

MEETING NOTICE AND AGENDA
TECHNICAL ADVISORY COMMITTEE
OF THE SEASIDE BASIN WATER MASTER

DATE: Wednesday, March 9, 2022

MEETING TIME: 1:30 p.m.

IN KEEPING WITH GOVERNOR NEWSOMS EXECUTIVE ORDERS N-29-20 AND N-35-20,
 THE TECHNICAL ADVISORY COMMITTEE MEETING WILL BE CONDUCTED BY
 TELECONFERENCE AND WILL NOT BE HELD IN THE MONTEREY ONE WATER OFFICES.

YOU MAY ATTEND AND PARTICIPATE IN THE MEETING AS FOLLOWS:

JOIN FROM A PC, MAC, IPAD, IPHONE OR ANDROID DEVICE (NOTE: ZOOM APP MAY NEED
 TO BE DOWNLOADED FOR SAFARI OR OTHER BROWSERS PRIOR TO LINKING) BY GOING
 TO THIS WEB ADDRESS:

<https://us02web.zoom.us/j/87606010835?pwd=VzBURUxXalFOelBrRjhsL0ppM29ldz09>

If joining the meeting by phone, dial this number:

+1 669 900 9128 US (San Jose)

If you encounter problems joining the meeting using the link above, you may join from your Zoom
 screen using the following information:

Meeting ID: 876 0601 0835

Passcode: 472586

OFFICERS

Chairperson: Jon Lear, MPWMD

Vice-Chairperson: Tamara Voss, MCWRA

MEMBERS

California American Water Company	City of Del Rey Oaks	City of Monterey
City of Sand City	City of Seaside	Coastal Subarea Landowners
Laguna Seca Property Owners	Monterey Peninsula Water Management District	Monterey County Water Resources Agency

<u>Agenda Item</u>	<u>Page No.</u>
1. Public Comments	
2. Administrative Matters:	
A. Approve Minutes from the January 12, 2022 Meeting	2
B. Sustainable Groundwater Management Act (SGMA) Update	15
C. Make Findings Required Under AB 361 Regarding Holding Meetings Via Teleconference	20
3. Presentation and Discussion of Flow Velocity Modeling	21
4. Discuss Performing Additional Replenishment Water Modeling Using Different Assumptions	53
5. Discuss and Provide Direction on Concerns About the Final Draft Groundwater Sustainability Plan for the Monterey Subbasin	56
6. Discuss Groundwater Level Protective Elevations	60
7. Schedule	75
8. Other Business	78
The next regular meeting is tentatively planned for Wednesday April 13, 2022 at 1:30 p.m. That meeting will likely also be held via teleconference.	

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

MEETING DATE:	February 9, 2022
AGENDA ITEM:	2.A
AGENDA TITLE:	Approve Minutes from the January 12, 2022 Meeting
PREPARED BY:	Robert Jaques, Technical Program Manager
SUMMARY:	<p>Draft Minutes from this meeting were emailed to all TAC members. Any changes requested by TAC members have been included in the attached versions.</p>
ATTACHMENTS:	Minutes from this meeting
RECOMMENDED ACTION:	Approve the minutes

D-R-A-F-T
MINUTES

**Seaside Groundwater Basin Watermaster
Technical Advisory Committee Meeting
January 12, 2022
(Meeting Held Using Zoom Conferencing)**

Attendees: TAC Members

City of Seaside – Scott Ottmar
California American Water – Tim O’Halloran
City of Monterey – Cody Hennings
Laguna Seca Property Owners – Wes Leith
MPWMD – Jon Lear
MCWRA – Tamara Voss
City of Del Rey Oaks – No Representative
City of Sand City – Leon Gomez
Coastal Subarea Landowners – No Representative

Watermaster

Technical Program Manager – Robert Jaques
Administrative Officer – Laura Paxton

Consultants

Montgomery & Associates – Pascual Benito, Abby Ostovar
EKI – Tina Wang, Vera Nelson

Others

SVBGSA – Emily Gardner
MCWDGSA – Patrick Breen
MoCo Supervisor Mary Adams Office – Sarah Hardgrave
Nolan Fargo

The meeting was convened at 1:31 p.m.

1. Public Comments

There were no public comments.

2. Administrative Matters:

A. Approve Minutes from the November 17, 2021 and December 15, 2021 Meetings

On a motion by Ms. Voss, seconded by Mr. Leith, the minutes were unanimously approved as presented.

B. Sustainable Groundwater Management Act (SGMA) Update

Mr. Jaques summarized the agenda packet materials for this item and there was no other discussion.

C. Make Findings Required Under AB 361 Regarding Holding Meetings Via Teleconference

After a brief introduction by Mr. Jaques, a motion was made by Mr. Lear, seconded by Mr. Gomez, to adopt the findings contained in the agenda packet. The motion passed with all members voting in favor except for Mr. Leith who voted no.

3. Status Report on Flow Direction and Flow Velocity Modeling

Mr. Jaques summarized the agenda packet materials for this item.

Mr. Benito gave a brief update explaining that the updated baseline model from the replenishment water modeling work will be used in the flow direction/flow velocity modeling work.

4. Presentation and Discussion of Replenishment Water Modeling

Mr. Jaques introduced this agenda item and Mr. Benito provided a PowerPoint presentation to describe the work. Attached are copies of the PowerPoint slides that he used in his presentation.

Mr. O'Halloran noted that Cal Am had used a different sea level rise projection of 3.5 feet in the design of the Monterey Peninsula Water Supply Project. Mr. Benito reported that that sea level rise was intended for use in the design of critical infrastructure. He said he investigated this, and found that the projected mean sea level rise does not reach that high a level within the modeling timeframe for the replenishment modeling work.

Mr. Leith asked a question regarding the amounts of diversion from the Carmel River. Mr. Benito responded that the 2013 model used 1,400 acre-feet per year, but the average amount is lower in the updated hydrologic modeling.

Mr. O'Halloran commented that climate change impacts the amounts of water that can be diverted from the Carmel River. Mr. Benito said he concurred, and Mr. Lear added to Mr. Benito's response.

Mr. Benito said that the Pure Water Monterey Project is seeking permit approval to increase the amount of water that can be injected under that project to 4,100 acre-feet per year.

Mr. Leith raised a question about the extraction of native versus Pure Water Monterey injected water. Mr. Benito responded that even though the basin is "credited" with the amounts of water injected by the Pure Water Monterey Project, the water that is actually extracted is not necessarily all Pure Water Monterey injected water, some of it is native groundwater.

Mr. Benito went on to say that he had created a fourth scenario, in addition to the three scenarios described in the Technical Memorandum, to examine the effect of doing some replenishment to the Paso Robles aquifer, and shifting some of the pumping to the Santa Margarita aquifer from the Paso Robles aquifer. Mr. Jaques commented that this scenario is not described in the text, and Mr. Benito responded that he would add a discussion of it to the text in the final version of the Technical Memorandum. He noted that in the three other scenarios all of the replenishment water is injected into the Santa Margarita aquifer.

Mr. Benito also pointed out that the protective water elevations increase slightly due to sea level rise, which is taken into account in the modeling work.

Mr. Benito went on to say that periodic drought conditions have a big impact on the availability of replenishment water to achieve and maintain protective water levels. Drought conditions reduce the amount of replenishment water that is available in any given year.

Mr. Ottmar asked what the historical water quality is at well MSC-shallow. Mr. Lear said that the well is not currently showing any signs of sea water intrusion. He went on to say that the well has never had groundwater levels at protective water levels, and he felt that how protective water levels are determined should be reevaluated for the shallow wells.

In response to a question from Mr. Ottmar, Mr. Benito explained that as groundwater levels within the Basin rise due to replenishment, more water flows out of the Seaside Groundwater Basin to the Monterey Subbasin in the Marina-Ord area, and also to the ocean.

In performing the modeling, it was assumed that Cal Am would extract ASR water as its last source of supply, after exhausting available water from the Pure Water Monterey Project and native groundwater. Consequently, the ASR water tends to have the long-term effect of raising water levels in the Basin because much of the injected ASR water is left in the Basin.

Mr. Jaques asked whether the Watermaster should be concerned about groundwater levels at well MSC-shallow, since there do not appear to be any production wells in that part of the Basin. Mr. Lear reiterated his earlier comment that it would be a good topic for discussion at a future TAC meeting to revisit the method of determining protective water levels, and also to inform some of the newer TAC members about what protective water levels are and how they are determined.

Mr. Lear asked if the Pure Water Monterey's CSIP drought reserve was not included in the simulation, what would be the effect. Mr. Benito said it probably wouldn't have a significant impact, but it would result in slightly lower groundwater levels than those resulting from the modeling, which includes the drought reserve.

In response to a question, Mr. Lear explained that Table 13 water is a river-flowrate-dependent water right that Cal Am can use in its Carmel River well fields. It is in addition to the 3,376 acre-feet per year water right which Cal Am has to divert water from the Carmel Valley basin.

A motion was made by Mr. O'Halloran, seconded by Ms. Voss, to approve the Technical Memorandum with edits to reflect today's discussion and input, and to forward it to the Board for its consideration. The motion passed unanimously.

5. Discuss Performing Additional Replenishment Water Modeling Using Different Assumptions

Mr. Jaques summarized the agenda packet materials for this item.

Mr. Ottmar reviewed the two items on page 57 of the agenda packet that he had commented on.

1. He said he felt that the updated model adequately addresses Seaside's concerns about Item 1 on page 57. Mr. O'Halloran questioned whether the timing was realistic with regard to using recycled water at the Seaside golf courses to stop groundwater pumping there. Mr. Ottmar said he felt it was realistic to expect that the golf courses will begin using recycled water in 2023.
2. Mr. Ottmar reported that a new well will need to be installed to supplement Municipal Well No. 4 in order to supply future developments. The City will be looking for the best location to construct a new well.

Mr. Ottmar went on to say that the City will probably use the full amount of its golf course allocation of 540 acre-feet per year to help supply the new developments. Mr. Ottmar and Mr. Breen reported that the amount of recycled water planned for the Seaside golf courses under the Regional Urban Water Augmentation Project (RUWAP) is 453 acre-feet per year, not the full 540 acre-feet per year allocation contained in the Adjudication Decision. This would leave about 90 acre-feet per year of Seaside groundwater allocation not accounted for. Mr. Benito said the model currently assumes that this 90 acre-feet is not used. There was brief discussion about whether it is worth performing another model run reflecting using the full 150 acre-feet per year difference between the Campus Town's 301 acre foot per year of projected demand, and the 453 acre-feet per year of recycled water planned to be provided by the RUWAP project. Mr. Jaques said he would talk with Mr. Benito to get an idea of what costs would be associated with performing another model run with that taken into account.

Mr. O'Halloran reviewed the seven items on page 57 of the agenda packet that he had commented on.

1. Mr. O'Halloran recommended using 13 acre-feet per day for the ASR diversions, not the 20 acre-feet per day that was used in the modeling. He felt that 13 acre-feet per day was a more realistic estimate.

2. He felt that the Pure Water Monterey Expansion Project should not be expected to reliably deliver 5,700 acre-feet per year, and that a lower volume than that should be used to provide a factor of safety. Mr. Lear said the latest Water Purchase Agreement contains water supply guarantees from M1W, and that those guarantee quantities could be used to establish “floors” since M1W would be committed to meeting those guarantees.
3. Mr. O’Halloran commented that Cal Am was under no legal requirement to start the 700 acre-foot per year reduction at a specific time. There was discussion of this topic but no clear direction.
4. Mr. O’Halloran said that no revisions to the modeling work needed to be performed to address Item 4.
5. Mr. Benito reported that the model currently has some producers pumping less than their full Decision allocations, and that it uses an average of actual pumping in the most recent five years. Mr. O’Halloran felt it was okay to use the model’s assumption of actual pumping in the most recent five years.
6. Mr. O’Halloran recommended using Cal Am’s Urban Water Management Plan demand figures rather than MPWMD’s demand figures. This would increase projected demands over what the model has currently in it. Mr. Benito noted that in many other basins, their Groundwater Sustainability Plans use Urban Water Management Plans as their demand assumptions.

Mr. Lear commented that the Pure Water Monterey Expansion’s SEIR used the MPWMD demand projections. Mr. O’Halloran commented that Cal Am’s Urban Water Management Plan demands were used in the approved CEQA document for the Monterey Peninsula Water Supply Project.

7. Mr. O’Halloran felt that Mr. Benito had adequately explained the sea level rise approach that had been used in the modeling, and that no changes were needed to address this Item.

Mr. Ottmar asked if model runs should be made of various “what if” scenarios to get an idea of the range of replenishment needs for those differing assumed conditions.

Ms. Voss questioned whether revising the assumptions to be more conservative and coming up with greater replenishment water needs would provide helpful information for the Watermaster Board.

Mr. Lear commented that another scenario could be one that evaluates the effect on the Seaside Basin if the Groundwater Sustainability Plan’s projects and management actions in the Monterey Subbasin are implemented. Mr. Benito said a new model scenario could be run using the groundwater levels projected in those GSPs to see the effect on the Seaside Subbasin. The model currently assumes that no GSP implementation projects are implemented.

There was consensus to accept Mr. Jaques’ proposal that he discuss with Mr. Benito, Mr. O’Halloran, and Mr. Ottmar these various issues and to come back to the TAC with more refined descriptions of potential additional scenario(s) to be modeled, and what the cost to run the additional scenario(s) would be.

6. Discuss and Provide Direction on Concerns About the Final Draft Groundwater Sustainability Plan for the Monterey Subbasin

Mr. Jaques summarized the agenda packet materials for this item. He reported that his concerns were principally in the following four areas:

1. Modeling differences between the Watermaster’s Seaside Basin groundwater model and the one being used for preparation of the Monterey Subbasin GSP.
2. Concerns about the impacts on the Laguna Seca Subarea from pumping within the Corral de Tierra Subarea.
3. Unrealistic expectations for GSP projects and management actions to bring groundwater levels back up in the Monterey Subbasin.
4. Over-subscribing the amount of recycled water that will be available for projects to reduce pumping of groundwater.

Mr. Lear said that his main point of concern is water flowing out of the Laguna Seca Subarea into the Corral De Tierra Subbasin and the falling groundwater levels in the eastern part of the Laguna Seca Subarea.

Ms. Voss said she agreed with these concerns, and that the Laguna Seca Subarea is of special concern. She concurred that a better explanation is needed in the GSP about the reality of getting Monterey Subbasin groundwater levels up within the 20-year GSP implementation timeframe.

Mr. Hennings said he concurred with the concerns about inter-basin groundwater flows.

Mr. O'Halloran said he concurred with Mr. Jaques' and the others' comments about these concerns. In particular, the likelihood of projects being implemented as rapidly as the GSP projects.

Mr. Ottmar said it was important to ensure that the models coordinate together and was also concerned about over-subscribing recycled water.

Mr. Leith encouraged working collaboratively as much as possible so all are on "the same page".

Mr. Lear noted that the GSP's are to be updated during the implementation timeframe.

Ms. Wang commented that Patrick Breen had to leave for another meeting, and that she would present his comments. The MCWDGSA will investigate other water sources in addition to recycled water. They will measure groundwater levels and report on them as the GSP implementation progresses, and will update the groundwater levels as time goes on. They will continue working with the Watermaster and will be adding monitoring wells for detection of sea water intrusion. Also, they will work to refine the cross-boundary flow projections.

Ms. Nelson said that during the implementation period, the interim milestones will be evaluated by the Department of Water Resources (DWR) to see if the Groundwater Sustainability Agencies are fulfilling their GSP milestones.

Ms. Ostovar said that she has tried to address the Watermaster's comments in the GSP and will continue working with the Watermaster on the issues of concern.

Mr. Jaques recommended waiting to see the language in the Final GSP that is submitted to DWR, and to then resume discussion of this topic to see if any action should be recommended to the Watermaster Board. There was consensus to take this approach and to not take any further action at this time.

7. Schedule

Mr. Jaques noted that the only change in the schedule in this update was the timing of the presentations on the flow velocity/flow direction modeling work. There was no other discussion.

8. Other Business

There was no other business.

The meeting adjourned at 4:35 PM.

SEASIDE GROUNDWATER BASIN


**2021
UPDATED
REPLENISHMENT
MODELING**

Presented to
the Seaside
Basin TAC
January 12,
2022



PROJECT PURPOSES

- Develop updated “do-nothing” baseline predictive simulation that incorporates:
 - an extended hydrology period (1987-2017),
 - sea level rise,
 - all new and proposed projects, including PWM Expansion & Cal-Am 700 AFY repayment, and
- Assess how much replenishment it will take to achieve protective groundwater elevations within 20 years




2

UPDATED BASELINE SIMULATION

- Simulates period from WY2018-2050
- WY2018-2021: measured pumping, injection & hydrology
- WY2022-2050: projected pumping, injection, & cycled hydrology

← Calibrated Model Predictive Model →

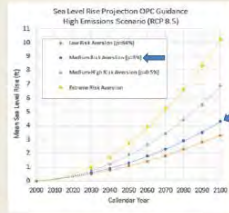
WY1988	WY2017 / 2018	WY2021 / 2022	WY2050
Actual	Actual	Repeat	
WY 1988 – 2017 Hydrology (30 water years)	WY 2018 – 2021 Hydrology (4 years)	WY 1988 – 2016 Hydrology (29 years)	




3

INCORPORATING SEA LEVEL RISE

- Mean Sea Level Rise (MSLR) of 1.3 ft by 2050
- Sea level rise incorporated by adjusting MSL used for ocean boundary in model
- Protective elevations adjusted for MSLR by increasing elevations by the projected MSLR amount over time





PROJECTED PUMPING

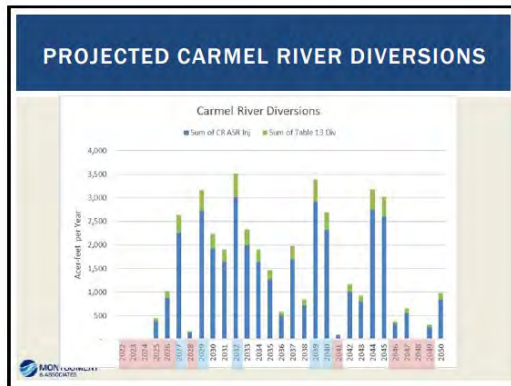
- Standard & Alternative Producers
 - WY2018-2021 - Actual Values
 - WY2022-2050 5-year average of WY2017-2021 pumping
- Cal-Am stops pumping in Laguna Seca subarea in WY2021 (though continues pumping in Hidden Hills Unit just outside basin at 5-year average of reported rates)
- Cal-Am's projected demand & pumping based on updated version of MPWMD supply-demand forecast model
- Golf course irrigation pumping matches historical pumping aligned with repeated historical hydrology
- All projected SPA & APA pumping within safe yield allocations, except for Seaside Municipal
- Pumping in adjacent subbasins remains at average of recent reported or estimated levels, with no assumption that any projects in their respective GSP's are implemented

EXISTING & PLANNED PROJECTS

- Carmel River ASR and Cal-Am Table 13 diversions operate same as currently but based on cycled historical Carmel River hydrology
- Pure Water Monterey (PWM) base injection averages 3,500 AFY beginning in WY2020 with PWM Expansion project increasing to an annual average of 5,750 AFY assumed to start in WY2024.
- Cal-Am's 700 AFY reduction in pumping of native groundwater as part of its 25-year groundwater over-pumping repayment starts in WY2024


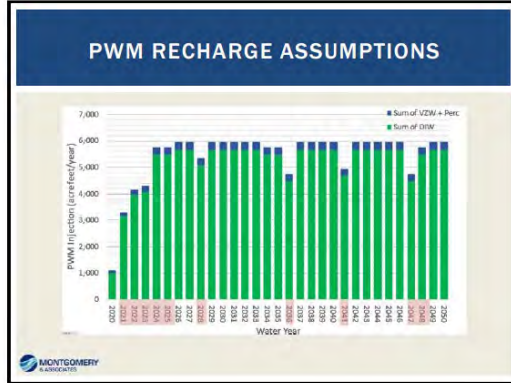
EXISTING & PLANNED PROJECTS

- SNG development completed WY2025 and supplied up to a max of 70 AFY water from Cal-Am wells
- In WY2023 City of Seaside replaces its golf course irrigation with PWM recycled water and uses its 540 AFY golf course irrigation allocation to supply the Campus Town development with up to max of 301 AFY



PWM RECHARGE ASSUMPTIONS

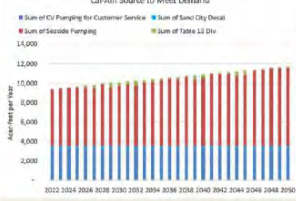

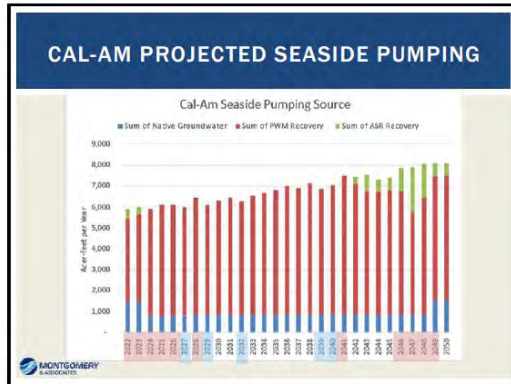
- WY2020-2023 Base Project ramps up from 3,500 AFY to 4,100 AFY
 - 95% to Santa Margarita, 5% to Paso Robles
- PWM Expansion Project Begins in WY2024
 - Annual average of 5,750 AFY Injection
 - 98.5% to Santa Margarita, 1.5% to Paso Robles
 - 1,000 AF Drought Reserve
 - 200 AFY additional injection during up to 5 consecutive non-drought years
 - Reduced injection during drought years to supply CSIP with recycled water for irrigation in Salinas Valley
 - Cal-Am recovers "banked" water during drought years

CAL-AM SUPPLY & DEMAND PROJECTION

- Estimated using MPWMD PWM Expansion SEIR supply-demand forecast model, updated for new hydrology period
- Total demand increases from 9,300 AFY to 11,700 AFY from WY2022 to 2050
- Supply Sources:
 - Carmel Valley (CV)
 - Sand City Desal
 - CR Table 13 Div
 - Seaside Pumping
 - Native GW
 - PWM
 - ASR

