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John Forsythe
Senior Environmental Planner; CEQA Lead
California Public Utilities Commission
550 Kearny Street, Suite 800
San Francisco, CA 94108
MPWSP-EIR@esassoc.com

Paul E. Michel
Superintendent; NEPA Lead
Monterey Bay National Marine Sanctuary
99 Pacific Street, Bldg 455A
Monterey, CA 93940
montereybay@noaa.com

SUBJECT: HWG COMMENTS ON TECHNICAL APPENDICES/ATTACHMENTS TO LETTERS SUBMITTED BY MCWD AND CITY OF MARINA TO THE CPUC AND MBNMS ON APRIL 19, 20018

Dear Mr. Forsythe and Mr. Michel,

This letter has been prepared by the Hydrogeologic Working Group (HWG) to provide comments on various technical appendices/attachments referenced by Marina Coast Water District (MCWD) and the City of Marina (Marina) in April 2018 comment letters submitted on the Final Environmental Impact Report and Final Environmental Impact Statement (FEIR/EIS) in Application No. 12-04-019 (Application of California-American Water Company (U210W) for Approval of the Monterey Peninsula Water Supply Project and Authorization to Recover All Present and Future Costs in Rates).

The HWG has reviewed the Final Airborne Electromagnetics (AEM) Report (Final AEM Report) dated March 15, 2018 (but not made available to us until late April 2018) and several Technical Memos (TM) and letters dated April 2018 (by Hopkins Groundwater Consultants (HGC), Aqua Geo Frameworks (AGF), EKI, GeoHydros, and Jacobson James) providing additional comments on the FEIR/EIS and, to some extent, on the HWG Final Technical Report (2017). The vast majority of these recent comments provided by MCWD and Marina groundwater consultants repeat previous comments on the Draft EIR/EIS (DEIR/EIS) and HWG Final Technical Report. The HWG previously responded to comments on the HWG Final Technical Report in January 2018, and we refer the reader to that document (HWG, 2018). The California Public Utilities Commission's environmental consultant, ESA, also responded to comments on the DEIR/EIS in great detail in the March 2018 FEIR/EIS (ESA, 2018). The fact that MCWD/Marina groundwater consultants do not agree with the FEIR/EIS responses to their DEIR/EIS comments does not make the FEIR/EIS responses wrong and does not make the FEIR/EIS inadequate.

Nonetheless, the HWG has reviewed the relevant technical reports, TMs, and letters referenced above and is providing both an Executive Summary and detailed comments related to our assessment of these documents.

EXECUTIVE SUMMARY

This letter responds to comments raised in the Final AEM Report, and technical comments on the FIER/EIS submitted by MCWD's and Marina's consultants.

As a preface to our comments, the HWG notes that the AEM study overall does not provide significant new and validated technical data or interpretations that require changes to previous HWG interpretations or conclusions. The potential presence of lower salinity water in the inland perched/mounded aquifers or upper portion of a sea water intrusion wedge is not new information and is already considered and accounted for in FEIR/EIS analyses and previous work documented by the HWG. The HWG has previously demonstrated that groundwater in the inland perched/mounded aquifers (most properly referred to as the "A" Aquifer in the Fort Ord area and the 35-Foot Aquifer in the Monterey Peninsula Landfill area, but often incorporated under the term "Dune Sand Aquifer" by others) is hydraulically isolated from aquifers to be screened in the proposed MPWSP wells. Thus, pumping of MPWSP wells will have essentially no impacts on groundwater levels or quality in the perched/mounded aquifer system. MCWD's own consultant, Hopkins Groundwater Consultants, concurs with this opinion in its April 17, 2018 letter to MCWD that states, "…pumping of the proposed MPWSP wells will not impact the water on top of the semi-perching aquitard layer…" (page 22).

Although the HWG has many detailed comments on the Final AEM Report that are provided in the Detailed Comments section of this letter, key comments are summarized below:

- The Final AEM Report represents biased and poor science using data, assumptions, and methodologies that are not documented, lack justification, are poorly calibrated and non-unique, and result in misleading interpretations and conclusions, as documented by HWG in this letter;
- The Final AEM Report does not provide the raw AEM data, details of the inversion process, QA/QC methods and procedures, formulas utilized, or methods/formulas for conversion of AEM data to lithologic/water quality conclusions. Thus, the results, interpretations, and conclusions of the AEM study cannot be validated by others, and does not allow for sufficient peer review. Furthermore, there has been no academic peer review even though the study is being promoted as a Stanford University work product;
- There are many aspects of the Preliminary AEM Study (July 2017) and related public presentation of preliminary AEM results (August 2017) that were misleading to the public and basin stakeholders. Furthermore, the Final AEM Report results and presentation still include misinformation and many of the same undocumented/unsupported (and non-unique)

hydrogeologic and water quality interpretations that continue to mislead the public and basin stakeholders;

- The Final AEM Report (and AGF) claim the use of 318 control points to calibrate the AEM data. In reality, the Final AEM Report uses only 7 control points (from MPWSP monitoring well boreholes) to calibrate AEM data. This fact is readily apparent in the Final AEM Report and was confirmed by Ian Gottschalk during his April 2018 presentation at a MCWD Board Meeting. The result is that the vast majority of the AEM study data and resultant hydrostratigraphic and water quality interpretations are not calibrated or "ground-truthed"; hence, there are several different interpretations of this AEM data that can be considered equally valid (i.e., non-unique);
- A majority of the comments provided by other MCWD/Marina groundwater consultants rely heavily on the flawed and misleading Final AEM Report to support their own statements and conclusions, which are also addressed by the HWG in this letter.

Many of the comments by MCWD/Marina groundwater consultants (HGC, AGF, EKI, GeoHydros, Jacobson James) are either unsupported statements/claims and/or are comprised of inaccurate/misleading statements. We highlight a few of the more important issues in this Executive Summary in the bullets below and provide our detailed comments in the sections following the Executive Summary.

