MEETING NOTICE AND AGENDA

TECHNICAL ADVISORY COMMITTEE OF THE SEASIDE BASIN WATER MASTER

DATE: Wednesday, March 10, 2021
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/85023080771?pwd=cEZVaytvM2RIQUk5cURQbjhURWF6UT09
If joining the meeting by phone, dial either of these numbers:
+1 408 638 0968 US (San Jose)
+1 669 900 6833 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: 850 2308 0771
Passcode: 945858

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 County Water Resources Agency**
Monterey Peninsula Water Management District

The next regular meeting is tentatively planned for two weeks earlier than the normal time, on Wednesday March 31, 2021 at 1:30 p.m. That meeting will likely also be held via teleconference.

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SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 10, 2021
AGENDA ITEM:	2.A
AGENDA TITLE:	Approve Minutes from the February 10, 2020 Meeting
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

Draft Minutes from this meeting were emailed to all TAC members. Any changes requested by TAC members have been included in the attached version.

Note: One topic that was raised in the February 10 meeting under the Agenda item titled "Update on Concerns about Possible Detection of Seawater Intrusion in Monitoring Wells FO-9 and FO-10 Shallow, and Board Direction to Obtain a Cost Estimate to Install a New Monitoring Well" was why water quality sampling was not being performed on Monitoring Well FO-11 Shallow. I researched the original *"Seaside Basin Monitoring and Management Program"* which was prepared in 2006 to see if there was any mention of this in it. The only specific reference I found to this well was in Figure 2 titled *"Location of Production and Monitor Wells in and Near the Seaside Basin"* which shows the locations of wells where water level monitoring is performed. That Figure shows FO-11 to be a monitoring well for water level. However, Figure 3 titled *"Location of Existing Coastal Groundwater Quality Monitor Wells in and Near the Seaside Basin"* does not show FO-11 Shallow to be a groundwater quality monitoring well.

I was not able to find any discussion of how wells were selected for water quality monitoring versus water level monitoring. It may be that because FO-11 is further inland and away from the coast than FO-10 and FO-9 that there did not seem to be any reason to have that well monitored for water quality.

ATTACHMENTS:	Minutes from this meeting
RECOMMENDED ACTION:	Approve the minutes

D-R-A-F-T
MINUTES

Seaside Groundwater Basin Watermaster
Technical Advisory Committee Meeting
February 10, 2021
(Meeting Held Using Zoom Conferencing)

Attendees: TAC Members

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

Watermaster
Technical Program Manager - Robert Jaques
Administrative Officer – Laura Paxton

Consultants
Montgomery & Associates – Georgina King

Others
City of Seaside – Nisha Patel
MCWD – Patrick Breen
EKI (consultant to MCWD) – Tina Wang

The meeting was convened at 1:32 p.m.

1. **Public Comments**

There were no public comments.

2. **Administrative Matters:**

A. Approve Minutes from the November 18, 2020 Meeting

Mr. Jaques noted that the Draft Minutes failed to include Mr. Cook of Cal Am as an attendee. On a motion by Mr. Gaglioti, seconded by Mr. Rieser, the minutes were unanimously approved with the correction noted by Mr. Jaques.

B. Sustainable Groundwater Management Act (SGMA) Update

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

Mr. Lear said that there is a new data portal for SGMA, and wondered if a new portal was going to replace the CASGEM reporting portal. Ms. Voss mentioned that MCWRA is using the new portal. Mr. Jaques said he would inquire about this at the Adjudicated Basins Annual Workshop which is coming up this later this month, and report back to Mr. Lear.

Mr. Ottmar asked if draft chapters of the Groundwater Sustainability Plan being prepared by Marina Coast water District were being reviewed and commented on by Watermaster representatives. Mr.

Jaques responded yes, and briefly described his involvement in providing review comments to MCWD and his involvement with MCWD's hydrogeologic consultant (EKI), Montgomery and that Associates, and SVBGSA representatives in a Zoom meeting to discuss those comments.

C. PWM Project Tracer Study Conclusions and Next Steps

Mr. Jaques summarized the agenda packet materials for this item. He asked Mr. Lear if he could elaborate on the difficulty being experienced in identifying the location of the front of the injected water plume and the need to, for the time being, rely on the groundwater model to make that prediction.

Mr. Lear explained that quarterly reporting is required by the permitting agencies and that is why the Tracer Test Status Reports are being prepared. He elaborated on the detection of the front of the injected water plume. The tracer data will be used to recalibrate the model when more data is acquired.

3. Discuss the Need for Dataloggers in Monitoring Wells

Mr. Jaques summarized the agenda packet materials for this item. He then turned the discussion over to those on the TAC more familiar with data logging, and when having data loggers justify the expense.

Mr. Lear provided background information on the history of the data logger network

Mr. Gaglioti voice opinion that the more data the better. He has surplus data loggers which you would offer to donate, if they would be of use.

Mr. Lear would need additional scope and cost authorization each year to download and work up the data sets. This would include performing a yearly data download, maintaining the data loggers, and providing the data to Montgomery and Associates.

Mr. Gaglioti asked what the immediate value was a processing the data logger data. Ms. King responded that the data loggers listed in Table 3 of her Technical Memorandum help us to understand what is going on during the time periods between the monthly water level measurements that are currently being made. She referred to this as "nuanced data" which can be helpful in better understanding the basin. She feels being able to review the unprocessed data that currently exist could be helpful. If we find it doesn't provide anything helpful, it might help to better decide where data loggers are providing the most helpful data.

Ms. Voss felt that having the detailed information from data loggers was good to have in areas where pumping depressions and groundwater divides exist. She noted that having a data logger in Monitoring Well FO – 11 might help to understand what is causing the groundwater depression there.

Mr. Lear felt it would be good to process the historical data to see if it is helpful or not. He mentioned, however, that he did not have the staff available to support doing quarterly downloads of the data, only annual downloads. After downloading, he would send the data to Montgomery and Associates for them to process it.

Mr. Gaglioti asked Mr. Lear what kind of data loggers MPWMD is currently using. Mr. Lear described the various types of data loggers MPWMD has and how they are operated.

Mr. Lear said that processing is the more time-consuming activity compared to just downloading the data. They probably spend about 1 ½ days per year doing the data downloading. Processing, however, involves a number of steps to get accurate data and is more time consuming.

Mr. Gagliano recommended using Table 3 in Ms. King's technical memo for the locations where data loggers should be in place. He also felt it was beneficial to retro-process all the data that has thus far been acquired. After doing that, we should ask for feedback from Ms. King on whether or not continuing to process data from each location is proving to be beneficial. After receiving that feedback, TAC could make a decision about revising how the data logger network data is handled. He said he also was supportive of recommendation number 4 in Ms. King's Tech Memo about reinstalling the datalogger in Monitoring Well PCA-West shallow.

Mr. Lear reported that the data loggers in monitoring well FO-nine (deep and shallow) is part of MPWMD's network, and not a cost to the watermaster. The datalogger in monitoring well FO-10 is a watermaster datalogger. There is a data logger in Monitoring Well PCA-West shallow, which is stuck and cannot be used. That well is screened only the Paso Robles aquifer, whereas the Sentinel wells are not perforated in the Paso Robles aquifer.

Ms. King said that the Monitoring Well PCA-West shallow is important to understanding water quality data in that area of the Seaside basin. As recommended in her technical memorandum, the data logger there should be replaced. Mr. Lear said he recommended having Martin Feeney do that work. He also said that he would do some research to determine the best type of datalogger to put in that well in order to avoid future problems such as the one currently being experienced. Mr. Jaques will coordinate with Mr. Lear and Mr. Feeney to develop a cost estimate to replace the datalogger in that well.

Mr. Lear also said he could provide recommendations to the TAC about the types of dataloggers to be used in the various locations, and other things related to the datalogger network management at a future TAC meeting.

Ms. Voss said that MCWRA does quarterly data downloads from its dataloggers. She was interested in Ms. King's thoughts on the value of getting data downloaded on a quarterly basis versus an annual basis.

Ms. King said that the $2,900 cited in her Technical Memorandum is for annual data processing, not quarterly. Quarterly processing would increase the cost.

Mr. Jaques said he would compile further information on these various issues for continued discussion by the TAC at a near future meeting.

4. Update on Concerns about Possible Detection of Seawater Intrusion in Monitoring Wells FO-9 and FO-10 Shallow, and Board Direction to Obtain a Cost Estimate to Install a New Monitoring Well

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

Mr. Lear suggesting asking Ed Ghandour if we could sample his well to obtain additional water quality information in that part of the Seaside Basin, noting that it would provide another data point. Mr. Ghandour's well is southwest of Monitoring Well PCA-West. He said that MPWMD could collect that sample if Craig Evans, who does other well related work for Mr. Ghandour, could not do it.

Mr. Jaques said his recollection was that, following TAC meeting discussion late in 2020, the Watermaster had already asked Mr. Ghandour to collect a water quality sample and provide the results to the Watermaster. He said he would look into this and report back at a future TAC meeting.

Mr. O'Halloran asked if, in the February 2 Zoom meeting with the hydrogeologic consultants, there was discussion about where the high chloride level water is coming from. Mr. Lear described what is being seen in the monitoring wells in the vicinity of FO-9 shallow. Ms. King said the theory is that the dune

sand is already intruded, and that seawater from the dune sand is percolating downward into the Paso Robles aquifer. Mr. Lear said that induction logging of monitoring wells FO-9 and FO-10 shallow was recommended in that Zoom meeting, as well as performing a geophysical survey. He went on to say that he is coordinating with Martin Feeney on performing this induction logging work.

Mr. Jaques clarified that the Board had provided direction not to install a new monitoring well now, but instead to do induction logging in Monitoring Wells FO – 9 and FO – 10 and see what is learned from that.

Ms. Voss asked how often monitoring well FO-11 shallow is sampled. Mr. Lear said this well is not one that is required to have water quality samples taken from it. She wondered if MCWD would be willing to do water quality monitoring in well FO-11, since that well is located within the Monterey Subbasin in the Marina-Ord area. Ms. Wang said she felt it would be good to get water quality data from that monitoring well. However, this is not currently discussed in Draft Chapter 5 of the Groundwater Sustainability Plan.

5. Schedule

Mr. Jaques said he had no update to report on from the schedule contained in the agenda packet.

6. Other Business

Mr. Leith asked that at a future TAC meeting there be discussion about the potential to provide reclaimed water for irrigation of the Laguna Seca golf course. Mr. Jaques said he would provide background information on this topic for discussion at a future TAC meeting.

The meeting adjourned at 2:53 PM.

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 10, 2021
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 learned that the State, through DWR, is planning to conduct Airborne Electromagnetic (AEM) Surveys around the State. They will be holding an informational workshop on this program in March, which I will attend (via Zoom). I am hopeful that this work will provide some information that will be useful to the Watermaster, particularly with regard to the concern about possible onset of seawater intrusion in Monitoring Well FO-09 Shallow. Attached is a PowerPoint slide from a recent webinar that announces this program.

At the Monterey County level:
Because so many meetings are being cancelled, the Board asked that I keep them updated on issues related to my participation in meetings held by the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) by sending out meeting summaries on a monthly basis. Attached are summaries of those meetings held in February 2021.

ATTACHMENTS:	Meeting Summaries
RECOMMENDED ACTION:	None required – information only

SUMMARY OF
PURE WATER MONTEREY,
SALINAS VALLEY GROUNDWATER SUSTAINABILITY, AND
MARINA COAST WATER DISTRICT GROUNDWATER SUSTAINABILITY
ZOOM MEETINGS
IN FEBRUARY 2021

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 18, 2021

Topics discussed included:

- A presentation on work by MCWRA on destruction of wells in the Lower Salinas Valley
- A progress report by Montgomery & Associates on the United States Geological Survey (USGS) model and how it is being evaluated by comparing it to previously developed inputs (water balance, etc.). The model has been extensively delayed and is not expected to be released in a final form in time to use that in preparing the subbasin GSPs. Instead a non-published draft version will have to be used. Once the final version is released the GSA may make revisions to the GSP to reflect the differences between the draft and final versions.
- A report on development of a strategic plan for the Salinas Valley Basin Groundwater Sustainability Agency

The only item in this meeting that will eventually be of interest to the Watermaster is the development of the USGS Model, since that will be used by the SVBGSA to evaluate impacts from their implementation of the Sustainable Management Criteria that will be included in their GSPs.

Department of Water Resources Annual Adjudicated Basins SGMA Workshop, February 19, 2021

There are 29 adjudicated basins in California. Nearly all of them are in southern California and in inland areas. There is one in northern California and our basin in central California.

During this meeting there was a presentation of what data has been submitted to DWR by all of the reporting adjudicated basins, and a presentation of what that data has shown with regard to reducing groundwater pumping.

There have been some updates to the data submittal portal, but there are no new or changed reporting requirements.

Data submittal for the Watermaster's "Voluntary Wells" (wells which we monitor but which are not California Statewide Groundwater Elevation Monitoring [CASGEM] wells) will continue to be through the CASGEM portal as it has been in the past. No change to this is anticipated at this time.

SVBGSA Seawater Intrusion Work Group meeting, February 22, 2021

At this meeting there was a presentation by MCWRA on the well destruction grant project. This project intends to destroy 105 abandoned or inactive wells in the lower Salinas Valley in the Castroville Seawater Intrusion Project (CSIP) service area of the 180/400-foot aquifer system. The objective is to eliminate potential vertical conduits that would allow intruded seawater in the shallower of the aquifers to flow downward into the deeper of the aquifers.

There was also a presentation by M1W and the City of Salinas on the work they have gotten a State grant for which will increase the flow of water to the M1W wastewater treatment plant so that more recycled water can be made available. The augmentation water includes agricultural wash water that flows to the City's Industrial Wastewater Treatment Facility, and storm water from the City that would otherwise be discharged to the Salinas river.

There was also a progress report on work being planned to modify the Salinas Valley Reclamation Plant (which currently provides irrigation water to the CSIP) to increase its capacity to serve an expansion of

the CSIP service area. This is one of the projects listed in the 180/400-Foot Aquifer Groundwater Sustainability Plan (GSP), along with others that include developing a seawater intrusion barrier (by injecting or extracting water along the coastline to stop seawater from flowing into the aquifers) and increasing diversions from the Salinas river to reduce groundwater pumping.
It was also noted that MCWD, as part of developing a GSP for the Monterey Subbasin, will be developing a model for the Monterey Subbasin.

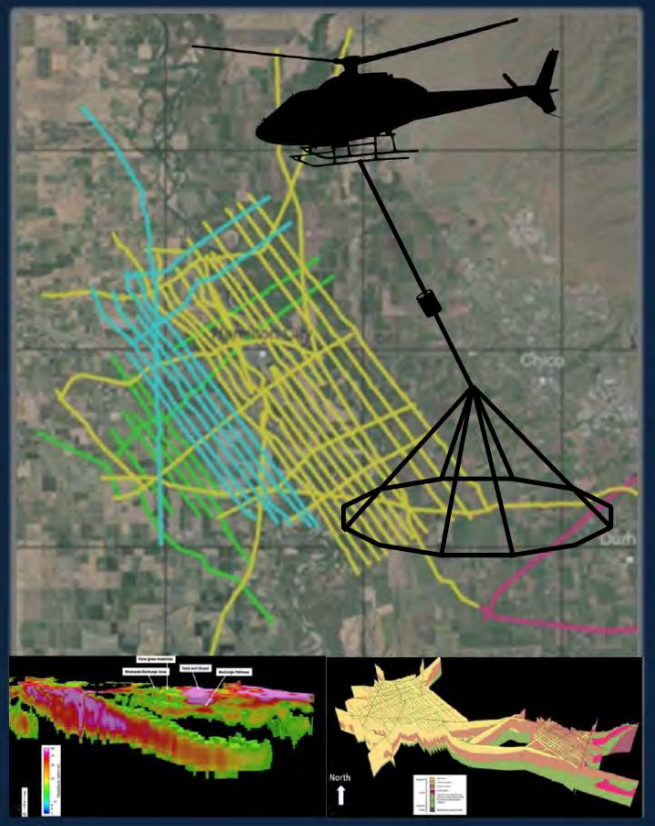
SVBGSA Modeling Workshop February 24, 2021

At this meeting there was an extensive presentation on what water budgets are and how they are being developed for the Salinas Valley Groundwater Basin (SVGB). Historical, current, and future water budgets will be developed using the Salinas Valley Integrated Hydrologic Model (SVIHM) and the Salinas Valley Operational Model (SVOM). The models will also be used to develop the Sustainable Yield of the SVGB, and to allocate the Sustainable Yield among the subbasins of the SVGB. Sustainable Yield is an estimate of the quantity of groundwater that can be pumped on a long-term average annual basis without causing undesirable results.
I reported that my understanding from attending meetings of the TAC for the development of the SVIHM was that it would not be providing modeling data covering the Seaside Basin. Mr. Franklin of MCWRA confirmed that, even though the SVIHM and SVOM model boundaries include the area of the Seaside Basin. I asked about how those models would be coordinated with the Watermaster's Seaside Basin model, and the response was that this would be done when the output from those models becomes available. Apparently there are going to be some specific meetings on that topic at a future date.