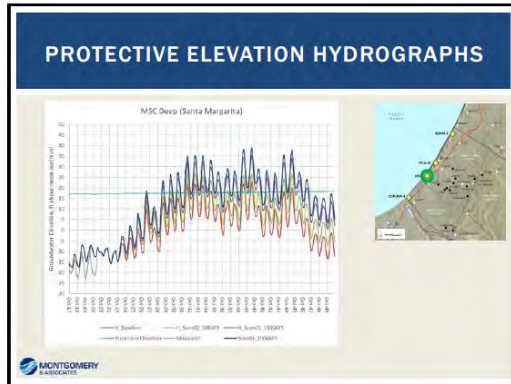
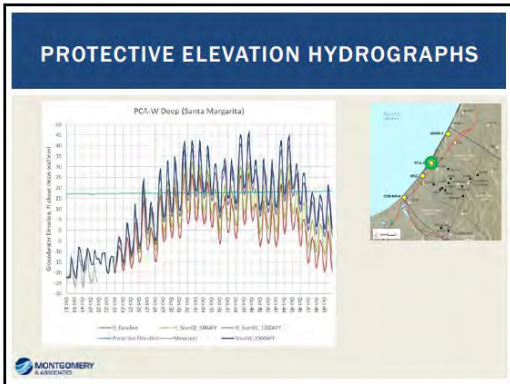
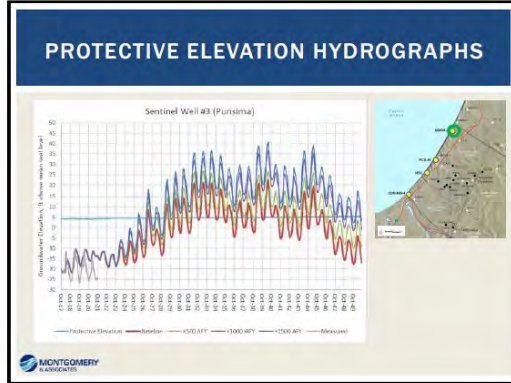
Cal-Am Source to Meet Demand

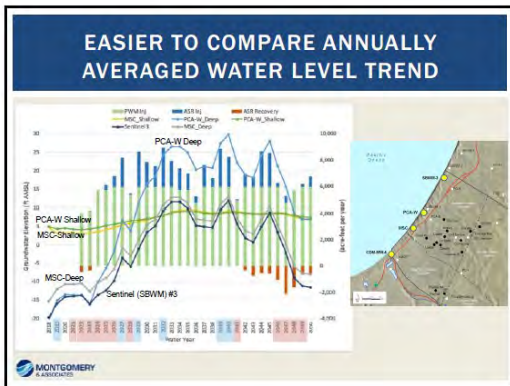
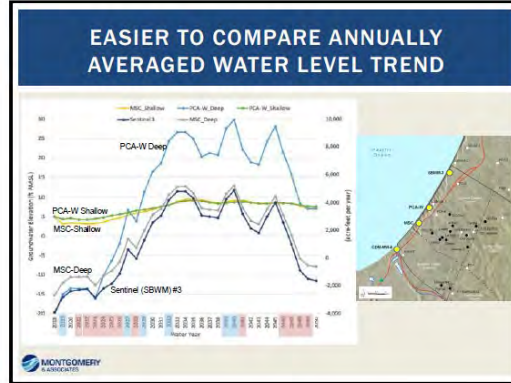
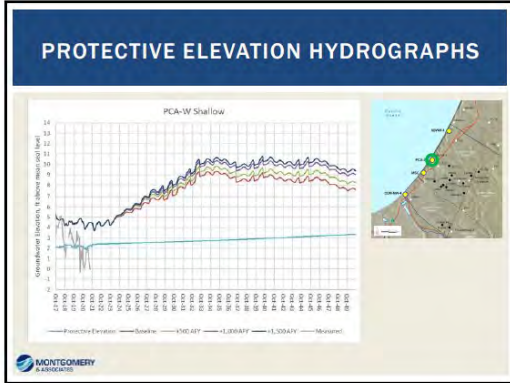




REPLENISHMENT SCENARIOS

- Scenario 0: Updated Baseline – aka "Do-Nothing"
- Scenario 1: 500 AFY of replenishment starting WY2024
- Scenario 2: 1,000 AFY of replenishment starting WY2024
- Scenario 3: 1,500 AFY of replenishment starting WY2024

- Replenishment water injected into the Santa Margarita formation via the PWM DIW wells
- Does not affect projected PWM/ASR recovery by Cal-Am



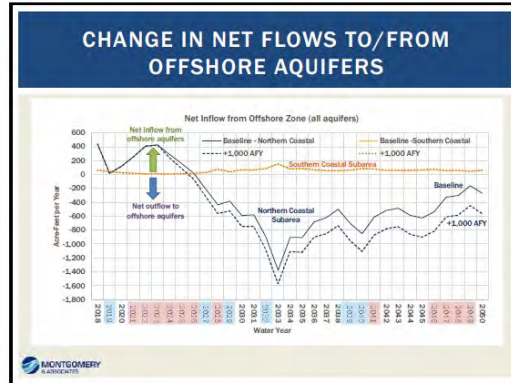
DEEP WELL RESULTS (ANNUALLY AVERAGED WATER LEVEL)

Scenario	1st Year Protective Elevation Reached	# Years to Reach Protective Elevation	# Years to Protective Elevation	% Years Reached	max Dd (ft)	Dd _{max} - Dd _{baseline}	Dd (ft) per 500 APY Increase
Sentinel #3 (Deep)							
Baseline	2031	7	13	52%	28	-	-
1) 500 APY	2030	6	18	72%	33	5	5
2) 1,000 APY	2029	5	22	88%	42	14	9
3) 1,500 APY	2027	3	22	88%	46	18	4
4) 1,000 APY + Q Resid.	2027	3	23	84%	44	16	-2
PCA-W (Deep)							
Baseline	not reached	not reached	0	0%	30	-	-
1) 500 APY	2033	9	9	12%	35.3	6	6
2) 1,000 APY	2031	7	14	66%	44.4	15	8.1
3) 1,500 APY	2030	6	18	72%	43	16	4
4) 1,500 APY + Q Resid.	2031	7	16	64%	45	16	-2
MSC (Deep)							
Baseline	not reached	not reached	0	0%	25	-	-
1) 500 APY	2033	9	9	8%	30	5	5
2) 1,000 APY	2032	8	13	62%	38	13	8
3) 1,500 APY	2030	6	17	69%	41	16	3
4) 1,500 APY + Q Resid.	2031	7	16	64%	40	14	-2

MONTGOMERY CONSULTANTS

SHALLOW WELL RESULTS (ANNUALLY AVERAGED WATER LEVEL)

Scenario	1st Year Protective Elevation Reached	# Years to Reach Protective Elevation	# Years to Protective Elevation	% Years Reached	max DH (ft)	DH _{max} - DH _{min}	DH (ft) per 500 AFY Increase
CDM MW (Shallow)							
Baseline	already reached	0	25	100%	4.6	-	-
1) 500 AFY	already reached	0	25	100%	5.2	0.4	0.4
2) 1,000 AFY	already reached	0	25	100%	5.8	1.0	0.6
3) 1,500 AFY	already reached	0	25	100%	6.0	1.2	0.2
4) 1,500 AFY + Q Replst.	already reached	0	25	100%	6.3	1.5	0.3
CDM (Shallow)							
Baseline	not reached	not reached	0	0%	6.3	-	-
1) 500 AFY	not reached	not reached	0	0%	7.1	0.8	0.8
2) 1,000 AFY	2035	11	1	4%	8.0	1.7	0.9
3) 1,500 AFY	2034	10	5	20%	8.5	2.2	0.5
4) 1,500 AFY + Q Replst.	2033	9	10	40%	8.7	2.4	0.2
CDM MW4 (Shallow)							
Baseline	already reached	0	25	100%	2.4	-	-
1) 500 AFY	already reached	0	25	100%	2.4	0.0	0.0
2) 1,000 AFY	already reached	0	25	100%	2.4	0.0	0.0
3) 1,500 AFY	already reached	0	25	100%	2.4	0.0	0.0
4) 1,500 AFY + Q Replst.	already reached	0	25	100%	2.5	0.1	0.1



- ### CONCLUSIONS
- Under 1,000 AFY replenishment scenario:
 - protective elevations reached, at least initially, in all protective elevation wells within 11 years
 - average annual groundwater levels remain above protective elevations for over 50% of period in all wells except at MSC Shallow, at which the protective elevation is reached only once, in WY 2035
 - Increasing replenishment to 1,500 AFY results in only slight improvement at MSC Shallow, and only marginal increases in protective elevation metrics at the other protective elevation wells

- ### CONCLUSIONS
- There may be limited benefit in trying to further raise the groundwater levels at MSC Shallow by increasing injection in the deeper Santa Margarita formation
 - Other alternatives could be evaluated such as:
 - redistributing pumping from Paso Robles to Santa Margarita
 - increasing use of recycled water for irrigation purposes, such as at Mission Memorial Park
 - additional recharge directly to the Paso Robles aquifer

CONCLUSIONS

- The original 2013 replenishment modeling assumed a constant average ASR injection and recovery rate rather than having it fluctuate with hydrologic cycles
- The updated simulations that couple ASR and PWM operations to the hydrology illustrate the significant impact that drought, or even below normal periods can have on availability of recharge water and on the timing of reaching and maintaining protective elevations
- Simulated groundwater levels rose quickly in response to replenishment during periods of Normal and Above Normal water years following the prolonged drought at the start of the simulated replenishment period, suggesting that levels would rebound again after the drought at the end of the simulation period



FUTURE CONSIDERATIONS

- Is it sufficient to stay above the protective elevations for most of the time?
 - The 2009 modeling that established the protective elevations was based on a steady state assumption and does not consider for how long a period groundwater levels can drop or stay below protective elevations intermittently without greatly increasing the risk of sea water intrusion
- How would climate change and the potential increased frequency and duration of drought events impact the ability to reach protective elevations?



QUESTIONS?



**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

MEETING DATE:	February 9, 2022
AGENDA ITEM:	2.B
AGENDA TITLE:	Sustainable Groundwater Management Act (SGMA) Update
PREPARED BY:	Robert Jaques, Technical Program Manager

At the State level:

Since my last update, I received this update of interest to the Watermaster:

The Department of Water Resources' (DWR's) Statewide Airborne Electromagnetic (AEM) Surveys Project is funded through California's Proposition 68 and the General Fund. The goal of the project is to improve the understanding of groundwater aquifer structure to support the state and local goal of sustainable groundwater management and the implementation of the Sustainable Groundwater Management Act (SGMA).

During an AEM survey, a helicopter tows electronic equipment that sends signals into the ground which bounce back. The data collected are used to create continuous images showing the distribution of electrical resistivity values of the subsurface materials that can be interpreted for lithologic properties. The resulting information will provide a standardized, statewide dataset that improves the understanding of large-scale aquifer structures and supports the development or refinement of hydrogeologic conceptual models and can help identify areas for recharging groundwater.

DWR is collecting AEM data in all of California's high- and medium-priority groundwater basins, where data collection is feasible. Data are collected in a coarsely spaced grid, with a line spacing of approximately 2-miles by 8-miles. AEM data collection started in 2021 and will continue over the next several years. Visit the AEM Survey Schedule Webpage to get up-to-date information on the survey schedule: <https://gis.water.ca.gov/app/AEM-schedule>.

Additional information about the Statewide AEM Surveys can be found at the project website: <https://water.ca.gov/Programs/SGMA/AEM>

AEM data were successfully collected in over 20 groundwater basins during the summer and fall of 2021. Approved datasets and reports are expected to become publicly available for the Salinas Valley and Cuyama Valley surveys in the coming months. AEM surveys in the Central San Joaquin Valley are scheduled to begin in early March 2022.

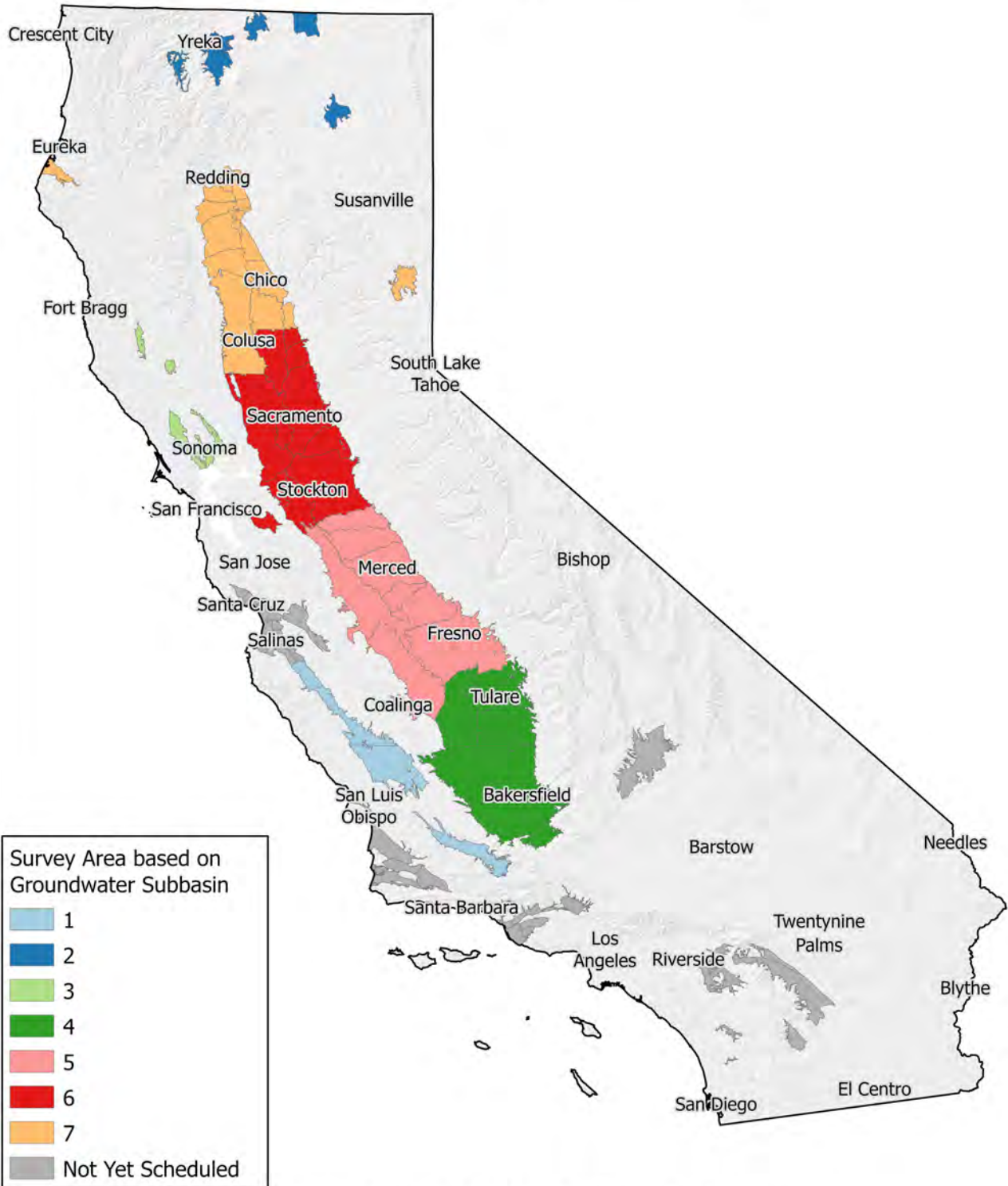
As the attached AEM Survey Map from DWR shows, only the southern portion of the Salinas Valley Groundwater Basin was evaluated. No data was developed in the Seaside Basin.

At the Monterey County level:

Attached are summaries of meetings held in January and February 2022

ATTACHMENTS:	1. AEM Survey Map 2. Meeting Summaries
RECOMMENDED ACTION:	None required – information only

AEM Survey Area Key



For a complete list of groundwater subbasins surveyed in each survey area, please visit: <https://water.ca.gov/Programs/Groundwater-Management/Data-and-Tools/AEM> and click on AEM Survey Schedule.

SUMMARY OF
PURE WATER MONTEREY,
SALINAS VALLEY GROUNDWATER SUSTAINABILITY, AND
MARINA COAST WATER DISTRICT GROUNDWATER SUSTAINABILITY
ZOOM MEETINGS
IN JANUARY 2022

Note: This is a synopsis of information from these meetings that may be of interest to the Seaside Basin Watermaster

SVBGSA Seawater Intrusion Working Group Meeting January 24, 2022:

Topics of interest to the Watermaster at this meeting included:

Deep Aquifer Study:

- Montgomery and Associates is partnering with Ramboll, a Danish firm, in this work.
- This study will include AEM, well construction data, water level measurements, water quality testing, and other sources of data to define the deep aquifer properties.

Goals in Addressing Seawater Intrusion:

- The Minimum Threshold is the 2017 MCWRA 500 mg/L chloride iso-contour.
- The Measurable Objectives are staged in five-year increments to mitigate seawater intrusion.
- SGMA requires that the SVBGSA take action to mitigate the seawater intrusion problem, so work must be undertaken in this regard.
- One of the participants in this meeting recommended reviewing the comments submitted by John Farrow with regard to prioritizing projects and what is economically feasible. [Note: I reviewed these letters and found that they focus on having the SVBGSA do a thorough feasibility assessment of its various proposed projects and proposed management actions, with particular attention to unit costs of water either saved or provided, and the “willingness to pay” of the users that would be expected to provide the revenues to support those projects.]

Update on Department of Water Resources Spending Plan (a Grant):

- Donna Myers gave an update on this grant. She reported that the Governor has elevated SGMA funding importance, especially for critically overdrafted basins.
- \$7.6 million has been allocated as a grant with no local match required to the SVBGSA to perform initial implementation work on the 180/400-foot aquifer subbasin.
- There are approximately 20 critically overdrafted basins within the State.
- About \$1 billion will be needed by critically overdraft basins to address their problems, according to a very preliminary State estimate.
- The 180/400-foot aquifer Implementation Committee will be recommending seven projects or actions as follows (these are all feasibility studies or management actions, not actually construction of any facilities, with the exception of modifying the M1W recycling plant):
 - Compliance reporting and data expansion
 - Demand management actions
 - Performing the deep aquifer study
 - Optimizing CSIP operations and modifying the M1W recycling plant to produce more recycled water per year
 - Seawater intrusion pumping barrier and desalination for municipal reuse
 - SRDF flow injection (ASR)
 - Stakeholder outreach

One of the meeting participants recommended assessing the willingness of stakeholders (such as the agricultural community) to pay for these projects, if they are to be implemented. [Note: This is a topic raised in the John Farrow comment letter mentioned above.]

Retirement:

Gary Peterson reported that this will be his last meeting involvement with the SVBGSA, as he is retiring.

The next meeting will be on Monday, February 28 at 10:00 AM.

SUMMARY OF
PURE WATER MONTEREY,
SALINAS VALLEY GROUNDWATER SUSTAINABILITY, AND
MARINA COAST WATER DISTRICT GROUNDWATER SUSTAINABILITY
ZOOM MEETINGS
IN FEBRUARY 2022

Note: This is a synopsis of information from these meetings that may be of interest to the Seaside Basin Watermaster

SVBGSA Advisory Committee Meeting February 17, 2022:

Topics of interest to the Watermaster included an update on the 180/400-foot aquifer GSP:

- The chapters of the GSP are being updated in response to DWR's requirements and to include recently acquired groundwater data.
 - Average water lost from storage in this aquifer during the time period 1980-2016 has been 14,800 AFY. During the time period 2019-2020 the loss was 7,750 AFY.
 - Groundwater pumping averaged about 95,000 AFY during the time period 1980 to 2016.
 - The historical sustainable yield has historically been between 101,600 and 123,400 AFY. By 2070 the sustainable yield is projected to be about 117,100 AFY.
 - Groundwater levels are continuing to decline. In 2015-2016 the groundwater levels were below the Minimum Threshold. The Minimum Threshold is one foot above the 2015 groundwater level.
 - The monitoring well network has been expanded from 23 to 91 wells.
 - Seawater Intrusion is still advancing inland, but at a slower rate than in the past.
 - Prioritizing the projects and management actions which are described in Chapter 9 of the GSP will not be done until the upcoming grant-funded feasibility studies are completed. Currently, the projects and management actions are just listed, but not prioritized.
-
- There was also a presentation and discussion of Monterey County's well permitting process.
 - DWR has opened the public comment period for all of the recently completed SVBGSA subbasin GSPs. This includes the GSP for the Monterey Subbasin.
 - The SVBGSA Board is reviewing its numerous committees and may be making some recommendations for changes.

SVBGSA Seawater Intrusion Working Group Meeting February 28, 2022:

At this meeting there was discussion of the updates being made to the 180/400-Foot Aquifer Subbasin GSP. Some of the updated information included:

- Projected sustainable yield of the Subbasin in 2030 is 111,200 AFY and it is projected to increase to 116,900 AFY in 2070
- Overdraft of the Subbasin is projected to be approximately 14,000 AFY in 2070. This is the amount of pumping in excess of the Sustainable Yield after the Minimum Thresholds have been met and the Subbasin is thereby considered to be in a sustainable condition. The GSP sets the Minimum Threshold for groundwater elevations at 1 foot above 2015 groundwater elevations.
- The Seawater Intrusion Minimum Threshold in the GSP is set at the seawater intrusion line set by MCWRA for 2017.

In addition a lengthy presentation was made on progress in development of the Seawater Intrusion Model.

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

MEETING DATE:	February 9, 2022
AGENDA ITEM:	2.C
AGENDA TITLE:	Make Findings Required Under AB 361 Regarding Holding Meetings Via Teleconference
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

As discussed at prior TAC meetings, in order to remain in compliance with AB 361 the TAC needs to adopt certain findings every 30 days in order to keep meeting remotely.

One action required at today's meeting is to readopt the same findings the TAC adopted at its November 17 meeting, namely that:

- (1) The Governor's proclaimed state of emergency is still in effect,
- (2) The TAC has reconsidered the circumstances of the state of emergency, and
- (3) The Monterey County Health Officer continues to recommend social distancing measures for meetings of legislative bodies.

I recommend that the TAC again adopt these three findings.

ATTACHMENTS:	None
RECOMMENDED ACTION:	Approve Making the Findings Described Above

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

MEETING DATE:	February 9, 2022
AGENDA ITEM:	3
AGENDA TITLE:	Presentation and Discussion of Flow Direction/Flow Velocity Modeling
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

At its March 10, 2021 meeting the TAC approved a contract with Montgomery & Associates to perform flow direction/flow velocity modeling, and the Board approved this contract at its September 1, 2021 meeting. The work consisted of these Tasks:

- Developing Groundwater Elevation Surface Map Snapshots of the Shallow Aquifer
- Performing Particle Tracking and a Travel Time Analysis on the Developed Water Elevation Maps
- Preparing a Technical Memorandum
- Making a presentation to the TAC

Attached is the Draft Flow Direction/Flow Velocity Modeling Technical Memorandum.

At today's meeting Montgomery & Associates will make a PowerPoint presentation describing this work and will respond to questions and comments from the TAC.