- It is important to note that the Preliminary and Final AEM Report interpretations and conclusions are based on significant input by AGF and HGC. The involvement of these consultants is apparent from the list of authors on the document (includes AGF staff) and the public presentation (MCWD Board Meeting, April 2018), where Ian Gottschalk acknowledges the important contributions from Curtis Hopkins and the fact that Mr. Hopkins was "only a phone call away" for any hydrogeologic input needed;
- The Final AEM Report (and MCWD/Marina consultant TMs/Letters) utilizes an improper standard of 3,000 mg/L total dissolved solids (TDS) to define fresh water, whereas the standard definition of fresh water is less than 1,000 mg/L TDS (Todd, 1980; Marella/USGS, 1993). A large proportion of groundwater inland of the proposed MPWSP site with TDS between 1,000 and 3,000 mg/L has chloride exceeding MCLs (and the 500 mg/L standard to define seawater intrusion) and/or has nitrate exceeding the MCL;
- The Final AEM Report (and MCWD/Marina Consultant TMs/Letters) does not attempt to delineate areas of fresh water. Instead, they attempt to delineate areas of brackish water with TDS up to 3,000 mg/L that include chloride exceeding 500 mg/L;
- The Final AEM Report (and MCWD/Marina groundwater consultant TMs/Letters) makes many unsupported and undocumented claims/conclusions and/or make interpretations/conclusions that are in conflict with MPWSP borehole data that has been verified by other MPWSP data (e.g., groundwater levels, pumping tests, water quality). One example is the claim that gaps

exist in the 180/400-Foot Aquitard in the MPWSP vicinity. This claim is based on previous studies that don't incorporate the latest MPWSP borehole/well data, and uncalibrated/flawed AEM data. In reality, an abundance of data collected since 2015 demonstrate that gaps in the 180/400-Foot Aquitard are not present in the MPWSP area;

- The analysis of capture zones provided by various MCWD/Marina groundwater consultants do not account for the ocean as a recharge boundary, which invalidates the entirety of their capture zone comments;
- While the capture zone created by the MPWSP would not capture all seawater currently entering the basin due to the inland gradient, it does significantly decrease the amount of seawater that would be entering the basin without the project. In short, the MPWSP would have a beneficial impact on seawater intrusion that would not be realized under the "no project" alternative, as documented in the FEIR/EIS.
- Many MCWD/Marina consultant comments are made on the FEIR groundwater model's representation of the perched/mounded aquifer portion of the Dune Sand Aquifer, but it is important to understand that any FEIR/EIS model-based prediction of MPWSP impacts to the perched/mounded aquifers are overestimated because pumping from proposed MPWSP wells will not impact the inland perched/mounded aquifers, as acknowledged by HGC at the top of page 22 of HGC's April 17, 2018 letter to MCWD.

These Executive Summary comments are intended just to highlight some of the major points in our Detailed Comments section below. The detailed comments provide further support for the key comments listed above. In addition, the Detailed Comments section provides many additional review comments on the Final AEM Report along with responses to many other MCWD/Marina Consultant comments on the FEIR/EIS (and the HWG Final Report).

Comments on Final AEM Report dated March 15, 2018 (and made publicly available on April 23, 2018)

As a preface to the initial comments provided below, the HWG would note that the importance of the AEM study to actual EIR/EIS issues that need to be addressed has been grossly over exaggerated in the public forum. Whether or not isolated pockets of less saline water exist within the zone of sea water intrusion defined by Monterey County Water Resources Agency, it has little relevance or importance to the MPWSP's environmental analysis.

First, it is important to note the vast majority of the purported "fresh water" pockets (inappropriately defined as water with TDS up to 3,000 mg/L that is well beyond potable limits), occur in the perched/mounded water portion of the shallow aquifer or in the upper portion of the sea water wedge within the 180-FTE Aquifer. Perched water will clearly not be impacted by the project because it is hydraulically disconnected from the aquifers that will be pumped by MPWSP wells. A sea water wedge naturally contains less saline water in the upper portion of the aquifer, and any attempt to pump from the upper less saline portion of the sea water wedge will quickly result in a salted in and unusable production well.

Second, to the extent any actual "fresh water" pockets do exist at some inland locations as suggested in portions of the Final AEM Report, those pockets resulted from aquifer heterogeneities (and not some purported conservation/reclamation effort) and any attempt to develop a water supply from such "fresh water" pockets will quickly result in salted in wells from the surrounding saline water.

Third, as demonstrated in previous HWG work products, to the extent one was to conduct a realistic and unbiased evaluation of the AEM data, it is apparent the AEM data merely supports the existing data and hydrogeologic conceptual model (HCM) already provided by the HWG (2017).

In light of the above overview discussion, the more detailed comments provided below by the HWG should not be interpreted as attaching more importance to the AEM study than is warranted in assessment of the MPWSP's potential environmental impacts. With that being said, there are many technical issues to comment on in the Final AEM Report including, but not limited to, the following:

1. For this AEM study, the artificial signal was shown schematically in the Stanford April 2018 MCWD presentation to be generated by a wire loop suspended from a helicopter, to which a current was applied. The same loop was then used to measure an induced current due to the earth resistivity properties of the subsurface. No further description was provided in the Final AEM Report, so the details and quantification of AEM data collection remain unclear. The actual instrument operator is not named, unless it is SkyTEM, named in Asch (2018) as the type of antenna that was used. Therefore, the documentation of this phase of the study is not adequate to judge its validity.

2. With respect to the measurement of volts (or other measured signal units) and QA/QC of the data collection instrumentation: as described in the Stanford MCWD presentation, there was apparently a measurement of the induced current in the suspended wire loop (perhaps in amperes instead of volts). Although no other details are provided in the Stanford presentation or Final AEM Study, Asch (2018) stated: "AGF (Aqua Geo Frameworks) performed 'in the field' Quality Assurance on the data acquisition vendor", but this process and the QA results, are not documented or explained. Therefore, documentation of this phase of the study is not adequate to judge its validity.
3. With respect to the conversion of volts (or other measured signal units) to some earth material property: Asch (2018) stated: "AGF then processed, edited, and numerically inverted the acquired data." This numerical inversion presumably resulted in the values of ohm-m (resistivity) used in the Final AEM Report, but the process is not further explained. Thus, the documentation of this phase of the study is not adequate to judge its validity.
4. There is a question of validity and uniqueness regarding further interpretation of the earth material property into other earth material properties. The Final AEM Report has discussion of the interpretation of bulk resistivity data in terms of lithologic variation and groundwater chemistry (expressed as total dissolved solids, TDS), for which interpretation utilized downhole data from MPWSP borings and monitoring wells. The Final AEM Report noted "a monotonic relationship does not exist for the relationship between resistivity and lithology in this study area, due to the complicating factor of changing water quality. As a result, the relationship between resistivity and lithology tends to be much more site-specific." This means the distinction between lithologic type and groundwater chemistry is not unique, but subject to interpretation. Previous reports and earlier comments by HWG (2017, January 2018, this letter) and the FEIR/EIS (March 2018) provide further comments on the non-unique aspect of AEM data interpretation in the Stanford/AGF/HGC AEM study.
5. The Final AEM Report uses outdated or incorrect terminology to describe the hydrogeology in the MPWSP vicinity. For example, lack of recognition of the "180-FTE" Aquifer and "FO-SVA" Aquitard demonstrates the Stanford/AGF/HGC AEM study team have not incorporated the most up-to-date hydrogeologic information documented by the HWG (2017). The use of a flawed hydrogeologic conceptual model in the Final AEM Report contributes to a flawed hydrogeologic interpretation of AEM data.
6. The Final AEM Report document made available to the public and HWG members does not include the actual AEM data, the equations and calculations used to convert from raw AEM data to inverted AEM data, a detailed description of how AEM data inversion and interpolation was done, or a description of QA/QC methods and procedures used during field data acquisition and during data interpretation. Therefore, public agencies, HWG members, and other stakeholders are not able to conduct a complete review of the AEM data collection and interpretation or validate conclusions that have been presented in the Final AEM Report. Therefore, the HWG

can only address the Preliminary and Final AEM Reports along with two public presentations of results by Stanford/HGC August 2017 and April 2018 to provide the comments in this letter. The HWG may provide additional comments in the future if the missing data and documentation are made available for review.

