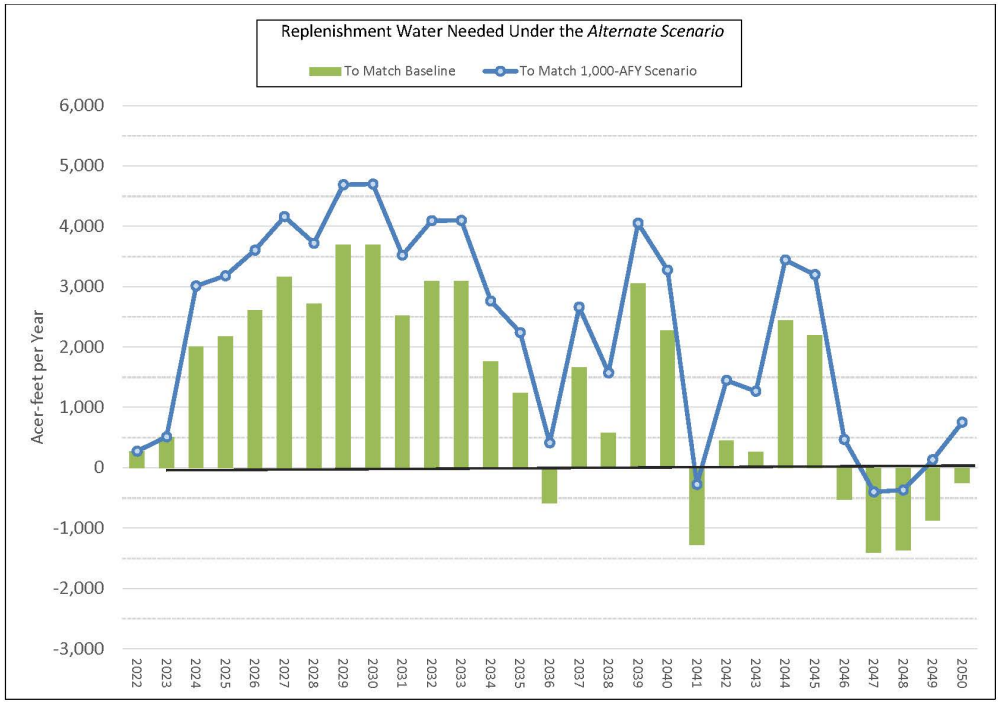


Figure 12. Replenishment Water Needed Annually to Achieve Protective Elevations Under the *Alternate Scenario*



CONCLUSIONS

General:

1. The updated analyses tie ASR and PWM injection and extraction volumes to the hydrologic cycle and illustrate the significant impact that multi-year droughts, and even just below normal rainfall periods, can have on the availability of water for ASR and PWM recharge and on the timing of reaching and maintaining protective elevations.
2. The protective elevations developed in 2009 assumed steady-state conditions that had no time component to them. That modeling work assumed that sufficient time would have passed such that conditions would have equilibrated to a fixed state. That modeling did not consider and did not suggest for how long a period groundwater levels could stay below protective elevations without greatly increasing the risk of sea water intrusion. This is something that would require additional modeling to evaluate, and would also require making an assumption about how far offshore the seawater-fresh water interface is located.
3. Groundwater levels rise quickly in response to replenishment during periods of normal and above-normal water years following the prolonged drought occurring at the start of the simulation period. This suggests that levels would rebound again after the drought that occurs at the end of the simulation period. However, the rapid rebound is also a function of the assumption that Cal-Am will extract ASR water as its last source of supply, after exhausting available water from its native groundwater rights and PWM water. This assumption has the consequence that a very large portion of the injected ASR water is left in storage in the Basin.
4. If groundwater levels in the Monterey Subbasin do not rise, outflows to the Monterey Subbasin will increase in all aquifers as groundwater levels in the Seaside Subbasin rise. An initial net inflow of water from the offshore region into the Seaside Subbasin reverses to a net outflow in all aquifers as groundwater levels increase.
5. Projected sea level rise is not a significant driver of inland flows compared to the changes in water levels associated with changes in injection and extraction in the subbasin.
6. Groundwater conditions in the adjacent Monterey Subbasin have a big effect on the amount of replenishment water needed. For all of the Scenarios in most years outflow from the Seaside Subbasin to the Monterey Subbasin is the single largest net outflow.
7. All of the Scenarios assume that water levels along the boundary between the Monterey Subbasin and the 180-400 Foot Aquifer subbasin stay fixed at recent levels and that no management actions or projects are implemented to increase groundwater levels in these neighboring subbasins during the simulation period.
8. As groundwater levels in the Seaside subbasin begin to rise in response to increased recharge, steeper gradients develop towards the Monterey Subbasin, producing increased outflows to the Monterey Subbasin. This reduces the effectiveness of replenishment activities and necessitates greater volumes of replenishment water to reach protective elevations than would be needed if water levels in the Monterey Subbasin were also increasing over time.
9. Increasing the amount of replenishment water while keeping the injection of this water focused in a narrow strip of the Basin results in localized mounding of groundwater that causes water to be lost to the Monterey Subbasin. It may be that spreading the area of injection of the replenishment water out over a broader area further from the subbasin boundary could reduce the amount of this loss.