ATTACHMENTS:	Flow Direction/Flow Velocity Modeling Draft Technical Memorandum
RECOMMENDED ACTION:	Discuss and provide comments, questions, and suggested revisions to the Technical Memorandum and then forward the document to the Board with the TAC's recommendation for approval



DRAFT TECHNICAL MEMORANDUM

DATE: February 25, 2022
PROJECT #: 9150.0503
TO: Bob Jaques, Technical Program Manager, Seaside Basin Watermaster
FROM: Pascual Benito, Ph.D. and Georgina King, P.G., C.Hg.
PROJECT: Seaside Basin Watermaster
SUBJECT: Assessment of Potential Seawater Intrusion Travel Rates

INTRODUCTION

The objective of this analysis is to estimate the velocities, time scales, and travel distances associated with potential seawater intrusion inland from locations along the coastline in the Northern Coastal Subarea of the Seaside basin. The analysis considers both current conditions and projected potential future conditions.

The modeling analyzes particles released along the entire extent of the coastline of the Seaside Subbasin and the portions of the neighboring Monterey Subbasin in the top 4 layers¹ of the Seaside Basin Watermaster's groundwater Model (the Model) and tracked inland throughout the simulation to look at how inland flow velocities vary spatially along the coastline of the basin and under different basin conditions. Groundwater travel velocity is very sensitive to the effective porosity of the aquifer, and since the effective porosity of the Paso Robles is not a calibrated parameter² from the Model, upper and lower bound estimates on the travel times are developed based on considering a reasonable range of aquifer effective porosities to provide a range of possible inland travel velocities. The maximum inland travel velocity is then used to provide estimates of travel times from the coastline to varying distances inland.

¹ Layer 1 = Aromas Sands & Older Dune Deposits; Layer 2 = Upper Paso Robles, Layer 3 = Middle Paso Robles; Layer 4 = Lower Paso Robles

² During the Model calibration process (Hydrometrics LLC, 2009), aquifer parameters including hydraulic conductivity and storage coefficients, were adjusted iteratively to minimize the differences between observed historical water levels and simulated water levels. The effective porosity was not one of the parameters adjusted or used in the calibration of the Model to water levels.

This particle tracking analysis cannot tell us where the interface between fresh groundwater and saline groundwater, also referred to as the seawater interface, is located currently, or where it will be in the future. In un-intruded aquifers the seawater interface can be located at some distance offshore depending on the geometry of the aquifer and the magnitude of freshwater flux in the offshore direction, while the interface will be located at some distance inland for an intruded aquifer. The analysis can provide a range of potential groundwater travel rates from the coastline under different potential basin conditions, and as such can provide insights into the time scales and distances at which further inland intrusion could occur if early signs of seawater intrusion are detected in coastal monitoring wells.

ASSUMPTIONS FOR UPDATED BASELINE SIMULATION

In this Technical Memorandum the term “baseline simulation” refers to the simulation of future conditions assuming only operation of currently planned projects with no additional replenishment added. The updated baseline simulation represents recent conditions from water year (WY) 2018 through 2021 based on actual measured pumping, injection, and hydrology; and projected potential future conditions from WY 2022 through WY 2050 based on projected pumping, currently planned projects, and a repeated historical hydrology record.

The baseline simulation includes:

- A new extended hydrology period with 2 multi-year drought periods
- Projected mean sea level rise of up to 1.3 feet by 2050
- Seaside Aquifer Storage and Recovery (ASR) injection of Carmel River water, which is tied to the cycled hydrology and the assumption that planned upgrades to the Cal-AM Carmel Valley wellfield are completed by WY 2024
- Cal-Am's 25 year 700 AFY in-lieu replenishment begins in WY 2024
- Pure Water Monterey (PWM) Expansion project (tied to the new hydrology) begins in WY 2024
- Other planned projects including the City of Seaside's replacement of groundwater with recycled water for golf course irrigation in WY 2024 and the construction of the Security National Guaranty (SNG) and Campus Town developments in the City of Seaside occur
- No other sources of replenishment water are provided to the basin
- The assumption that no proposed Groundwater Sustainability Plan (GSP) projects are implemented in the neighboring coastal Monterey and 180/400 Foot Subbasins, such 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.

DRAFT

Page 3

The updated baseline model simulates a 33-year period from October 2017 through the end of September 2050 (WY 2018–2050). The hydrology (rainfall, recharge, and streamflow) for WY 2018–2021 is based on measured values, while the hydrology for WY 2022 through 2050 is simulated by repeating the hydrology record from WY 1988 through 2016, as illustrated on Figure 1. Table 1 provides a listing of the simulated WY types, data sources, and major project events. A complete description of the baseline simulation assumptions and output is provided in the recent technical memorandum (M&A, 2022).

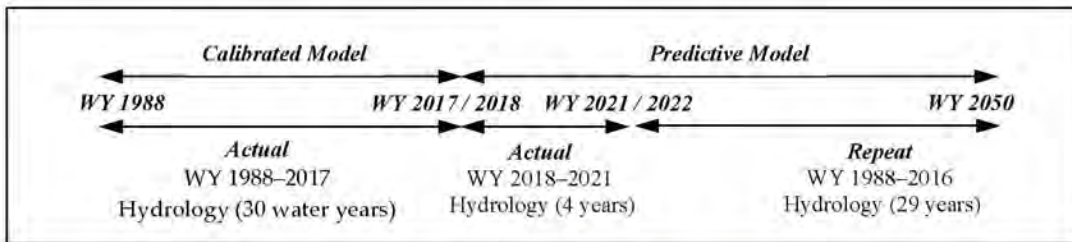


Figure 1: Repetition of Hydrology for Predictive Model

Table 1. Annual Summary of Updated Baseline Simulation Water Year Types, Data Sources, and Major Project Events

Sim Year	Water Year	Carmel River WY Type	Hydrology Source WY	Pumping & Injection	Cal-Am Repayment Period	Projects Timeline
1	2018	Below Normal	Actual	Actual		
2	2019	Extremely Wet	Actual	Actual		
3	2020	Normal	Actual	Actual		
4	2021	Critically Dry	Actual	Actual		PWM Base Project Begins (3,500 AF&) Cal-Am ceases pumping in Laguna Seca
5	2022	Critically Dry	1988	Projected		PWM ramps up to 4,100 AFY
6	2023	Critically Dry	1989	Projected		Seaside Golf Courses shift to PWM water, Campus Town starts up (100 AFY)
7	2024	Critically Dry	1990	Projected	1	PWM Expansion Begins (5,750 AFY), Campus Town ramp up (130 AFY)
8	2025	Dry	1991	Projected	2	SNG starts up (25 AFY), Campus Town ramps up (215 AFY)
9	2026	Normal	1992	Projected	3	SNG ramps up (30 AFY), Campus Town full capacity (301 AFY)
10	2027	Wet	1993	Projected	4	SNG ramps up (50 AFY)
11	2028	Critically Dry	1994	Projected	5	SNG full Capacity (70 AFY)
12	2029	Extremely Wet	1995	Projected	6	
13	2030	Above Normal	1996	Projected	7	
14	2031	Above Normal	1997	Projected	8	
15	2032	Extremely Wet	1998	Projected	9	
16	2033	Normal	1999	Projected	10	
17	2034	Above Normal	2000	Projected	11	
18	2035	Normal	2001	Projected	12	
19	2036	Below Normal	2002	Projected	13	
20	2037	Normal	2003	Projected	14	
21	2038	Below Normal	2004	Projected	15	
22	2039	Wet	2005	Projected	16	
23	2040	Wet	2006	Projected	17	
24	2041	Critically Dry	2007	Projected	18	
25	2042	Normal	2008	Projected	19	
26	2043	Normal	2009	Projected	20	
27	2044	Above Normal	2010	Projected	21	
28	2045	Above Normal	2011	Projected	22	
29	2046	Dry	2012	Projected	23	
30	2047	Dry	2013	Projected	24	
31	2048	Critically Dry	2014	Projected	25	Potential Final Year of Cal-Am Repayment Period (see footnote on page 6)
32	2049	Dry	2015	Projected		
33	2050	Below Normal	2016	Projected		

SUMMARY OF SIMULATED BASELINE CONDITIONS

To provide context for the simulated basin conditions used for particle tracking analysis, a summary of the results of the baseline simulation are provided below, starting with an overview of simulated groundwater levels at coastal monitoring wells and following with a summary of simulated inland fluxes from the offshore portions of the aquifers.

Groundwater Levels at Coastal Monitoring Wells

Six monitoring wells have been used for establishing protective elevations against seawater intrusion in the basin (HydroMetrics LLC, 2009). These monitoring wells are: MSC Deep, MSC Shallow, PCA-West Deep, PCA-West Shallow, Sentinel Well 3 (also referred to as SBMW-3), and CDM MW-4 and are shown on Figure 2. Annually averaged hydrographs of groundwater levels in these coastal monitoring wells for the updated baseline simulation along with the simulated change in mean sea level are shown on Figure 3. Also overlain on the figure are the total annual replenishment volumes from ASR injection and PWM injection during the baseline simulation, as well as the periods and annual volumes when Cal-Am is projected to recover stored (“banked”) ASR water. The right-hand vertical axis represents the groundwater level elevation and the left-hand vertical axis the annual recharge volumes.

At all the protective elevation monitoring wells, except for CDM MW-4³, the annual average groundwater levels rise steadily starting in WY 2024 (when both the PWM Expansion and the Cal-AM replenishment repayment period begin) through WY 2033. After WY 2033 mean annual groundwater levels begin to either level off and/or drop to varying degrees in response to wetter and drier periods. During years when the Carmel River WY is classified as Below Normal, Dry, or Critically Dry (identified by dates with orange shading), the volumes of both ASR injection and Table 13 Carmel River diversions⁴ to meet Cal-Am Monterey District demand are greatly reduced. Similarly, drought conditions in the Salinas Valley Castroville Seawater Intrusion Project (CSIP) service area result in a marked reduction in injected PWM water, as PWM source water is diverted to augment the CSIP agricultural irrigation supply and as Cal-Am recovers credited water from the banked drought reserve. Groundwater levels drop markedly in the last several years of the simulation period (WY 2046 through 2050) due to the impacts of a simulated

³ As has been observed in previous modeling, because of its very shallow depth and position in the Southern Coastal subarea of the basin, the groundwater levels at CDM MW-4 are largely insensitive changes in operations in the Northern subareas of the basin.

⁴ Table 13 diversions refers to a streamflow-dependent water right that Cal-Am can use in its Carmel River well fields as identified in Table 13 of SWRCB Decision 1632 (1995). It is in addition to Cal-Am’s entitled 3,376 AFY water right from the Carmel Valley basin with no streamflow restrictions.

multi-year drought period⁵ during which both ASR and PWM injection are greatly reduced, and Cal-Am begins recovering banked ASR water credits to meet their system demand. The last 2 years of this period also coincides with the end of Cal-Am's repayment period⁶, such that Cal-Am can exercise their full native groundwater rights from WY 2049 through 2050.

The direct correlation between drops in groundwater level and the Carmel River hydrology in terms of decreased Carmel River diversions for ASR and decreased PWM injection during these dry years and the sharp drops in groundwater level can be clearly seen in the overlay on Figure 3 of the total replenishment from ASR injection and PWM injection during the baseline simulation, as well as the periods and annual volumes when Cal-Am is projected to recover stored ASR water.

Change in Net Inflow to the Basin from Offshore

Figure 4 shows the results of a water budget analysis of the model and provides an estimate of the net annual inflow of groundwater into the Seaside Basin from the offshore portions of the aquifer for the updated baseline simulation. Positive values represent net inflow of groundwater moving from offshore across the coastline into the basin. Negative values represent net outflow of water from the onshore aquifers into the offshore region. The solid dark blue line represents the net inflow into the Northern Coastal subarea of the basin for the baseline simulation, and it shows that prior to the start of the repayment period in WY 2024 there is a net inflow of water from the offshore areas into the basin along the coastal boundary associated with the multi-year drought period and for conditions before future projects commence. While not necessarily implying seawater intrusion, because there may be freshwater stored offshore in the aquifer, this represents a condition that would increase the potential for seawater intrusion. In WY 2024 when both the PWM Expansion and the Cal-Am repayment period begins, groundwater levels in the basin begin to rise and simulated flows change to reflect a net outflow of groundwater from the basin in the offshore direction. The net outflow reaches a peak in WY 2033 following a series of above normal and extremely wet years (identified by dates with blue shading), and then begins to decrease in magnitude and remains relatively constant through WY 2045 before flow to the offshore areas decreases further during the final multi-year drought. Increased offshore groundwater flow minimizes the potential for seawater intrusion. The orange line represents the Southern Coastal subarea, which as would be expected appears to be insensitive to projects in the Northern subareas. This analysis considers the total net flow over the entire coastal boundary of each coastal subarea and for all the layers combined, however, and does not show differences in

⁵ The WY 2046–2050 drought is based on the repeated hydrology of the recent 2012–2015 drought

⁶ Cal-Am's repayment period may extend to more than 25 years depending on the amount of water that needs to be repaid.



trends that could be spatially localized along the coast or within different model layers that could indicate risk for localized seawater intrusion. The layer-by-layer particle tracking results in the next section will provide a sense of the variability in offshore inflows by depth and location along the coastline.

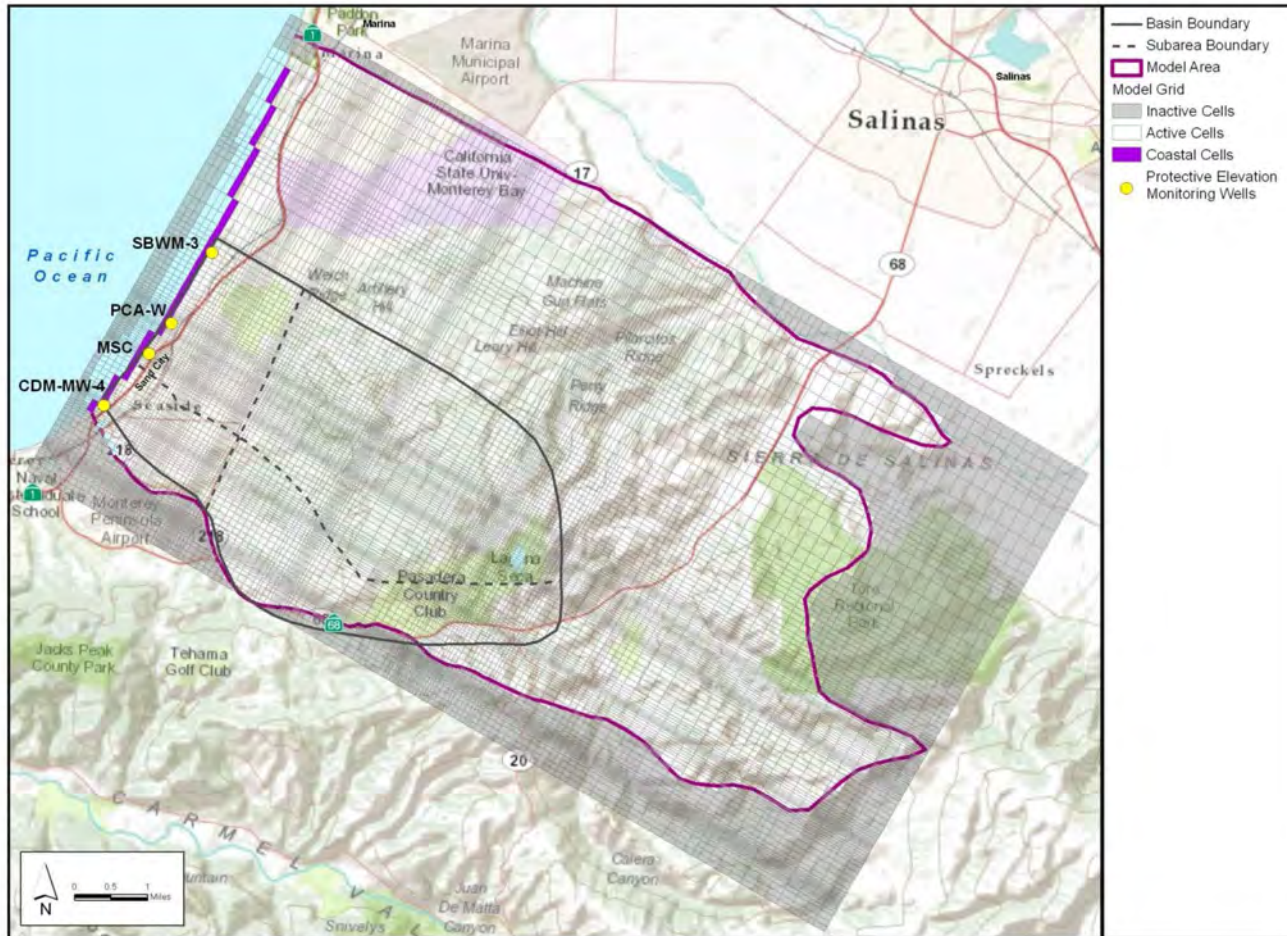


Figure 2. Location of Protective Elevation Monitoring Wells

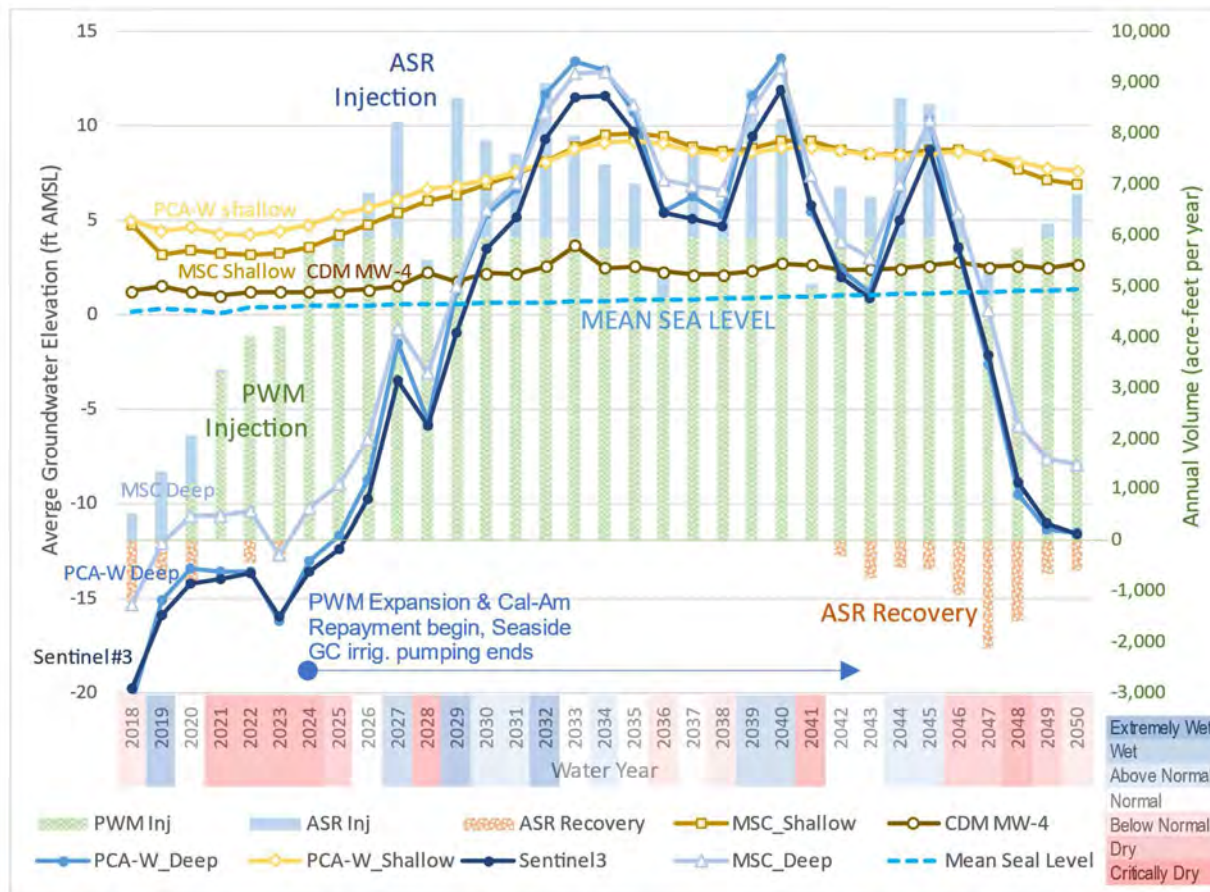


Figure 3. Annually Averaged Groundwater Elevations in Protective Elevation Wells Compared to PWM and ASR Injection and ASR Recovery (Right Axis) for the Baseline Simulation

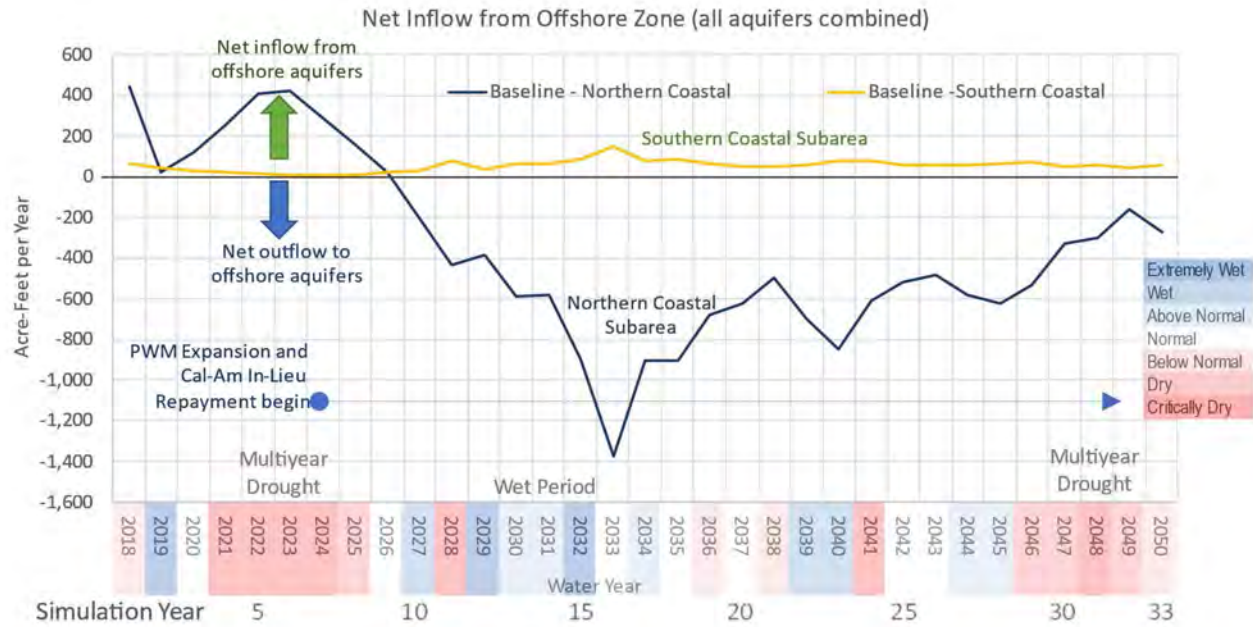


Figure 4. Net Groundwater Inflow to the Seaside Basin from Offshore for the Baseline and 1,000 AFY of Replenishment Water Scenario)

PARTICLE TRACKING OF INLAND FLOW ALONG COASTLINE

Particles are released every 500 feet along the entire coastline (as shown on Figure 5) at the mid-depth of model layers 1 through 4 (Aromas Sands & Older Dune Deposits, Upper, Middle, and Lower Paso Robles) at the start of the baseline simulation (October 2017) and their individual flow paths are tracked through the end of the 33-year baseline simulation (September 2050). Particles move with the groundwater and stop when they arrive at either a model boundary or a production well, or when the simulation ends.