7. Based on review of the Final AEM Report, comments provided by other MCWD/Marina hydrogeologists, and public presentations of AEM results, it is clear that much of the work related to collection, processing, analysis, underlying assumptions, and interpretation of AEM data was either done by or directly influenced by AGF and HGC (consultants employed by MCWD, who paid for the AEM study). Thus, the Final AEM Report should not be considered as an independent and unbiased work product developed solely by Stanford University, regardless of whether or not Stanford University staff are listed as the primary authors.

8. To the extent that anyone might consider the Final AEM Report to be a work product of an academic institution (i.e., Stanford University), it is clear the work has not been subject to standard academic peer review.

9. The Final AEM Report description of project vicinity and regional hydrostratigraphy (pages 7-11) and hydrostratigraphic cross-sections (pages 40-55) do not incorporate use of the MPWSP monitoring well borehole lithology/geophysics data or the comprehensive hydrogeologic conceptual model prepared by the HWG using all available data and presented in the Task 2 Report and HWG Final Report (2017). Instead, the authors developed their own hydrogeologic model by using older reports and cherry picking available data to fit their desired interpretation of the AEM data. The only Final AEM Report references to work products resulting from HWG efforts are a 2014 report and one weekly monitoring report out of 148 weekly reports made public. The 2014 report was subsequently updated with the significant data collection efforts that occurred from 2015 to 2017, which included drilling, coring, and geophysical logging of 24 boreholes for construction of 24 monitoring wells, pumping tests using the test slant well and monitoring well network, collection of groundwater level and groundwater quality data for the test slant well and 24 monitoring wells between 2015 and 2017, and analysis/syntheses of all the above data along with available surrounding data (e.g., Monterey Peninsula Landfill, Fort Ord, DWR well logs, previous hydrogeologic studies, etc.) to develop a comprehensive HCM (HWG, 2017).

10. In general, the Final AEM Report relies heavily on old reports (e.g., MCFCWCD, 1960; Kennedy Jenks, 2004) and HGC (2016) to provide the basis for their hydrogeologic understanding of the project area and surrounding vicinity, and does not utilize the most recent and comprehensive synthesis of all available hydrogeologic data prepared by the HWG (2017). Use of the most up-to-date HCM would result in a more accurate and reliable interpretation of AEM data.

11. The Final AEM Study (along with AGF comments) claim the use of data from 318 boreholes in this study, yet only seven of those boreholes were used for AEM data calibration and ground-truthing. A major consequence of insufficient AEM data calibration is non-unique hydrostratigraphic and water quality interpretations.
12. It is important to note that even the limited calibration of AEM data to seven MPWSP borehole geophysical logs has inherent uncertainties for multiple reasons. First, the MPWSP monitoring well borehole geophysics data were collected in 2015 (at the end of a dry period), whereas the AEM data were collected in May 2017 immediately after one of the wettest winter/spring rainfall seasons on record. Therefore, water quality conditions in the vadose zone and shallow aquifers were potentially very different between the borehole geophysics data and AEM data, and adjustments to compensate for this discrepancy creates significant uncertainty at best (this point was acknowledged by Ian Gottschalk in his public presentation to the MCWD Board in April 2018). Second, the Final AEM study completely ignores the borehole geophysical log associated with MW-3, which is provided in the 2014 GEOSCIENCE TM (E-log of CX-B2 in Appendix E) that is referenced in the Final AEM Report. Third, the Final AEM Report acknowledges that AEM data cannot capture the important detail of borehole geophysical logs (e.g., page 18) that show the variability in lithology and water quality with depth; instead the AEM data can only average those properties over large vertical distances (typically 20 to 30 feet). This could easily contribute to misinterpretation of stratigraphy, including not detecting significant clay layers.
13. Given that the AEM data collection effort represents a single snapshot in time (May 2017) with maximum input of fresh water from rainfall percolation to the vadose zone and shallow aquifer after a record wet year, it should be noted that any assessment of purported "fresh water" pockets from this AEM data will be heavily biased towards maximum wet year conditions and not representative of average groundwater quality conditions in these zones during the more common average and dry years.
14. The definitions of water quality based on total dissolved solids (TDS) concentrations on page 6 of the Final AEM Report are very confusing and misleading to the reader. The Final AEM Report defines four water quality groupings, the most important of which have overlap (TDS from 0 to 1,000 mg/L and 0 to 3,000 mg/L). It is clear that the only grouping that potentially consists of potable drinking water (i.e., fresh water) is the 0 to 1,000 mg/L TDS grouping (Marella, 1993; Todd, 1980; California MCL). The Final AEM Report misleads the reader with confusing terms such as "source of drinking water", "water of potential beneficial use", and "water of limited beneficial use", derived in part from an obscure 30-year old EPA reference. It is clear that groundwater with TDS in any of these other three groupings (i.e., those with groundwater TDS greater than 1,000 mg/L) would require expensive water treatment in order to be served to customers. The bottom line is that the Final AEM Report discussion of purported pockets of "fresh water" is largely composed of water unfit for human consumption and agricultural

irrigation. Figure 1 in this comment letter was prepared with publicly and readily available data. The Figure shows wells with measured TDS concentrations above the recommended maximum contaminant level for TDS for public drinking water.

15. There are many aspects of the Final AEM Report discussion of hydrostratigraphy that are misleading and/or inaccurate. For example, the authors attempt to equate the Salinas Valley Aquitard (SVA) with the Fort Ord Salinas Valley Aquitard (FO-SVA) as being one continuous unit. These two hydrostratigraphic units are distinct from one another and occur at significantly different elevations, as demonstrated in the HWG HCM (2017). Another example is the reference to mounding of groundwater in the 180-FTE Aquifer near the coast at the bottom of page 7 of the Final AEM Report, for which no map or evidence is provided in the Final AEM Report. In fact, the HWG Report (2017) demonstrates such mounding does not occur in the 180-FTE Aquifer, but the AEM study neglects to utilize data and information presented in the HWG Final Report. A third issue is the use of terminology, applicable only several miles south-southeast of the CEMEX site in the Fort Ord area, involving an Upper 180-Foot Aquifer, Intermediate 180-Foot Aquitard, and Lower 180-Foot Aquifer. This hydrostratigraphic layering does not carry over to the project area and areas inland of the CEMEX property, where the 180-FTE Aquifer is comprised of one aquifer unit. There are many other flaws and inaccuracies in the description of hydrostratigraphy in the Final AEM Report that are too numerous to list here, all of which contribute to flawed interpretations of AEM data in the Final AEM Report.