PowerPoint Slide Announcing the AEM Program from DWR

Statewide Airborne Electromagnetic (AEM) Surveys

- AEM data can improve the understanding of regional and local aquifer structure
  - Surveys to be conducted in all high and medium priority basins
  - Data collected in a coarse grid with flight lines oriented to cover important areas
  - Surveys to begin in summer 2021
  - AEM Webinar to be held this spring
  - Ongoing GSA and public outreach
  - More information from AEM webpage



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SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 10, 2021
AGENDA ITEM:	3
AGENDA TITLE:	Continued Discussion of the Need for Dataloggers in Monitoring Wells
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

At its February 10, 2021 meeting the TAC discussed the need for dataloggers in monitoring wells. My understanding of the TAC's conclusions and recommendations is presented below.

Collection and Processing of Data Logger Data

- The immediate value in processing the data from the data loggers listed in Table 3 from Georgina King's Technical Memorandum (attached) is that it may help us to understand what is going on during the time periods between the monthly water level measurements that are currently being made, and may be helpful in gaining a better understanding of groundwater conditions in the Basin. If we find that some of the processed data doesn't provide anything helpful, it might at least help us to better decide which data loggers are providing the most helpful data. After processing the data we should ask for feedback from Ms. King on whether or not continuing to process data from each location is proving to be beneficial. After receiving that feedback, the TAC could decide if any changes should be made in how the data logger network data is handled.

- Having detailed information from data loggers in areas where pumping depressions and/or groundwater divides exist (such as in Monitoring Well FO – 11) might help to understand what is causing the groundwater depression there.

- MPWMD will need additional scope and cost authorization each year to download and work up the data sets from the data loggers listed in Table 3. This would include performing a yearly data download, maintaining the data loggers, and providing the data to Montgomery and Associates for them to process. MPWMD does not have the staff available to support doing quarterly downloads of the data, only annual downloads. MPWMD spends about 1 ½ days per year doing the data downloading, evaluating if the loggers are still functioning properly, and archiving the downloaded logs. The contract currently only provides 8 hours for the entire year to download the Sentinel Well data loggers and does not include downloading of the other Watermaster data loggers. Completing annual downloads of the other data loggers in the Watermaster network, verifying the data, and archiving the data now takes MPWMD over 2 days for the single annual download. An increase in the contract of 8 hours in the field to perform an annual download of the loggers and 4 hours in the office evaluating if the loggers are functioning properly, archiving the data, and responding to data requests for logger data, will be needed to perform this work.

- Processing data logger data involves a number of steps to get accurate data and is more time consuming than simply downloading the data. The $2,900 cited in Ms. King's Technical Memorandum is for annual data processing, not quarterly. Quarterly processing would increase the cost.

AGENDA ITEM:	3 (Continued)

Wells in Which Data Loggers Should be Installed

- Table 3 should be used to select the locations where data loggers should be in place.
- The recommendation in the Technical Memorandum about reinstalling a datalogger in Monitoring Well PCA-West Shallow should be carried out. [Note: After the TAC meeting Martin Feeney discussed what needs to be done with Jon Lear to replace the data logger and reported that this well has a pump and transducer stuck in it which will need to be removed before a new transducer can be installed. This will require a pump contractor to be mobilized to the site. Since the site is all sand the rig will need to be 4-wheel drive. The pump contractor would attempt to pull it out, but if that fails, he would push it to the bottom. There is a 10-foot cellar in the well which can accommodate the abandoned pump without blocking perforations. This effort is hard to price as there is a lot of uncertainty in whether a given approach will work. Mr. Feeney will work on a proposal with a contingency in it. He is thinking this effort may cost more than the induction logging of FO-9 and FO-10, and should be a separate RFS from the one to perform the induction logging. I concur with Mr. Feeney's assessment and proposed approach. Once he is able to submit a scope and cost proposal, I will bring that to the TAC for discussion/approval.] Mr. Lear will do some research to determine the best type of datalogger to put in this well in order to avoid future problems such as the one currently being experienced.
- Mr. Lear will provide recommendations to the TAC about the types of dataloggers to be used in the various locations, and other things related to the datalogger network management for TAC discussion at a future meeting.

In summary I understand the TAC's recommendations to be:

- Process the data that has previously been downloaded but not yet processed. After this data has been processed and evaluated, obtain feedback from Montgomery & Associates about any revisions that should be made to how the data logger network is managed.
- Deploy data loggers in all of the wells as described in Table 3. Use Mr. Lear's recommendations about what types of data loggers to install.
- Replace the datalogger in Monitoring Well PCA-West Shallow.
- Perform annual downloads from all of these data loggers and take into consideration the recommendations from Montgomery & Associates about processing that data.

The TAC is asked to review the description above and to provide any corrections or additions. Once there is TAC agreement on this, I will draft contracts with the appropriate parties to carry out the TAC's recommendations and bring them to the TAC for discussion and approval.

ATTACHMENTS:	Table 3 from Technical Memo from Georgina King
RECOMMENDED ACTION:	Finalize Recommendations to the Technical Program Manager Regarding Changes to the Watermaster's Datalogger Management Program

Table 1. Recommendations on Datalogger Monitoring Wells

Well	Justification	Action
Monitoring Wells to Install Dataloggers in		
MSC Shallow	Coastal well and protective elevation well	Move logger from another well
Kmart	Key monitoring well for shallow aquifer in Southern Coastal subarea	Move logger from another well
CDM WW-4	Coastal well and protective elevation well	Move logger from another well
Monitoring Wells with Dataloggers		
PCA West Deep	Coastal well and protective elevation well	Already has logger
MSC Deep	Coastal well and protective elevation well	Already has logger
Sentinel Well 1	Coastal well	Already has logger
Sentinel Well 2	Coastal well	Already has logger
Sentinel Well 3	Coastal well and protective elevation well	Already has logger
Sentinel Well 4	Coastal well	Already has logger
Military[2]	Within the Northern Coastal subarea pumping depression	Already has logger
Pasadera Paddock[1]	Within the Laguna Seca subarea pumping depression	Already has logger
FO-5 Shallow[1]	Monitors basin boundary with Coral de Tierra	Already has logger
FO-5 Deep[1]	Monitors basin boundary with Coral de Tierra	Already has logger
Remove Dataloggers from these Wells		
York Road West Deep[1]		
Pistol Range[1]		
Luxton[2]		
Hilby[2]		

[1] Laguna Seca subarea well ; [2] former-Cal-Am production well converted to monitoring well

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 10, 2021
AGENDA ITEM:	3
AGENDA TITLE:	Contract Amendments for Martin Feeney and Montgomery & Associates
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

At its February 3, 2021 meeting the Board asked the TAC to undertake the following actions:

1. Performing induction logging of Monitoring Wells FO-9 and FO-10 so that data can be compared to the E-logs when the wells were constructed to see what information that may provide regarding SWI in those wells
2. Having Montgomery & Associates perform an analysis of groundwater flow directions and velocities to determine where groundwater in the vicinity of Monitoring Well FO-9 Shallow is moving and at what speed

The attached amendments to the current contracts with Martin Feeney and Montgomery & Associates will add scope and cost authorizations to accomplish this work.

Because there will be a cost savings if Mr. Feeney can perform this work in March, I will authorize him to proceed based on the Board's direction and will provide his contract amendment to them for their retroactive approval at their next meeting.

Since the work for Montgomery & Associates is less time-critical, and because it is more expensive, I will provide their contract amendment to the Board for pre-approval before giving Montgomery & Associates a notice to proceed.

ATTACHMENTS:	1. Amendment No. 1 to Martin Feeney RFS No. 2021-01 2. Amendment No. 1 to Montgomery & Associates RFS No. 2021-01
RECOMMENDED ACTION:	Approve these contract amendments

SEASIDE BASIN WATERMASTER
REQUEST FOR SERVICE

DATE: March 10, 2021

RFS NO. 2021-01 Amendment No. 1
(To be filled in by WATERMASTER)

TO: Martin Feeney
Martin Feeney
PROFESSIONAL

FROM: Robert Jaques
WATERMASTER

Services Needed and Purpose: Perform additional induction logging as described herein.

Completion Date: All work of this RFS as amended shall be completed not later than December 31, 2021.

Method of Compensation: Time and Materials (As defined in Section V of Agreement.)

Total Price: The Total Price for RFS No. 2021-01 is increased by $10,338.50 by this Amendment No. 1, and the Total Price for RFS No. 2021-01 is therefore increased to $28,839.06.

Total Price may not be exceeded without prior written authorization by WATERMASTER in accordance with Section V. COMPENSATION.

Requested by: _____ **Date:** 3/10/21.
WATERMASTER Technical Program Manager

Agreed to by: _____ **Date:** _____.
PROFESSIONAL

ATTACHMENT 1

PROFESSIONAL was authorized by RFS No. 2021-01 to perform induction logging on WATERMASTER's Sentinel Wells. WATERMASTER wishes to also have induction logging performed on Monitoring Wells FO-9 and FO-10, and to have the induction logging results on those wells compared to the E-logs for those wells when they were constructed to identify possible changes in water quality surrounding those wells. This Amendment No. 1 to RFS No. 2021-01 authorizes the performance of the work described in Attachment 2 hereto.

ATTACHMENT 2

Martin B. Feeney
Consulting Hydrogeologist

P.G. 4634
C.E.G. 1454
C.Hg 145

March 1, 2021

Seaside Basin Watermaster
PO Box 51502
Pacific Grove CA.
93950

Attention: Bob Jaques, PE

Subject: Geophysical Investigation Fort Ord Monitoring Wells FO-9 and FO-10 – Proposal for Hydrogeologic Services

Dear Bob:

Two monitoring wells in the Seaside Basin monitoring program, FO-9 Shallow and FO-10 Shallow, have recently displayed increasing concentrations of chloride ions raising the possibility that these data are indicative of advancement of seawater into the basin. However, these data are difficult to reconcile with other data from the more seaward Sentinel Wells that have seen no changes. The ad-hoc advisory team discussed this and generally believed that the data from the monitoring wells would benefit from further confirmation. It was suggested that the monitoring wells be induction logged and the data from the induction logs be compared to the original electric logs to see if there have been conductivity changes in the formation since the time of the wells installation. Following up on these discussions, I'm pleased to provide this proposal to assist the Seaside Basin Watermaster the induction logging of these wells, the processing of the data, and the comparison with the original logs. Presented in this proposal are an outline of the data collection plan and an estimate of associated costs.

Background.
Monitoring Wells Clusters FO-9 and FO-10 were drilled in 1994 and 1996, respectively. The wells are nested completions with multiple casings of varying lengths in the same borehole. FO-9 has two completions a shallow completion in the Paso Robles Formation and a deeper completion in the Santa Margarita Sandstone. FO-10 has 3 completions - one in the Paso Robles Formation, one in the Santa Margarita Sandstone and a third completion in an intermediate depth. Schematics of the wells are attached.

Scope of Work

The work to be performed is presented below broken down in to tasks. Costs for the tasks are presented on the table below.

Task 1 – Backgrounding – This task will include confirming access for logging equipment, review of the reports documenting the construction of the well nests, acquisition of the original electric logs, and digitizing the original analog electrical logs to simplify comparison with the new logs.

Task 2 – Field Work – This task will include the induction logging of the deeper well in each cluster. The deeper well is selected because the original elog was performed for the entire depth of the borehole. At the same time and as part of the same service charge, the shallow well at each completion will be conductivity/temperature logged. These data can confirm the collected samples. Prior to logging, it is understood the MPWMD will remove the dedicated sampling pumps.

P.O. Box 23240, Ventura, CA 93002 ♦ **Phone: 831-915-1115** ♦ e-mail mfeeney@ix.netcom.com

It should be noted that the induction logging tool is 1.7 inches in diameter and the inside diameter of Schedule 40 is 2.067 inches. Typically the tool can be used in nominal 2-inch PVC, but occasionally due to curvature in the casing the tool will not advance. If this happens, the next deepest well at each nest will be logged. The conductivity temperature tool is 1.5 inches in diameter and seldom has a problem descending.

Task 3 – Analysis and Reporting – After collection of the field data, data collected will be compared to previous data to identify locations where conductivity has changed. The collected data and interpretations will be summarized in a brief technical memorandum.

Costs for the logging program are estimated at $ 10,338.50 inclusive of outside services. A breakdown of costs is presented in the table below.

FO-9 and FO-10 - Induction Logging

Pacific Surveys	Unit Cost	Number		Cost
Service Charge	1006	1	$	1,006.00
Induction Logging FO-9 (minimum charge)	750	1	$	750.00
Induction Logging FO10 (per ft charge)	0.75	1410	$	1,057.50
Conductivity/Temperture Logging	715	2	$	1,430.00
per diem	195	1	$	195.00
			$	4,438.50
Professional Services (hrs)				
Backgrounding	175	8	$	1,400.00
Supervise Logging	175	12	$	2,100.00
Analysis/Reporting	200	8	$	1,600.00
Travel	100	8	$	800.00
			$	5,900.00
TOTAL			**$**	**10,338.50**

The opportunity to present this proposal is appreciated. Please call if you have any questions.