Effective Porosity Parameter

The groundwater flow rate represented in Darcy's Law, which forms the basis for the groundwater flow equations used in the model, represents the groundwater velocity averaged over the total cross-sectional area of aquifer material. The actual travel velocity of a particle of water—or solute moving with the water—is greater, as the water flows through only the fraction of the cross-sectional area that represents the pore spaces between the solid grains. For this reason, the actual groundwater travel velocity is inversely dependent on the effective porosity of the aquifer material. The effective porosity represents the fraction of the total aquifer volume (both pore space and solid grains) through which water actually flows (i.e., only the connected pore space). For the same volumetric flux, a higher effective porosity produces a slower particle travel velocity, and a smaller effective porosity produces faster travel velocity, because the same amount of flow is concentrated through a smaller cross-sectional area.

For a regional scale model, like the Seaside Model, where aquifers may be represented by a single model layer, the effective porosity parameter can also take on a surrogate role of accounting for depth intervals within an aquifer that are thinner than the total vertical layer thickness represented in the model, which are more permeable and through which a greater portion of the flow is concentrated. In this case, in order to represent faster flow through this depth interval in the model, it may be necessary to use values of effective porosity that are lower than the effective porosity value that could be measured in the laboratory for the bulk aquifer material, or than would be needed if using multiple thinner model layers to represent the same single aquifer. For example, this has been found to be the case in recent and ongoing work analyzing and calibrating the Model to match the results of tracer studies recently conducted in the Santa Margarita formation for the Pure Water Monterey project (M&A, 2021). Spinner log vertical flow profiling in the ASR wells indicates that 70% of the flow in the well is occurring through only the lower 20% of the Santa Margarita formation (Padre, 2002; Pueblo, 2008). The result of this is that to match the faster observed tracer travel times resulting from preferential

flow through only a portion of the total formation thickness, effective porosities as low as 7-8% have been needed to calibrate the particle tracking models (M&A, 2021).⁷

The Seaside model has been calibrated to groundwater levels but not to solute transport travel times, and as such the effective porosity of each aquifer is not currently a calibrated value in the model. For this reason, the particle tracking analysis evaluates a range of effective porosities to provide an upper and lower range estimate for potential inland travel times. A spatially uniform effective porosity of 8% is chosen to represent the higher range of potential travel velocities and an effective porosity of 16% to represent a lower velocity range. For comparison, previous estimates of average coastal influx rates used a higher effective porosity of 20% (Hydrometrics WRI, 2013).

It needs to be emphasized that particle tracking is not a substitute for full seawater intrusion modeling. Particle tracking represents the advective⁸ transport of freshwater and does not account for the gradients due to density differences between saltwater and freshwater, or hydrodynamic dispersion and mixing, such as would be represented by using a density-dependent flow and transport model such as SEAWAT. The basin model has been spatially discretized⁹ and calibrated specifically to evaluate changes in water levels and water fluxes at a basin subarea scale, and not specifically to evaluate solute transport travel times. As such, particle tracking based on the basin model will have limitations based on the vertical and horizontal model grid cell size. Particle tracking also does not tell us where the interface between freshwater and seawater is located currently or where it will be in the future. What particle tracking can provide is a range of potential groundwater travel rates from the coastline under different potential basin conditions, and as such can provide insights into the time scales and distances at which further inland intrusion could occur if early signs of seawater intrusion are detected in coastal monitoring wells.

⁷ Ongoing analysis of preliminary results from a more sensitive fluorescent dye tracer study suggest effective porosities as low as 5% may be needed.

⁸ Advection refers to a solute being carried along with the bulk or average movement of groundwater, at the average local groundwater velocity, and does not include the additional spreading of solutes due to hydrodynamic dispersion that would lead to a lower concentration leading edge traveling faster than the average groundwater flow.

⁹ Spatial discretization refers to the horizontal model grid cell size and model layer thicknesses selected to represent the groundwater basin by means of a numerical model. The finer the spatial discretization (e.g. smaller grid cells, thinner layers) that is chosen, the more detailed and refined the numerical representation can become, but at a tradeoff of increased computational complexity and data requirements. The degree of spatial resolution needed for accurately modeling solute transport is often greater than the spatial resolution needed to model average water levels and fluxes.

Particle Tracking Results

The results of the particle tracking simulations for model layers 1 (Aromas Sands & Older Dune Deposits) and layers 2 through 4 (Upper, Middle, and Lower Paso Robles) are presented on Figure 6 through Figure 9, focused on the Northern Coastal Subarea of the Seaside Subbasin. For each model layer, the figures show the path taken by each particle, after it is released at the coastline, over the entire 33-year baseline simulation period. The left-hand panel of each figure shows the results particle paths with an assumed layer effective porosity of 8%, while the right-hand panel shows the results for an assumed effective porosity of 16%. The particle paths are color-coded by travel time, with each color band representing a 5-year increment of time traveled since the particle was first released at the coastline at the start of the simulation. For example, the red color represents the position(s) of the particle in the first 5 years, orange represents the position in years 5 through 10, *etc.*

Note that only model layers 1 and 2 have active coastal grid cells across the entire shoreline in the Southern Coastal Subarea. Layers 3 through 5 pinch out just south of the boundary between the Southern and Northern Coastal Subareas where the Monterey Formation occurs at very shallow depths on the south side of the Seaside Fault. So, particles cannot be tracked from the Southern Coastal Subarea coastline in the deeper layers. In the 2 shallower layers, the flow is always in the offshore direction, consistent with the observations that water levels in the Southern Coastal Subarea are already at or above protective elevations. The particles tracks for Layer 1 and Layer 2 for the Southern Coastal Subarea are shown in Figure 10 and Figure 11.

Some general observations can be made by comparing the results for each layer

- For all model layers, the particles under the 8% effective porosity assumption travel significantly faster and further than under the 16% effective porosity assumption, as would be expected.
- As shown on Figure 6, for Layer 1 (Aromas Sands & Older Dune Deposits), the movement of particles (and the flow of water) in the basin is almost entirely in the offshore direction for the entire simulation except in the vicinity of Sentinel Well #3 along the subbasin boundary with the Monterey Subbasin. In the first 10 years of the simulation there is some movement of particles from the Monterey Subbasin into this area, but these appear to then move back toward the coast or toward the Monterey Subbasin as water levels in the Seaside Subbasin rise relative to the water levels in the Monterey Subbasin, reversing the flow gradients. Particles released along the coastline in the neighboring Monterey Subbasin appear to travel quickly large distances inland due to a combination of higher modeled hydraulic conductivities in this area and the inland gradients generated by the hydraulic heads assigned along the northern boundary of the

model. The portions of the Seaside Subbasin groundwater Model that represent areas outside of the boundaries of the Seaside Subbasin itself have not been the primary focus of model development and calibration, so the results in those areas have a greater degree of uncertainty than areas within the Seaside Subbasin itself.

- In Layer 2 (Upper Paso Robles), as shown on Figure 7, the movement of particles (and the flow of water) in the basin starts off in the first 5 years initially as moving very slowly in an inland direction in the northern half of the Northern Coastal Subarea, and moving offshore in the southern half, and then switches to almost entirely moving in the offshore direction as water levels rise. As in Layer 1, there is some inland crossflow at the boundary in the vicinity of Sentinel Well #3 along the subbasin boundary with the Monterey Subbasin. And similarly, particles released along the coastline in the neighboring Monterey Subbasin appear to travel quickly large distances inland due to a combination of higher modeled hydraulic conductivities in this area and the inland gradients generated by the hydraulic heads assigned along the northern boundary of the model.
- In Layer 3 (Middle Paso Robles), as shown on Figure 8, the movement of particles is initially inland at very slow rates, and then reverses to the offshore direction. The offshore flow is at very low rates in the northern and southern portions of the Northern Coastal Subarea, while in the central portion of the coastline, this offshore flow appears to be much faster, reflective of both higher hydraulic conductivities in this portion of the model, and because this area is directly downgradient from the PWM recharge areas. There is consistent inland flow in the vicinity of Sentinel #3 and the bordering areas of the Monterey Subbasin but at much smaller rates than simulated in Layers 1 and 2.
- As shown on Figure 9, the inland movement of particles in Layer 4 (Lower Paso Robles), is much greater than in the other layers. The movement of particles is initially inland at relatively high rates, penetrating almost half a mile in the first decade in the area around PCA-W and PCA-E before the flow gradients reverse to be in the offshore direction for some time. There is also significant and consistent inland flow in the vicinity of Sentinel #3 and the bordering areas of the Monterey Subbasin, though as simulated this flow appears to be directed further in the direction of the Marina area rather than further into the Seaside Subbasin. The greater inland flow rates and distances in Layer 4 as compared to Layers 1 through Layer 3 are a function both of the Model having higher calibrated hydraulic conductivities for the layer and of greater inland gradients. The area of fastest and greatest inland travel in the region of PCA-W lines up with the regional cone of depression resulting from several larger production wells that are partially screened across the Lower Paso Robles, such as Luzern, Ord Grove, Paralta, and Seaside Muni 4, and is also a zone where calibration of the model suggests higher hydraulic

conductivities than the areas on either side. The modeling identifies this area of the Lower Paso Robles as having the highest risk of seawater intrusion.

The sequence of projected hydrologic conditions in the baseline simulation is based on the repetition of historical hydrologic data. A different sequence of wet and dry years, for example a greater number of dry years early on, would change the picture and could show much further inland penetration.

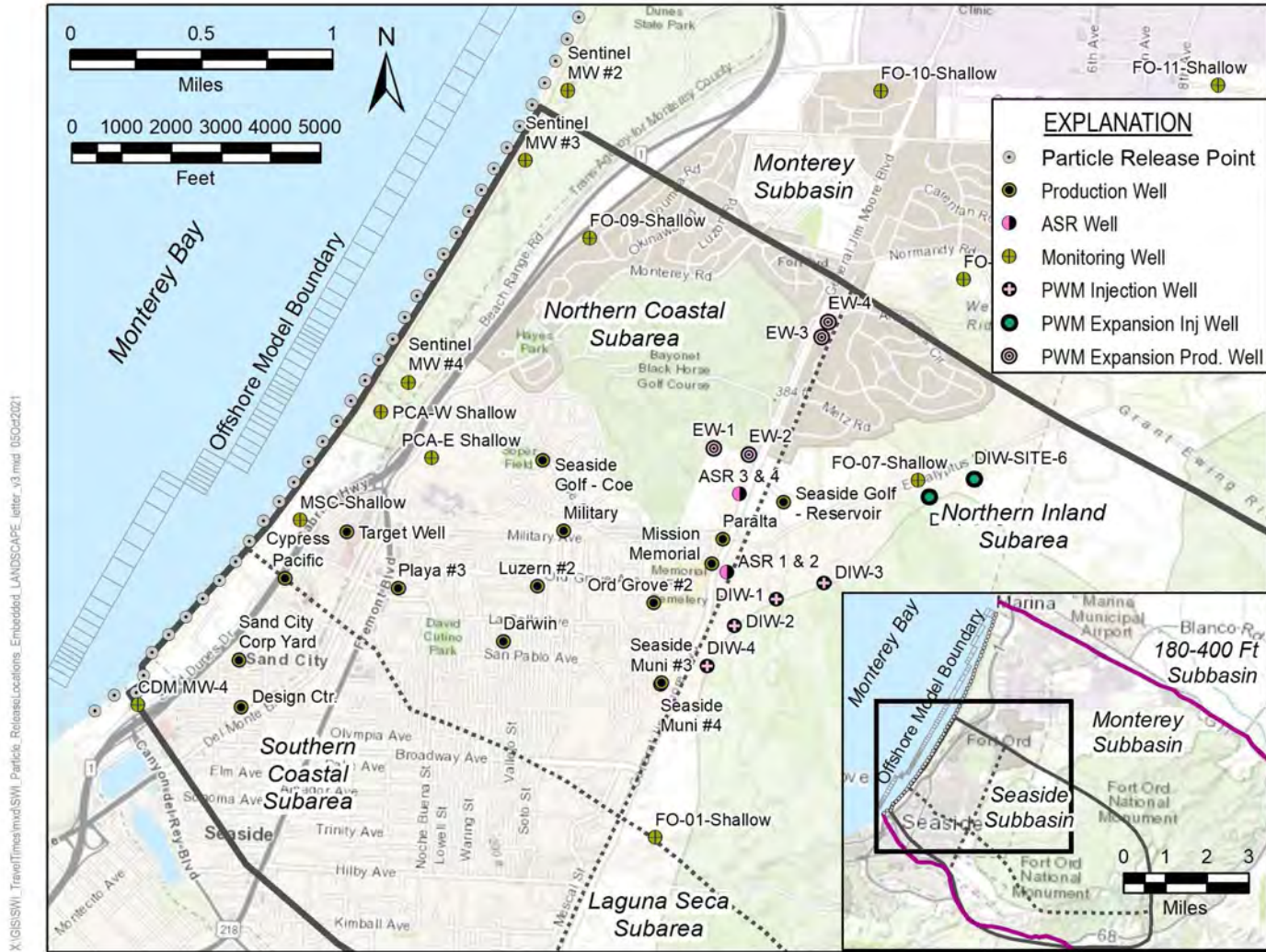


Figure 5. Particle Release Points Along the Coastline

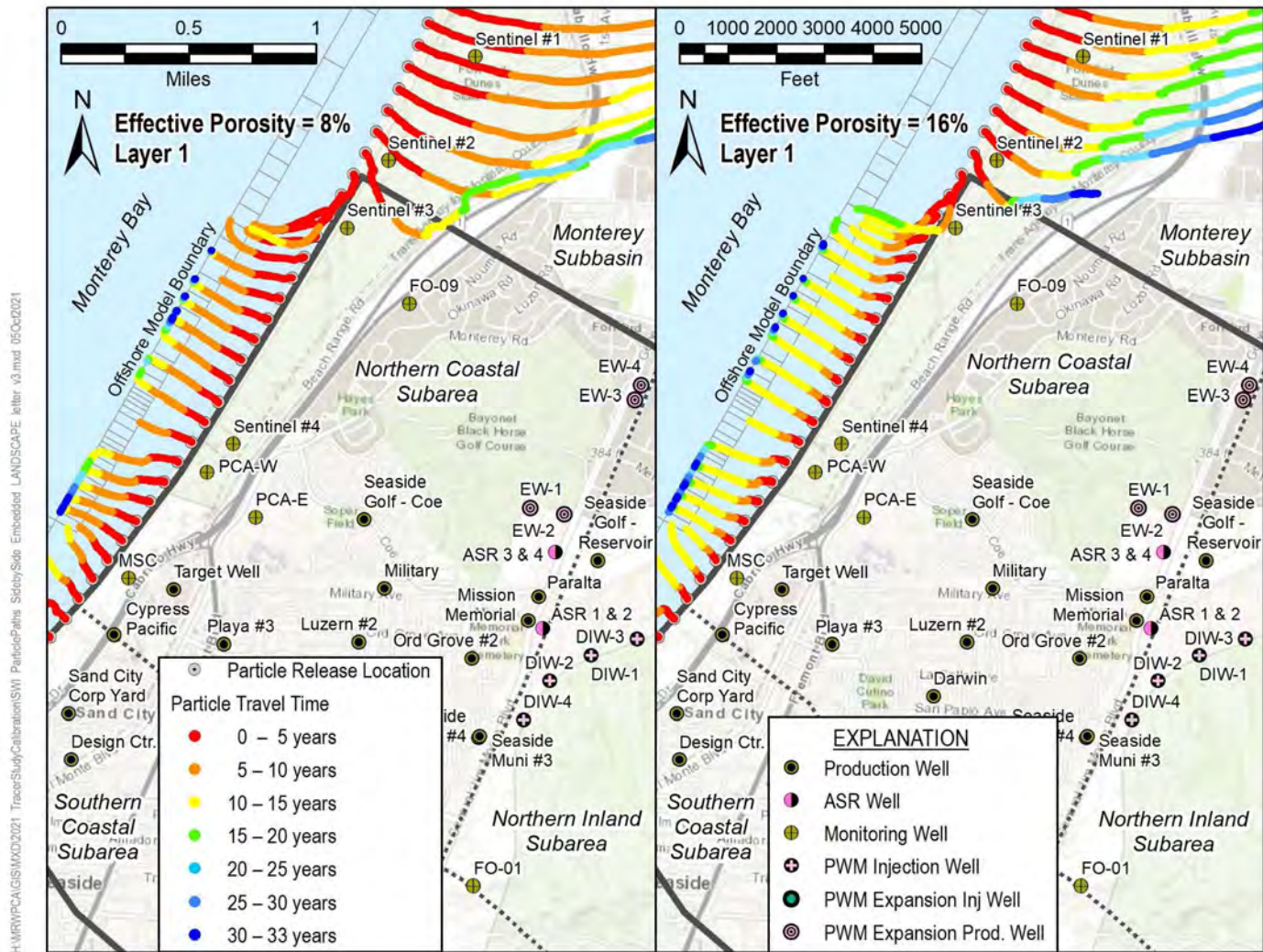


Figure 6. Particle Tracks in Layer 1 (Aromas Sands & Older Dune Deposits) for 8% and 16% Assumed Effective Porosity

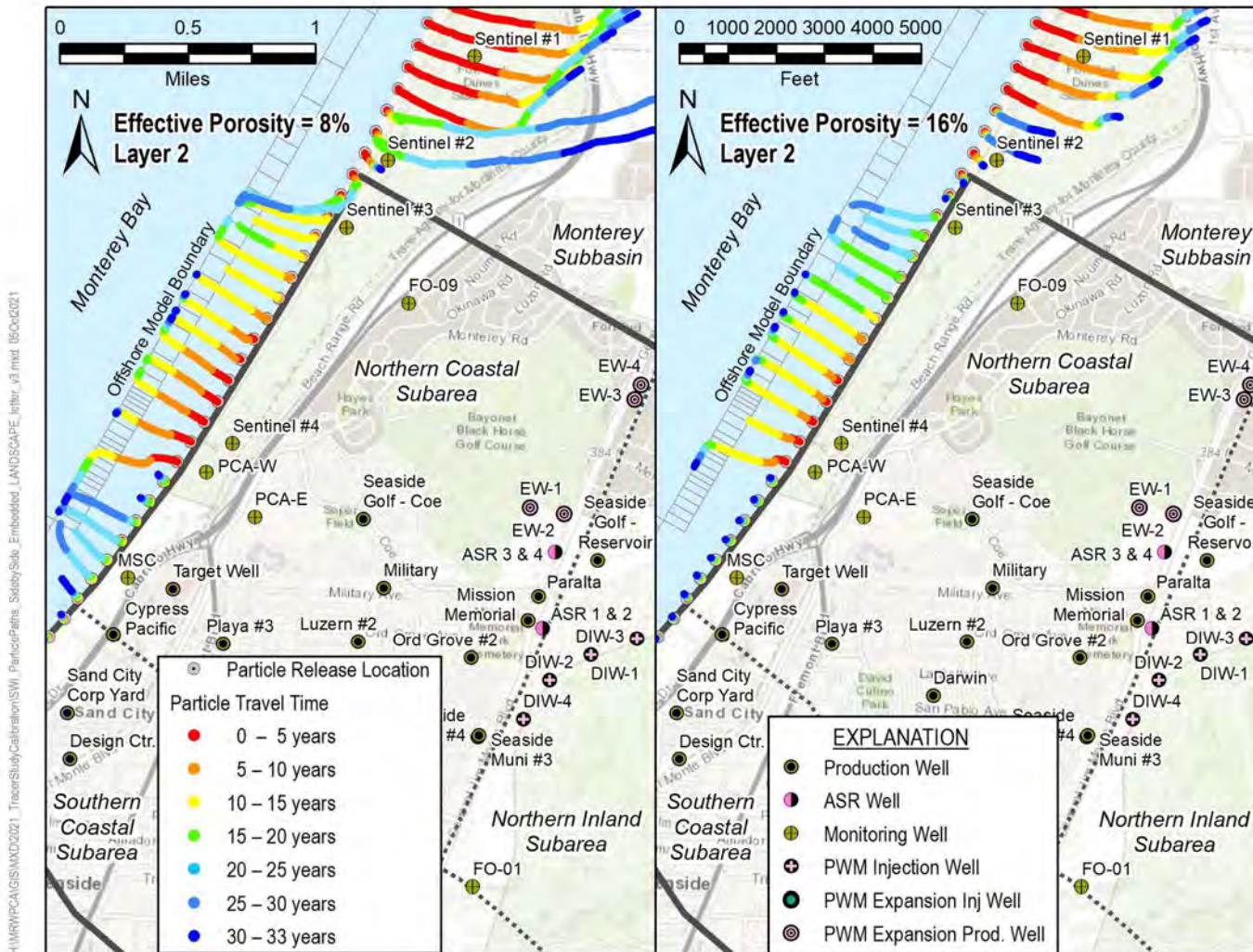


Figure 7. Particle Tracks in Layer 2 (Upper Paso Robles) for Assumed 8% Effective Porosity