Baseline Scenario:

1. Under the *Baseline Scenario*, with no replenishment water added it is not possible for the Basin to

achieve protective groundwater elevations. This means the Basin would continue to be vulnerable to seawater intrusion.

Baseline With Replenishment Water Added Scenario:

1. Three amounts of added annual replenishment water were evaluated: 500 AFY, 1,000 AFY, and 1,500 AFY.
2. If only 500 AFY of replenishment water is added protective groundwater elevations are only achieved in some parts of the Basin.
3. If 1,000 AFY of replenishment water is added:
   - Protective groundwater elevations are reached throughout the Basin within 11 years. Average annual groundwater levels remain above protective elevations for over 50% of the water years during Cal Am's 25-year overpumping repayment period, except at one of the protective elevation monitoring wells, at which the protective elevation is reached only once, in WY 2035. After this year, groundwater levels stop increasing and slowly decline due to the impact of drought years in the projected hydrologic cycles. In addition to the constant 1,000 AFY of replenishment water, additional "booster" injections might be necessary following protracted drought periods to make up the lost water.
   - There is a reversal from a net inflow of water from offshore to a net outflow of water to offshore, even when protective elevations are not being met at all protective elevation wells. The additional replenishment water adds an additional buffer to maintain strong net offshore outflows even in drought years.
   - A net annual volume of between 200 to 500 AFY flows out from the Shallow Aquifers to the Monterey Subbasin once water levels in the Shallow Aquifers begin to rise, driven by the increasing relative gradients between the groundwater levels in the Northern Coastal Subarea and the lower groundwater levels in the Monterey Subbasin. A similar magnitude of net outflow occurs to the offshore portions of the Shallow Aquifers.
   - A net annual volume of between 600 to1,700 AFY flows out from the Deep Aquifer to the Monterey Subbasin as groundwater levels rise. In addition a small amount flows from the Deep Aquifer to the overlying Shallow Aquifer during peak periods when Deep Aquifer groundwater levels rise above the levels in the Shallow Aquifer.
4. Increasing the addition of replenishment water to 1,500 AFY results in only marginal increases in protective elevations . This is particularly true for the Shallow Aquifers. This suggests that there is limited benefit in trying to raise Shallow Aquifer groundwater levels by increasing the amount of replenishment water injected into the Deep Aquifer. Rather, other alternatives could be considered and evaluated such as redistributing pumping from wells screened completely or partially in the Paso Robles aquifer, increased use of recycled water for irrigation purposes such as at Mission Memorial Park, and additional recharge directly to the Paso Robles aquifer.
5. The simulation period ends just as Cal-Am's 700 AFY for 25-years overpumping repayment program comes to an end. Once Cal Am resumes pumping at its full groundwater allocation of 1,474 AFY it is likely that additional replenishment water would be needed to offset this increased level of extraction.

Alternate Scenario

1. The increases in Deep Aquifer groundwater levels under the *Baseline Scenario* and the *Baseline with Replenishment Water Added Scenario* would not occur under the supply and demand assumptions of the *Alternate Scenario* without very large quantities of replenishment water being added.
2. The amounts of replenishment water needed to achieve protective elevations under the *Alternate Scenario* is significantly greater than under the *Baseline Scenario.* As Figure 12 shows, under the *Alternate Scenario* in some years the amount of replenishment water needed to achieve protective

elevations would be more than 4,500 AFY, and an average of 3,600 AFY of replenishment water would be needed annually during the time period of 2024-2035. This compares to the 1,000 AFY of replenishment needed under the *Baseline Scenario*. This highlights the sensitivity of predicted groundwater conditions in the Basin to the assumptions that are made about future water demands, future rainfall patterns, and the availability of water supplied from outside the subbasin, including Carmel River ASR diversion, the expanded Pure Water Monterey Project, and the MPWSP Desalination Plant.