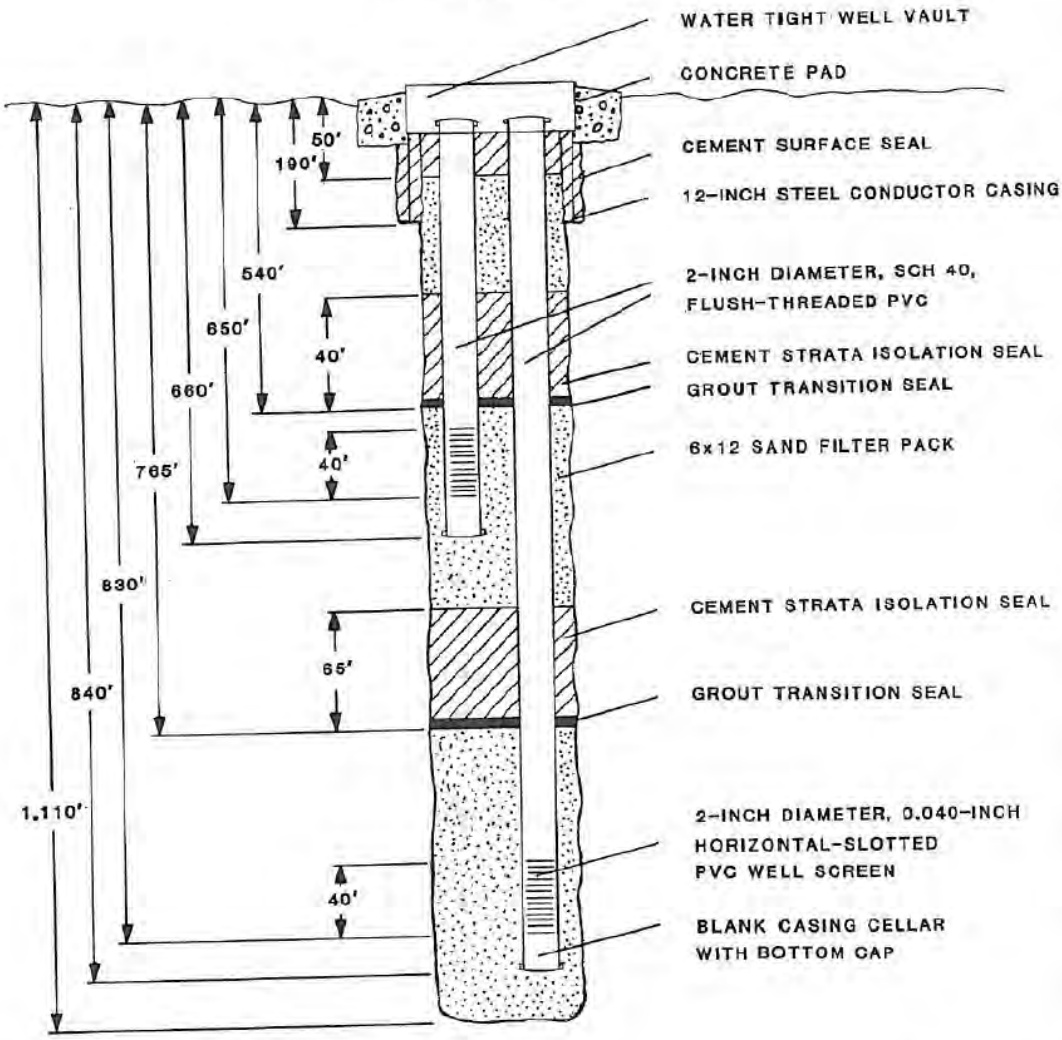
Sincerely,

Martin B. Feeney

FORT ORD COASTAL SUBBASIN GROUND WATER MONITORING PROJECT

MONITOR WELL CONSTRUCTION

MPWMD #FO-09



NOT TO SCALE

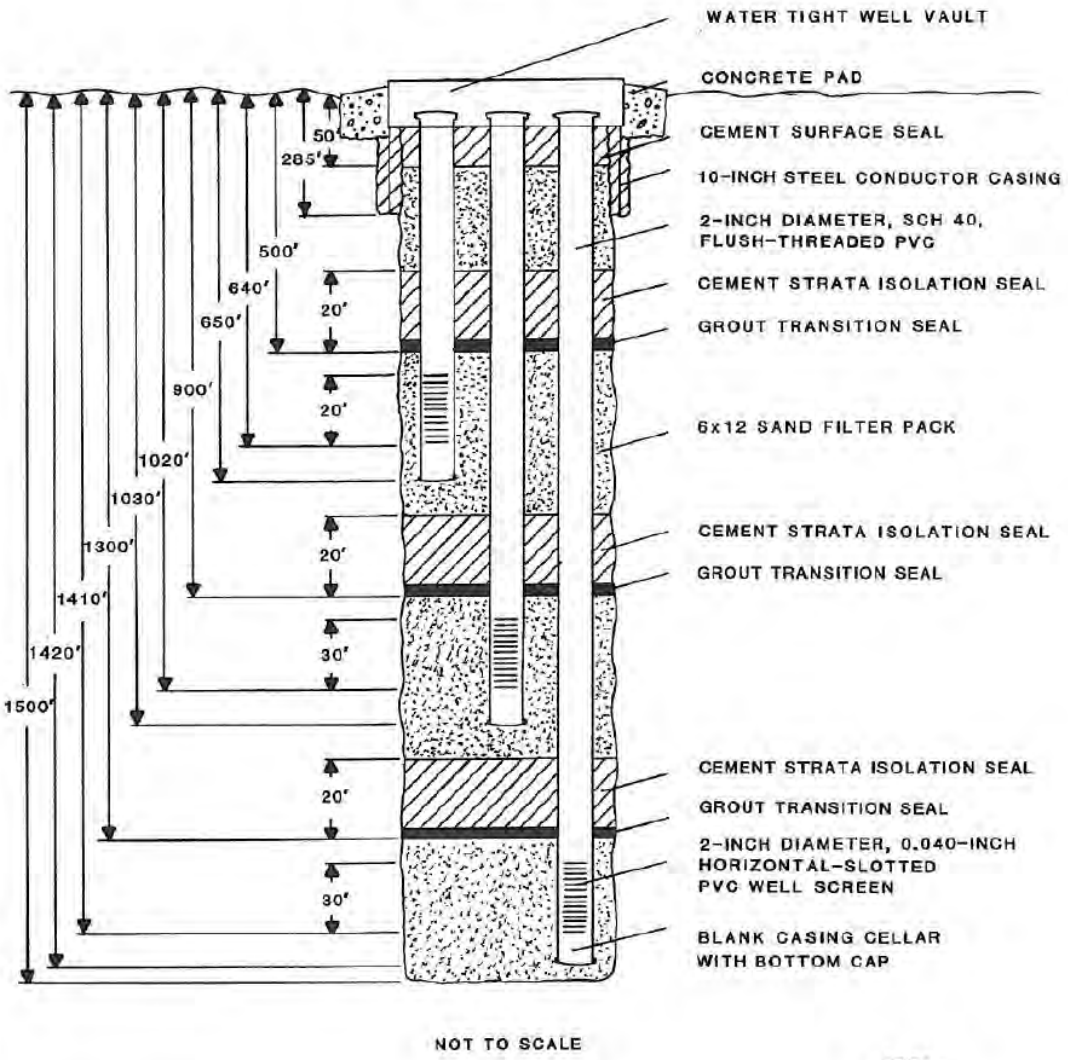
MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

Figure 6. FO-09 Completion.

1996 SEASIDE BASIN GROUND WATER MONITORING PROJECT

MONITOR WELL CONSTRUCTION

MPWMD #FO-10



NOT TO SCALE

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

Figure 3. MPWMD Site FO-10 Well Completion.

SEASIDE BASIN WATERMASTER
REQUEST FOR SERVICE

DATE: March 10, 2021 **RFS NO**. 2021-01 Amendment No. 1
(To be filled in by WATERMASTER)

TO: Hale Barter
Montgomery & Associates
PROFESSIONAL

FROM: Robert Jaques
WATERMASTER

Services Needed and Purpose: Perform additional hydrogeologic consulting services as described herein.

Completion Date: All work of this RFS shall be completed not later than December 31, 2021, and shall be performed in accordance with the Schedule contained in Attachment 2.

Method of Compensation: Time and Materials (As defined in Section V of Agreement.)

Total Price The Total Price for RFS No. 2021-01 is increased by $21,690.00 by this Amendment No. 1, and the Total Price for RFS No. 2021-01 is therefore increased to $39,010.00.

Total Price may not be exceeded without prior written authorization by WATERMASTER in accordance with Section V. COMPENSATION.

Requested by: _____ Date:_____.
WATERMASTER Technical Program Manager

Agreed to by: _____ Date:_____.
PROFESSIONAL

ATTACHMENT 1

SCOPE OF WORK

PROFESSIONAL was authorized by RFS No. 2021-01 to perform general on-call hydrogeologic consulting services. WATERMASTER wishes to also have PROFESSIONAL perform an analysis of groundwater flow directions and velocities to determine where groundwater in the vicinity of Monitoring Well FO-9 Shallow is moving and at what speed. This Amendment No. 1 to RFS No. 2021-01 authorizes the performance of the work described in Attachment 2 hereto.

ATTACHMENT 2

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

www.elmontgomery.com
1814 Franklin Street, Ste. 501
Oakland, CA 94612
510.903.0458

March 2, 2021

Mr. Bob Jaques
Seaside Watermaster Technical Program Manager
83 Via Encanto
Monterey, CA 93940

SUBJECT: SCOPE FOR ASSESSMENT OF SEASWATER INTRUSION TRAVEL TIME TO PASO ROBLES PRODUCTION WELLS

Dear Mr. Jaques

Montgomery & Associates (M&A) appreciates the opportunity to provide this scope of work for assessing the potential range of travel times of potential seawater intrusion recently detected in shallow monitoring wells to municipal and irrigation water supply wells screened in the Paso Robles formation in the Northern Coastal Subarea of the Seaside Basin.

While the Seaside Basin Watermaster Model ("the Model") could be used for this type of analysis, this would require first updating the model to reflect current and recent pumping operations, estimated groundwater recharge and boundary conditions, and validating the updated model against recently observed water levels. The Model was most recently updated in 2018 to include historical operations and conditions through the end of 2017. Some of these new model update activities are already scheduled to occur as part of ongoing work that M&A is carrying out in support of the permitting for the Pure Water Monterey (PWM) aquifer replenishment project, which will also include estimates on the impacts of the PWM injection future water levels. These PWM activities, however, will likely not be completed until June and would thus delay a preliminary analysis of potential seawater intrusion travel times.

What we propose as an alternative, is a hybrid analytic approach for estimating travel times that integrates aquifer parameters for the Paso Robles formation from the calibrated Seaside model, including aquifer thickness, hydraulic conductivity and storage coefficients, with groundwater elevation maps based on recent groundwater level monitoring data in the shallow aquifer that reflect current conditions and operations in and around the Northern Coastal Subarea of the basin. These groundwater elevation maps would be conceptually similar to the contour maps of the shallow aquifer that are regularly developed for the annual Sea Water Intrusion Analysis Reports, but would focus only on the Northern Coastal subarea and would include refined contours based on all available monitoring data, including available data from the Cal-Am ASR and PWM projects.

The contour maps will represent the potentiometric surface that drives groundwater flow and in combination with the aquifer parameters from the model by applying Darcy's law, they can be used to generate flow fields that can be used to estimate groundwater velocities and

travel times from one point in the aquifer to another. The advantage of this approach is that we benefit both from using aquifer data already developed for the Model combined with actual groundwater level measurements reflecting current basin operations and conditions.

In order to bracket potential conditions, we will develop a groundwater elevation map that represents a "best case" scenario where groundwater elevations remain constant at current annually averaged conditions, and a worst-case scenario of lower groundwater elevations. The worst-case scenario will be selected either from output of previous model simulations of potential future conditions in the basin, or from historical groundwater level data that represent maximum cone of depression in the Paso Robles aquifer.

The travel time analysis can be automated in GIS using an existing groundwater particle tracking toolset implemented and available within the ESRI ArcGIS Spatial Analyst Toolbox. M&A has recently used these tools in support of work in the Santa Cruz Mid-County groundwater basin to estimate travel times between proposed injection wells and water supply and will adapt existing workflows developed during that work to minimize the effort necessary for this analysis. Particles will be released along the coastline and tracked inland to determine if, and when they reach the vicinity of the supply wells screened in the Paso Robles formation. Groundwater travel times are very sensitive to the effective porosity of the aquifer; and since the effective porosity of the Paso Robles is not a calibrated parameter from the Model, upper and lower bound estimates on the travel times will be developed based on considering a reasonable range of aquifer effective porosities supported by available field data and literature values to provide a range of possible travel times.

The tasks to be performed are detailed in the following scope of work.

Scope of Work

TASK 1 – Develop Groundwater Elevation Surface Map Snapshots of Shallow Aquifer

M&A will review available groundwater level monitoring data for supply and monitoring wells in the Northern Coastal Subarea and will develop a dataset to be used for creating groundwater elevation maps representative of the recent conditions in the subarea. Existing simulations of potential future basin conditions with the PWM project operating will also be reviewed to determine if they can be used for extracting a groundwater elevation map representing a potential worst-case future scenario for seawater intrusion. Alternately, historical monitoring data may be used for this purpose. Generally speaking, even when groundwater levels fluctuate seasonally in relation to seasonal demands, the average velocity can be evaluated through use of an average groundwater level (e.g. during periods of peak pumping, gradients are steeper and groundwater velocities are faster, and in periods of lower pumping, the gradients decrease and groundwater velocities are slower, and average gradients will adequately represent the average velocities). The groundwater elevation maps will incorporate observed levels in the Paso Robles aquifer along the coastline and will also incorporate overlapping pumping cones of depression and injection mounds associated with extraction and injection wells during the monitoring period.

Assumptions:

1. The analysis will assume that average groundwater levels remain at the same conditions for the duration of the travel time analysis.
2. For purposes of evaluating a range of scenarios, two sets of groundwater level maps will be produced:
    a. One based on annually averaged current conditions (best case scenario).
    b. One worst-case scenario based on either simulated future groundwater levels (from existing model runs) or historical water level data that maximize the cone of depression.

TASK 2 – Perform Particle Tracking and Travel Time Analysis on the Developed Water Elevation Maps

M&A will extract the spatially variable hydraulic aquifer properties from the Model grid and convert into the GIS format used by the particle tracking tool set.

The travel time analysis tools assume that hydraulic heads remain constant for the duration of the analysis. This is equivalent to assuming that moving forward the pumping and recharge conditions in the basin were such that the current hydraulic heads would still be a representative snapshot of conditions in the future. This is a simplification that will allow for an initial assessment of an average ground water velocity field representative of current basin conditions and a range of potential travel times under the assumption that we could temporarily freeze the conditions in the basin. The approach also assumes that flow is two-dimensional and horizontal and uniform across the thickness of the aquifer. Broadly

speaking this is the same approach used for preliminary assessment of well head protection zones.

The particle tracking analysis will be performed for the two groundwater level maps representative of average and worst-case scenarios developed in Task 1, and for each scenario a lower and upper range effective porosity will be evaluated, for a total of four sets of particle tracking runs.

The analysis considers only advective groundwater transport and does not consider spreading of a potential salinity plume due hydrodynamic dispersion which would have the effect of some particle flow paths getting farther out in a shorter amount of time.

From the results of the particle tracking analysis maps will be produced that show the path that particles of water released at the coast take as they travel inland, color-coded by the estimated travel time. Tables will also be produced summarizing the range of estimated travel times to the supply wells for each of the sets of simulated conditions.

TASK 3 –Technical Memorandum and TAC Presentation

M&A will prepare a technical memorandum which documents Tasks 1 and 2, with a synthesis of the results for the conditions and scenarios evaluated. For costing purposes, we assume preparing one draft, responding to and addressing one round of review comments, and one final version of the report. The report will be provided in Microsoft Word and PDF formats.

M&A will present the results to the Seaside Basin Technical Advisory Committee (TAC) at a regularly scheduled TAC meeting. The presentation will review the analysis assumptions and results, and provide any additional information requested by the TAC.

Staffing Plan

Georgina King, P.G., C.Hg., will be the project manager, and Pascual Benito, Ph.D. will be the technical lead overseeing the work. Pascual is an experienced hydrogeologist who is currently supporting the Pure Water Monterey indirect potable reuse project and as needed hydrogeological services for the Seaside Basin Watermaster and it also supporting modeling work for the Salinas Valley groundwater basin sustainability plans. Derrik Williams, P.G., C. Hg., will provide senior review.

Project Budget and Schedule

We anticipate that this work can be completed within a two-month period, though the timing may depend on the scheduling of TAC and Board meetings. We can begin work on this immediately following notice to proceed.

The total estimate costs for these tasks is $21,690 as detailed in the attached cost table.

Please feel free to contact us with any questions about the proposed scope of work and budget.

Sincerely,

E.L. MONTGOMERY & ASSOCIATES

Pascual Benito, Senior Hydrogeologist

Georgina King, Senior Hydrogeologist

Detailed Cost Table

Cost Estimate for Seaside Basin Sea Water Intrusion Travel Time Estimates									
		Montgomery & Associates Labor						Other Direct Costs	TOTALS
		Scientist VIII D. Williams	Scientist VI G. King	Scientist V P. Benito	Scientist III	Labor Total			
Task	Hourly Rates	$260	$215	$195	$150	Hours	($)	($)	
1.0	DEVELOP SCENARIO GROUNDWATER LEVEL MAPS								
	Review and compile monitoring data & previous modeling results and develop hydraulic head maps for average and worst-case scenarios	1	2	8	20	31	$5,250	$0	$5,250
	Task 1 Subtotal	*1*	*2*	*8*	*20*	*31*	*$5,250*	*$0*	*$5,250*
2.0	PERFORM PARTICLE TRACKING & TRAVEL TIME ANALYSIS								
2.1	Prepare Aquifer Parameter + hydraulic head GIS grid input files	0	0	4	8	12	$1,980	$0	$1,980
2.2	Particle Tracking Runs & Travel Analysis	0	0	8	20	28	$4,560	$0	$4,560
2.3	Develop travel time maps and tables	0	0	4	16	20	$3,180	$0	$3,180
	Task 2 Subtotal	*0*	*0*	*16*	*44*	*60*	*$9,720*	*$0*	*$9,720*
3.0	TECHNICAL MEMORANDUM AND TAC PRESENTATION								
	Document, Summarize & Synthesize Analysis and Results	4	8	8	16	36	$6,720	$0	$6,720
	Task 3 Subtotal	*4*	*8*	*8*	*16*	*36*	*$6,720*	*$0*	*$6,720*
	Total	5	10	32	80	127	$21,690	$0	$21,690

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 10, 2021
AGENDA ITEM:	5
AGENDA TITLE:	Discuss Board Direction Regarding Concerns about Possible Detection of Seawater Intrusion in Monitoring Wells FO-9 and FO-10 Shallow
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

At its February 10, 2021 meeting the TAC received an informational presentation about the possible detection of seawater intrusion (SWI) in Monitoring Wells FO-9 and FO-10 Shallow. At its February 3, 2021 meeting the Board asked the TAC to undertake a number of actions regarding this, including:

1. Informing the Board what the TAC envisions if:
- No Basin replenishment projects are constructed
- The Cal Am Desalination Project is constructed
- The Pure Water Monterey (PWM) Expansion Project is constructed

2. Recommending what the Watermaster should do right now if it is determined that SWI is determined to be occurring?

3. Reviewing the Seawater Intrusion Response Plan (SIRP) to determine if it is up-to-date and adequate at this time
- Clarifying why the four criteria were selected in the SIRP to make the determination as to whether or not SWI is occurring
- Providing more detail on SIRP response actions (listed only in general terms in the SIRP) e.g. specific steps to take, timelines for taking them, etc.