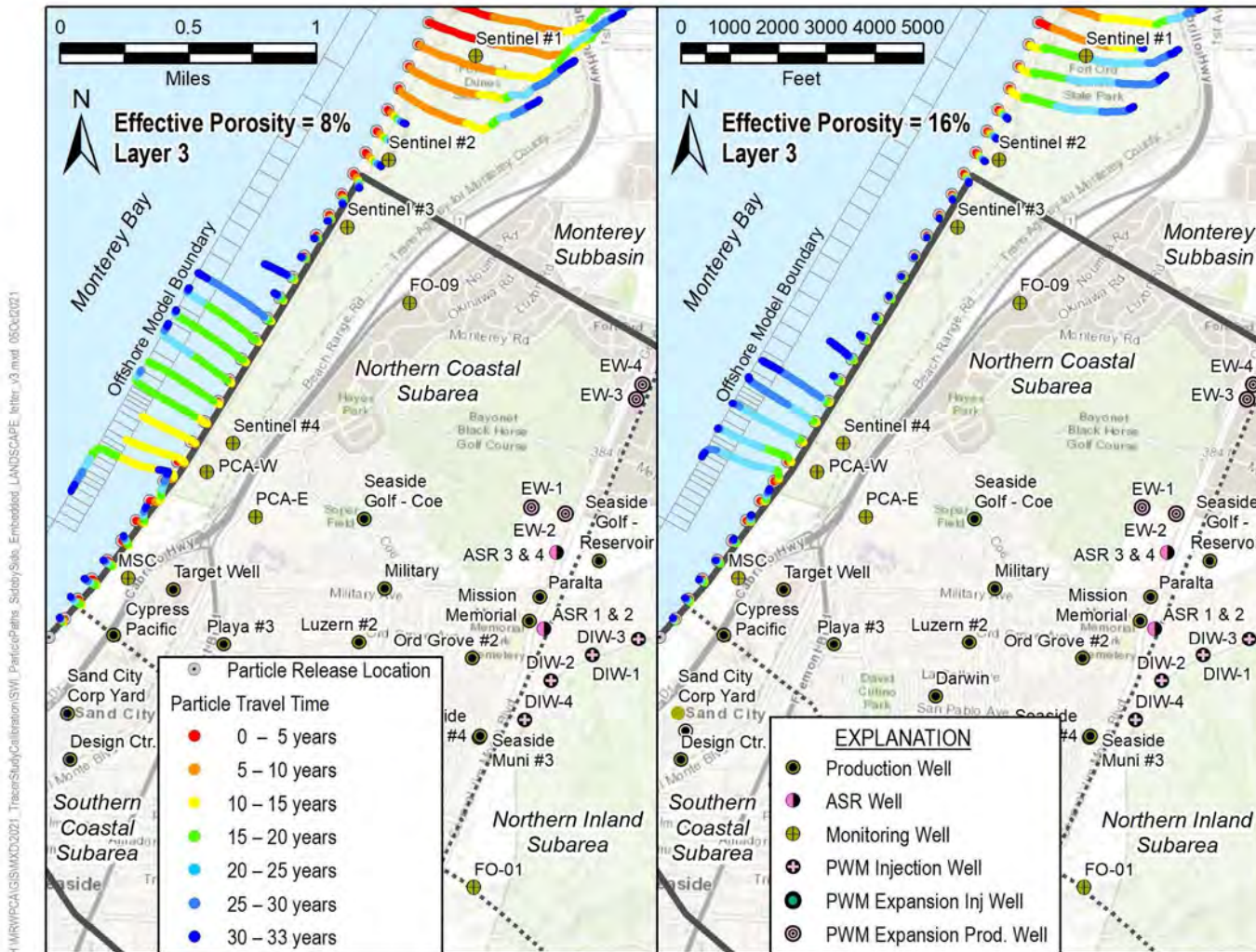


Figure 8. Particle Tracks in Layer 3 (Middle Paso Robles) for Assumed 8% Effective Porosity

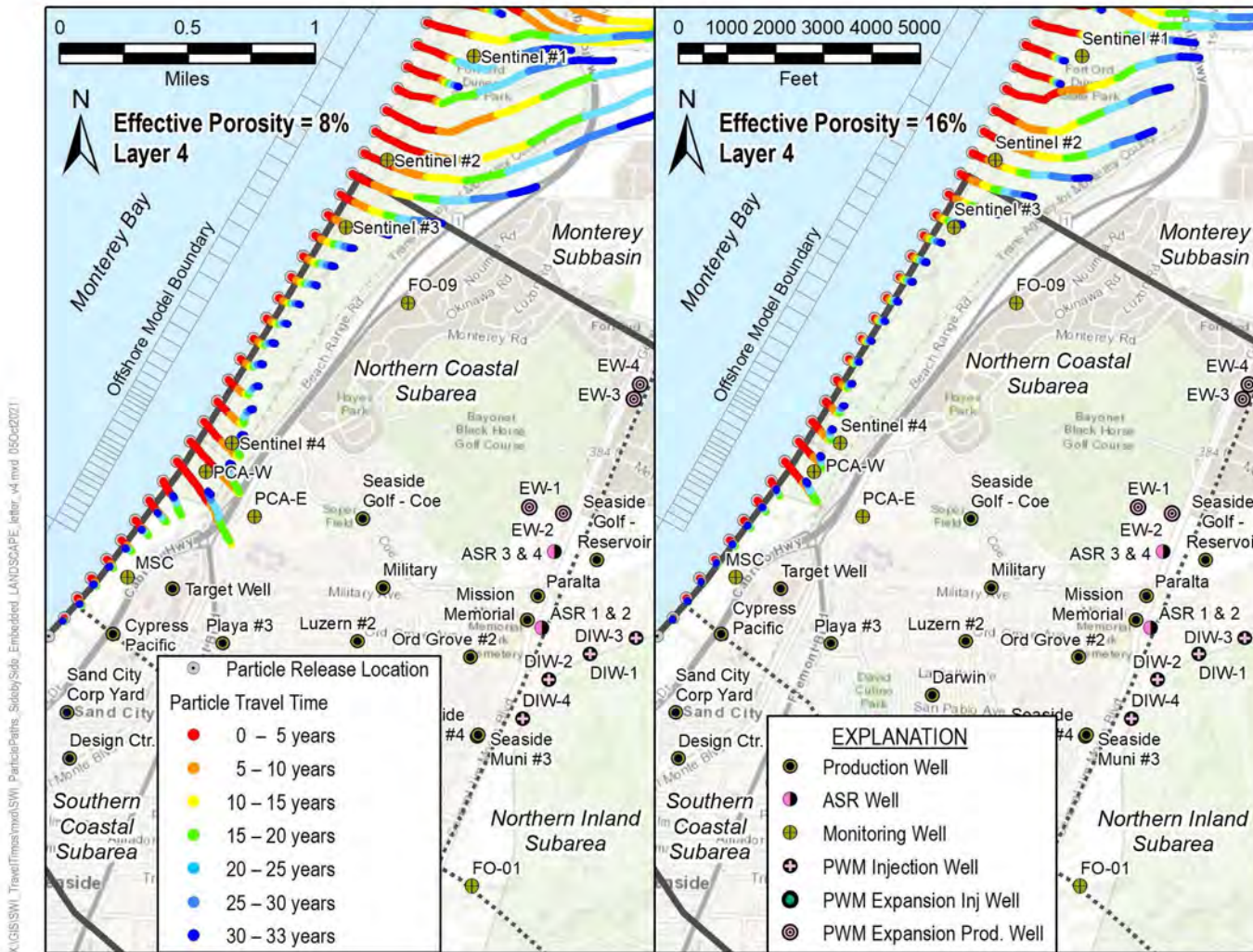


Figure 9. Particle Tracks in Layer 4 (Lower Paso Robles) for Assumed 8% Effective Porosity

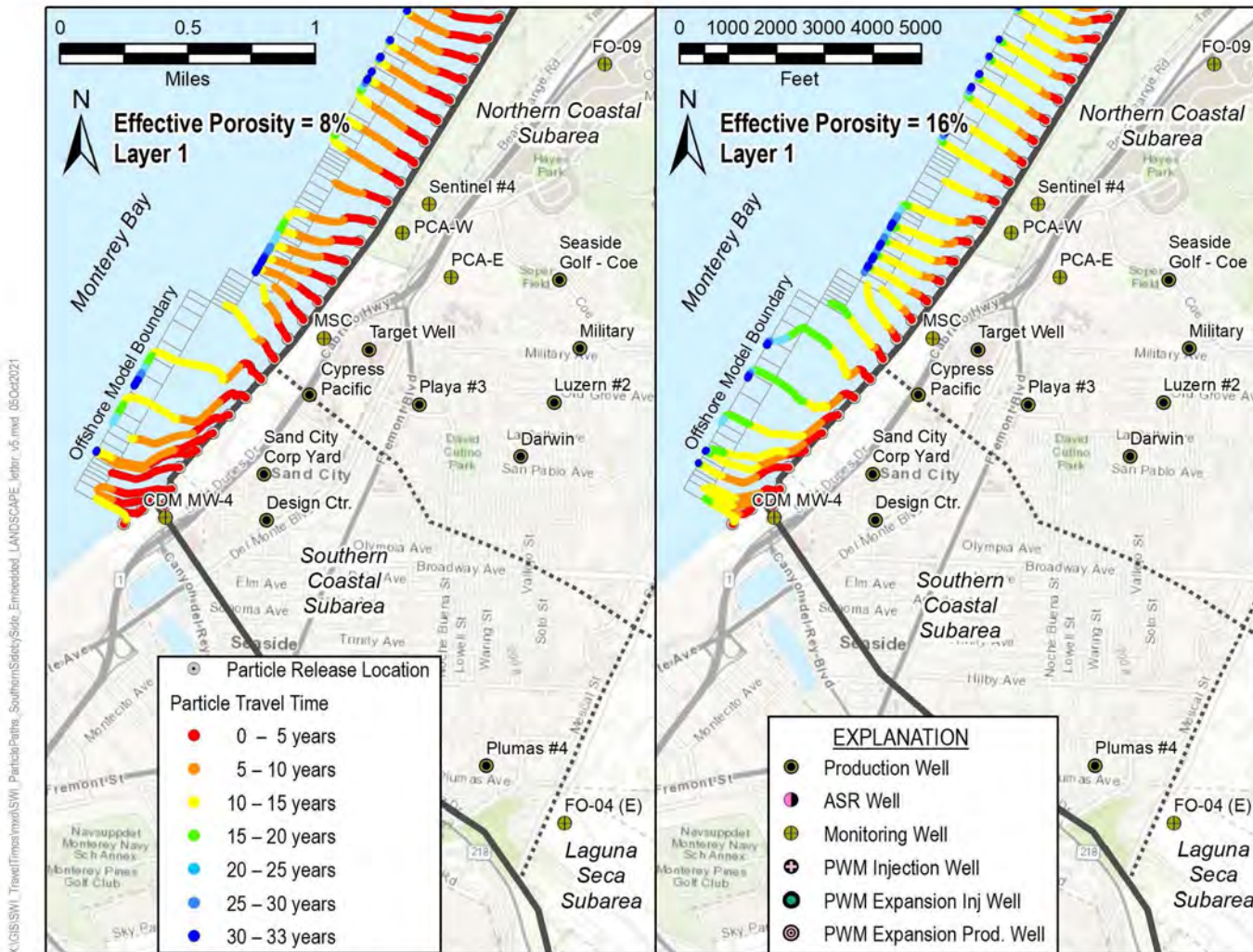


Figure 10. Particle Tracks in Southern Coastal Subarea Layer 1 (Lower Paso Robles) for Assumed 8% Effective Porosity

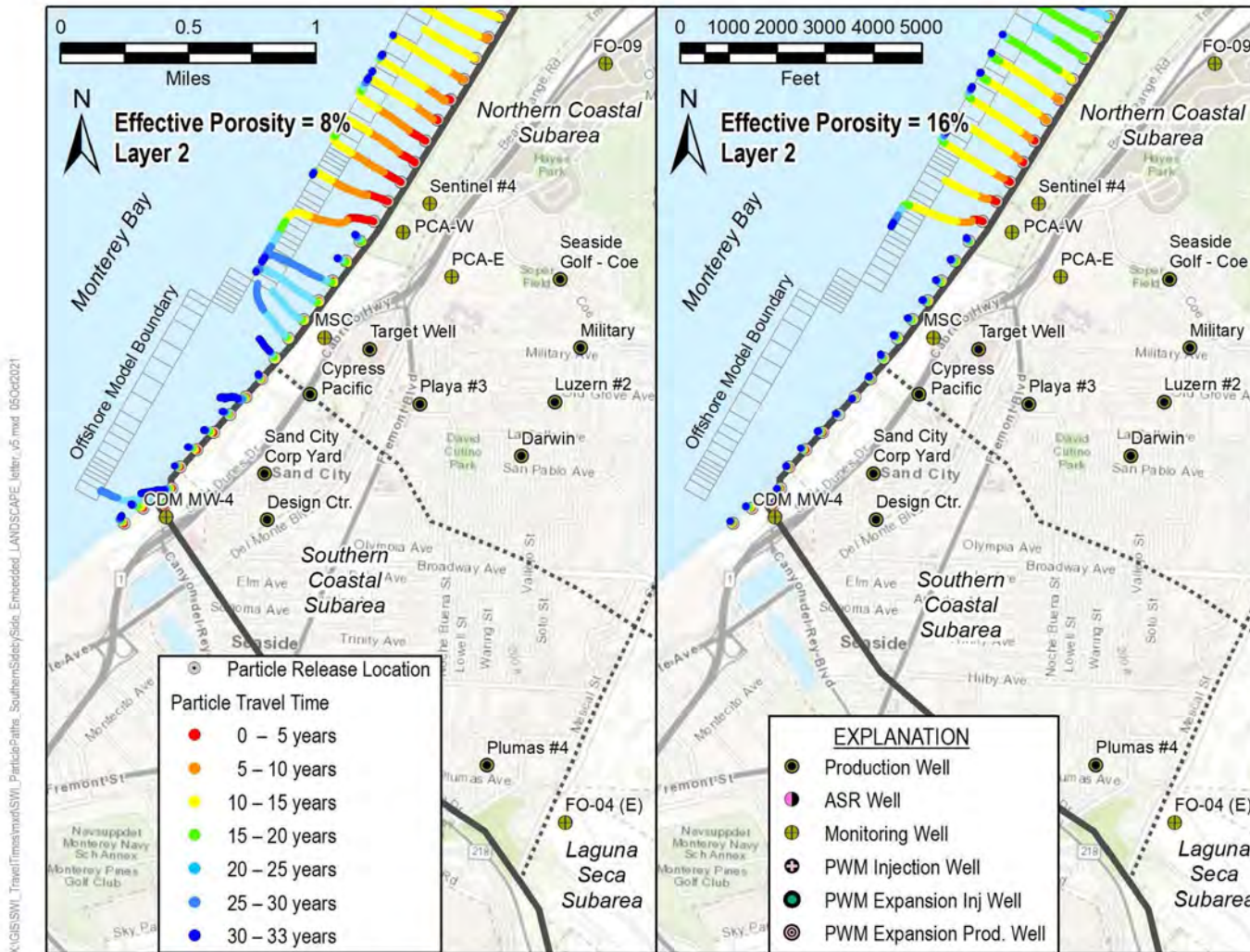


Figure 11. Particle Tracks in Southern Coastal Subarea Layer 2 (Lower Paso Robles) for Assumed 8% Effective Porosity



Inland flow velocities

A zoomed in view of the area of fastest inland penetration in Layer 4 is shown on the inset map of Figure 12. The graph on the left of the figure shows the annually average inland velocity (in feet per year) of the fastest particle track trace outlined by the blue rectangle in the inset map, over the simulation period for the 8% effective porosity scenario. Values greater than zero represent the inland velocity when the particle is traveling inland from the coastline, and negative values represent velocity of travel toward the coastline. The numbered bullet points on the map and the graph represent simulated periods with different operational and hydrologic conditions in the basin as follows:

1. This first period represents current conditions in the basin under current operations before the simulated planned projects begin in WY 2024 and reflective of prolonged multi-year drought conditions that limit natural recharge 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 inset map this period is shown as the red color-coded portion of the particle paths.
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.
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, with the groundwater levels reaching their highest simulated point, buoyed by 5 back-to-back extremely wet and above-normal wet years that allow for large amounts of net-ASR recharge. The particles no longer move any further inland and begin moving back toward the ocean.
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 changes in WY type 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).
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 the simulated WY 2050.



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

The analysis in the previous section allows us to develop a range of inland flow rates along the coastline that can be associated with different hydrologic and operational conditions in the basin. From the perspective of the threat posed by potential seawater intrusion, the temporal and spatial distribution 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. In this context it makes sense to focus the next step of our analysis on evaluating how quickly and how far could the seawater interface move inland from the coastline along one such fast pathway, such as the one that formed around the area of PCA-W, under conservative worst-case conditions.

The seawater interface moves not as a sharp interface, but rather as a diffuse transition zone between freshwater and full-strength seawater, as depicted conceptually on Figure 13. The seawater interface transition zone can be characterized by 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 usually already represent a very high salinity concentration that is much greater than groundwater quality objectives for the basin.

For our analysis we assumed that the basin conditions that resulted in the fastest simulated pre-WY 2024 travel rates are held constant and that the seawater interface moves inland from the coast at that same maximum rate of 250 feet per year for the 8% effective porosity scenario. Additionally, we do not account for the fact that the travel velocity will accelerate closer to an active production well because of the exponential steepening of the gradients around the cone of depression that forms around a pumping well. For these assumed conditions, Figure 14 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 in the area are shown, placed vertically at their respective distances inland from the coastline. For this scenario for example, it could take as little as 1 year between when the leading edge of seawater interface is observed at a coastal monitoring well such as PCA-W and when the seawater interface would reach smaller wells located close to the coast, 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 Playa 3 at a distance of 3,800 feet from the coastline, it could take on the order of 9 years of travel time to arrive after detection of the leading edge at a coastal monitoring well. If we were to hypothetically assume a seawater interface transition zone width of 2,000 feet and assume that the midpoint of the seawater interface moves at the same rate as the leading edge, it



**MONTGOMERY
& ASSOCIATES**

would take as little as 4 years between when the leading edge of the seawater interface is observed at a monitoring location and when the very high concentration of the midpoint arrives at that well.

It should be emphasized that there are a lot of assumptions and unknowns at play here, so these estimates should be taken only as order of magnitude values to provide a sense of the possible scale of travel times and distances. There are no data currently available on the position of the seawater interface offshore, or the width of the transition zone. Similarly, there are no data sets that allow us to identify where potential preferential paths may be located and to improve the estimates of the effective porosity. Analysis of the ongoing PWM added tracer study indicates that effective porosity parameter values as low as 5% may be needed to represent travel times between PWM injection wells and downgradient production wells in the Santa Margarita formation. So, while the assumed 8% effective porosity scenario may be representative of fast travel times, it may not necessarily represent the fastest possible travel rates that could occur.

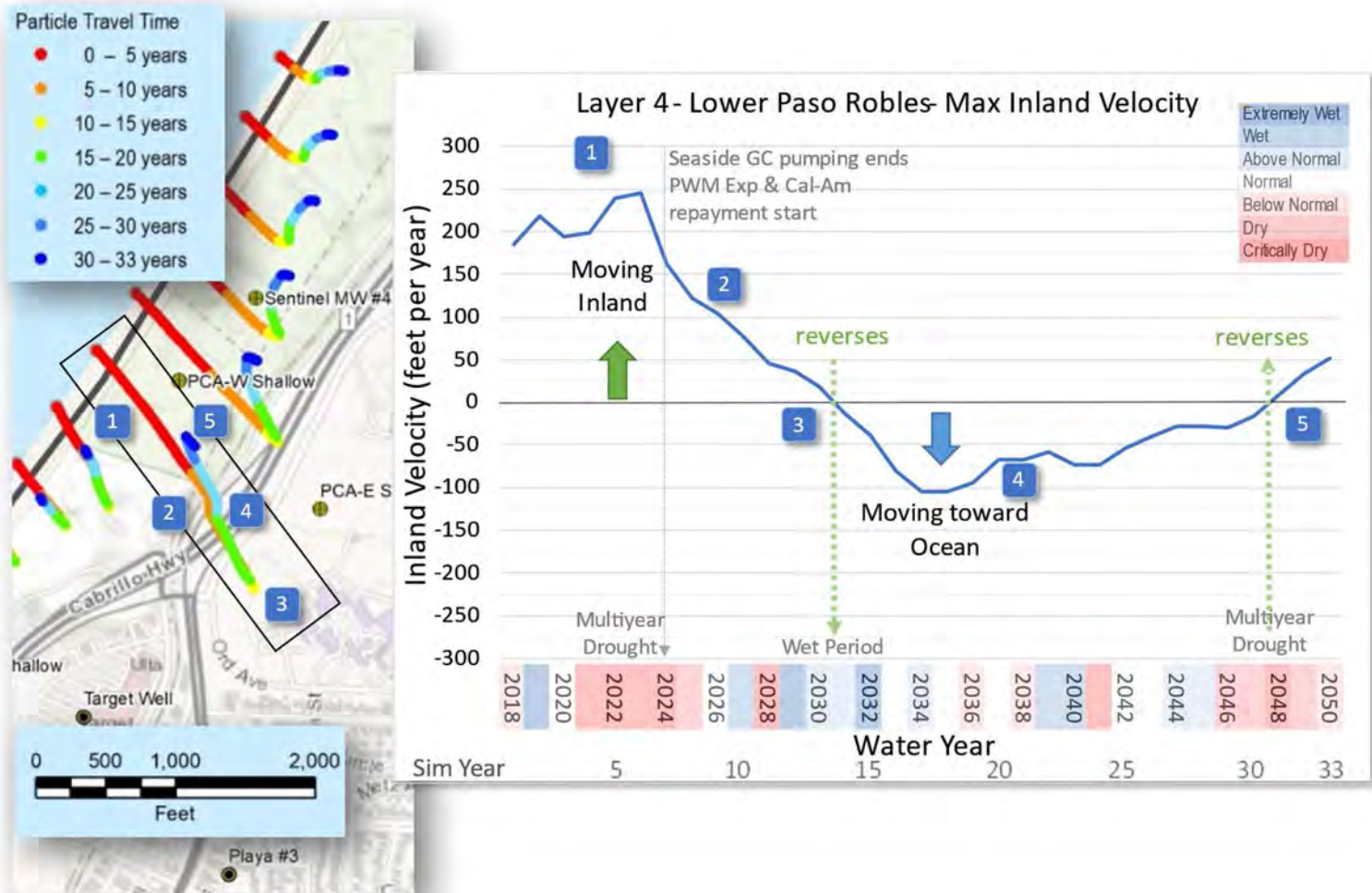


Figure 12. Particle Flow Paths and Inland Velocity Along Fastest Pathway for 8% Effective Porosity Scenario