16. Figures 1 and 2 and pages 5 and 14 of the Final AEM Report claim to show an outline (in light blue) of a portion of the Dune Sand Aquifer. This is not correct as the area encompassed by the light blue line extends into the Perched "A" Aquifer area of Salinas Valley where the Dune Sand Aquifer does not exist. In addition, much of the area inland of MW-7 is more appropriately termed the "A" Aquifer and the 35-Foot Aquifer because they are perched on the FO-SVA clay layer.

17. The description of ancillary data on pages 9 and 10 of the Final AEM Report is very misleading. This section of the Final AEM Report references use of lithology data from 318 well locations, but does not provide a map of these locations, which is standard professional practice. Subsequent sections of the report only use (and continually refer back to) seven MPWSP monitoring well borehole geophysical logs for ground-truthing of AEM data (the geophysical log associated with the MPWSP MW-3 monitoring well location is not utilized for some reason even though the geophysical log near MW-3 is provided in the 2014 report that is referenced). The only other use of the "318 well locations" is that approximately 20 lithologic logs (presumably from water well drillers reports) are shown on the four cross-sections on pages 52-55. These 20 lithologic logs were not used for ground-truthing AEM data, such as partially described for the seven MPWSP monitoring well sites; therefore, the key component of the study (i.e., resistivity) was not calibrated for most of the AEM study area. In summary, the Final AEM Report authors partially document use of only seven of the 318 well locations for ground-truthing (i.e.,

calibration) of AEM data. This fact (i.e., the use of only seven well locations for AEM data calibration) was confirmed in the public presentation made by Ian Gottschalk in April 2018 to the MCWD Board during questioning by one of the Board members. The use of only 7 data points for AEM data calibration represents a major flaw in the overall AEM data analysis because it renders the interpretations unreliable (non-unique) beyond the immediate vicinity of the MPWSP wells due to a high degree of uncertainty in postulated hydrostratigraphy and water quality interpretations and conclusions.

18. Page 9 of the Final AEM Report states, "Much of the analysis in this report relies specifically on data collected between 2014 and 2015 as part of the assessment phase of the Monterey Peninsula Water Supply Project (MPWSP)." HWG comments are: a) This text acknowledges that the borehole and monitoring wells installed by Cal Am and data collected from those wells represents the highest quality data available in the project area and vicinity, and provides the only calibration data for the AEM study; and b) 2014 and 2015 comprised a period of substantially different rainfall conditions (dry) relative to the May 2017 AEM data collection period (very wet), which creates uncertainty in use of these borehole data for calibration of AEM data.

19. On page 12 of the Final AEM Report several statements are made about timing of data collection activities associated with MPWSP borehole drilling and well construction. These statements are incorrect: the geophysical log for MW-3 is available to study authors in the Task 1 TM (GEOSCIENCE, 2014) that was also included as an appendix in the Final HWG Report (2017), geophysical logging was conducted immediately upon completion of pilot borehole drilling, the initial water quality samples were collected about three weeks after completion of well development, and pressure transducers were installed on average 26 days after well completion.

20. The AEM study has been presented to the public (see video of April 2018 MCWD Board Meeting) as providing geophysical imaging across the study area to a depth of 1,000 feet. However, on page 13 of the Final AEM Report the depth of investigation (DOI) for AEM data is described as being from 50 meters below ground surface (mbgs) near the coast to 150-200 mbgs at inland locations (this DOI restriction is related to the difficulty the AEM tool has in "seeing" through low resistivity zones). This is equivalent to a DOI of 164 feet to 492-656 feet below ground surface (fbgs), not nearly the 1,000 feet represented to the public by the MCWD General Manager at the MCWD Board meeting. Given a 180/400-Foot Aquitard depth range of 200 to 350 fbgs, the DOI is inadequate to fully image the 180-FTE Aquifer and does not even reach the top of the 180/400-Foot Aquitard or 400-Foot Aquifer near the coast (which is the most important location with respect to potential impacts of the proposed MPWSP slant well pumping). Related to DOI, it is interesting to compare AEM cross-section C-C' on page 15 to the Figure 14 cross-section on page 44. While the cross-section on page 15 clearly shows a DOI limited to no more than about 50 to 100 meters, the Figure 14 cross-section shows AEM imaging

to depths ranging from 150 to 200 meters for the same general area as shown on page 15. This apparent discrepancy of the DOI in this area is not explained in the Final AEM Report.

21. It is important to note that the MPWSP monitoring well depths range from about 330 to 440 feet bgs, or a maximum of approximately 50 feet into the top of the 400-Foot Aquifer. Given that the MPWSP wells are the only calibration/validation points used in the AEM study, the interpretation of AEM data in the 400-Foot Aquifer is effectively uncalibrated even near MPWSP boreholes. As noted above, the AEM DOI does not even reach the 400-Foot Aquifer near the coast, which limits AEM calibration efforts even further.

22. Page 18 of the Final AEM Report states, "While the borehole resistivity in MW-1 measures some sudden jumps in resistivity, (e.g., at 40 mbgs), the resistivity measurements from the nearest AEM sounding trace out an average resistivity." The authors fail to acknowledge that AEM cannot detect vertical stratification of salinity in the aquifer over short distances in a seawater wedge. This adds a level of complexity and uncertainty that is not described or accounted for in the AEM report.

23. Page 20 of the Final AEM Report states in reference to water quality trends at MW-4S, "This trend is interpreted as a result of fresher water in the Dune Sand Aquifer flowing toward the coast…This groundwater gradient may be due in part to pumping from the coast Test Slant Well of the MPWSP. During pumping, the Test Slant Well creates a depression in the groundwater potential, drawing groundwater in its direction." These AEM study interpretations are incorrect because a) extremely high rainfall recharging the shallow aquifer in the area surrounding MW-4 accounts for changes in water quality, and b) previous HWG documents demonstrate that Test Slant Well pumping had no effect on water levels at MW-4S.

24. On page 20, the authors state, "…the decline in water conductivity in the shallow screen of MW-4 did not cease after the winter of 2016/2017…the wet winter of 2016/2017 does not appear to be the dominant cause of changing groundwater conductivity." HWG review of shallow water levels and conductivity show the wet winter resulted in higher groundwater levels that correspond with decreased conductivity. The high groundwater levels have been slow to dissipate and conductivity has remained relatively low, indicating that infiltration of rainfall is the dominant cause.