4. Performing induction logging of Monitoring Wells FO-9 and FO-10 so that data can be compared to the E-logs when the wells were constructed to see what information that may provide regarding SWI in those wells

5. Having Montgomery & Associates perform an analysis of groundwater flow directions and velocities to determine where groundwater in the vicinity of Monitoring Well FO-9 Shallow is moving and at what speed

6. Revisiting the previously discussed topics of (1) lowering the Natural Safe Yield (NSY) to match the lower NSY value in the Basin Management Action Plan (BMAP) Update of July 2019, and (2) changing from using NSY to using Sustainable Yield for Basin management purposes

7. Preparing a Gantt Chart showing the timing for actions that should be taken if it is determined that SWI is occurring

Attached is a Draft document I have prepared in response to these requests from the Board. The TAC is asked to provide comments and suggested edits to this document, so I can incorporate them into the version that I will present to the Board at its April meeting. Also attached is an earlier document from HydroMetrics.

ATTACHMENTS:	1. Draft Discussion Paper on Board-requested actions regarding the possible detection of seawater intrusion (SWI) in Monitoring Wells FO-9 and FO-10 Shallow 2. February 2, 2017 Proposed Work Plan to Investigate Sources of Fluctuating Chlorides in the Sentinel Wells
RECOMMENDED ACTION:	Provide comments and suggested edits to the attached document, for incorporation into the version that will be presented to the Board

DISCUSSION PAPER
ON BOARD-REQUESTED ACTIONS
REGARDING THE POSSIBLE DETECTION OF SEAWATER INTRUSION (SWI)
IN MONITORING WELLS FO-9 AND FO-10 SHALLOW

What is envisioned if:

a. No Basin replenishment projects are constructed.

If no replenishment projects are constructed there will be no way of achieving protective groundwater levels, short of drastically reducing pumping from the Basin and waiting for natural recharge from rainfall to begin to raise groundwater levels. Because the Basin is recharged mainly from inland areas, and since groundwater flows very slowly in the horizontal direction, it would be many years before natural recharge water could adequately raise groundwater levels near the coast. Modeling performed for the Watermaster by HydroMetrics in 2013 is described in the Technical Memorandum titled *Groundwater Modeling Results of Replenishment Repayment in the Seaside Basin*, dated April 5, 2013. This Technical Memorandum can be viewed in Attachment 10 of the Watermaster's 2013 Annual Report, which starts on page 143, at this link: http://www.seasidebasinwatermaster.org/Other/Final%20Annual%20Report%202013%20A%2012-5-13-1.pdf. This modeling found that in order to achieve protective groundwater elevations in all six of the wells for which protective elevations have been established, all pumping from the Basin by both Standard and Alternate Producers would have to cease for a period of 25 years, with the exception of recovery of ASR injected water. Some of the wells achieved protective elevations sooner than 25 years, but these were wells in the shallow aquifers, not the deep aquifers where the majority of the production pumping occurs. Clearly, unless a new water source becomes available to completely replace the Seaside Basin as a water supply source, it would be infeasible to discontinue all pumping from it.

This means the Basin will continue to be vulnerable to SWI. Our consultants have told us that if protective groundwater elevations are not achieved, seawater will eventually enter the Basin's aquifers. This may be a slow process, but it would accelerate if groundwater levels continue to fall. It may already be occurring in the vicinity of Monitoring Well FO-9, and possibly in other areas of the Basin where there are no monitoring wells that would detect this. Because of the pumping depression in the Northern Coastal Subarea, intruded seawater will flow toward that due to the downward hydraulic gradient. Unless wells in that part of the Northern Coastal Subarea are relocated elsewhere, they would eventually begin pumping intruded seawater.

b. The Cal Am Desalination Project is constructed.

If the Desalination Project is constructed, it would offer the potential to produce water that could be used to replenish the Basin. Replenishment means water would be injected into the Basin and not pumped back out, so that it would raise groundwater levels. The 2013 HydroMetrics modeling report referred to above found that it would take approximately 1,000 acre-feet-per-year (AFY) of replenishment water, injected for a period of 25 years, in order to achieve protective elevations in all six of the protective elevation wells. This would be a total replenishment water volume of approximately 25,000 AF.

Because the Desalination Project would be designed to provide an adequate water supply to support expected growth in demand in future years, in its initial years of operation its production capacity would exceed the levels of demand, thus enabling the plant to produce replenishment water. An evaluation of the Desalination Project's replenishment water production potential was provided to the Board at its February 3, 2021 meeting, under Agenda Item XI.C, the subject of which was *Direct Staff Regarding Obtaining Additional Water to Recharge the Basin to Raise*

Groundwater Levels. The attachment included with that Agenda Item, titled *Information on Issues Associated with Obtaining Additional Water to Recharge the Basin in Order to Raise Groundwater Levels* contained a Figure showing the potential amounts of replenishment water that the Desalination Project could provide out to the year 2050 under five growth scenarios, and assuming the Desalination Project began operation in 2020. A revised copy of that figure, reflecting the later start-of-operation dates used to prepare Gantt Chart 2, is shown below in Figure 1. Figure 1 shows that the Desalination Project could provide 25,000 AF of water for replenishment by 2028 under the average growth rate of the five growth scenarios.

c. The Pure Water Monterey (PWM) Expansion Project is constructed.

Similarly, the PWM Expansion Project would be designed to support expected growth in demand in future years. Therefore, just like the Desalination Project, in its initial years of operation its production capacity would exceed the levels of demand, thus enabling it to produce replenishment water. Under the later start-of-operation dates used to prepare Gantt Chart 2, the PWM Expansion Project does not go into operation until 2023. As a consequence, the PWM Expansion Project would not be able to provide more than a maximum of 22,010 AF of water for replenishment, and that would not occur until 2059. After that date all of the Pure Water Monterey Project's water would be needed to meet projected water demands, and it would not be able to provide replenishment water. By the end of 2048 the total potential amount of replenishment water the PWM Expansion Project could provide would be approximately 20,625 AF under the average growth rate of the five growth scenarios.

What should the Watermaster should do right now if it is determined that SWI is determined to be occurring?

If it is determined, using the criteria contained in the Watermaster's Seawater Intrusion Response Plan (SIRP), that SWI is occurring, then the Seawater Intrusion Contingency Actions contained in Section 4 of the SIRP should be implemented. These consist of:

Action 1: Verification
Action 2: Declaration of Seawater Intrusion
Action 3: Notification
Action 4: Pumping Redistribution Plan
Action 5: Focus Supplemental Supplies to Halt and Reverse Seawater Intrusion

Each of these actions is described in more detail in the SIRP.

Under Action 4 the pumping redistribution plan is designed to contain observed seawater intrusion, and to protect production wells until a supplemental water supply is obtained. The pumping redistribution plan consists of a series of activities including relocating and reducing pumping in order to prevent intruded seawater from reaching production wells. It includes evaluating the potential benefit of installing additional monitoring wells.

Under Action 5 when a supplemental water supply becomes available for Basin replenishment, the Watermaster is to have the supplemental water used strategically to protect the Basin from further seawater intrusion, and to restore the Basin to pre-seawater intruded conditions. Supplemental supplies are to be used to both offset pumping that causes the observed seawater intrusion, and to raise groundwater levels to reverse seawater intrusion, i.e. to achieve protective groundwater levels.

Regarding supplemental water supplies, the 2019 update of the Watermaster's Basin Management Plan includes a recommendation to develop a long-term financing plan for replenishment water, which reads as follows:

The Adjudication Decision identifies three separate budgets that the Watermaster oversees: (1) the Monitoring and Management Plan budget, (2) an annual Administrative budget, and (3) a Replenishment budget. These budgets are set every year by the Watermaster.

The replenishment assessments are only intended to offset overproduction that has occurred after the Decision was issued. The current replenishment assessments are not sufficient to buy water that offsets over-pumping that occurred prior to the Adjudication Decision. The over-pumping prior to the Adjudication Decision added to the Basin's deficit. Offsetting only the over-production that occurred after the Adjudication Decision may not be sufficient to raise groundwater levels in the Basin sufficiently to prevent seawater intrusion.

The Watermaster should develop a plan to address this issue.

Based on cost information provided by Cal Am, the currently projected cost of water from the Desalination Project is on the order of $5,500/AF, and from the PWM Expansion Project is on the order of $2,500/AF. Regardless of which project moves forward, acquiring 1,000 AFY of replenishment water will cost several million dollars per year.

The Watermaster should right now (1) start negotiating with both Cal Am and MPWMD/M1W to establish terms and conditions under which replenishment water can be provided by the Desalination Project or the PWM Expansion Project, respectively, and (2) start developing a plan to finance the cost of obtaining such replenishment water for the Basin.

Is the Seawater Intrusion Response Plan (SIRP) up-to-date and adequate at this time?

After thoroughly reviewing the Watermaster's 2009 SIRP, I only found a few things that I felt might be worth updating:

1. Page 7 in the SIRP includes this paragraph: *Some production wells in the Seaside Groundwater Basin are screened across multiple depth zones, and the water qualities of these wells reflect a blend from multiple sources. These wells cannot be used for assessing water quality of individual aquifers. Water quality data are, however, collected at these wells; and seawater intrusion indicators should be established for these wells after sufficient data are acquired. Seawater intrusion indicators for wells completed across multiple depth zones should be the least restrictive indicators of all the screened zones. As additional geochemical data are collected through future groundwater monitoring, groundwater quality in these wells should be evaluated to determine site-specific indicators.*

We now have additional water level and water quality data since the SIRP was prepared. Would it be beneficial to develop site-specific indicators (e.g. chloride threshold values) for these wells?

2. Page A-15 in the SIRP includes this paragraph: *Hem (1989) suggested several other indicators for seawater intrusion, including the concentration ratio of calcium to magnesium (approximately 0.3 in seawater and greater in fresh water); the percentage of sulfate among all ions (approximately 8 percent in seawater and larger in fresh water); and the concentrations of minor constituents such as iodide, bromide, boron, and barium.*

These other indicators have thus far not been used when preparing the annual Seawater Intrusion Analysis Reports, but data to analyze these anions and cations has been collected in many wells since the SIRP was prepared. In addition to these, Martin Feeney suggested other anion/cation analyses that might also be helpful, specifically:

- *Ca to HCO3+SO4 (mg/l) - greater than 1 can be indicative of SWI*
- *Ratio of Chloride to Bromide (mg/l) – Seawater~297, Pajaro GW ~*

- *Simpson Ratio (Todd 1959) – Ratio of Cl/HCO3 + CO3 (mg/l)=> good quality(< 0.5), slightly contaminated (0.5-1.3), moderately contaminated (1.3-2.8), injuriously contaminated (2.8-6.6), highly contaminated (6.6 – 15.5)*

- *Base Exchange Index (BEX) – BEX= Na +K + Mg – 1.0716 Cl (all units in meg/l1[2]); positive value indicates freshening, negative value indicates salinization.*

I believe it would be beneficial at this time to perform these analyses on Monitoring Well FO-9 Shallow, to help see if the source of the increasing chloride levels can be determined. A Work Plan was developed for us by HydroMetrics in 2017 after we became concerned about seeing fluctuations in chloride levels in some of our Sentinel Wells. A copy of that Work Plan, which we never pursued after deciding that water quality samples taken in the Sentinel Wells were not representative of the water quality in the aquifers where these wells are located, is attached. If at this time we only performed the anion/cation analyses described in the Work Plan, and had only an informal report prepared on the findings of those analyses as they pertain to determining the source the source of the increased chloride in FO-9 Shallow, the cost would be much lower than that shown in Table 1 of the Work Plan. This information could be helpful in determining whether or not the increased chloride levels are being caused by intruding seawater, and thus what actions the Watermaster should take.

Comments not involving updating of the SIRP:

- Page A-6 in the SIRP contains this paragraph: *No single analysis definitively identifies seawater intrusion, however by looking at various analyses we can ascertain when fresh groundwater mixes with seawater. At low chloride concentrations, it is often difficult to identify incipient seawater intrusion. Mixing trends between groundwater and seawater are more easily defined when chloride concentrations exceed 1,000 milligrams per liter (mg/L). This is due to the dominance of natural variation in fresh water chemistry at chloride concentrations below 1,000 mg/L (Richter and Kreitler, 1993). Chloride concentrations greater than 1,000 mg/L are clearly indicative of seawater intrusion in the local aquifers.*

It is interesting to know that it takes higher chloride levels than we are seeing in any of our wells before it is likely that mixing trends between freshwater and seawater will be easily seen.

- Page A-11 in the SIRP contains this paragraph: *Example graphs showing historical chloride concentration increases indicative of seawater intrusion are shown in Figure 8 and Figure 9. Figure 8 graphs steadily increasing chloride concentrations in a shallow well in the Salinas Valley. Figure 9 graphs increasing chloride concentrations in a well in the Pajaro Valley. Both of these graphs show that the rise in chlorides is a lengthy and persistent process; chloride concentrations began to increase in the representative Salinas Valley well in 1982, and took six years before exceeding the Safe Drinking Water Act secondary drinking water standard of 250 mg/L. This long-term and relatively slow increase in chlorides suggests that while chloride concentrations are strongly indicative of seawater intrusion, it often takes time for the increasing chloride trend to be recognizable.*

It is interesting to know that it may take a trend of increasing chloride levels a long time to be easily recognized. It is also interesting to note that well FO-9 Shallow currently is showing chloride levels in the 90 mg/L range, whereas the Safe Drinking Water Act secondary drinking water standard is 250 mg/L, much higher than the level in FO-9 Shallow.

- Page A-14 in the SIRP contains this paragraph: *In addition to plotting increasing chloride concentrations, decreasing sodium/chloride ratios are plotted on Figure 8 and Figure 9. The strong correlation between the two indicators of seawater intrusion can be observed on these two figures. The potential utility of sodium/chloride ratios as an early indicator of seawater intrusion is shown on Figure 9.*

This figure shows that by August 1988, chloride concentrations in the Pajaro Valley well had remained relatively constant, yet sodium/chloride ratios were beginning to drop, suggesting incipient seawater intrusion. By September 1990, the rising chloride levels can be clearly correlated to dropping sodium/chloride ratios; definitively associating the high chlorides with seawater intrusion.

It is interesting to know that a decrease in the sodium/chloride ratio may be an earlier indicator of SWI than is an increasing trend in chloride levels.