ATTACHMENT 10

INFORMATION AND GRAPHICS FROM THE FLOW DIRECTION/FLOW VELOCITY MODELING TECHNICAL MEMORANDUM

Methodology Used

The modeling analyzed the movement of seawater by simulating the release of "particles" along the coastline of the Seaside Subbasin and portions of the neighboring Monterey Subbasin. The movement of these particles was then tracked to see how flow velocities and flow directions vary along the coastline under different conditions. Groundwater travel velocity is very sensitive to the effective porosity of the aquifer. Upper and lower estimates of the travel times were developed based on a reasonable range of assumed aquifer effective porosities to provide a range of possible inland travel velocities.

Inland flow velocities

A view of the area of fastest inland seawater intrusion movement in the lower portion of the Paso Robles aquifer is shown in the figure below. The map on the left of the figure shows the movement of seawater intrusion starting from at a series of locations along the coast. The location of the fastest rate of movement is highlighted in the rectangular box drawn around the particle track trace in that map. In the graph on the right of the figure, values greater than zero represent the velocity of travel when the seawater is traveling inland from the coastline, and negative values represent the velocity of travel when it is moving toward the coastline. The numbered points on the map and the graph represent time periods with different operational and hydrologic conditions in the basin as described below:

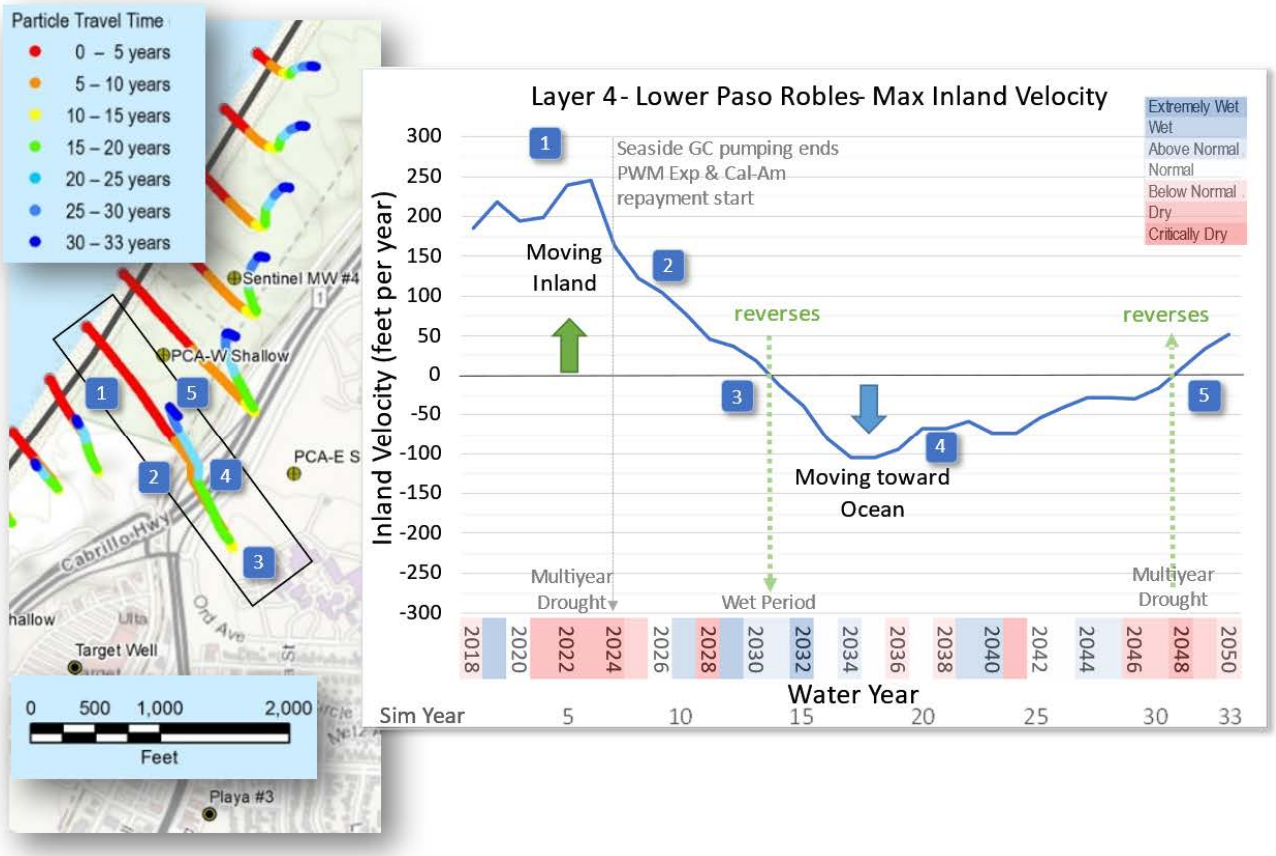
Period 1: This first period represents current conditions in the basin before the simulated planned projects begin in WY 2024. It reflects the impact of the recently experienced prolonged multi-year drought which limited natural and ASR recharge. Inland groundwater levels are at their lowest, creating conditions of maximum seawater intrusion potential with the highest inland flow velocity (as high as 250 feet inland per year). On the map this period is shown as the red color-coded portion of the particle paths.