25. Page 20 of the Final AEM Report states, "Water level measurements in the Fort Ord area by Ahtna Environmental (2017) show that Salinas Valley Aquitard thins out toward the coast at a distance in the vicinity of MW-4. This is reflected by the very thin clay layer found in MW-4 at a depth of approximately 38 mbgs." HWG review indicates the depth of 38 mbgs is well below the base of the Dune Sand Aquifer so it cannot be the FO-SVA. Furthermore, the SVA does not even exist south of the Salinas River, although a different aquitard known as the FO-SVA is present inland of MW-4 and MW-7 in portions of the area south of Salinas River.

26. In the first paragraph on page 22, the Final AEM Report incorrectly refers to the SVA and Upper vs. Lower 180-Foot Aquifer. This stratigraphy is incorrect; as explained in the HWG Final Report, the area is underlain by the FO-SVA aquitard and the 180-FTE Aquifer (a single unit without Upper and Lower designations).

27. The middle paragraph on page 22 the Final AEM Report concludes the observations described may suggest a slight degradation of water quality within the 180-Foot FTE Aquifer over time. However, an alternative explanation may be a salinity stratification and increasing salinity with depth.

28. Several points are important to note on the profiles on pages 19 to 29 of the Final AEM Report with respect to calibration of AEM data to MPWSP borehole geophysics and lithologic logs. First, AEM data are averaged over approximately 25 to 30 foot thickness intervals below depths of 160 feet. The authors acknowledge that the AEM data effectively cannot see many of the changes in lithology with depth (this would apply to water quality as well), and only provide a single average resistivity value over each 25 to 30 foot interval. This fact has major implications to the use of AEM data to accurately define clay layers and aquitards. Aquitard definition is even further challenged by the fact that monitoring wells are not screened in aquitards and thus aquitard water quality is unknown for calibration purposes. In reality, the AEM data has major limitations that create non-uniqueness and considerable uncertainty in hydrostratigraphy and water quality interpretations as applied in the Marina area by AEM study authors.

29. The text on pages 32 and 33 of the Final AEM Report describes attempts to map the water table in the AEM study. HWG comments include the following: a) the AEM study only used MPWSP wells to map the shallow water table, but should also have used data from Monterey Peninsula Landfill and Fort Ord to greatly expand their database of shallow aquifer groundwater levels; b) while the authors note their water table mapping is a source of uncertainty, the level of uncertainty is much higher than implied in their discussion – especially since the AEM study neglected to use so much of the available data.

30. On pages 32-34, the Final AEM report authors attempt to eliminate the unsaturated zone from the imaging they showed the public in the August 2017 presentation of AEM results (which were a dark blue color produced by high resistivity that is always characteristic of an unsaturated zone). However, the Final AEM Report fails to distinguish between the perched water table and the regional Dune Sand Aquifer water table. This is another important distinction that needs to be made given the lack of potential impacts from the MPWSP on a perched water table and the tendency for shallow perched water to have lower salinity immediately after a record rainfall year.

31. Figure 12 on page 36 of the Final AEM Report helps demonstrate the challenges of making water quality interpretations with AEM data. Given that any definition of fresh water would have to be less than 1,000 mg/L TDS (at a maximum, and 500 mg/L would be a better representation of

fresh water TDS (Marella, 1993)), the range of resistivity values that clearly indicate fresh water (according to the chart in Figure 12) are 55 to 75 ohm-m. The range of resistivity values that most clearly indicate TDS greater than 10,000 mg/L (according to the chart in Figure 12) is less than 3 ohm-m. Therefore, resistivity readings between 3 and 55 to 75 ohm-m have potential TDS values in the range of 1,000 to 10,000 mg/L, which by standard water quality definitions would be considered brackish water. However, there are a wide range of lithology/water quality combinations that can produce bulk resistivity between 3 and 55 to 75 ohm-m, and insufficient calibration wells to make the lithology/water quality distinctions. The Final AEM Report use a range of resistivity values from 20 to 75 ohm-m to represent a purported “drinking water source” and claims this range is conservative (i.e., underestimates extent of “drinking water sources”). However, this is not a conservative range of resistivity values to define fresh or potable water, and includes a considerable amount of brackish water.

32. The Final AEM Report appears to cherry pick available data to suit a desired outcome. For example, the first full paragraph on page 37 describes how data were removed that don’t fit certain assumptions with an attempt to justify the actions as removing “outliers”. The authors also cherry pick the use of the MPWSP monitoring well borehole and water quality data, choosing not to incorporate this data in their hydrogeologic setting discussion or their hydrostratigraphic profile interpretations.

33. Pages 36-37 of the Final AEM Report state in reference to Figure 12, “Because of the low percentage of AEM resistivity measurements corresponding to this range, we focus primarily on sources of drinking water in this report, rather than on drinking water.” The HWG notes there are significant uncertainties in all water quality ranges since the control points represent a low percentage of the entire area over which interpretations are offered. Therefore, the AEM study is either unable to identify groundwater with TDS less than 1,000 mg/L (i.e., fresh water) or there is very little fresh water to be mapped within the zone of sea water intrusion mapped by MCWRA.

34. Page 38 of the Final AEM Report states, “The two resistivity modes, with peaks near 1.5 and 30 ohm-m, represent sediment saturated with water of high TDS concentration, and water of low TDS concentration, respectively.” HWG review indicates this conclusion is much too simplistic. Water quality can change significantly over very short ranges, with the upper portion of the seawater intrusion wedge being significantly lower in TDS. The pumped water quality sample and the single point conductivity measurements are a general indication of water quality. However, detailed vertical conductivity measurements in the well screen are necessary to accurately correlate vertical distribution of resistivity with lithologic and pore water quality changes.

35. To some degree the Final AEM Report authors acknowledge the challenges they face and the considerable uncertainty in their interpretation of AEM data. For example, the authors state on page 38: “we find…that clay-related lithologies in this region have a wide span of resistivity

values…"; and "The bimodal nature of these resistivity values demonstrates the site-specific nature of relating resistivity measurements to lithology; in this case due to the complicating factor of the change in salinity of the pore water." These statements reinforce the uncertainty and non-uniqueness in interpreting AEM data when seven control points of limited depths are the only calibration data used in the study. These statements show that, much beyond the control points provided by MPWSP, the vertical and lateral interpretation of hydrostratigraphy and water quality from AEM data is speculation.

36. The hydrostratigraphic modeling described on pages 40 to 55 is based to a large extent on two previous studies: Kennedy Jenks (KJ) (2004) and GEOSCIENCE (2014). Neither of these studies incorporates data from the MPWSP monitoring wells (water quality) and associated boreholes (lithology and geophysics data). None of the MPWSP monitoring wells are shown on the hydrostratigraphic profiles. The use of GEOSCIENCE (2014) is most curious in that an updated and far more comprehensive hydrogeologic conceptual model developed by the HWG with all available data (including MPWSP monitoring well data) was made available in 2017. With respect to Kennedy Jenks (2004), the authors neglect to mention the possible gap in the 180/400-Foot Aquitard shown on KJ cross-section B-B' can now be updated using MPWSP wells that fall on or near this cross-section line and clearly show the potential gap in the aquitard in the MPWSP vicinity suggested in the KJ report actually does not exist. The MCWRA Report (2017) also relies on the KJ report to show this potential aquitard gap area; however, the HWG does recognize that KJ and MCWRA did not have access to the HWG updated HCM at the time of their studies, unlike the AEM Final Report authors who had more than sufficient time to incorporate this information into the Final AEM Report.