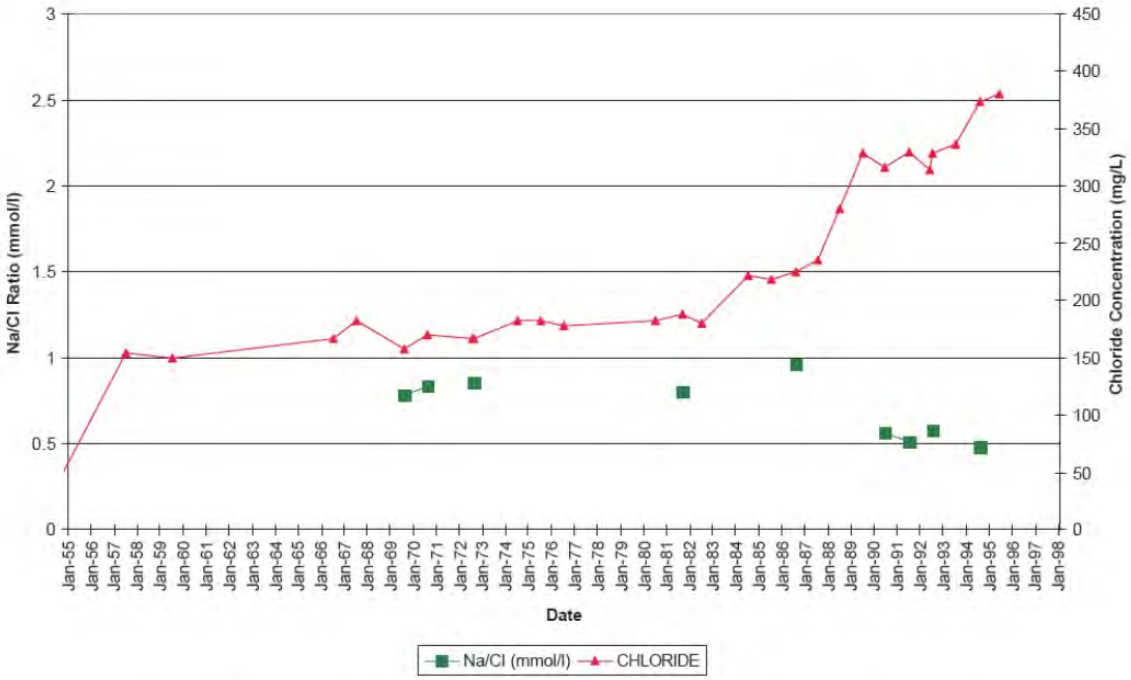


Figure 8: Historical Chloride Concentrations and Sodium/Chloride Ratios for a Well in Salinas Valley Showing Incipient Intrusion
(Source: MCWRA)

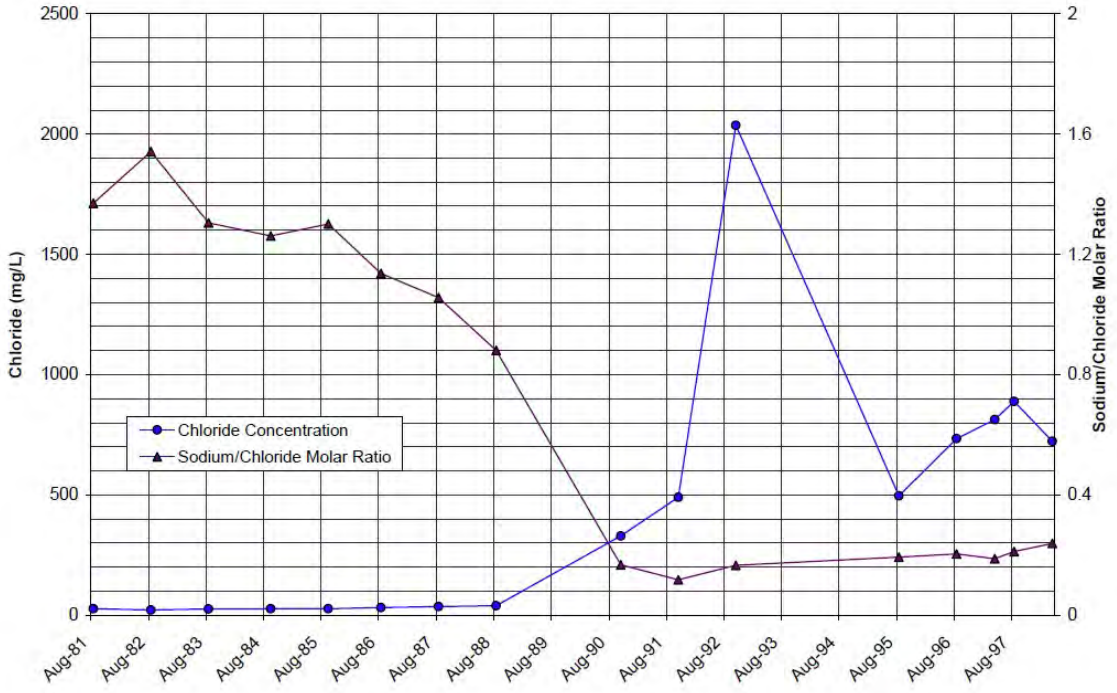


Figure 9: Historical Chloride Concentrations and Sodium/Chloride Ratios for a Well in Pajaro Valley Showing Incipient Intrusion
(Data source: PVWMA)

Why were the four criteria listed in the SIRP selected in order to make the determination as to whether or not SWI is occurring?

The following four indicators of SWI are used in the SIRP. A brief explanation of why each of these indicators were selected is provided below.

Indicator 1: Increasing Chloride Concentrations

Unusually high or steadily increasing chloride concentrations are one of the most commonly used indicators of seawater intrusion. At low chloride concentrations, trends are often as important as absolute concentrations because of natural variations in groundwater chemistry. While chloride concentrations are strongly indicative of seawater intrusion, it often takes time for the increasing chloride trend to be recognizable due to the long-term and relatively slow increase in chlorides during seawater intrusion.

Indicator 2: Decreasing Sodium/Chloride Molar Ratios

A rapid decline in the molar ratio of sodium to chloride may indicate seawater intrusion. In the early stages of seawater intrusion, sodium often replaces calcium on the aquifer's clay particles through ion exchange before significant chloride increases are observed. This effectively removes sodium from the water, and sodium/chloride molar ratios drop. The ratio of sodium to chloride in groundwater can therefore sometimes be used as an early indicator of seawater intrusion. Sodium/chloride molar ratios can also be used to differentiate between seawater intrusion and other sources of salinity. The literature suggests that sodium/chloride molar ratios in advance of a seawater intrusion front will be below 0.86 molar ratio.

Indicator 3: Visual Inspection of Cation/Anion Ratios

Seawater intrusion is often indicated by graphically analyzing shifts in groundwater quality. Two common graphical techniques for these analyses are Piper diagrams and Stiff diagrams.

Indicator 4: Chloride Concentration Maps

In basins experiencing seawater intrusion, chloride concentrations will be highest at the coast. If chloride concentrations have a distribution that can be contoured, annual chloride iso-concentration maps can be generated. This would show whether seawater is migrating in from the coast. Chloride data compiled in the annual Seawater Intrusion Analysis Reports for the shallow aquifer has not shown a distribution that could be contoured. Therefore, the data were simply plotted on the maps but not contoured.

Provide more detail on SIRP response actions (listed only in general terms in the SIRP) e.g. specific steps to take, timelines for taking them, etc.

As noted above, these are the response actions listed in the SIRP:

Action 1: Verification
Action 2: Declaration of Seawater Intrusion
Action 3: Notification
Action 4: Pumping Redistribution Plan
Action 5: Focus Supplemental Supplies to Halt and Reverse Seawater Intrusion

The first three Actions are administratively straightforward and are clearly described in the SIRP.

Action 4 involves the following eight steps, some of which should be applied iteratively:

- ***Discontinue or substantially reduce pumping the Impacted Well(s).*** *If seawater intrusion has been declared for a production well, pumping at this well shall be discontinued or substantially reduced as soon as possible, but no longer than 30 calendar days after the Declaration of Seawater Intrusion. If seawater intrusion has been declared for only monitoring wells, this activity is unnecessary.*

Since the current well of concern (FO-9 Shallow) is a monitoring well, not a production well, this step is not applicable.

• ***Identify At Risk Well(s) where seawater intrusion might occur.*** *At Risk Wells are production wells that have the potential to become impacted by seawater intrusion based on their proximity to the Impacted Well(s), local groundwater gradients, and other conditions.*

Using either the Seaside Basin Groundwater Model, or by performing manual analyses of groundwater level data, the direction (and potentially the speed of movement) of groundwater containing the increasing chloride levels in FO-9 Shallow can be estimated. This will enable the identification of the production well(s) that will be at the greatest risk of experiencing increased chloride levels. From a discussion with Montgomery & Associates (Georgina King) it will be quicker and considerably less expensive to do this manually than it will be to use the Groundwater Model. As time goes on and the Basin reacts to the impacts of injection and extraction of water from the Pure Water Monterey Project, it might be necessary to use the Groundwater Model. However, the results from the manual analysis should be adequate to make decisions at this time.

• ***Identify and/or install additional monitoring wells.*** *The Watermaster will evaluate the benefit of installing additional groundwater monitoring wells to evaluate the movement of seawater intrusion towards the At Risk Well(s). If this evaluation concludes that monitoring wells should be installed, the Watermaster will pursue installation of these wells with due diligence.*

As reported to the Board at its February 3, 2021 meeting, installing a new monitoring well will be quite costly and will only provide data from the location where the well is installed. However, a new monitoring well would be useful in seeing how water quality in its location is changing over time. As discussed above, using the groundwater model, or manually estimating groundwater flow patterns using available groundwater level data, would provide information on how groundwater is moving in a larger area, but would only be as accurate as the model or the manual plotting can predict. The model is currently not capable of predicting changes in water quality, only the movement of groundwater. A supplemental software would need to be added to the model to predict water quality changes. In the Zoom meeting with the Watermaster's hydrogeologic consultants held on February 2, 2021 there was general consensus that performing a geophysical survey would be a better and more cost-effective means of testing the hypothesis that seawater is coming in via the shallow sand formations near the coastline and gradually working its way downward into the Paso Robles aquifer, than it would be to put in a monitoring well at this time. This information could also be helpful in finding the best location for a new monitoring well, if it was ultimately decided that it would be beneficial to install a new monitoring well.

• ***Estimate the groundwater conditions that protect production wells.*** *The Watermaster shall estimate the maximum acceptable groundwater gradient between the Impacted Well(s) and the At Risk Well(s) that prevents seawater intrusion from reaching the At Risk Wells before a supplemental supply is obtained, currently estimated to be 2015. The Watermaster should further estimate the expected total dissolved solids (TDS) and chloride concentrations over time that might be observed at existing or new monitoring wells under this maximum groundwater gradient.*

We now know that no supplemental supply will be available to the Basin by 2015. In fact there is currently no estimated date for which a new supplemental supply, to augment the existing Pure Water Monterey Project, will become available. The two potential supplemental supply sources are the Cal Am Desalination Plant and the Pure Water Monterey Expansion Project. Consequently, it would be impossible at this time to estimate the maximum acceptable groundwater gradient required under this Action. Once a date is known upon which a supplemental supply will be available to the Basin, this Action could be carried out using the groundwater model, or manually estimating groundwater flow patterns using available groundwater level data, to estimate the maximum acceptable groundwater gradient.

• ***Identify and evaluate production wells' influence on observed seawater intrusion.*** *All production wells in the Seaside Groundwater Basin shall be evaluated and ranked for their influence on the*

groundwater gradients that are causing seawater intrusion and migration. The Watermaster shall estimate one or more recommended pumping scenarios that will achieve the maximum acceptable gradient between Impacted and At Risk well(s).

As noted above, it is currently not possible to estimate the maximum acceptable groundwater gradient. Therefore, it is not currently possible to evaluate and rank production wells for their influence on those gradients. However, it may be possible using the groundwater model to draw some conclusions, based on locations and production quantities, that would enable estimating which wells will likely have the greatest effect on the movement of SWI into the Basin.

• ***Increase monitoring frequency.*** *The Watermaster should increase the monitoring frequency of the Impacted Well(s), monitoring wells, and At Risk Well(s) to evaluate the progress of the seawater intrusion. Groundwater elevations at these wells should be measured monthly, and groundwater samples should be collected from these wells and analyzed monthly for major cations and anions. The groundwater gradient should be analyzed every month to confirm that the pumping reduction is having the planned effect.*

The water quality monitoring frequency in FO-9 Shallow has already been increased from twice a year to quarterly, and the monitoring frequency of FO-10 Shallow has already been increased from annually to quarterly. If this more frequent monitoring data provides further indication of the occurrence of SWI at well FO-9 Shallow, then it would be appropriate to increase this frequency to monthly. These wells are already being monitored monthly for groundwater level, so that requirement is already being fulfilled. The only well within the Seaside Basin currently showing the appearance of potentially being impacted by SWI is monitoring well FO-09 Shallow. Since this is not a production well, pumping from it cannot be reduced. However, as described above, if it is possible to estimate which production well(s) will likely have the greatest effect on the movement of SWI, then efforts to reduce pumping from those well(s) could be undertaken as an early proactive step to control the movement of SWI, if it is occurring.

• ***Re-evaluate the Operating Yield.*** *In accordance with the Amended Decision, the Watermaster should re-evaluate the Operating Yield to prevent further Material Injury.*

The *Seaside Groundwater Basin 2018 Basin Management Action Plan* (BMAP) dated July 19, 2019 estimated the Natural Safe Yield (NSY) for the Basin as a whole to be 2,370 AFY. This is lower than the 3,000 AFY Decision-established NSY. At its June 5, 2019 meeting the Board received a presentation on this BMAP and determined to ramp-down the Operating Yield to match the 3,000 AFY NSY for the time being while awaiting completion of the Groundwater Sustainability Plan (GSP) for the Monterey Subbasin. The Seaside Basin groundwater level impacts that would result from implementation of the Monterey Subbasin GSP could then be evaluated. At this same meeting the Board also determined that after that evaluation was made, it would be appropriate to reevaluate the NSY and also to consider changing from the NSY approach to a Sustainable Yield (SY) approach for Basin management purposes. If the determination is made that SWI is occurring at FO-9 Shallow, then it would be appropriate to now consider both (1) lowering the NSY from 3,000 AFY to 2,370 AFY and (2) changing to the SY approach.

The following activity shall be initiated within 90 calendar days of the Water master Board adopting recommendations from the previous activities:

• ***Modify pumping to achieve the desired groundwater gradient.*** *Groundwater pumping at the most influential production wells should be modified to achieve the groundwater gradient calculated above.*

This Action could be undertaken after it becomes possible to calculate the maximum acceptable groundwater gradient.

Action 5 pertains to the use of a supplemental water supply for Basin replenishment. Action 5 reads as follows: *When a supplemental water supply becomes available for Seaside Groundwater Basin*

replenishment, the Watermaster will seek to have the supplemental water used strategically to protect the Seaside Groundwater Basin from further seawater intrusion, and to restore the Basin to pre-seawater intruded conditions. Supplemental supplies should be used to both offset pumping that causes the observed seawater intrusion, and to raise groundwater levels to reverse seawater intrusion.
Since no supplemental water supply is currently available, it is not currently possible to carry out this Action. Further, simply having a supplemental supply become available would not immediately halt the advance of seawater intrusion. The advance would only be sufficiently halted by raising groundwater levels such that there was no downward gradient between the seawater intruded area(s) and the production wells that are At Risk. As the groundwater levels rise, the rate of advance would slow. However, it would be a complicated analysis requiring the use of the Groundwater Model, and making a number of assumptions, to determine how best to use the supplemental water to protect production wells against seawater intrusion.

Perform induction logging of Monitoring Wells FO-9 and FO-10 so that data can be compared to the E-logs when the wells were constructed to see what information that may provide regarding SWI in those wells.

At its February 3, 2021 meeting the Board provided direction to staff to perform this work. A scope of work and cost proposal to perform this work has been requested, and will be authorized by the issuance of a contract with Martin Feeney once the proposal is received. It is expected that this work will be performed in March 2021.

Perform an analysis of groundwater flow directions and velocities to determine where groundwater in the vicinity of Monitoring Well FO-9 Shallow is moving and at what speed.

At its February 3, 2021 meeting the Board provided direction to staff to perform this work. A scope of work and cost proposal to perform this work has been requested, and will be authorized by the issuance of a contract with Montgomery & Associates once the proposal is received and the work is approved by the Board. It is expected that this work will be performed later this Spring following Board approval.

Revisit the previously discussed topics of (1) lowering the Natural Safe Yield (NSY) to match the lower NSY value in the Basin Management Action Plan (BMAP) Update of July 2019, and (2) changing from using NSY to using Sustainable Yield for Basin management purposes.

As noted above it would be appropriate to do this if the determination is made that SWI is occurring at any location within the Seaside Basin.

Prepare a Gantt Chart showing the timing for actions that could be taken in response to determining that SWI is occurring.