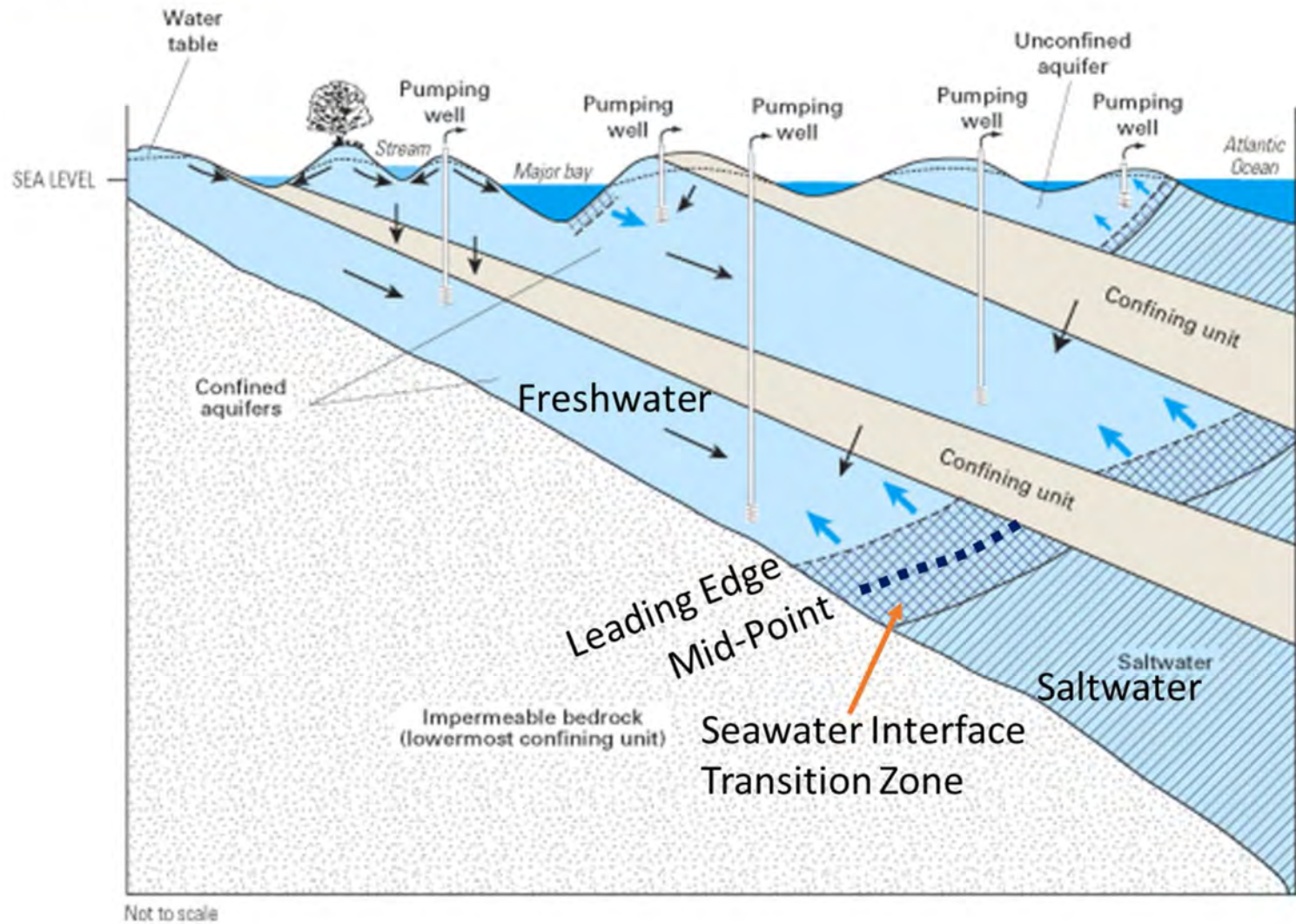


Figure 13. Schematic Representation of Inland Movement of Seawater Interface (Modified from Barlow, 2003)

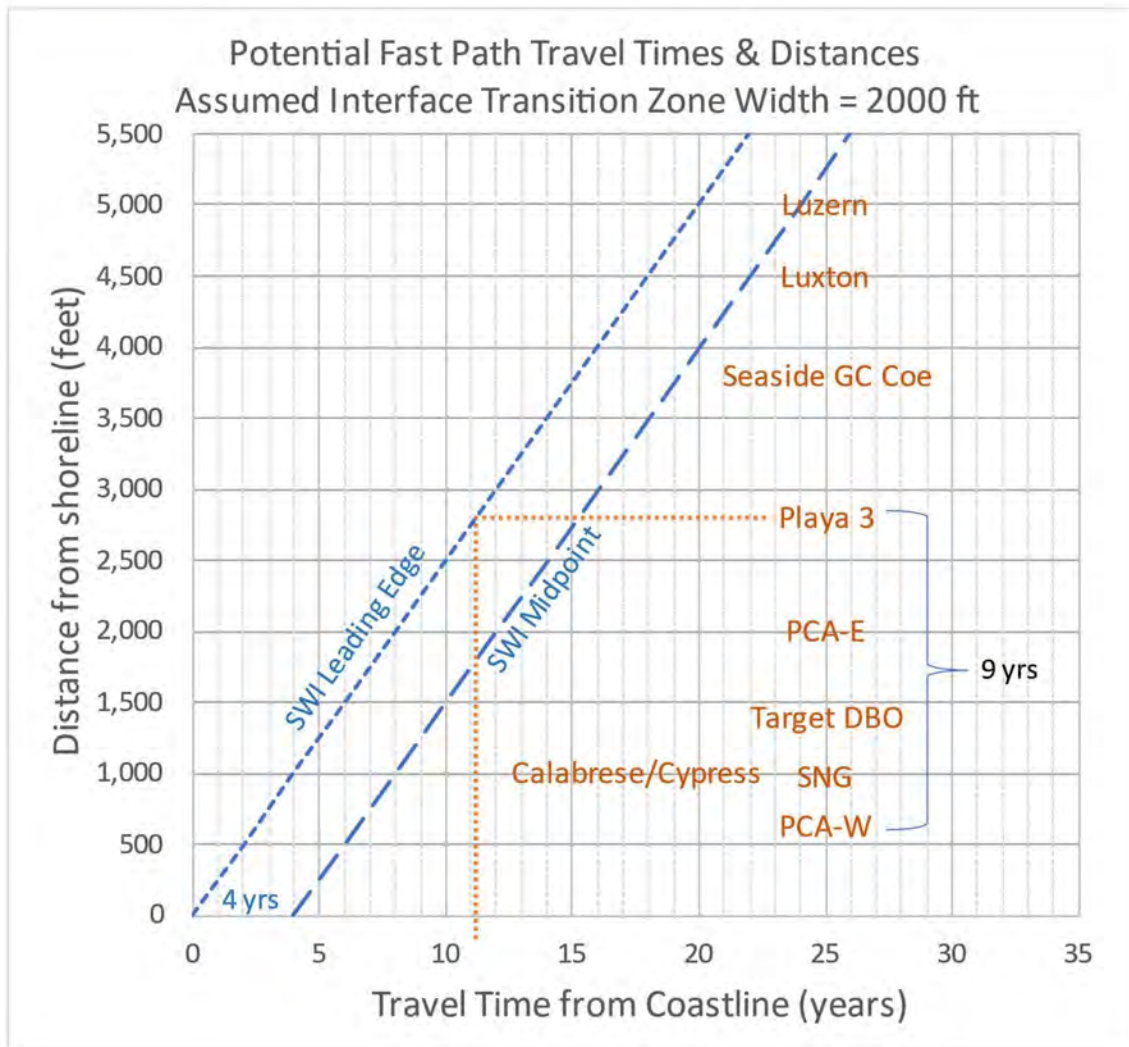


Figure 14. Potential Maximum Inland Travel Times and Distances Along a Preferential Flow Path

Conclusions & Considerations

1. In Layers 1 (Aromas Sands & Older Dune Deposits) and Layers 2-3 (Upper and Middle Paso Robles) flow in the basin is predominantly in the offshore direction during the simulation period.
2. Offshore flow rates increase and accelerate as recharge operations in the basin increase post WY 2024 because of planned project operations and periods of wetter simulated hydrologic conditions that allow for increased net recharge.
3. The most significant inland flows (in terms of both rates and distance) occur in Layer 4 (Lower Paso Robles) 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.
4. 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 and 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.
5. 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.
6. Inland flow in the Monterey Subbasin and cross-boundary flows between the Seaside and Monterey Subbasins may be dependent on assumptions on the groundwater levels assigned to the model in the Marina/Ord area and the assumptions that these remain unchanged should be reviewed and the impact evaluated.
7. 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.

REFERENCES

- Barlow, P. M., 2003. Ground Water in freshwater-saltwater environments of the Atlantic coast, U.S. Geological Survey Circular 1262, 113 p.
- HydroMetrics Water Resources, LLC. 2009. Seaside Groundwater Basin Modeling and Protective Groundwater Elevations, report prepared for Seaside Basin Watermaster, November, 151 p.
- HydroMetrics Water Resources, Inc., 2013. Technical Memorandum, Groundwater Modeling Results of Replenishment Repayment in the Seaside Basin, April.
- Montgomery & Associates, Inc., 2021. Draft Technical Memorandum, PWM Intrinsic Tracer Study Analysis & Operational Modeling, August.
- Montgomery & Associates, Inc., 2022. Technical Memorandum, Updated Modeling of Seaside Basin Replenishment Options, January.
- Padre Associates, Inc. 2002. Summary of Operations, Well Construction and Testing, Santa Margarita Test Injection Well, prepared for Monterey Peninsula Water Management District.
- Pueblo Water Resources, Inc., 2008. Summary of Operations, Well Construction and Testing, Santa Margarita Test Injection Well No. 2, prepared for Monterey Peninsula Water Management District.

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

MEETING DATE:	February 9, 2022
AGENDA ITEM:	4
AGENDA TITLE:	Discuss Additional Replenishment Water Modeling Using Different Assumptions
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

At its January 12, 2022 meeting the TAC discussed a proposed list of revised assumptions that Montgomery & Associates could potentially use to run additional replenishment water modeling scenarios. The proposed revised assumptions were requested by representatives of Cal Am and the City of Seaside. Also, during that meeting the MPWMD representative suggested one additional revised assumption.

Subsequent to that meeting I provided to the Cal Am and Seaside representatives a draft list of proposed revised assumptions and asked if it satisfactorily addressed their requests. The attached *Proposed Revised Assumptions for Additional Replenishment Water Modeling "What If" Scenarios* reflects the responses I received from them.

At today's meeting the TAC should discuss these proposed revised assumptions and provide its recommendation as to whether it feels it would be desirable to run additional scenarios to determine replenishment water needs of the Basin under these revised assumptions.

Because the scope of work and costs thus far authorized to Montgomery & Associates to perform the replenishment water modeling work were based on an earlier set of assumptions, asking them to perform additional modeling scenarios to reflect different assumptions would require a contract amendment. Montgomery & Associates' initial

I asked Montgomery & Associates if they give me a "ball park" cost estimate to run these two scenarios. They replied that they thought they could give us a very rough ball-park cost before today's TAC meeting, which they will orally report on today. They said that the changes needed for something like the additional City of Seaside pumping and new well are fairly low effort to implement because it is an isolated component of the model. However, the changes to the Cal-Am demand and ASR and PWM injection assumptions are quite a bit more involved because of how they interlink with one another and because of how they tie in with the hydrology. They are essentially like small models in and of themselves that need to be setup and then their output fed into the groundwater model.

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

***** AGENDA TRANSMITTAL FORM *****

AGENDA ITEM:

4 (Continued)

For the second scenario they would need to spend some time familiarizing themselves with the proposed Monterey GSP projects and water level targets and thinking about how they would implement those into the model.

ATTACHMENTS:

List of Proposed Revised Assumptions to be Used in Potential Additional Replenishment Water Modeling Scenarios

RECOMMENDED ACTION:

Provide input to the Technical Program Manager regarding performing additional modeling scenarios to reflect these revised assumptions

PROPOSED REVISED ASSUMPTIONS FOR ADDITIONAL REPLENISHMENT WATER MODELING “WHAT IF” SCENARIOS

The following set of revised assumptions follows up from the January 12, 2022 Watermaster TAC meeting and the discussion and input that took place under Item 5 of that Agenda titled “*Discuss Performing Additional Replenishment Water Modeling Using Different Assumptions.*”

PROPOSED “WHAT IF” SCENARIO NO. 1 (THIS COULD BE A “MAXIMUM POTENTIAL REPLENISHMENT WATER NEED” SCENARIO):

Mr. Ottmar of the City of Seaside requested that the following revised assumptions be used:

1. Assume golf course uses 491.4 AFY of recycled water.
2. Assume City pumps an in-lieu amount of 491.4 AFY from the deep aquifer at Latitude = 36.615304, Longitude = 121.826278 (Which is generally in the location of the Lincoln-Cunningham Park in Seaside).
3. Convert 26 AFY of golf course allocation from APA to SPA. New golf course allocation = $540 - 26 = 514$.
4. The remaining unused balance of $514 - 491.4 = 22.6$ AFY would be held as a reserve and/or for flushing of greens and tee boxes.

Mr. O’Halloran of Cal Am requested that the following revised assumptions be used:

1. 13 acre-feet per day will be used as the average daily amount of ASR diversion, not the 20 acre-feet per day that was used in the earlier modeling.
2. To provide a factor of safety, the amount of water that the Pure Water Monterey Expansion Project will deliver will be reduced from 5,700 acre-feet to the “*Minimum Allotment*” of 4,600 acre-feet per year as set forth in the “*Amended and Restated Water Purchase Agreement*” executed between Cal Am, MPWMD, and M1W in late 2021.
3. The MPWSP’s desalination plant and the Pure Water Monterey Expansion Project both include supplying the 700 acre-feet per year needed for Cal Am to start its repayment of that quantity of water for historical overpumping from the Seaside Basin. Therefore, no change will be made to the assumed date used in the modeling for that repayment program to start, which is at the later of the projected completion dates for those projects, i.e. 2024.
4. Cal Am’s *Urban Water Management Plan* demand figures rather than MPWMD’s demand figures will be used for Cal Am’s projected water demands.

PROPOSED “WHAT IF” SCENARIO NO. 2 (THIS COULD BE A “MINIMUM POTENTIAL REPLENISHMENT WATER NEED” SCENARIO):

As suggested by Mr. Lear, evaluate the effects on the Seaside Basin if the projects and management actions in the Monterey Subbasin Groundwater Sustainability Plan (GSP) are successfully implemented and result in significant reductions in the amounts of water lost from the Seaside Subbasin to the Monterey Subbasin. In this scenario the inter-basin groundwater levels projected in those GSPs at the end of the 20-year GSP implementation time frame would be used. The model currently assumes that no GSP implementation projects are implemented.

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

MEETING DATE:	February 9, 2022
AGENDA ITEM:	5
AGENDA TITLE:	Discuss and Provide Direction on Concerns About the Final Draft Groundwater Sustainability Plan for the Monterey Subbasin
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

At the TAC’s January 12, 2022 meeting there was discussion about concerns I raised regarding some parts of the Final Draft Groundwater Sustainability Plan (GSP) for the Monterey Subbasin. I have subsequently reviewed the Final Draft (no longer just “Draft”) version of that GSP, and found that most of the concerns discussed at the January 12 meeting have been adequately addressed, with the following two exceptions:

- No explanation is provided as to how the time line for recovery of declined groundwater levels was developed. The estimated costs to implement the numerous projects and management actions identified in this GSP and the GSP for the 180/400-foot subbasin run into the hundreds of millions of dollars, and some are likely to encounter extensive environmental and permitting issues. Some may potentially be determined to be infeasible, either from a financial or a permitting standpoint. Thus, implementing them will be a formidable task. This leaves me concerned that the recovery timeline is more a “wish” and a “hope” than something for which there is reasonable assurance of being achieved. I feel that the feasibility for the timeline for recovery of declined groundwater levels should be discussed and justified in the GSP.
- Many projects identified in the GSPs for both the Monterey Subbasin and other subbasins within the Salinas Valley Groundwater Basin involve using recycled wastewater to replace groundwater that is currently being pumped to meet demands. It appears that most, if not all, of these recycled water projects rely on wastewater coming into the Monterey One Water Regional Wastewater Treatment Plant. The total flow into that plant is already needed to supply the Castroville Seawater Intrusion Project (CSIP) and the PWM and PWM Expansion Projects. Thus, there may not be enough recycled water to supply all of these other GSP projects. I feel this is an issue that needs to be addressed in the GSP.

In addition my review raised concerns regarding the amount of water that is currently being lost from the Seaside Subbasin to the Monterey Subbasin due to the downward hydraulic gradient from the Seaside Subbasin to the Monterey Subbasin. The Final Draft GSP for the Monterey Subbasin shows significant ongoing loss of groundwater from the Seaside Subbasin even when/if the Minimum Thresholds are achieved in the Monterey and 180/400-Foot Subbasins. The attached Table 6-5 from the Final Draft GSP shows these projected interbasin flows. Table 6-5 has column headings including Minimum Threshold, Measurable Objective, and Seawater Intrusion Protective Boundary Conditions.

I communicated with Vera Nelson, who is the project manager with EKI for preparation of the Marina-Ord portion of the Monterey Subbasin GSP seeking clarification of how those related to the Sustainable Management Criteria (SMC) described in the GSP. Ms. Nelson explained that the intent of the MCWDGSA, via this GSP, is to achieve the Measurable Objective Sustainable Management Criteria (SMC) set forth in the GSP, recognizing that this may not be possible, but at least that is the desire/intent.

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

AGENDA ITEM:

5 (Continued)

She went on to clarify that there are no SMCs specified for inflows and outflows, and that the inflows and outflows shown in Table 6-5 are not SMCs. Rather, the SMCs for the Monterey Subbasin are identified in Table 8-1 of the GSP, and consist of the SGMA-required 6 sustainability indicators of (1) chronic lowering of water levels, (2) reduction in groundwater storage, (3) seawater intrusion, (4) degraded groundwater quality, (5) subsidence, and (6) depletion of interconnected surface water. The inflows and outflows identified on Table 6-5 are the predicted inflows and outflows from the Monterey Subbasin based upon water levels that are achieved in the 180/400 Foot Aquifer Subbasin.

I asked Ms. Nelson to explain the significance of the “Seawater Intrusion Protective Boundary Condition” in Table 6-5, and whether that is the condition that the GSA intends to achieve rather than the Measurable Objective. I commented that since one of the required SMCs is to mitigate seawater intrusion, in order to fulfill that SMC it would seem that achieving the Seawater Intrusion Protective Boundary Condition would have to be achieved in order to fulfill the Minimum Threshold established for that SMC, namely that the location of the seawater intrusion front would have to be held to not being further inland than the approximate location in 2015 of the 500 mg/L chloride concentration isocontour in the lower 180- Foot and 400-Foot Aquifers, and approximately 3,500 feet from the coast in the Dune Sand Aquifer, upper 180-Foot Aquifer, and Deep Aquifers. To do this would seem to supersede the listed Minimum Threshold for the SMC of “Chronic lowering of groundwater levels” as described in Table 8-1 of the GSP.

She said that the Seawater Intrusion Protective Boundary Condition refers to groundwater levels that would have to be achieved within the 180/400 Foot Aquifer Subbasin to stop seawater intrusion in the absence of an injection or extraction barrier. They are *groundwater levels along the entire boundary of the Monterey Subbasin and 180/400-Foot Aquifer Subbasin which are predicted to be protective against further seawater intrusion within the 180-and 400- Foot aquifers. These Seawater Intrusion Protective elevations are projected over the 20-year GSP implementation period (i.e., between 2022 and 2042). In the absence of the installation of a hydraulic injection and/or extraction barrier, which is one of the projects described in the 180/400-Foot Aquifer GSP, these SWI protective elevations represent the minimum groundwater elevations that would be needed in the coastal portions of the 180/400-Foot Aquifer Subbasin to stop further seawater intrusion consistent with the MTs for seawater intrusion established in the 180/400-Foot Aquifer Subbasin GSP.*

I asked her if the 180/400-Foot Aquifer GSP commits the SVBGSA to achieving the Seawater Intrusion Protective groundwater elevations in order to create the Seawater Intrusion Protective Boundary Condition. Her response was “no”, but the SVBGSA does commit to stopping further seawater intrusion as an SMC, so if no injection or extraction barrier is constructed it is the only other way of meeting that

The outflows from the Seaside Subbasin into the Marina-Ord portion of the Monterey Subbasin are of concern because they are so great that they may prevent the Seaside Subbasin from achieving sustainability unless large amounts of replenishment water are injected on an ongoing basis into the Seaside Subbasin. Such replenishment water would be needed in order to achieve protective groundwater elevations that will protect the Seaside Subbasin from seawater intrusion and thereby help make it sustainable.

The GSPs state that each of the boundary condition scenarios in Table 6-5 is predicated on the assumption that the 180/400- Foot Aquifer Subbasin will be managed to its SMCs over the 50-year projected model period, and that it has been assumed that the Seaside Subbasin will be managed such that

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

AGENDA ITEM:	5 (Continued)
<p>groundwater levels remain stable at 2017 levels into the future.</p> <p>Assuming that the 180/400- Foot Aquifer Subbasin will be managed to its SMCs is a significant assumption. That Subbasin will face very significant financial, permitting, and other challenges to achieve its groundwater level and seawater intrusion SMCs, and it may be unable to fully accomplish them. In my opinion the Monterey Subbasin GSP needs to address the concerns of the Seaside Subbasin if those SMCs are not accomplished.</p> <p>Does the TAC feel these concerns warrant having the Watermaster submit a letter to the Department of Water Resources (DWR), the agency that will review and approve the GSP, asking that the GSP not be approved until those issues are addressed in the GSP.</p>	
ATTACHMENTS:	Table 6-5 of the Final Draft Monterey Subbasin GSP
RECOMMENDED ACTION:	Discuss and provide direction on what action, if any, the Watermaster should take regarding these concerns

Table 6-5. Comparison of Projected Water Budget Results Under “No Project” Scenarios with Variable Boundary Conditions and 2030 Climate Condition, Marina-Ord Area WBZ

Net Annual Groundwater Flows (a) (AFY)	Historical Annual Inflows/Outflows (WY 2004-2018)	Projected Annual Inflows/Outflows (b) 2030 Climate Conditions		
		Minimum Threshold Boundary Conditions	Measurable Objective Boundary Conditions	Seawater Intrusion Protective Boundary Conditions
Recharge				
● Rainfall, leakage, irrigation	6,144	6,823	6,823	6,823
Well Pumping				
● Well Pumping	-4,346	-8,767	-8,767	-8,767
Net Inter-Basin Flow				
● Seaside Subbasin	1,310	2,513	1,361	-347
● 180/400-Foot Aquifer Subbasin	-8,633	-3,849	-1,927	1,171
● Ocean (Presumed Freshwater)	-524	-725	-752	-794
● Ocean (Presumed Seawater)	2,872	2,939	2,369	1,308
	-4,975	878	1,051	1,338
Net Intra-basin Flow				
● Corral de Tierra Area (Water Budget Zone)	1,544	923	1,026	985
Net Surface Water Exchange				
● Salinas River Exchange	0	0	0	0
NET ANNUAL CHANGE IN GROUNDWATER STORAGE	-1,632	-143	133	379

Notes:

- (a) The Marina-Ord Area Zone Budget includes inflows to and outflows from the portion of Corral de Tierra that is north of Reservation Rd.
- (b) Positive values indicate a net inflow and negative values indicate a net outflow.