37. Page 42 of the Final AEM Report states, "…the NMGWM does not include the SVA south of the Salinas River…" as if this is an incorrect conceptualization of the hydrogeologic model. As stated elsewhere and documented in HWG (2017), the SVA is not present south of the Salinas River in the MPWSP vicinity.

38. Page 43 of the Final AEM Report states, "The post-AEM model maps the Salinas Valley Aquitard beyond the edge of the Salinas Valley basin, and also maps the Salinas Valley Aquitard as an undulating, but generally continuous, aquitard with a nearly flat dip." This description of the SVA is incorrect, as documented by review of all available data described by the HWG (2017).

39. The Final AEM Report volume estimates of "Potential Drinking Water" on pages 56 to 63 are flawed for a number of reasons including: a) unreasonable definitions of "potential drinking water" that results in volume estimates primarily composed of brackish water; b) use of porosity values instead of specific yield values; c) in part because of b, use of unreasonably high assumed values of porosity; d) no mention of the fact that potential "production" wells screened in the perched/mounded aquifers would typically have wells yields less than 10 to 20 gpm; e) lack of recognition that even if a fresh water pocket did exist within the salt water intruded zone, it could not be developed for supply by a well without rapid salting in from nearby or vertically

proximate saline water; and f) most importantly, all the technical flaws in the study described above render these volume estimates completely unreliable and meaningless.

40. Figure 15 (AEM interpretation of the 180/400-Foot Aquitard) on page 46 of the Final AEM Report is incorrect, and does not provide the geologic information to support this interpretation. Figure 15 should show the geologic cross-sections and borehole control points that were used to support this interpretation. For example, the 180/400 ft aquitard is not shown to exist in the Marina area even though the USGS deep well log located at the MCWD treatment plant shows the aquitard is clearly present (Hanson, et.al., 2002). Similarly, all the MPWSP boreholes show the aquitard is present. None of these key data points are shown on Figure 15. Many other well logs are also available that show the aquitard is present in the MPWSP vicinity, as documented in HWG (2017).

41. On page 48, the Final AEM Report states, "While the relationship between resistivity and TDS and lithology is complex, as discussed earlier, we are confident that resistivity values greater than 20 ohm-m indicate the presence of sediments saturated with a source of drinking water, and resistivity values less than 3 ohm-m indicate the presence of water of limited beneficial use." The HWG notes this statement is based on extremely limited control points for calibration/validation and does not include the significant transition of salinity over short vertical distances in the seawater intrusion wedge. It also demonstrates that the goal of the AEM study was not to define fresh water.

42. On page 49, the Final AEM Report states, "At the eastern edge of the Dune Sand Aquifer, shown in Cross-section 1, a source drinking water has been identified, as well as within the Upper 180-Foot Aquifer, extending partially into the Lower 180-Foot Aquifer, which, north of the Salinas River, is not generally hydraulically separated from the Upper 180-Foot Aquifer." It is questionable whether this area actually falls within this category (TDS up to 3,000 mg/L). Furthermore, it is important to consider the implications of potentially pumping and treating groundwater at such a location. The appropriate practice has been to stop pumping from the inland portions of these aquifers to slow down sea water intrusion.

43. On page 49, the Final AEM Report states, "Near the coast in the region of Cross-section 2, the depth of investigation of the AEM data is at its shallowest, near 50 mbgs…" The HWG notes that the AEM data does not reach the 180/400-Foot aquitard at the coast even though Figure 15 displays a gap in the aquitard along the coast.

44. On page 50, the Final AEM Report states, "…the vertical migration of water of limited beneficial use is apparent. Small, isolated sources of drinking water exist within the 180-Foot Aquifer as well." The HWG notes the presence of a significant clay layer on log 4B01 in the middle of the aquitard gap shown on the profile – thus, the lithologic data appears to conflict with AEM data interpretation.

45. With regard to Figures 18-21 in the Final AEM Report in general and the claimed pockets of "Potential Drinking Water", the HWG notes these pockets have brackish water quality that likely represent the upper portion of the underlying seawater wedge. More importantly, this water would require treatment, and any pumping of this water would result in further degradation of the aquifer. Therefore, these aquifers have not and should not be pumped at inland locations.
46. On page 57, the Final AEM Report states, "Volume estimates are reported as cubic meters of subsurface. To calculate the volume of water in any water-saturated sediment requires knowledge of the porosity of the sediment. Without knowing at least the average porosity of each aquifer, reliable groundwater volumes are difficult to estimate." We note that after saying groundwater volumes are difficult to estimate, the authors proceed to provide the unreliable estimates of groundwater volumes. It is not clear why would the authors would provide an estimate of a volume that cannot be substantiated?
47. Regarding Figures 22-25 on pages 58-61 of the Final AEM Report, the HWG notes the following: These figures combine many unrelated things. As already reported (HWG 2017), water in the Dune Sand Aquifer represents rainfall recharge, is limited, and cannot be developed due to limited aquifer thickness. Less saline water in the inland 180-FTE Aquifer is likely the upper portion of the seawater wedge. This inland water should not be pumped (even if there actually were fresh water present) because it will further degrade the aquifer.
48. Regarding Table 5 on page 62 of the Final AEM Report, the HWG notes the following: The information in this table is not and cannot be substantiated with the current data base. But more importantly, the volumes of inland groundwater cannot be pumped because they will cause degradation to the aquifers. Groundwater is not pumped from any portion of the Dune Sand Aquifer or the 180-Ft Aquifer because of minimal aquifer thickness and/or the seawater intrusion already caused by MCWD and Fort Ord coastal pumping and agricultural pumping further inland.
49. Overall, the Final AEM Report provides numerous hydrogeologic opinions; however, none of the authors show the proper licensure or certifications to legally offer these opinions in California. If the hydrogeologic opinions were prepared by someone else, the person with California license/certification credentials should be listed as a co-author.

Comments on Aqua Geo Frameworks (AGF) Technical Memo to MCWD dated April 16, 2018

1. On page 1, Summary Item 1, AGF states that concerns stated in FEIR/EIS Response to Comments regarding the Preliminary AEM study results and presentation to the public in August 2017 were addressed in the Final AEM Report dated March 15, 2018 and made public in late April 2018. Notwithstanding the fact that many concerns expressed in the FEIR/EIS remain valid; the statements, presentations, and videos put out in public based on preliminary AEM study results

were (and remain) very misleading to the public, water agencies, and stakeholders, many of whom likely still base their understanding on the presentation of preliminary AEM results.