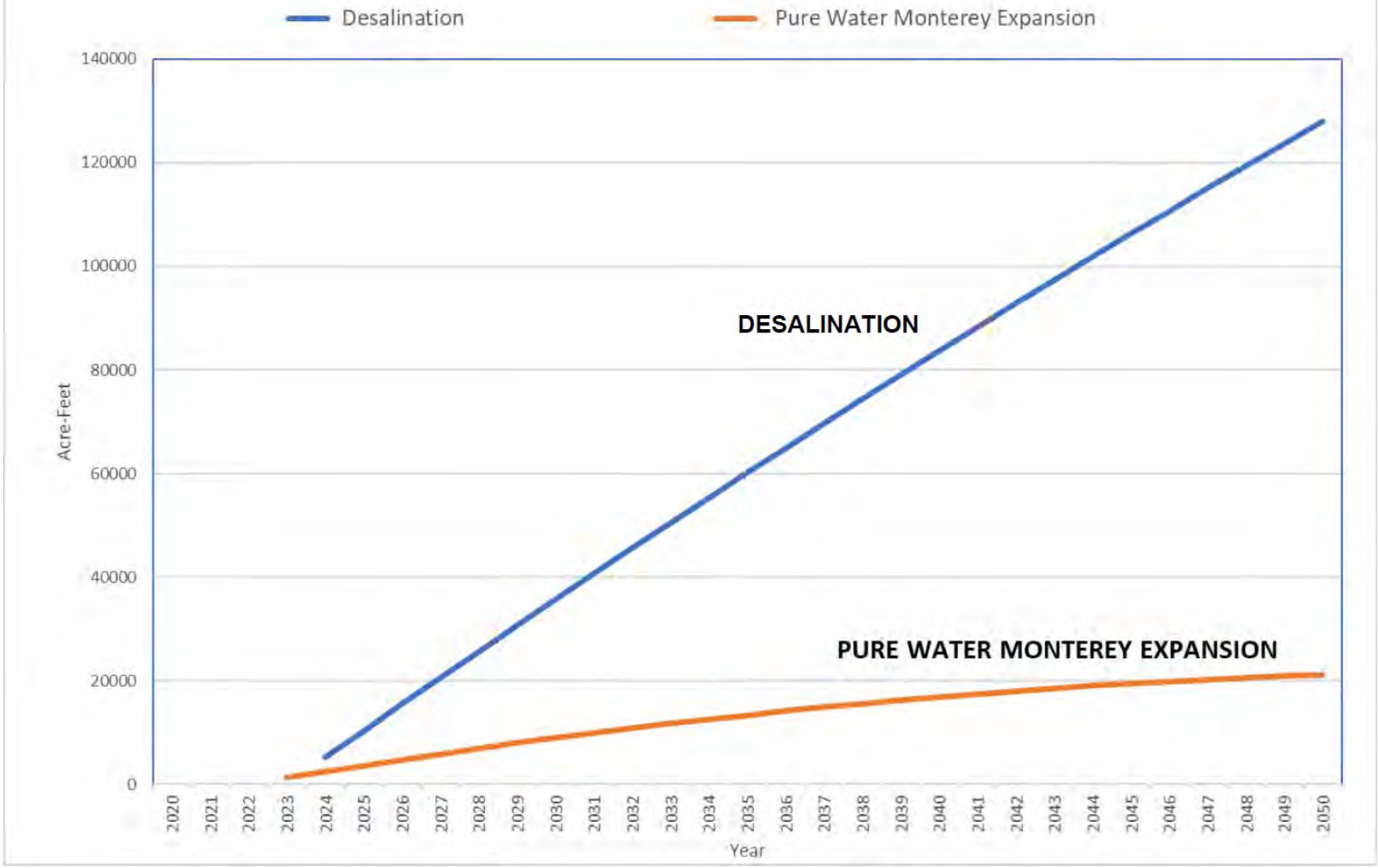
Two Gantt Charts were prepared, Gant Chart 1 showing activities to carry out the SIRP itself, and Gant Chart 2 showing the supplemental supply projects and their use in replenishing the Basin.

Preparing these charts required making a number of assumptions, as follows:

1. Since it is not currently known when or if the Cal Am Desalination Plant or the Pure Water Monterey Expansion Project will be constructed, the Gantt Chart 2 shows both of these projects. Construction of the Desalination Plant was assumed to start on October 1, 2021, following an assumed Coastal Commission permit approval sometime in the summer of 2021, and to have a 27-month construction period. Construction of the Pure Water Monterey Expansion Project was assumed to start on January 1, 2022, following an assumed approval of the Supplemental EIR in the summer of 2021 and completion of design and permitting by the end of 2021, and to have an 18-month construction period.

2. Although the SIRP calls for the Watermaster to initiate all of the activities under Action 4 – Pumping Redistribution Plan within 90 days after the Declaration of Seawater Intrusion, I assumed that the Board would want to start those activities as soon as practically possible, rather than waiting 90 days.
3. The durations of many of the activities are very preliminary and are based on past experience in carrying out similar types of activities. They will likely to need to be revised based on input from the consultants and contractors that will be performing certain of the activities, the amount of TAC and Board deliberation on certain of the activities, and other factors.
4. Construction of new monitoring well(s) under Task 12 in Gantt Chart 1 will be dependent on how long it takes to obtain permits and right-of-way for them, and the availability of the well drilling contractor to perform the work.
5. The 8-month duration of Task 20-Determine Sustainable Yield in Gantt Chart 1 is based on the proposal received from Montgomery & Associates dated February 1, 2019
6. The duration of Task 21-Modify Pumping will be dependent on the ability of producers (mainly Cal Am and the City of Seaside) to relocate their pumping to other wells, or to install replacement wells for the ones that are At Risk.

Figure 1. Comparison of Cumulative Excess Capacity Available with Pure Water Monterey Expansion and Desalination Under the Average of All 5 Growth Rate Scenarios



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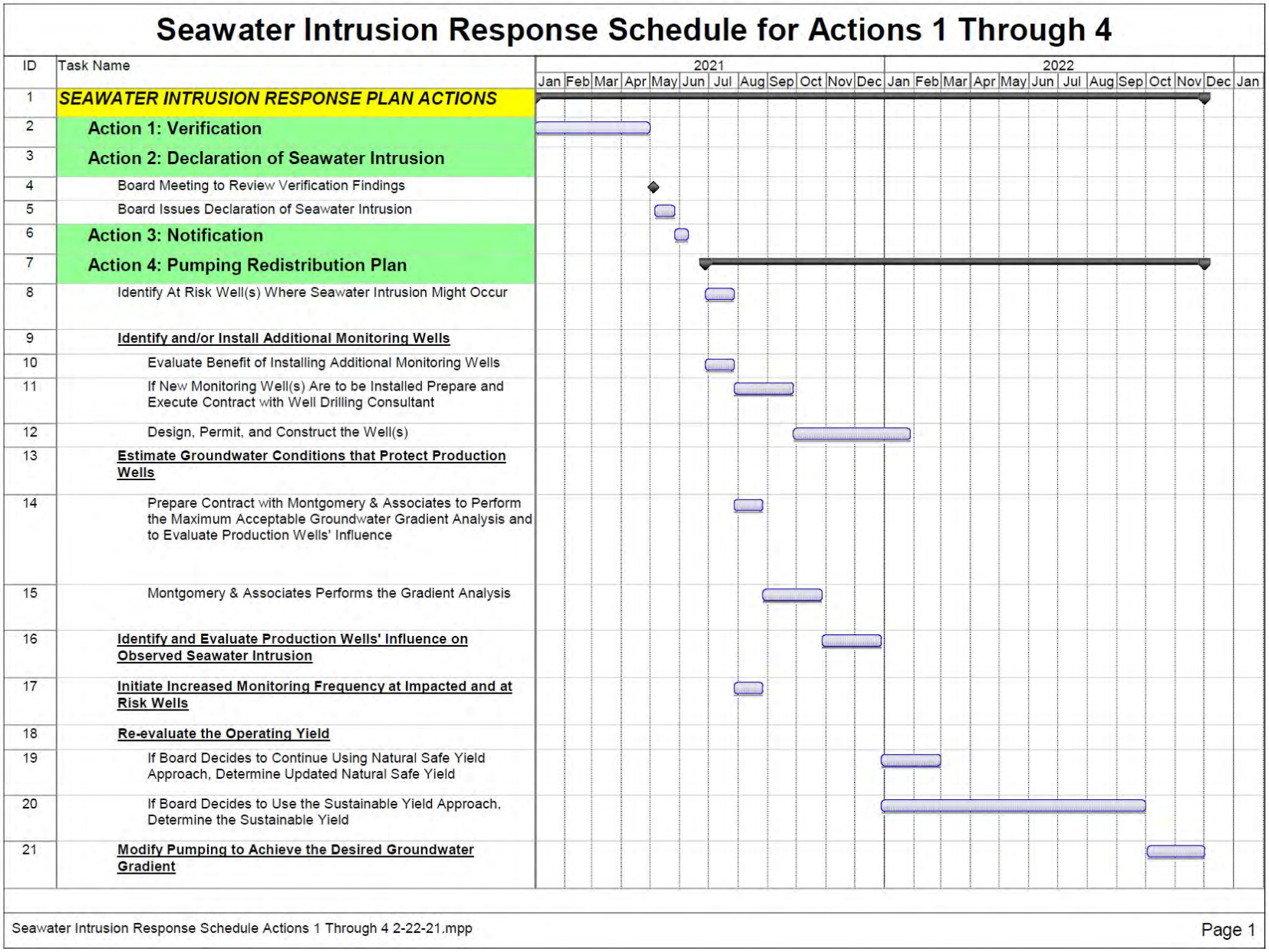
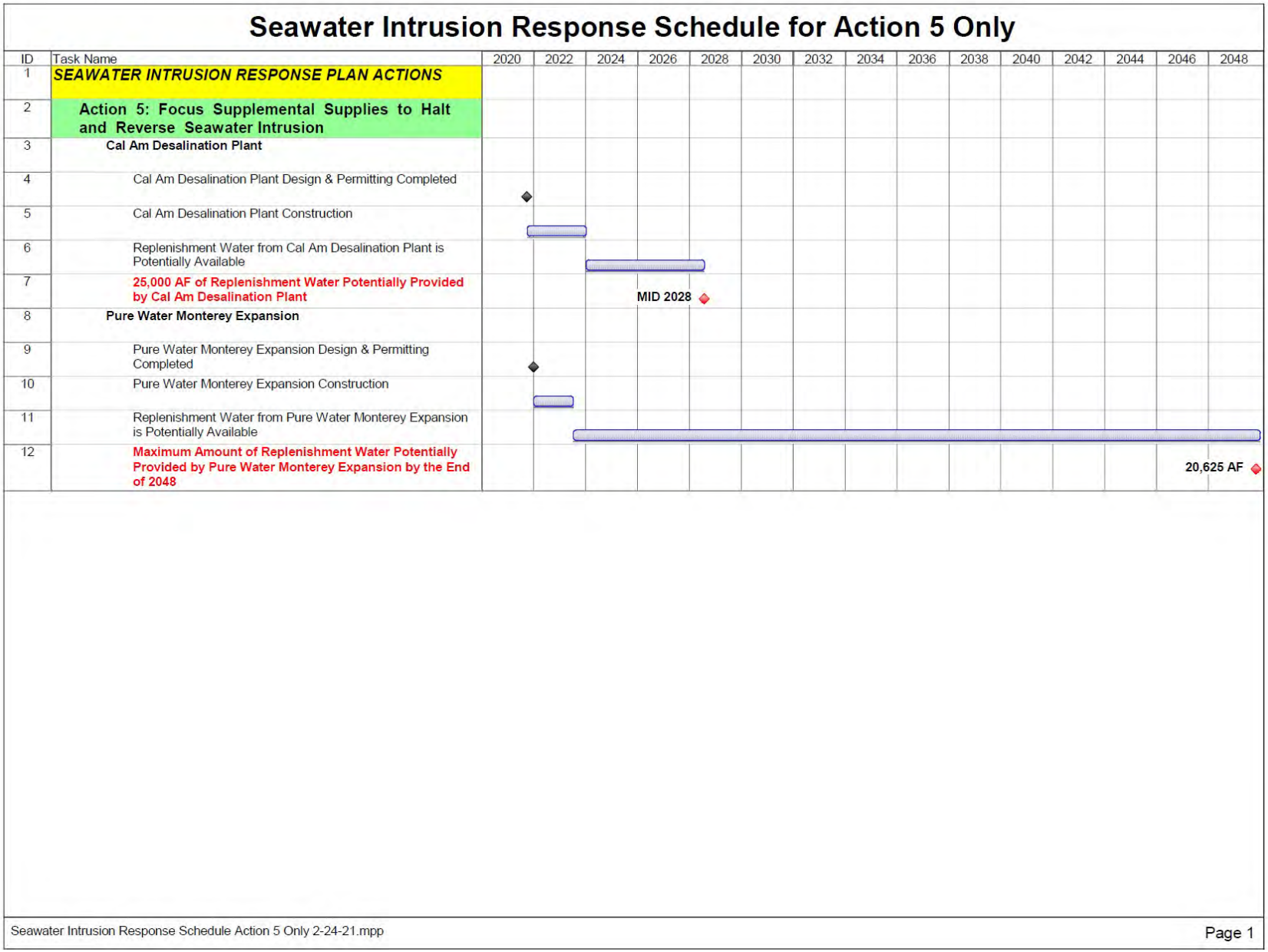
GANTT CHART 1

Seawater Intrusion Response Schedule for Actions 1 Through 4



GANTT CHART 2



HydroMetrics WRI

1814 Franklin St., Suite 501
Oakland, CA 94612

Mr. Robert S. Jaques
Seaside Groundwater Basin Watermaster
83 Via Encanto
Monterey, CA 93940

February 2, 2017

Subject: Proposed Work Plan to Investigate Sources of Fluctuating Chlorides in the Sentinel Wells

Mr. Jaques:

This letter outlines a proposed Work Plan to investigate sources of fluctuating chloride in some of the Seaside Basin's coastal sentinel wells. Preparation of the Work Plan was approved at the Technical Advisory Committee's January 11, 2017 meeting.

The Work Plan objectives are:

1. Investigate the source(s) of elevated chlorides.
2. Determine the mechanism causing the chloride fluctuations observed in recent groundwater samples.

Objective 1 – Investigate the Source of Elevated Chlorides

No single water quality analysis, or ratio between water quality constituents, can definitively differentiate between potential sources of chloride. This is partially because the source of the elevated chlorides may be from similar sources, e.g. ocean water. Figure 1 shows a number of potential salinization mechanisms, with three mechanisms highlighted are potential mechanisms introducing higher chloride water to the groundwater basin. Upwelling is not shown on Figure 1. The source of any potential upwelling water is the underlying Monterey Shale, which is a marine sediment containing connate water (seawater trapped at the time of sedimentation) that reflects its marine origin. The differences in the water chemistry of the various sources reflect the

amount of time the saline water has been separated from the ocean, and the amount of time the saline water has interacted with sediments. The proposed analyses can assess whether the chlorides are from recent seawater, or seawater that has been in contact with sediments for an extended period of time. Seawater intrusion, however, could occur through sediments that have had seawater in them for an extended period of time (bottom arrow on Figure 1), and that are geochemically similar to connate water. For this reason, the analyses may not definitively identify the source of the chlorides.

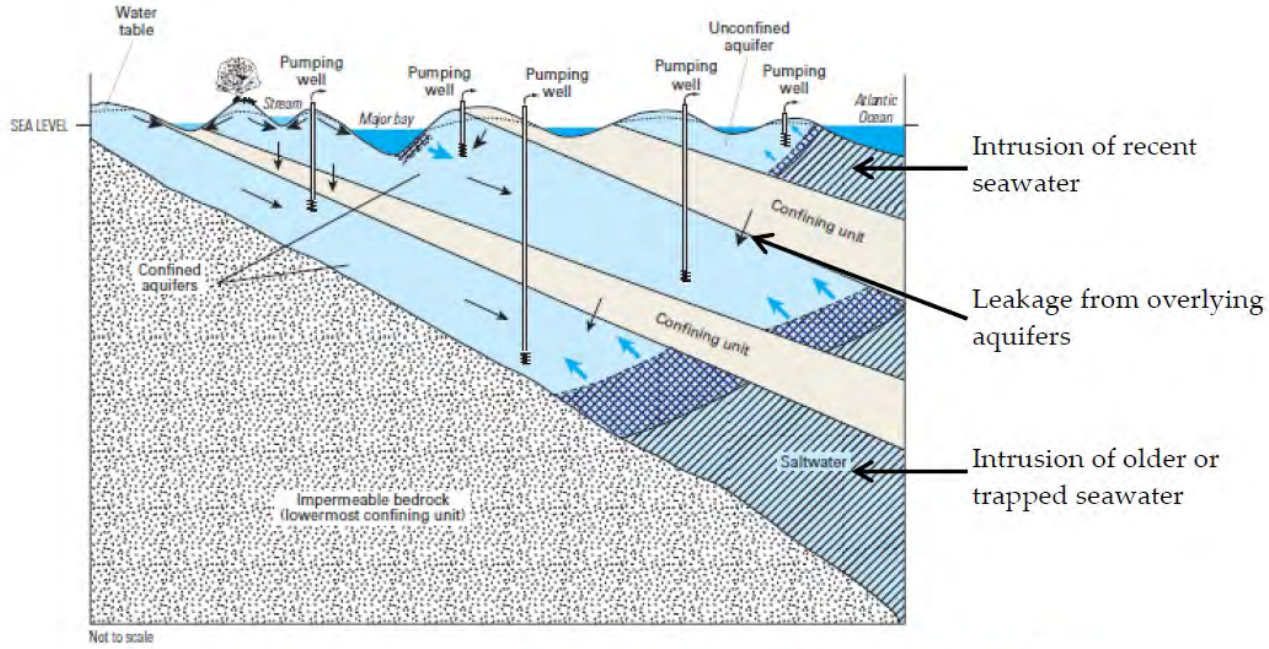


Figure 1: Potential Salinization Mechanisms (from Barlow, 2003)

As described above, comparing results from a number of analyses can suggest the source of elevated chlorides, although not always definitively. Typically, all or a combination of the following analyses are undertaken to investigate chloride sources (Izbicki et al., 2005; Martin, 1984; Klassen et al., 2014):

- Physical properties (temperature, pH, specific conductivity);
- Major-ion composition (piper and stiff diagrams; Na/Cl, Ca/Mg, Ca/(HCO_3 and SO_4), and Cl/EC plots);
- Selected minor ion and trace-element concentrations: boron, iodide, bromide, and barium;
- Minor ion ratio vs. chloride plots, e.g., Cl/Br vs. Cl, Cl/I vs. Cl, Cl/Ba vs. Cl, Cl/B vs. Cl); and
- Isotopic composition of groundwater using the stable isotopes of deuterium in hydrogen, oxygen-18 in oxygen, sulfur-34 in sulfur, and carbon-13 in inorganic carbon.