Period 2: This period represents when the projects come online in WY 2024 and after the multi-year drought period ends. The particles are still moving inland from the coast, but at increasingly slower velocity as groundwater levels in the basin rise reducing the inland hydraulic gradients. This is shown as the orange and yellow segments on the particle path map.

Period 3: This period represents the transition period when the gradient reverses from a condition of inflow from the offshore area to one of outflow toward the ocean. During this period the groundwater levels reach their highest simulated points, buoyed by five back-to-back extremely wet and above-normal wet years that allow for large amounts of ASR recharge. The particles no longer move any further inland and begin moving back toward the ocean.

Period 4: This period represents conditions when flow gradients are still in the offshore direction, and the particles move back toward the ocean at a generally steady rate that fluctuates with the hydrology and begins to decrease after a critically dry year in WY 2041 (shown in the green, cyan, and light blue particle colors on the map).

Period 5: This final period represents the effects of a new multi-year drought that significantly reduces ASR and PWM recharge and allows groundwater levels to drop to the point that the flow gradient reverses again. The particles begin to move inland again, though at a much slower rate than during the earlier inland flow period, ending at rate of 50 feet of inland travel per year in WY 2050.



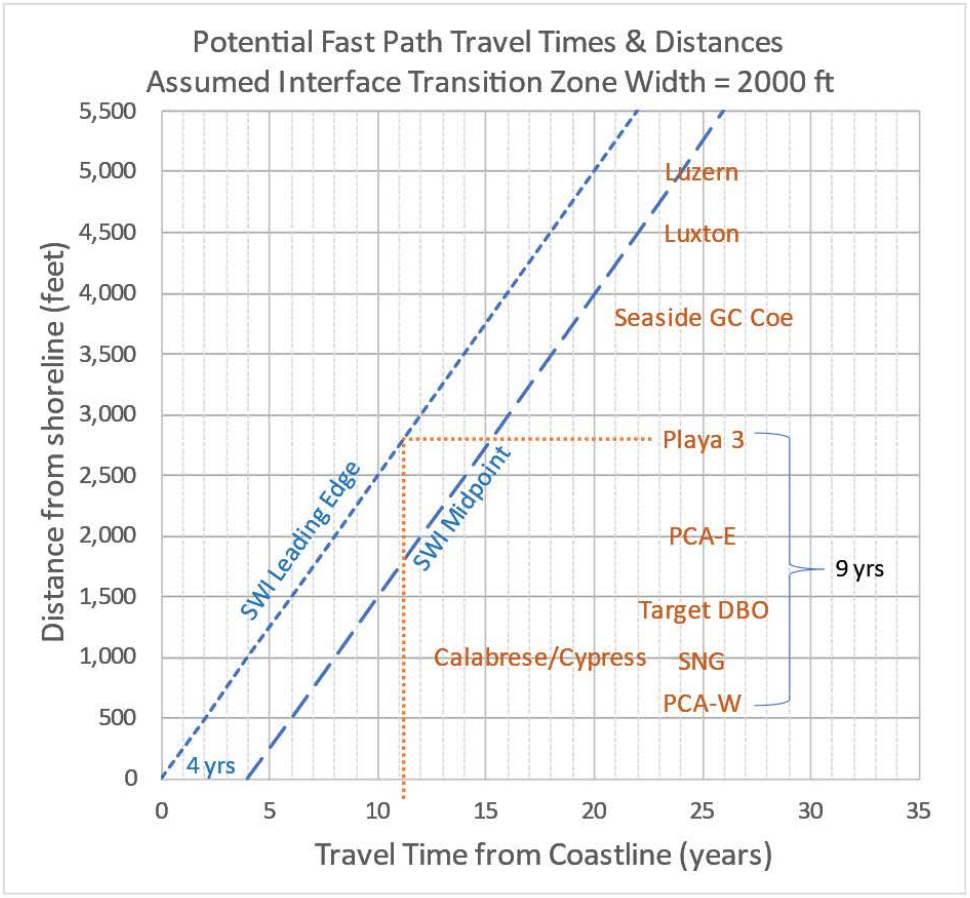
Particle Flow Paths and the Flow Velocities Along the Pathway of Fastest Movement