2. On page 2, Summary Item 9, AGF claims 318 boreholes were used as “control points” in the Final AEM Report, which provide “…a high level of confidence in the survey.” As explained elsewhere in these HWG comments, only 7 of the 318 boreholes were used as control points for calibration of AEM data. This is woefully inadequate for the AEM study area and leaves AEM data open to many non-unique interpretations (i.e., there is a very high level of uncertainty in the interpretation of AEM data). In addition, the 311 other borehole lithologic logs purported to be used in the AEM study are not provided anywhere in the documentation of the AEM study.
3. On page 3, Summary Item 10, AGF claims “…the 180/400 Foot Aquitard is not continuous across the survey area.” The HWG notes it is important to recognize that the survey area extends many miles beyond the area of interest (i.e., MPWSP area) and no specific areas with potential aquitard gaps are identified in this comment. Notwithstanding the questionable methodology and uncertainty regarding AEM interpretations discussed elsewhere in this HWG submittal, available data from MPWSP boreholes and wells (lithologic logs, geophysical logs, water quality data, groundwater level fluctuations, pumping test data) show a continuous aquitard is present in the MPWSP area. Potential gaps in the aquitard outside of the MPWSP area are irrelevant to assessment of potential water quality impacts from implementation of the MPWSP.
4. In Section 2.3 on page 4, AGF notes the Final AEM Report defines “potential drinking water” as “TDS less than or equal to 3,000 mg/L”. Given this basis for AEM study results, AEM study authors and others (e.g., HGC, EKI, Jacobson James, AGF) go on to equate groundwater with TDS up to 3,000 mg/L with “fresh water”. Examination of MPWSP monitoring network water quality data for wells with TDS between 1,000 and 4,000 mg/L TDS (see table below) demonstrates that groundwater with TDS between about 1,200 and 1,300 mg/L exceeds the chloride recommended MCL (250 mg/L) and/or the nitrate primary MCL (10 mg/L for nitrate as N), and groundwater with TDS exceeding 1,500 mg/L also contains chloride greater than 600 mg/L (the temporary highest chloride MCL). Thus, the “potential drinking water” purportedly defined in the Final AEM Report actually is not potential drinking water because it is unfit for human consumption and agricultural irrigation (see attached **Figure 1**).

Summary of MPWSP Monitoring Network Water Quality Data for Monitoring Wells with TDS Between 1,000 and 4,000 mg/L

Well I.D.	Sampling Date	TDS (mg/L)	Chloride (mg/L)	Nitrate (as N) (mg/L)
MW-7S	8/3/15	1,200	387	44
MW-8S	7/28/15	1,223	247	26
MW-5S	7/28/15	1,311	284	57
MW-6D	7/28/15	1,840	883	0.7
MW-5D	7/27/15	2,617	1,159	0.7
MW-9S	7/28/15	2,997	1,038	<0.9
MW-8D	7/28/15	3,796	1,901	0.9
MW-7M	8/2/15	3,832	1,739	3.3

Note: Table modified from HWG January 2018 Response to HWG Report Comments by inclusion of nitrate data.

5. The AGF TM provides several comments on the Final HWG Report discussion of preliminary AEM study results, including saying that HWG did not provide formulas or conversion factors for AEM data. However, the conversion factors, details/methods for data inversion, etc. should be provided by the authors of the AEM study, and not independent reviewers of the AEM study. In general, other AGF comments on the HWG study in their April 2018 TM were already addressed in our January 2017 Response to HWG Report Comments submittal (HWG, 2018).

6. On page 15 AGF notes that AEM study authors did not make the conversion from bulk resistivity to groundwater resistivity/conductivity using local data, or even data from California. Instead, the Final AEM Report authors relied on data from Florida, where the hydrogeology is completely different – consisting of karstic limestone aquifers with solution cavities in the rock. Thus, while claiming use of 318 boreholes in the Final AEM Report (although in reality only 7 of 318 could be used for AEM data calibration), it appears that the key conversion from bulk resistivity to TDS is dependent on using data from Florida. As an important note: A definition of fresh water taken from one of the USGS reports cited in the AGF-referenced Florida study is as follows: "Freshwater - Water that contains less than 1,000 milligrams per liter (mg/L) of dissolved solids; generally, more than 500 mg/L is considered undesirable for drinking and many industrial uses. Generally, fresh water is considered potable." (Marella/USGS, 1993). This definition of fresh water is inconsistent with descriptions of fresh water in the Final AEM Report and other TMs reviewed in subsequent sections of this comment letter.

7. Notwithstanding all the technical issues and flaws in the AEM study pointed out in the HWG Final Report and this letter, it is important to note that sea water intrusion in general is a non-uniform process due to aquifer sediment heterogeneities and will tend to result in localized areas of higher and lower salinity. However, it is clear that within the sea water intruded areas of the aquifers mapped by MCWRA, pumping of a new or existing production well within this

area will immediately or quickly produce water with elevated salinity that is unfit for human consumption or agricultural irrigation.

8. Notwithstanding the technical issues and flaws in the AEM study listed in other sections of this letter, we note with respect to AGF Figure 16 on page 27 the following: a) the map only includes the upper portion of the 180-Foot Aquifer, which will tend to have less saline water than the lower portion of the aquifer due to sea water wedge dynamics; b) a larger proportion, perhaps the majority, of blue areas in the figure are inland of the sea water intrusion front mapped by MCWRA and would be expected to be comprised of less saline water; c) this map displays purported water with TDS up to 3,000 mg/L, which does not equate to fresh water and hence is not comprised of drinking water.

Comments on Hopkins Groundwater Consultants Letter to MCWD dated April 17, 2018

The Hopkins Groundwater Consultants (HGC) April 17, 2018 Letter makes many unsupported/undocumented claims/opinions, and misleads the public and decision makers with unsupported hypothetical hydrogeologic claims and opinions. For example, HGC frequently refers to the "Cal-Am HWG", even though the HWG is a separate entity that includes two members that represent agricultural interests in the Salinas Valley who have been and continue to focus on identifying potential MPWSP impacts and protecting agricultural water rights and interests. The HWG further illustrates these points and others with our comments below.