To control the costs of differentiating between differing chloride sources, we have divided the chloride source assessment into two phases.

Phase I

Phase I will compare the groundwater quality from the Northern Coastal Subarea with (1) seawater and (2) the groundwater quality in selected Laguna Seca wells or other nearby wells that are influenced by connate water in the underlying Monterey Shale. Most of the analyses on major ions are already included in the annual SIARs, but they do not provide an indication of the source(s) of the elevated chloride levels in the Sentinel Wells.

For Phase I, we recommend focusing analyses on the minor ions of boron, iodide, bromide, and barium, and including some additional major ion analyses as listed in the bullets below. The minor ion analyses were also recommended in the 2016 SIAR and have been used together with other indicators in similar studies to determine chloride sources in Santa Barbara and Oxnard (Martin, 1984 and Izbicki et al., 2005, respectively). The Watermaster has been analyzing samples from selected coastal monitoring and production wells for iodide, bromide, boron, and barium since 2012. Figure 2 shows the location of wells with minor ion data.

The Phase I work will consist of:

- Compare chloride to iodide ratios. Iodide is strongly depleted in seawater as a result of biological sequestration by marine organisms, such as kelp. Enriched iodide in groundwater indicates long residence time where iodide has had the opportunity to leach out of the sediments and may build up in groundwater (Kim et al., 2002). Changes in the chloride to iodide ratio in high-chloride water are often diagnostic of the source of high-chloride water in coastal aquifers (Kim et al., 2002).
- Compare barium concentrations. High barium concentrations are presumptive (but not conclusive) evidence that the source of high chloride in groundwater might be from the underlying Monterey Shale and not seawater. Barium is a reactive chemical constituent. Its concentrations may provide a means of determining whether ocean water or water from the Monterey Shale is the source of increasing chloride levels in the groundwater. The concentration of barium in seawater is typically less than 100 µg/L, whereas its concentration in groundwater from connate water sources is generally greater.

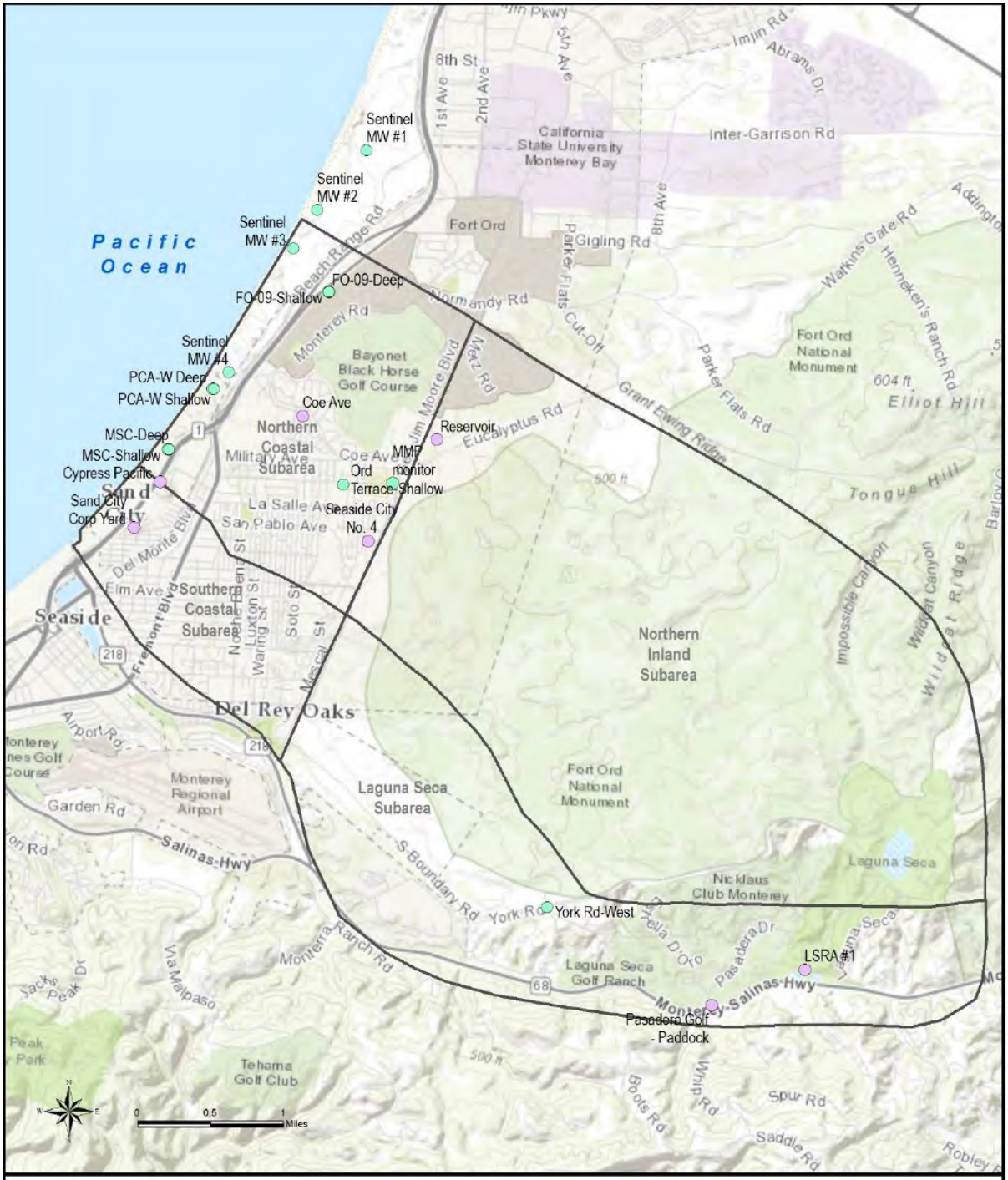


Figure 2: Location of Wells with Minor Ion Data

- Compare chloride to boron ratios. Chloride-to-boron ratios in the higher-chloride groundwater samples in the Sentinel Wells that are substantially less than the ratio for seawater is presumptive evidence that the source of the increased chloride levels is groundwater from the underlying Monterey Shale.
- Compare chloride to bromide ratios. Bromide is a generally nonreactive dissolved species, and like chloride, it behaves conservatively in groundwater environments (i.e., it does not take part in significant ion exchange reactions, nor are adsorbed onto mineral surfaces). Seawater typically has a bromide concentration of about 67 mg/L. Chloride-to-bromide ratios plotting along the native freshwater/seawater mixing line (blue line on Figure 3) may indicate evidence of groundwater mixing with seawater.

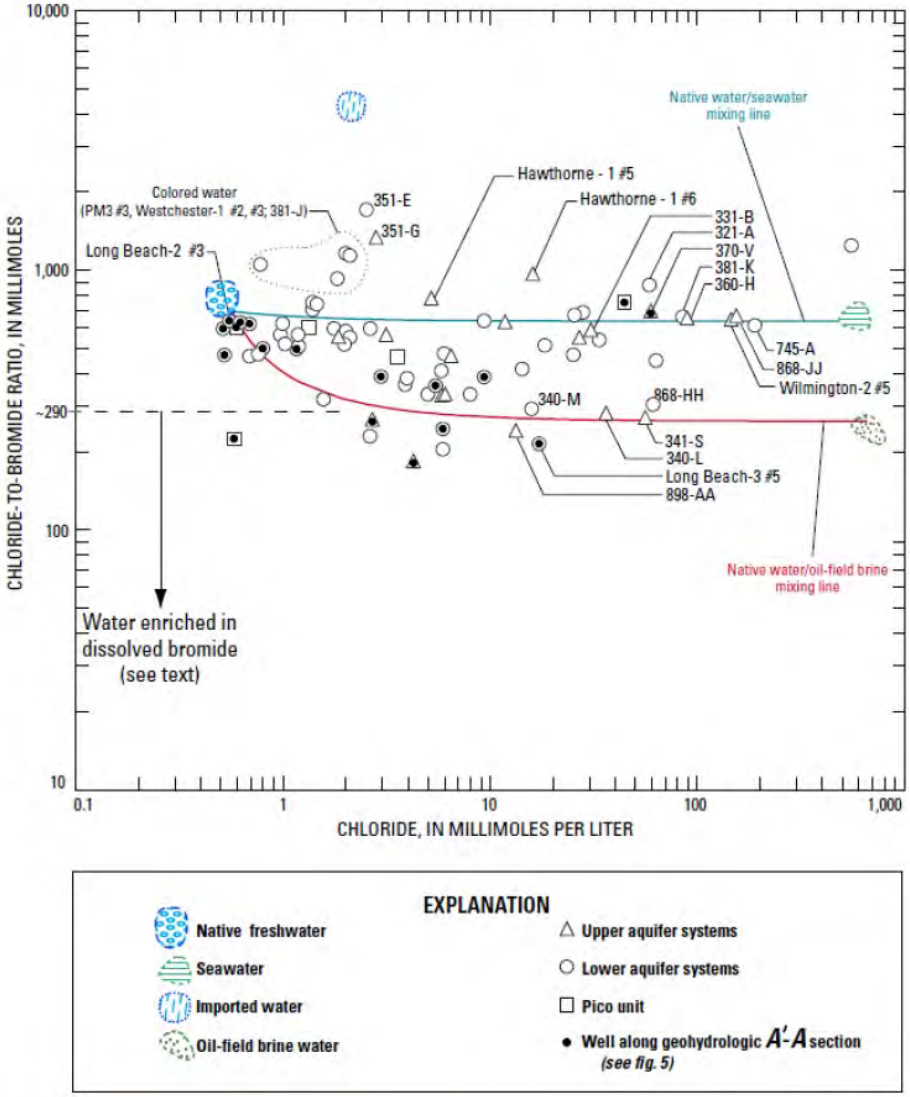


Figure 3: Example Chloride-to-Bromide Ratio of a Function of Chloride (from Land et al., 2004)

- Investigate whether calcium enrichment has occurred in any coastal monitoring wells. Evaluate whether calcium enrichment is taking place by plotting ratios of Ca/Mg and Ca/(HCO_3 and SO_4). Calcium enrichment may be occurring if Ca/Mg > 1 and Ca/(HCO_3 and SO_4) > 1. If it calcium enrichment is taking place, it may indicate incipient seawater intrusion.
- Profiling conductivity and temperature within each of the Sentinel Wells when they are next sampled in September/October 2017 may indicate whether upwelling is occurring within the wells.

Phase II

If determination of the source of elevated chloride levels in the Sentinel Wells from Phase I is inconclusive, it may be necessary to evaluate the isotopic composition of the coastal groundwater as a second phase of study. Isotopic analysis may be used to distinguish between waters of similar chemical character and to understand the source and movement of groundwater near the coast. Typically, the stable isotopes of deuterium in hydrogen and oxygen-18 in oxygen are the only isotopes analyzed. However, in Oxnard, Izbicki et al. (2005) included analysis of the stable isotopic composition in sulfur and inorganic carbon to evaluate the source of these dissolved constituents and to evaluate geochemical processes that may have altered their concentration and isotopic composition over time. If this phase is necessary, laboratory analyses will be needed from either Lawrence Livermore Laboratory, U.C Santa Cruz, University of Arizona or the USGS. If Phase II is required, a detailed work plan will be developed for TAC and Board approval.

Objective 2 – Mechanism for Fluctuating Chloride Concentrations

To determine a mechanism for the fluctuations in chloride concentrations in the Sentinel Wells, we will first need to identify the likely source of chloride (Objective 1) and also examine groundwater quality results from the October 2017 sampling event. These data are key to establishing a relationship between groundwater levels and chloride fluctuations.

As part of the analysis of fluctuating chloride concentrations, we propose to use a specialized diagram that can be used to categorize the hydrochemical environment of water types, also known as a hydrochemical facies evolution diagram (Figure 4) that has been used to track the onshore (intrusion) and offshore (freshening) movement of seawater in aquifers (Giménez-Forcada, 2010). Using the percentage content of principal major ions, the multi-rectangular diagram classifies groundwater by hydrochemical environment.

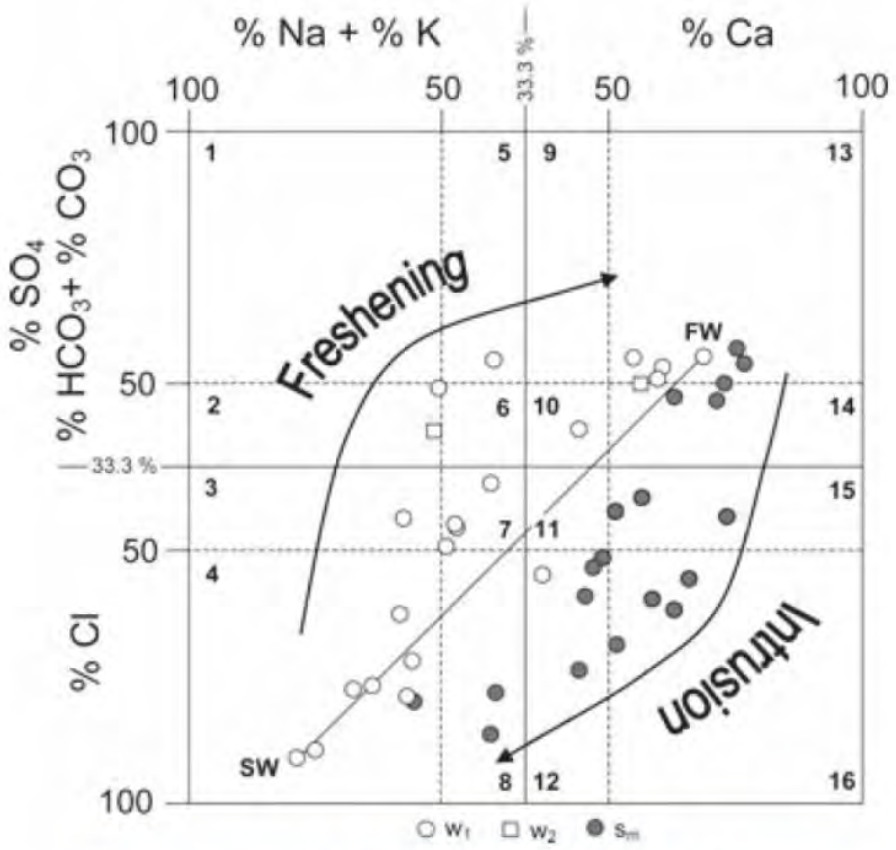


Figure 4: Example Hydrochemical Facies Diagram

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Estimated cost for Phase I

The estimated cost for Phase I (Objectives 1 and 2) are included in Table 1 at the end of this Work Plan. Work to investigate the source of elevated chlorides can be completed within six weeks from receiving a notice to proceed. However, work on determining the mechanism causing the chloride fluctuations can only be completed in November 2017 once the 4th quarter samples have been analyzed and conductivity and temperature profiling has been completed.