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

MEETING DATE:	February 9, 2022
AGENDA ITEM:	6
AGENDA TITLE:	Discuss Groundwater Level Protective Elevations
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

At the TAC’s January 12, 2022 meeting, under the agenda item titled *“Presentation and Discussion of Replenishment Water Modeling”*, in response to a question regarding Well MSC-Shallow, Mr. Lear reported that this well is not currently showing any signs of sea water intrusion. He went on to say that the well has never had groundwater levels at protective water levels, and he felt that how protective water levels are determined should be reevaluated for the shallow wells. He felt that the method used to determine protective water levels for the shallow (Paso Robles aquifer) wells should be reevaluated, and that this would be a good topic for discussion at a future TAC meeting. Such a discussion would also inform some of the newer TAC members about what protective water levels are and how they are determined.

In response to Mr. Lear’s suggestion I reviewed the HydroMetrics Technical Memorandums titled *“Seaside Groundwater Basin Modeling and Protective Groundwater Elevations,”* dated November 2009, (read or download at http://www.seasidebasinwatermaster.org/Other/Seaside_modeling_report_FINAL.pdf) and *“Groundwater Modeling Results of Replenishment Repayment in the Seaside Basin,”* dated April 5, 2013. The 2009 Technical Memorandum described the methods used to establish the protective elevations. The 2013 Technical Memorandum described the work done to see if the 2009 protective elevations should be updated, as was recommended in HydroMetrics Technical Memorandum titled *“Management Objectives, Additional Potential Scenarios, and Refined Protective Groundwater Elevations”*, dated January 4, 2010. The conclusion in the 2013 Technical Memorandum was that the calibrated parameters in the basinwide model did not indicate that the 2009 protective elevations should be lowered. This conclusion was reiterated in the *“Seaside Groundwater Basin 2018 Basin Management Action Plan”* (read or download at http://www.seasidebasinwatermaster.org/Other/BMAP%20Final_07192019.pdf). Attached are pertinent excerpts from these documents.

I subsequently contacted Montgomery & Associates and solicited their thoughts on this topic. Their thoughts on reevaluating protective groundwater elevations are shown in italics below:

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

AGENDA ITEM:	6 (Continued)
<p><i>M&A took a preliminary look at differences between MSC (shallow) and PCA-West (shallow) which are at a similar depth around 500 feet below ground and why their protective elevations are so different: MSC (shallow) = 11 feet above mean sea level; PCA-West (shallow) = 2 feet above mean sea level.</i></p> <p><i>The protective groundwater elevations were developed in 2009 using a 3D groundwater model. The relatively high protective elevations at MSC (shallow) have been questioned before.</i></p> <p><i>However, its protective elevation seems theoretically correct according to the Ghyben-Herzberg ratio that states that, for every foot of fresh water in an unconfined aquifer above sea level, there will be forty feet of fresh water in the aquifer below sea level. So in MSC (shallow), to protect from seawater intrusion to a depth of 500 ft, you need groundwater levels in the well to be at an elevation of 12.5 ft above sea level.</i></p> <p><i>If PCA-West (shallow) is the same depth as MSC (shallow), then why is its protective elevation only 2 feet above sea level? The answer to that lies in the geometry of the offshore extension of the aquifers in the model. For MSC (shallow), the shallow aquifer dips seawards while for PCA-West (shallow), its dips towards the land. M&A could take a more in-depth look at the sensitivity of the offshore geometry on protective elevations. However, it needs to be acknowledged that the geometry of the offshore sediments are not known. In the absence of data offshore, the onshore aquifers were simply extended offshore in the 3D groundwater model used to develop protective groundwater elevations.</i></p>	
ATTACHMENTS:	Excerpts from the Technical Memorandums and the Basin Management Action Plan referred to above.
RECOMMENDED ACTION:	Discuss protective elevations and determine whether it would be beneficial to reevaluate those that have been established for the shallow (Paso Robles) aquifer wells

EXCERPTS FROM 2009 TECHNICAL MEMORANDUM

DEVELOPMENT OF PROTECTIVE GROUNDWATER ELEVATIONS

In order to measure how successful any groundwater management scenario is, groundwater elevation targets were established. The targets are groundwater elevations that are high enough to protect the Seaside Groundwater Basin from seawater intrusion. These protective groundwater elevations were established using a different series of models than the regional groundwater flow model. The models were required to be different because variable density models are needed for establishing protective groundwater elevations, while the regional groundwater flow model does not require variable density ability. Furthermore, the size of the regional model would cause prohibitively long model run times if variable density was included. The U.S. Geological Survey's SEAWAT 2000 model code (Guo and Langevin, 2002) was used for protective groundwater elevation modeling. Figure ES-2 shows the relationship between the regional flow model and the protective groundwater elevation models.

The protective groundwater elevation models simulate groundwater conditions in four vertical planes through the earth, extending out under the ocean. The inland side of each protective groundwater elevation model is anchored to one of the four coastal monitoring wells: CDM-MW-4, MSC well, PCA-West well, or Sentinel Well 3 (SBWM-3). The locations of these four vertical planes (cross-sections) are shown in Figure ES-3. The models were used to estimate the groundwater elevation that must be maintained in each monitoring well to prevent seawater from intruding into the Santa Margarita aquifer. Additional analyses were performed to estimate the groundwater elevation that must be maintained to prevent seawater from intruding into the Paso Robles aquifer, and to prevent seawater from intruding into the top 90% of the Santa Margarita Sandstone aquifer. To account for uncertainty of offshore geology and aquifer parameters, the modeling included an uncertainty analysis that allowed us to attach a level of confidence to the protective groundwater elevation targets. The target elevations for each monitoring well are shown in Table ES-1.

Table ES-1: Summary of Protective Groundwater Elevations

Well	Protected Aquifer	Range of Protective Elevations from Uncertainty Analysis (feet MSL)	Final Estimate of Protective Elevation Measured in the Well (feet MSL)
SBWM-3	Purisima	2-6	4
PCA-W	Paso Robles	2-4	2
	Santa Margarita	11-19	17
MSC	Paso Robles	3-14	11
	Santa Margarita	15-18	17
CDM MW-4	Paso Robles	2-3	2



Figure ES-3: Cross-Section Model Locations

EXCERPTS FROM 2013 TECHNICAL MEMORANDUM

As a preliminary step in these modeling activities HydroMetrics WRI was asked to revisit and update the protective groundwater elevations, if necessary. Groundwater elevations that protect the Seaside Basin from seawater intrusion have been established at coastal monitoring wells SBWM-3, PCA-West deep and shallow, MSC deep and shallow, and CDM MW-4 using cross-sectional models (HydroMetrics LLC 2009). The locations of these wells are shown in Figure 1. These cross-sectional models were developed before the Seaside Groundwater Basin basinwide groundwater model was calibrated and completed. The horizontal (Kh) and vertical (Kv) hydraulic conductivity fields in the original cross-sectional models were based on estimated conductivities from previous studies. The purpose of this analysis was to evaluate whether incorporating the calibrated conductivity fields from the basinwide model into the cross-sectional models would result in lowering the previously-developed protective elevations. Hydraulic conductivity (Kv and Kh) are parameters that control the rate of flow in aquifers. If the basinwide model has higher hydraulic conductivities occurring below the depth that is being protected from seawater intrusion, the protective groundwater elevations can be lowered.

HydroMetrics WRI analyzed the calibrated conductivity fields in the basinwide model surrounding and offshore of the coastal monitoring wells. Horizontal and vertical conductivity values were identified for all active cells in each layer. Statistics of the conductivities, weighted by basinwide model cell area, were calculated for layers corresponding to hydrostratigraphic units in the cross-sectional model for each well.

Update Cross-Sectional Modeling of Well SBWM-3

Table 1 compares the original parameter ranges used in the cross-sectional models with the parameter averages calculated from the basinwide model for Sentinel Well 3 (SBWM-3).

Table 1: Well SBWM-3 Cross-sectional Model and Basinwide Model Hydraulic Conductivities Hydrostratigraphic Unit	Basinwide Model Layers	Cross-sectional Model Kh Range (feet per day)	Average Basinwide Model Kh (feet per day)	Cross-sectional Model Kv Range (feet per day)	Average Basinwide Model Kv (feet per day)
Seabed	N/A	N/A	N/A	Conductance = 0.01 – 10 day ⁻¹	N/A
Aromas	1	5 - 20	165	0.05 – 1.0	0.5
Upper & Middle Paso Robles	2-3	2 - 8	5	0.01 – 0.1	0.2
Lower Paso Robles	4	2 - 8	7	0.01 – 0.1	0.003
Purisima	5	2 - 8	19	0.02 - 0.4	0.0002

Note: Kh = horizontal conductivity and Kv = vertical conductivity.

For the SBWM-3 well, the protective elevation is established to protect the aquifer at the well site in the middle of the Purisima Formation. From the cross-sectional model sensitivity analysis (HydroMetrics LLC, 2009; Appendix C), the hydraulic conductivity of the aquifer below the protected depth has the greatest effect on the protective elevation. The basinwide model indicates that horizontal conductivity in the Purisima Formation below the protected location (Layer 5) is greater in the basinwide model than in the original cross-sectional model, suggesting that incorporating the basinwide model parameters will reduce the protective elevation. However, the overall hydraulic conductivity in the Purisima Formation below the protected location is smaller in the basinwide model than in the original cross sectional model due to the much lower vertical conductivity in the model. Therefore, using the parameters from the basinwide model will not lower the protective elevation from the already low value of 4 feet MSL.

Update Cross-Sectional Modeling of PCA-West Wells

Table 2 compares the original parameter ranges used in the cross-sectional models with the averages calculated from the basinwide model for the PCA-West wells (shallow and deep).

Table 2: PCA-West Well Cross-sectional Model and Basinwide Model Hydraulic Conductivities

Hydrostratigraphic Unit	Basinwide Model Layers	Cross-sectional Model Kh Range (feet per day)	Average Basinwide Model Kh (feet per day)	Cross-sectional Model Kv Range (feet per day)	Average Basinwide Model Kv (feet per day)
Seabed	N/A	N/A	N/A	Conductance = 0.01 – 10 day ⁻¹	N/A
Aromas	1	5 - 20	165	0.05 – 1.0	0.5
Upper & Middle Paso Robles	2-3	2 - 8	11	0.01 – 0.1	0.3
Lower Paso Robles	4	2 - 8	21	0.01 – 0.1	0.01
Purisima/Santa Margarita	5	5 – 20	144	0.05 – 1.0	0.00003
Monterey	N/A	0.5	N/A	0.025	N/A

Note: Kh = horizontal conductivity and Kv = vertical conductivity.

For the PCA-West deep well, a protective elevation is established to protect the aquifer at the well location at the bottom of the Santa Margarita Formation. From the cross-sectional model sensitivity analysis (HydroMetrics LLC, 2009; Appendix C), the hydraulic conductivity of the Monterey Formation which is the unit below the protected depth has the greatest effect on the protective elevation. However, because the basinwide model does not include the Monterey Formation, it cannot be used to lower the protective elevation from 17 feet MSL. Therefore, no changes to the protective elevation of the deep PCA-West well can be made based on the basinwide model.

A protective elevation is also established for the shallow PCA-West well that protects the aquifer at the well location below the Paso Robles Formation. The basinwide model indicates that the horizontal conductivity in the Purisima and Santa Margarita Formations below the protected location (Layer 5) are greater in the basinwide model than in the original cross-sectional model, suggesting that incorporating the basinwide model parameters will reduce the protective elevation. However, the overall hydraulic conductivity in the Purisima and Santa Margarita Formations below the protected location is smaller in the basinwide model than in the original cross-sectional model due to the much lower vertical conductivity in the basinwide model. Therefore, using the parameters from the basinwide model will not lower the protective elevation of the shallow PCA-West well from the already low value of 2 feet MSL.

Update Cross-Sectional Modeling of MSC Wells

Table 3 compares the original parameter ranges used in the cross-sectional models with the averages calculated from the basinwide model for the MSC wells (shallow and deep).

Table 3: MSC Well Cross-sectional Model and Basinwide Model Hydraulic Conductivities

Hydrostratigraphic Unit	Basinwide Model Layers	Cross-sectional Model Kh Range (feet per day)	Average Basinwide Model Kh (feet per day)	Cross-sectional Model Kv Range (feet per day)	Average Basinwide Model Kv (feet per day)
Seabed	N/A	N/A	N/A	Conductance = 0.01 – 10 day ⁻¹	N/A
Aromas	1	5 - 20	165	0.05 – 1.0	0.5
Upper & Middle Paso Robles	2-3	2 - 8	5	0.01 – 0.1	0.1
Lower Paso Robles	4	2 - 8	6	0.01 – 0.1	0.03
Santa Margarita	5	5 – 20	18	0.05 – 1.0	0.05
Monterey	N/A	0.5	N/A	0.025	N/A

Note: Kh = horizontal conductivity and Kv = vertical conductivity.

For the deep MSC well, a protective elevation is established to protect the aquifer at the well location at the bottom of the Santa Margarita Formation. From the cross-sectional model sensitivity analysis (HydroMetrics LLC, 2009; Appendix C), the conductivity of the Monterey Formation which is the unit below the protected depth has the greatest effect on the protective elevation. However, because the basinwide model does include the Monterey Formation, it cannot be used to lower the protective elevation from 17 feet MSL. Therefore, no changes to the protective elevation of the deep MSC well can be made based on the basinwide model.

A protective elevation is also established for the shallow MSC well that protects the aquifer at the well below the Paso Robles Formation. The basinwide model indicates that the horizontal conductivity in the Santa Margarita Formation below the protected location (Layer 5) is greater in the basinwide model than in the original cross-sectional model, suggesting that incorporating the basinwide model parameters will reduce the protective elevation. However, the overall hydraulic conductivity in the Santa Margarita Formation below the protected location is smaller in the basinwide model than in the original cross-sectional model due to the lower vertical conductivity in the basinwide model. Therefore, using the parameters from the basinwide model will not lower the protective elevation at the shallow MSC well from 11 feet MSL.

Update Cross-Sectional Modeling of CDM MW-4 Well

Table 4 compares the original parameter ranges used in the cross-sectional models with the averages calculated from the basinwide model for the CDM MW-4 well.

Table 4: CDM MW-4 Well Cross-sectional Model and Basinwide Model Hydraulic Conductivities

Hydrostratigraphic Unit	Basinwide Model Layers	Cross-sectional Model Kh Range (feet per day)	Average Basinwide Model Kh (feet per day)	Cross-sectional Model Kv Range (feet per day)	Average Basinwide Model Kv (feet per day)
Seabed	N/A	N/A	N/A	Conductance = 0.01 – 10 day ⁻¹	N/A
Aromas	1	5 - 20	165	0.05 – 1.0	0.5
Paso Robles	2-5	5-20	22	0.05 - 1.0	0.1
Monterey	N/A	0.5	N/A	0.025	N/A

Note: Kh = horizontal conductivity and Kv = vertical conductivity.

For the CDM MW-4 well, a protective elevation is established to protect the aquifer at the well at the bottom of the Paso Robles Formation. From the cross-sectional model sensitivity analysis (HydroMetrics LLC, 2009; Appendix C), the conductivity of the Monterey Formation which is the unit below the protected depth has the greatest effect on the protective elevation. However, because the basinwide model does include the Monterey Formation, it cannot be used to lower the protective elevation from 2 feet MSL. Therefore, no changes to the protective elevation of the CDM MW-4 well can be made based on the basinwide model.

CONCLUSIONS

The calibrated parameters in the basinwide model do not indicate that protective elevations should be lowered.

**EXCERPTS FROM THE SEASIDE GROUNDWATER BASIN
2018 BASIN MANAGEMENT ACTION PLAN**

Protective Groundwater Elevations

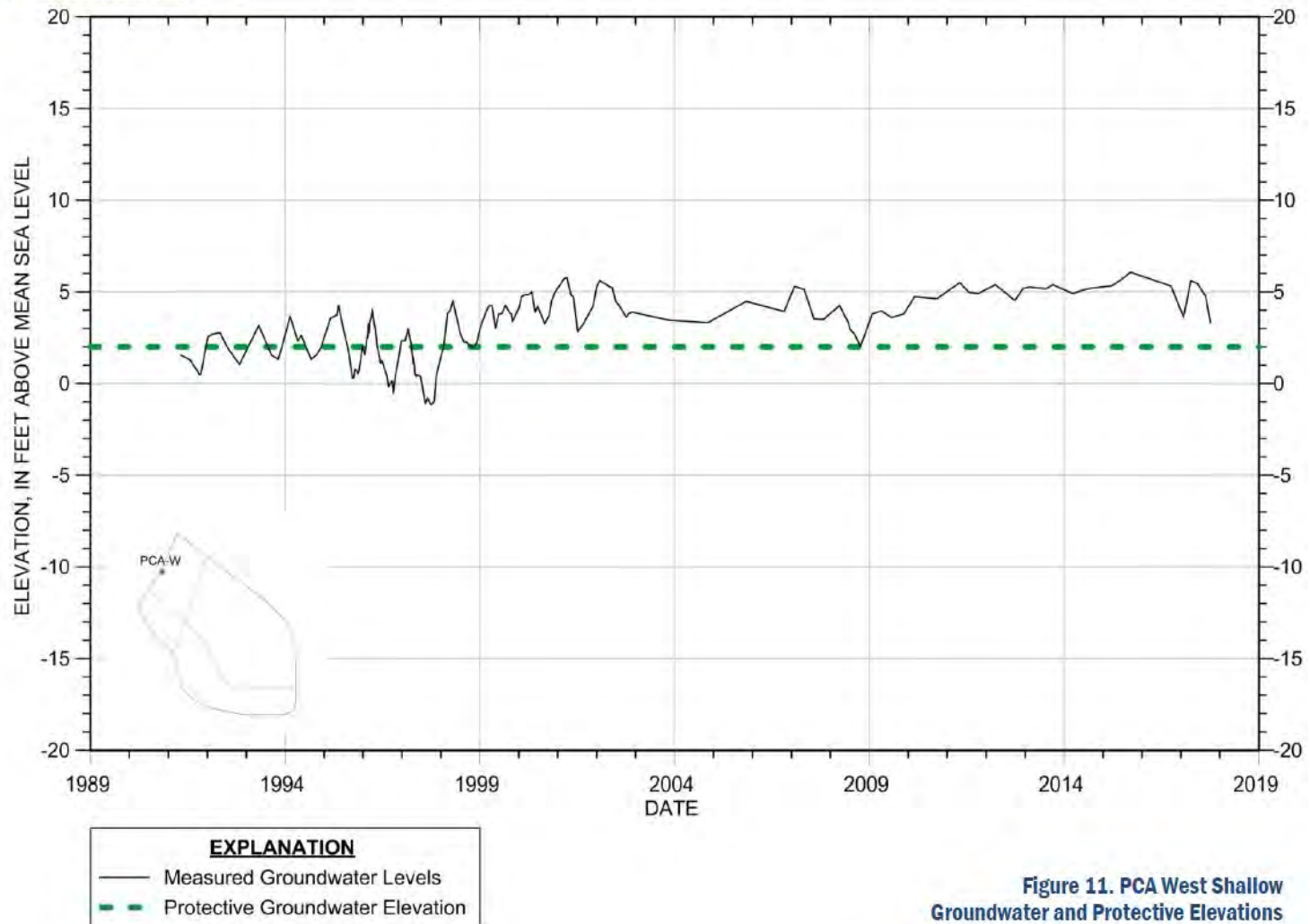
Protective groundwater elevations for selected coastal monitoring wells were established in 2009 using the Basin groundwater flow model and cross-sectional modeling (HydroMetrics LLC, 2009b). These protective elevations are designed to avoid and control seawater intrusion. Maintaining groundwater elevations at protective elevations will provide adequate pressure to prevent seawater intrusion. The 2009 protective elevations for both deep and shallow aquifers are summarized in **Table 5**. A subsequent study in 2013 to revisit and update the protective groundwater elevations concluded that protective elevations should not be lowered (HydroMetrics LLC, 2013).

Table 5. Summary of Protective Elevations for Coastal Monitoring Wells

Subarea	Well	Completion	Protective Elevation, feet above sea level
Northern Coastal	MSC	Deep	17
		Shallow	11
	PCA-W	Deep	17
		Shallow	2
	Sentinel Well 3	Deep	4
Southern Coastal	CDM-MW4	Shallow	2

Hydrographs for shallow monitoring wells for which protective elevations were established are shown on Error! Reference source not found. through Error! Reference source not found.. The only shallow protective elevation monitoring well with groundwater elevations below protective elevations is MSC shallow, which has levels 7 feet below protective elevations.

Hydrographs for deep monitoring wells for which protective elevations were established are shown on Error! Reference source not found. through Error! Reference source not found.. None of these deep monitoring wells have achieved protective groundwater level elevations.