Potential Inland Travel Times of Seawater Intrusion Interface Along a Preferential Flow Path

From the perspective of the threat posed by potential seawater intrusion, the history of movement of seawater intrusion in the Salinas Valley suggests that seawater intrusion occurs not as a uniform front moving inland across the entire coastline at one rate, but rather occurs and advances largely as localized fingers or lobes where the combination of both inland gradients and aquifer properties create preferential pathways for inland intrusion. For this reason this analysis focused on evaluating how quickly and how far seawater intrusion could move inland from the coastline along one such fast pathway under conservative worst-case conditions.

The seawater intrusion interface moves not as a sharp interface, but rather as a diffuse transition zone between freshwater and full-strength seawater. The seawater intrusion interface transition zone is the distance between the leading edge at some threshold salinity level that is much lower than full strength seawater, but above the native groundwater salinity, and a midpoint between the leading edge and full-strength seawater. The midpoint would represent a very high salinity concentration that is much greater than groundwater quality objectives for the basin.

The figure below is based on assuming that the basin conditions that resulted in the fastest simulated pre-WY 2024 travel rates were held constant, and that the seawater intrusion interface moved inland from the coast at that same maximum rate of 250 feet per year. It should be noted that the analysis did not account for the fact that the travel velocity will accelerate closer to an active production well because of the exponential steepening of the hydraulic gradients around the cone of depression that forms around a pumping well. The figure shows a graph of distance traveled inland from the coastline versus travel time. For a given distance inland on the vertical axis, one can read off the estimated travel time from the coastline on the horizontal axis. For reference, the names of several production and monitoring wells are shown, placed vertically at their respective distances inland from the coastline. In this scenario it could take as little as one year between when the leading edge of seawater interface is observed at a coastal monitoring well located very near the shoreline, such as PCA-W, and when the seawater interface would reach other wells located slightly further inland, such as the small SNG or Calabrese/Cypress wells located only 1,000 feet from the coastline. For a well a bit further inland, such as Cal Am's Playa 3 production well at a distance of 3,800 feet from the coastline, it could take on the order of nine years of travel time to arrive after detection of the leading edge at a coastal monitoring well. If it were assumed that the seawater intrusion interface transition zone had a width of 2,000 feet, and that the midpoint of the interface moved at the same rate as the leading edge, it would take as little as four years between when the leading edge of the interface would be observed at a well and when the very high concentration of the midpoint would arrive at that well.



Potential Maximum Inland Travel Times and Distances Along a Preferential Flow Path

Conclusions & Considerations

- In the shallow Aromas Sands & Older Dune Deposits and the upper and middle portions of the Paso Robles aquifer, flow in the basin is predominantly in the offshore direction during the time period that was modeled.

- Offshore flow rates increase and accelerate as recharge operations in the basin increase after WY 2024 because of planned project operations and periods of wetter simulated hydrologic conditions that allow for increased net recharge.

- The most significant inland flows (in terms of both rates and distance) occur in the lower portion of the Paso Robles aquifer in the Northern Coastal Subarea. The fastest travel times are concentrated in line with the main pumping depression where production wells are screened in the lower Paso Robles and where model calibration also has resulted in higher hydraulic conductivity values.

- Maximum inland flow velocities of up to 250 feet per year are simulated under current and near-term basin conditions (e.g., pre-WY 2024), and are shown to decrease as basin groundwater levels rise. The movement of the seawater intrusion interface can reverse direction as gradients change from an inland to an offshore direction due to rising water levels in the basin. Faster travel rates are possible depending on the nature of preferential flow paths, and future hydrology.

- The inland velocities and travel distances are sensitive to changes in hydrologic conditions that impact the amount of water available for net ASR recharge in the basin. Periods of prolonged drought will increase potential inland travel rates and increase the seawater intrusion risk. The sequence of projected hydrologic conditions in the baseline simulation represents only a single realization of many possible future hydrology scenarios. If desired, other future climatic conditions could be considered for future modeling.

- Inland flow in the Monterey Subbasin and cross-boundary flows between the Seaside and Monterey Subbasins is dependent on assumptions on the groundwater levels assigned to the model in the Marina/Ord area. The assumptions that these remain unchanged should be reviewed and the impact evaluated.

- More work and data would be needed to develop an understanding of where the seawater interface is currently located offshore of the basin, and to better characterize potential preferential flow paths along which seawater intrusion could move quickly inland.