It is assumed that HydroMetrics WRI will prepare for and attend two TAC meetings by phone to present the results. The cost estimate includes time for Derrik Williams to present study results in-person at up to two Board meetings, if needed.

Please call if you have any questions.

Sincerely,

Georgina King, Principal Hydrogeologist
HydroMetrics Water Resources Inc.

Table 1: Cost Estimate for Phase I

Phase I Tasks	HydroMetrics WRI Labor				Other Direct Costs	TOTALS
	Derrik Williams	Georgina King	Labor Total			
	President	Principal Hydrogeologist				
Rates	$220	$195	Hours	($)	($)	($)
Task 1. Characterize Monterey Shale Groundwater Chemistry	2	12	14	$ 2,780	$ -	$ 2,780
Task 2. Analyze Major Ions	1	8	9	$ 1,780	$ -	$ 1,780
Task 3. Analyze Minor Ions	2	16	18	$ 3,560	$ -	$ 3,560
Task 4: Analyze Conductivity and Temperature Profiling Data	2	8	10	$ 2,000	$ -	$ 2,000
Task 5: Prepare Technical Memorandum with Charts and Maps	6	32	38	$ 7,560	$ -	$ 7,560
Task 6: Prepare for and Present Results by Phone to TAC (assume 2 meetings)	4	8	12	$ 2,440	$ -	$ 2,440
Task 7: Prepare for and Present Results in Person to Board (assume 2 meetings)	16	8	24	$ 5,080	$ 400	$ 5,480
TOTAL			***125***	***$ 25,200***	***$ 400***	***$ 25,600***

Notes

Cost estimate does not include field work related to conductivity and temperature profiling in Sentinel Wells

Other direct costs include per diem, transportation, office supplies, photocopies, postage, and equipment rental

Per diem rate is $150 per day, mileage is at current IRS rate

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 10, 2021
AGENDA ITEM:	6
AGENDA TITLE:	Opinions of Consultants and TAC Members Regarding Implementation of the Seawater Intrusion Response Plan and Ionic Analysis
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

I asked each of the participants in the Zoom meeting I had in early February to discuss the increasing chloride levels at Monitoring Well FO-9 Shallow for their opinion as to whether they believed seawater intrusion (SWI) has been detected, and whether the Seawater Intrusion Response Plan should be implemented at this time.
Their responses are attached.

Their consensus is that it would be best to perform the induction logging of this well, and to obtain further water quality data from it, before making a determination as to whether or not seawater intrusion is occurring.

If the TAC concurs, I will provide that information to the Board.

Also, I performed the ionic analyses suggested by Mr. Feeney, all of which are potential indicators of SWI. The analysis is attached. The only one that seems to indicate possible SWI is the molar ratio of Sodium to Chloride. This has already been pointed out in the 2020 Seawater Intrusion Analysis Report. The other analyses do not appear to clearly indicate SWI. Of course in the early stages of SWI the samples would be largely fresh water with only some seawater, and thus would not have all of the properties of just seawater alone.

ATTACHMENTS:	1. Opinions from consultants and TAC members 2. Ion analyses of recent samples from FO-9 Shallow for possible indication of SWI
RECOMMENDED ACTION:	Provide direction to the Technical Program Manager on whether to recommend to the Board to delay making a determination about whether SWI is occurring until more data has been collected and the induction logging of FO-9 has been completed and evaluated

Opinions From Consultants and TAC Members Regarding the Increasing Chloride Levels at Monitoring Well FO-9 Shallow

Derrik Williams: My opinion is that seawater intrusion has been indicated, but the indications still contain too much uncertainty to state that seawater intrusion has been definitively observed.

I think the Watermaster has correctly opted to sample well FS-09 more frequently. The more frequent sampling will allow the Watermaster to assess any trends towards definitive seawater intrusion in a timely manner. And the Watermaster must be prepared to act swiftly if the current trends continue. However, with a chloride concentration of 90 mg/L, I believe we have the luxury of obtaining a couple more quarterly samples before initiating the Seawater Intrusion Mitigation Plan. However, should chloride levels rise more quickly during the next couple sampling events, and should the Na/Cl ratios change significantly, the Watermaster should not hesitated in implementing the Seawater Intrusion Response Plan.

I suggest we revisit this analysis after every quarterly sampling event.

Jon Lear: The District would like to see the results of Martin's work prior to supporting declaration of Seawater Intrusion.

Gus Yates: I concur with Derrik's description of the status and degree of urgency with respect to seawater intrusion. I think the data are indicating likely intrusion, but we might not be able to rule out influence from some local body of groundwater with elevated salinity. I think we can afford to spend a few months completing Martin's logging work and tracking the continued trends in FO-9 and FO-10 before concluding that intrusion response actions need to be implemented.

Martin Feeney: I agree with Derrik and Gus that more data are required before declaring SWI. I will be submitting a proposal to Bob this afternoon for the borehole geophysics so we can get some confirmation or not.

Tamara Voss: I would also agree with the general consensus that the group seems to be developing. If this is seawater intrusion, and I also think that this is likely the case, then it is at a very early stage and we can take the time to look at the induction logging and WQ sampling results before triggering the SIRP.

Georgina King: My thoughts on activating the SIRP are that we need hold off until we can be more sure that the source of chloride in FO-9 shallow is seawater. The Na/Cl molar ratio in that well is not declining as much I would expect compared to the increased chloride and so I think we need stronger confirmation on chloride source. Carrying out those items outlined in the attached work plan we put together in 2017 to investigate sources of chloride in the Sentinel wells would give us more certainty. Water quality results over the next few quarters are crucial for providing us even more definitive trends.

As Gus pointed out, Martin's work on logging the well is also a key part to the picture that we need to understand.

IONIC ANALYSIS OF RECENT SAMPLES FROM MONITORING WELL FO-9 SHALLOW						
DATA						
Sampling Date	5/13/2020	8/4/2020	9/28/2020			
Ion						
Ca	37	37	36			
Na	48	49	48			
Mg	9.6	9.6	9.7			
K	4.3	4.5	4.3			
HCO_3	113	107	116			
SO_4	20	34	31			
F	0.1	<0.1	0.1			
Cl	84.3	86.9	90.4			
N	0.2	0.2	<0.1			
Fe	0.07	0.054	0.054			
Mn	0.004	0.005	0.007			
HPO_4						
B	0.05	<0.05	<0.05			
Br	0.2	0.2	0.3			
ANALYSIS						
Ratios of Ca to HCO3+SO4 and Ratios of Ca to Mg (mg/l) greater than 1 can be indicative of SWICalcium enrichment						
Ratio of Ca to Mg mg/L	3.85	3.85	3.71			
Ca to HCO3+SO4 (mg/l)	0.2781955	0.2624113	0.244898			
Percentage of SO4 to all ions – 8% in seawater, greater in fresher waters						
Percentage of SO4 to all ions	6.3126531	10.351368	9.2300088			
Ratio of Chloride to Bromide (mg/l) – Seawater~297 in Pajaro Groundwater						
Ratio of Chloride to Bromide (mg/l)	421.5	434.5	301.3			
Jones Ratio - Ratios of Sodium to Chloride – molar ratios less than 0.86 possible SWI						
Molar ratio of Na to Cl	0.8779928	0.8694679	0.8187477			

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 10, 2021
AGENDA ITEM:	7
AGENDA TITLE:	Schedule
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

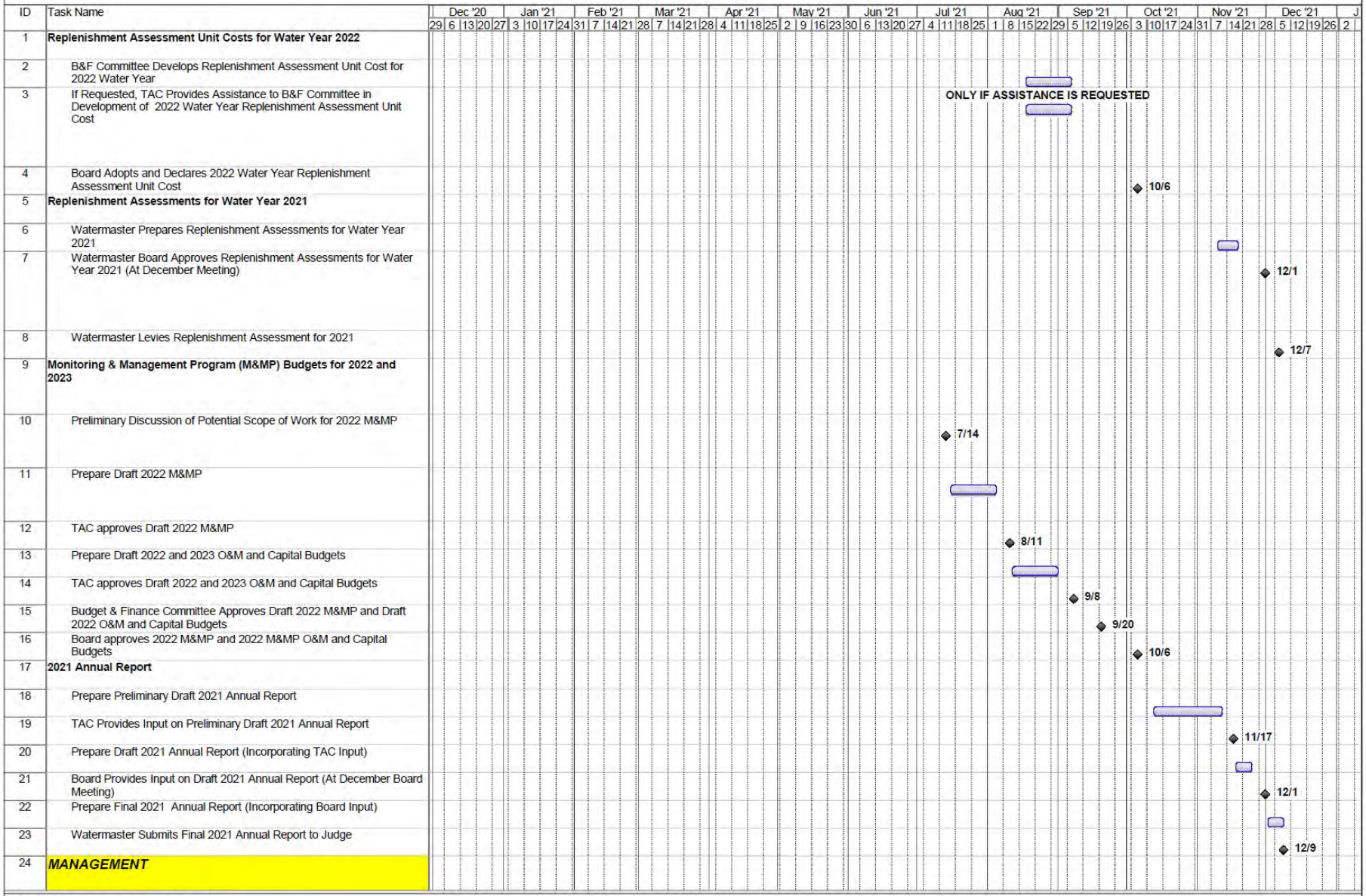
As a regular part of each monthly TAC meeting, I will provide the TAC with an updated Schedule of the activities being performed by the Watermaster, its consultants, and the public entity (MPWMD) which are performing certain portions of the work.

Attached is the updated schedule for 2021 activities. The attached schedule includes a new Task pertaining to implementation of the Seawater Intrusion Response Plan, if it is determined that seawater intrusion is occurring. It will probably be another month or more before that determination can be made.

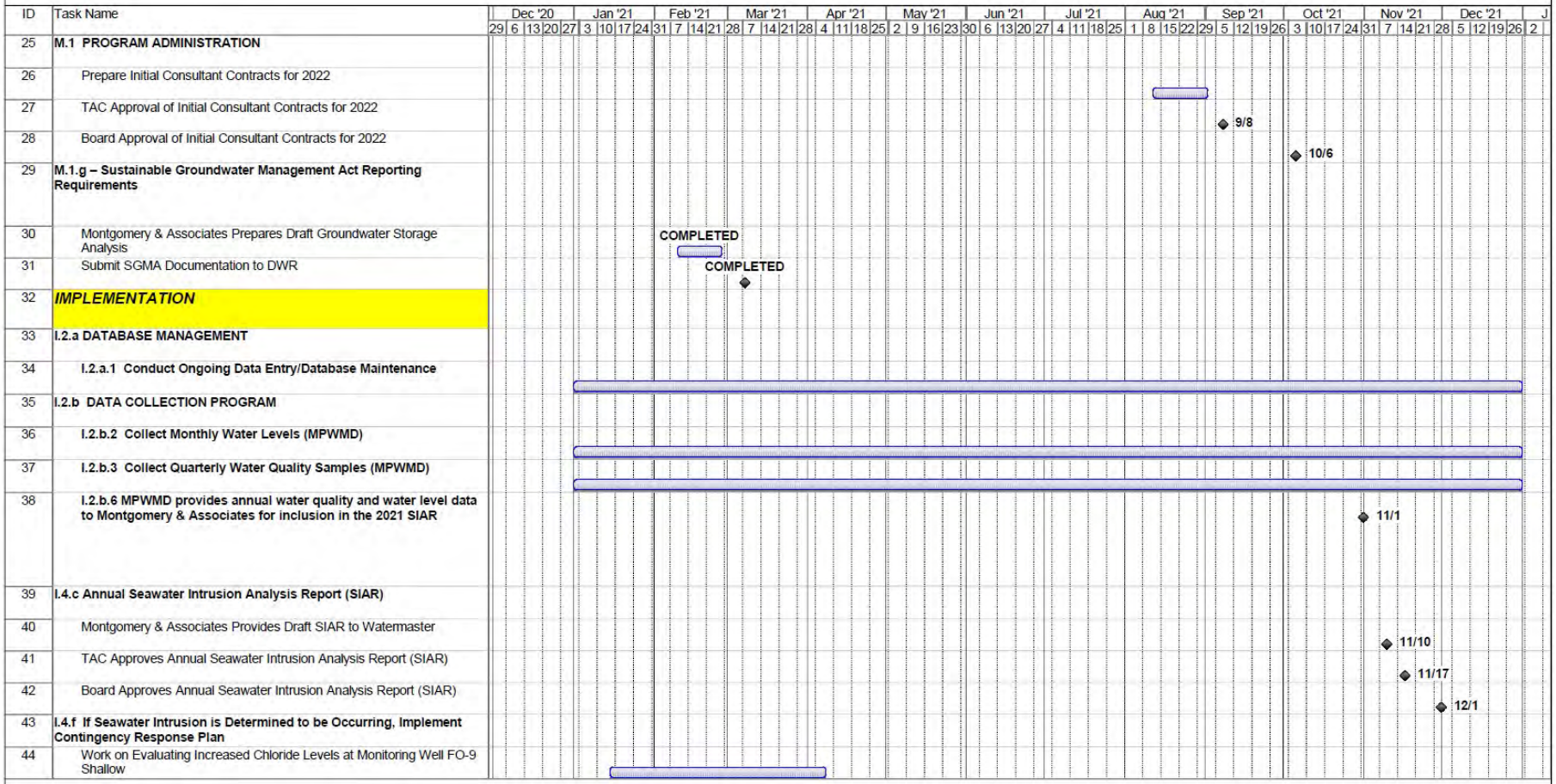
The Board has canceled its normal March meeting in order to allow time for the TAC to take the actions the Board directed at its February 3, 2021 meeting. Because of the Board's high level of concern about the possibility of seawater intrusion being detected in the Basin, I am asking that the TAC's next meeting be moved up two weeks from its normal second Wednesday of the month. This will enable the TAC to have an additional meeting before the Board's meeting, in order to be able to provide more complete responses and recommendations to the Board at its April 7th meeting. This would make the next TAC meeting date March 31st, rather than April 14th.

ATTACHMENTS:	Schedule of Work Activities for FY 2021
RECOMMENDED ACTION:	Provide Input to Technical Program Manager Regarding Any Corrections or Additions to the Schedules

Seaside Basin Watermaster
2021 Monitoring and Management Program
Work Schedule



Seaside Basin Watermaster
2021 Monitoring and Management Program
Work Schedule



SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 10, 2021
AGENDA ITEM:	8
AGENDA TITLE:	Other Business
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:
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.

ATTACHMENTS:	None
RECOMMENDED ACTION:	None required – information only