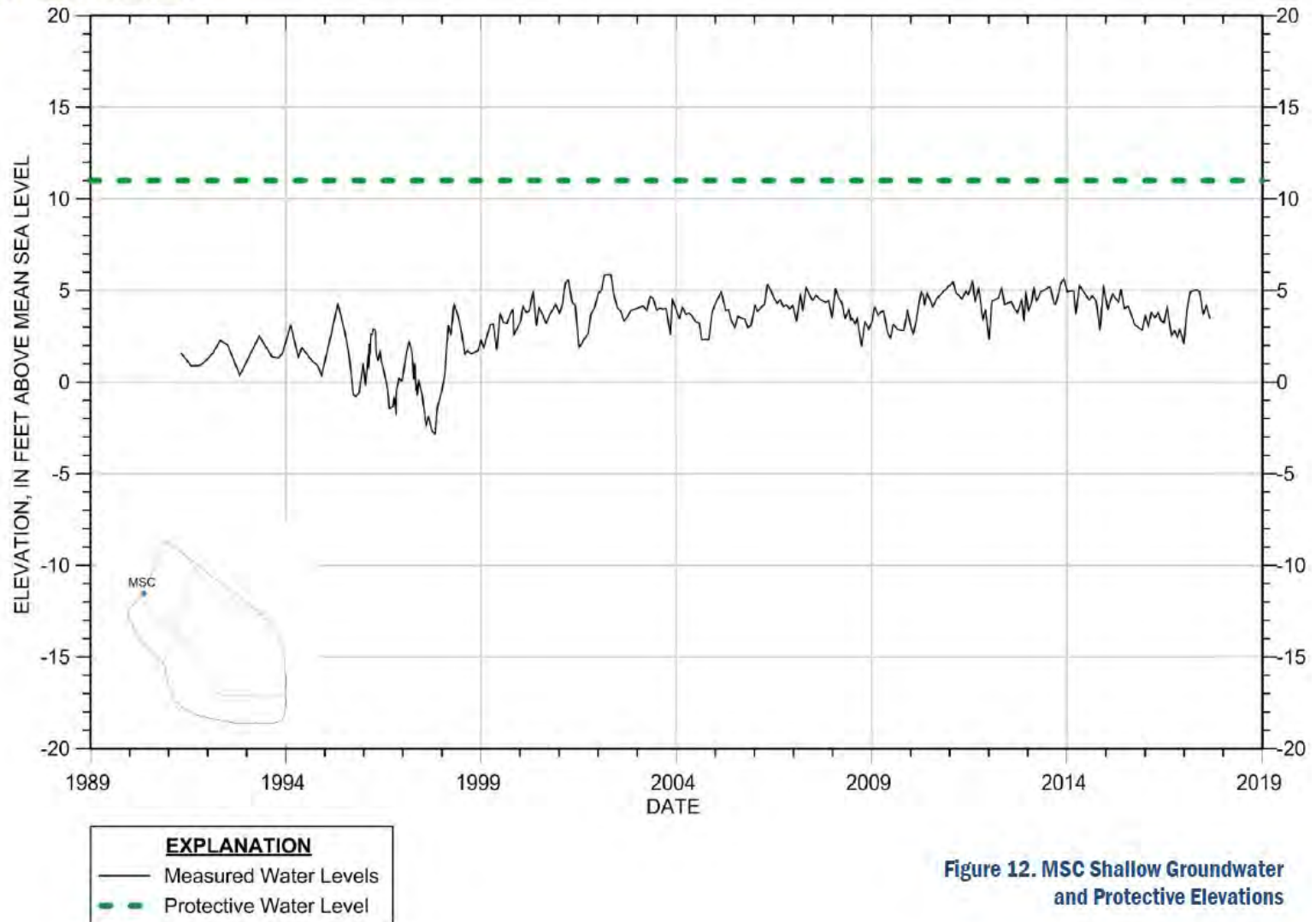


Figure 12. MSC Shallow Groundwater and Protective Elevations

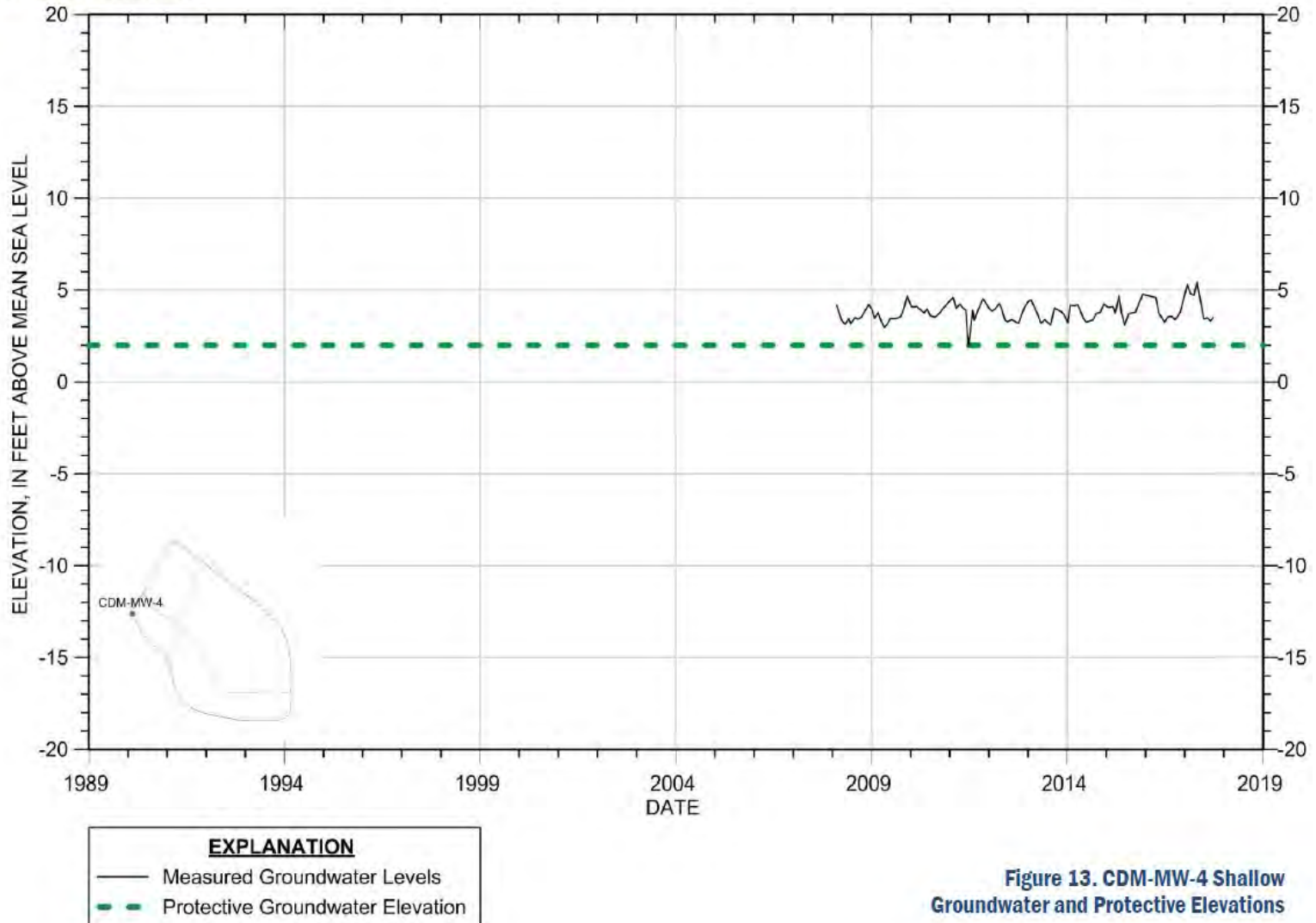


Figure 13. CDM-MW-4 Shallow Groundwater and Protective Elevations

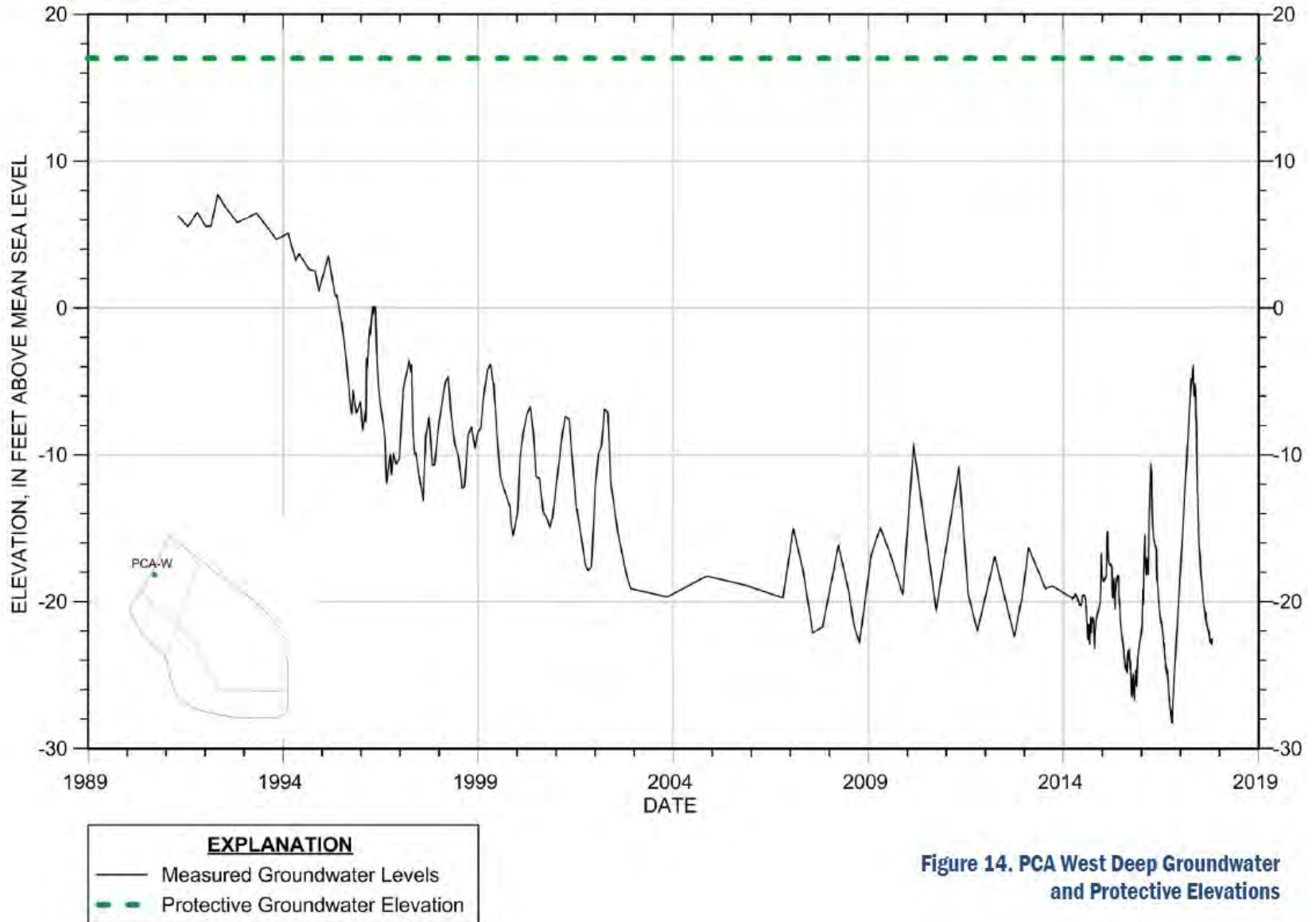


Figure 14. PCA West Deep Groundwater and Protective Elevations

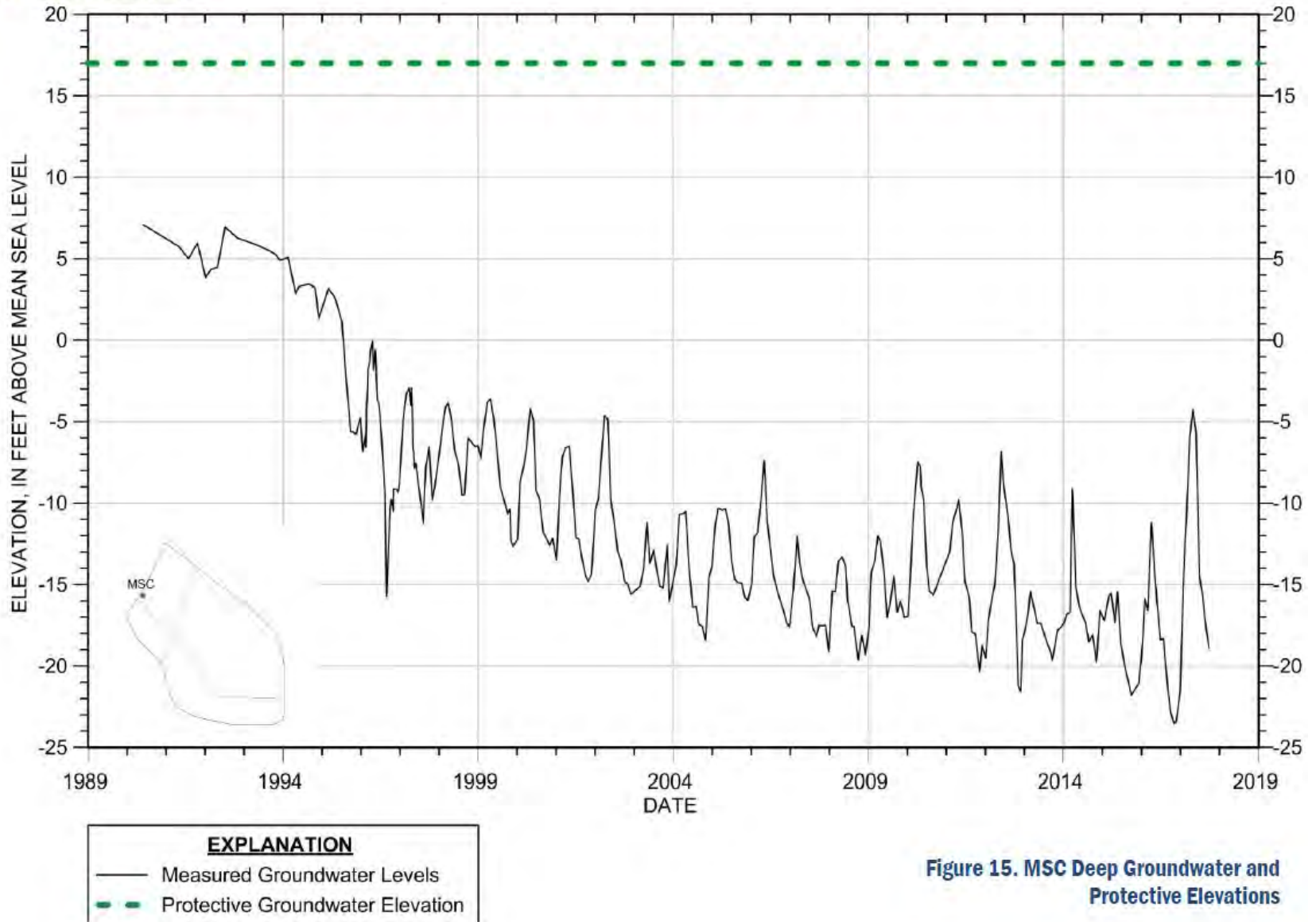


Figure 15. MSC Deep Groundwater and Protective Elevations

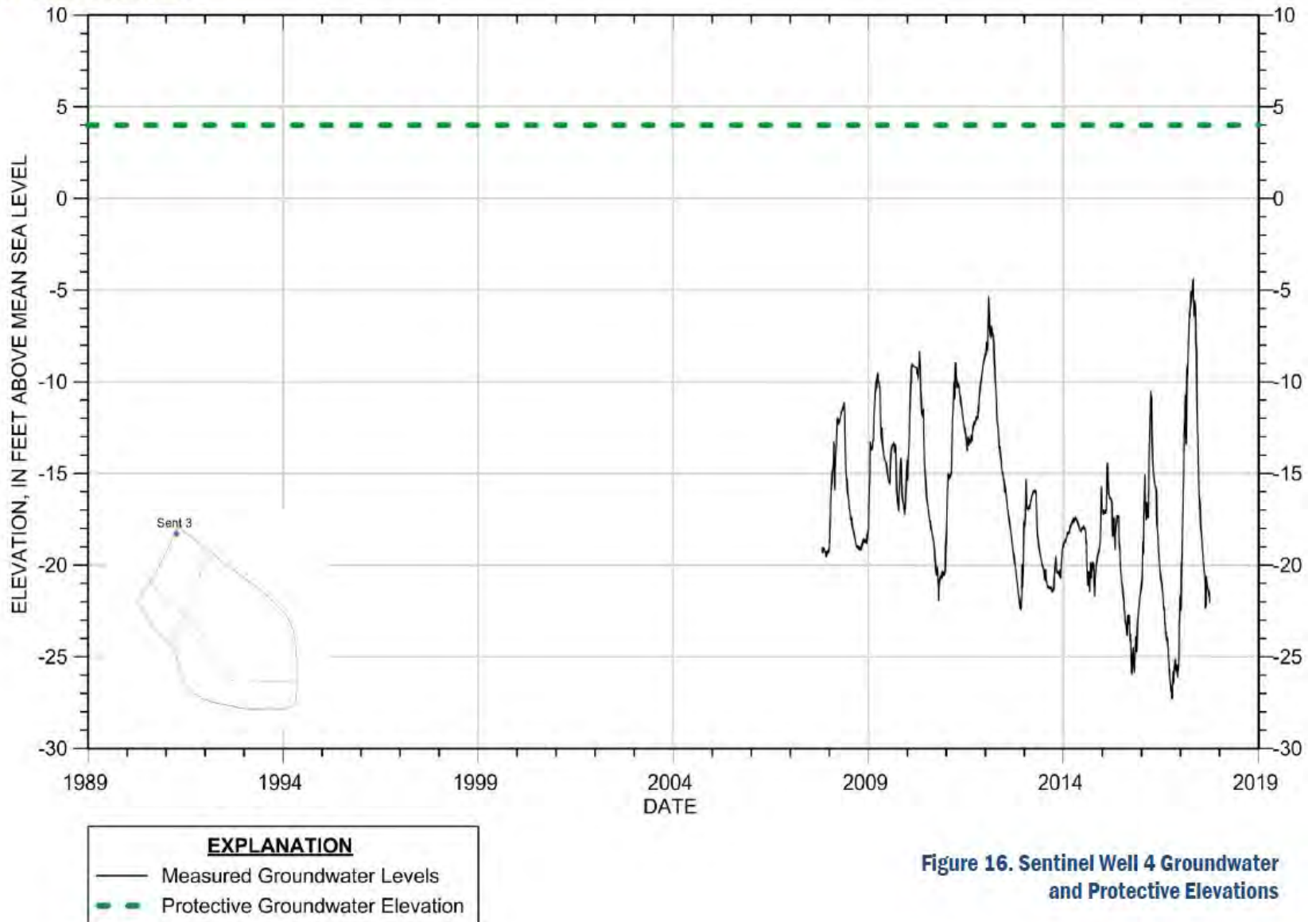


Figure 16. Sentinel Well 4 Groundwater and Protective Elevations

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

***** AGENDA TRANSMITTAL FORM *****

MEETING DATE:	February 9, 2022
AGENDA ITEM:	7
AGENDA TITLE:	Schedule
PREPARED BY:	Robert Jaques, Technical Program Manager
<p>SUMMARY: As a regular part of each monthly TAC meeting, I will provide the TAC with an updated Schedule of the activities being performed by the Watermaster, its consultants, and the public entity (MPWMD) which are performing certain portions of the work.</p> <p>Attached is the updated schedule for 2022 activities.</p>	
ATTACHMENTS:	Schedule of Work Activities for FY 2022
RECOMMENDED ACTION:	Provide Input to Technical Program Manager Regarding Any Corrections or Additions to the Schedules

Seaside Basin Watermaster 2022 Monitoring and Management Program Work Schedule

ID	Task Name	Dec '21	Jan '22	Feb '22	Mar '22	Apr '22	May '22	Jun '22	Jul '22	Aug '22	Sep '22	Oct '22	Nov '22	Dec '22	Jan '23	Feb '23
1	Replenishment Assessment Unit Costs for Water Year 2023															
2	B&F Committee Develops Replenishment Assessment Unit Cost for 2023 Water Year															
3	If Requested, TAC Provides Assistance to B&F Committee in Development of 2023 Water Year Replenishment Assessment Unit Cost															
4	Board Adopts and Declares 2023 Water Year Replenishment Assessment Unit Cost															
5	Replenishment Assessments for Water Year 2022															
6	Watermaster Prepares Replenishment Assessments for Water Year 2022															
7	Watermaster Board Approves Replenishment Assessments for Water Year 2022 (At December Meeting)															
8	Watermaster Levies Replenishment Assessment for 2022															
9	Monitoring & Management Program (M&MP) Budgets for 2023 and 2024															
10	Preliminary Discussion of Potential Scope of Work for 2023 M&MP															
11	Prepare 2023 M&MP															
12	TAC approves 2023 M&MP															
13	Prepare 2023 and 2024 O&M and Capital Budgets															
14	TAC approves 2023 and 2024 O&M and Capital Budgets															
15	Budget & Finance Committee Approves 2023 M&MP and 2024 O&M and Capital Budgets															
16	Board approves 2023 M&MP and 2024 M&MP O&M and Capital Budgets															
17	2021 Annual Report															
18	Prepare Preliminary Draft 2022 Annual Report															
19	TAC Provides Input on Preliminary Draft 2022 Annual Report															
20	Prepare Draft 2022 Annual Report (Incorporating TAC Input)															
21	Board Provides Input on Draft 2022 Annual Report (At December Board Meeting)															
22	Prepare Final 2022 Annual Report (incorporating Board Input)															
23	Watermaster Submits Final 2022 Annual Report to Judge															
24	MANAGEMENT															
25	M.1 PROGRAM ADMINISTRATION															
26	Prepare Initial Consultant Contracts for 2023															
27	TAC Approval of Initial Consultant Contracts for 2023															
28	Budget & Finance Committee Approves Initial Consultant Contracts for 2023															
29	Board Approval of Initial Consultant Contracts for 2022															

Seaside Basin Watermaster 2022 Monitoring and Management Program Work Schedule

ID	Task Name	Dec '21	Jan '22	Feb '22	Mar '22	Apr '22	May '22	Jun '22	Jul '22	Aug '22	Sep '22	Oct '22	Nov '22	Dec '22	Jan '23	Feb '23
30	M.1.g – Sustainable Groundwater Management Act Reporting Requirements			COMPLETED												
31	Montgomery & Associates Prepares Draft Groundwater Storage Analysis			COMPLETED												
32	Submit SGMA Documentation to DWR			COMPLETED												
33	IMPLEMENTATION															
34	I.2.a DATABASE MANAGEMENT															
35	I.2.a.1 Conduct Ongoing Data Entry/Database Maintenance															
36	I.2.b DATA COLLECTION PROGRAM															
37	I.2.b.2 Collect Monthly Water Levels (MPWMD)															
38	I.2.b.3 Collect Quarterly Water Quality Samples (MPWMD)															
39	I.2.b.6 MPWMD provides annual water quality and water level data to Montgomery & Associates for inclusion in the 2021 SIAR													◆ 11/9		
40	I.3. a. 3 Evaluate Replenishment Scenarios and Develop Answers to Basin Management Questions															
41	Montgomery & Associates Presents Flow Direction and Flow Velocity Modeling Report to the TAC				◆ 3/9											
42	Montgomery & Associates Presents Flow Direction and Flow Velocity Modeling Report to the Board						◆ 5/4									
43	Montgomery & Associates Presents Replenishment Water Modeling Report to the TAC		◆ 1/12													
44	Montgomery & Associates Presents Replenishment Water Modeling Report to the Board					◆ 4/6										
45	I.4.c Annual Seawater Intrusion Analysis Report (SIAR)															
46	Montgomery & Associates Provides Draft 2022 SIAR to Watermaster													◆ 11/9		
47	TAC Approves 2022 SIAR													◆ 11/16		
48	Board Approves 2022 SIAR														◆ 12/7	

**SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE**

*** * * AGENDA TRANSMITTAL FORM * * ***

MEETING DATE:	February 9, 2022
AGENDA ITEM:	8
AGENDA TITLE:	Other Business
PREPARED BY:	Robert Jaques, Technical Program Manager
SUMMARY:	<p>The “Other Business” agenda item is intended to provide an opportunity for TAC members or others present at the meeting to discuss items not on the agenda that may be of interest to the TAC.</p>
ATTACHMENTS:	None
RECOMMENDED ACTION:	None required – information only