1. A large portion of the comments included in HGC's letter rely upon AEM study results. HWG review of the Final AEM Report (see comments above) documents many flaws that result in unreliable (and non-unique) interpretations and conclusions presented in that study. Thus, HGC cannot rely on the Final AEM Report to support its statements.
2. Footnote 1 on pages 1 and 2 attempts to justify HGC's use of the term "North Marina Subarea", but it is a term made up and defined by HGC and not recognized by DWR.
3. On pages 1 and 2 (and elsewhere) HGC refers to "unique groundwater conditions" and "unique recharge conditions" in the MPWSP vicinity. In reality, there is nothing unique about perched aquifers or rainfall recharge to perched aquifers, some of which may ultimately migrate down to underlying aquifers. Such geologic and recharge conditions are common throughout California and elsewhere. Those conditions in the MPWSP vicinity have been proven to have essentially no effect on historical seawater intrusion. It is also irrelevant to the MPWSP potential impacts assessment, because those conditions will not change in the future with implementation of the MPWSP.
4. HGC's letter makes liberal use of the term "fresh water" without defining the term. While it is clear HGC would like to equate fresh water to 3,000 mg/L TDS using references to terms such as "potentially suitable for beneficial use"; in reality, the accepted upper limit to definition of fresh water is 500 to 1,000 mg/L (e.g., Todd, 1980; California Recommended MCL; Marella/USGS, 1993).

5. HGC states on page 2, “Data provided by both the monitoring wells for the MPWSP test slant well and the recent AEM study reveal that a significant amount of fresh water exists…south of the Salinas River.” The HWG notes that this statement is categorically false. Fresh water is not produced and cannot be produced from the MPWSP area. The native "fresh water" TDS concentration was less than 500 mg/L. TDS concentrations above this level are directly associated with the sea water intrusion wedge and/or (to a much lesser degree) with agricultural return water (mostly as demonstrated by high nitrates in shallow/perched aquifers). The AEM study did not and cannot accurately delineate "fresh water" in the area beyond the specific Cal Am monitoring wells. In fact, the AEM study did not even attempt to delineate fresh water; rather, it attempted to delineate brackish water with TDS up to 3,000 mg/L. Figure 1 (attached to this letter) was prepared with publicly and readily available data. The Figure shows wells with measured TDS concentrations above the recommended maximum contaminant level for TDS for public drinking water, in other words, water that is no longer considered “fresh” water. These wells include some wells abandoned by MCWD due to high TDS concentrations.

6. On pages 1 and 2, HGC states the, “…AEM study provided a clear understanding that the borehole and monitoring well data provided by the MPWSP are not isolated anomalies as argued by the California American Water Company.” The HWG notes the AEM study does not come close to providing a clear understanding, and in fact, the AEM data is only (somewhat) calibrated in the areas adjacent to the MPWSP monitoring wells.

7. On page 2, HGC states, “The AEM study and data further confirm this enhanced recharge condition does not exist in the main portion of the 180/400 Foot Aquifer Subbasin north of the Salinas River.”; and restates this claim in a different way in the bullet at the bottom of page 2. These statements contain the same unsupported claims on recharge, but now adds "enhanced" to the description. However, data from the MPWSP monitoring wells do not show influence of recharge from the perched/mounded portion of the Dune Sand Aquifer in either groundwater levels or water quality in the 180-FTE Aquifer. The recharge mechanisms that have been operating historically will not change in the future after implementation of the MPWSP.

8. HGC makes a statement at the bottom of page 2 that FEIR conclusions regarding potential MPWSP impacts “conflicts with best available information and science.”, To the contrary, the Final AEM Study (see HWG comments above), interpretations of AEM data used by HGC, and HGC comments in general conflict with the best available information and science. For example, claims of “holes” in the 180/400-Foot aquitard in the project vicinity is in complete opposition to the recent and highest quality borehole/geophysical data collected from MPWSP monitoring wells, local groundwater levels and fluctuations, and pumping test data.

9. On pages 2 and 3 HGC claims that the FEIR/EIS, “…fails to recognize or address that the groundwater recharge for the aquifers in this area of the basin is enhanced…” However, HGC does not provide any supporting data or analysis for the enhanced groundwater recharge claim. In fact, data from the MPWSP monitoring wells do not show influence of recharge from the

perched/mounded portion of the Dune Sand Aquifer in either groundwater levels or water quality in the 180-FTE Aquifer.

10. In the third bullet on page 3 HGC states, “The groundwater gradient in the shallow Dune Sand Aquifer is predominantly towards the coast…” The HWG provided groundwater elevation contour maps for the perched/mounded portion of the Dune Sand Aquifer (i.e., “A” Aquifer and 35-Foot Aquifer) that show a significant portion of the groundwater flow towards the north and east. Assuming that HGC is not referring to the perched/mounded aquifers (“A” Aquifer and 35-Foot Aquifer), the HWG Final Report (2017) demonstrates inland flow in the regional Dune Sand Aquifer (with exception of localized flow towards the test slant well during pumping).

11. In the fourth bullet on page 3, HGC states, “…the best available science demonstrates the FEIR/EIS’s conclusion that this additional seawater intrusion will be limited to the MPWSP’s capture zone…is inaccurate.” HGC’s statement is unsupported and, in fact, HGC’s later discussion of capture zones is flawed in that it omits the ocean recharge boundary, and fails to mention the fact that inland flow paths outside the MPWSP capture zone occur with or without the MPWSP.

12. The first paragraph on page 4 states, “The FEIR/EIS’s inadequate consideration of these important issues appears to be a result of unsupported assumptions based on sparse historical data which the AEM study and other information discussed below now are shown to be inaccurate.”; and, “…demonstrates that the FEIR/EIS’s conclusions regarding the MPWSP’s potential impacts to groundwater resources are not accurate…” To the contrary, the FEIR/EIS has based its conclusions on extensive historical and recently collected data, unlike HGC (and others) who offer sweeping unsupported statements. The FEIR has responded to all technical comments, regardless of whether or not the comments are supported by valid data/analyses. The AEM study is misused and misinterpreted by HGC and others. "Significant" or even small volumes of "fresh water" are not documented to be present in the MPWSP vicinity, as the AEM study does not even attempt to delineate fresh water. There is no documented support for unusual or significant recharge from the shallow aquifer system. Sea water intrusion has occurred in the 180-FTE Aquifer for many years despite purported shallow aquifer recharge. These and other statements on “important issues” by HGC and others are simply false and/or unsupported by valid data.

13. On page 4, HGC states that the Final AEM Study Report, “…indicates the presence of a large fresh water lens that is wedge shaped and located in the shallower aquifers in the North Marina Subarea. As stated elsewhere in this letter by the HWG, this statement is false. The AEM study does not delineate "fresh" water. It delineates brackish water associated with the sea water intrusion wedge.

14. At the bottom of page 4 and top of page 5, HGC misrepresents HWG's previous opinion based on preliminary AEM results. The preliminary data showed the presence of a sea water intrusion wedge as documented in MPWSP (and other) data, and mostly brackish water in the mounded/perched inland aquifers. Certain claims made in the Final AEM Report were not made by Stanford/AGF/HGC or others in presenting the preliminary AEM results. As previously anticipated by the HWG, the Stanford/AGF/HGC team needed to justify the expense of the surface geophysics project; hence, the new claim of "holes" in the 180/400-Foot Aquitard implied to be in the MPWSP vicinity. The HWG does not agree with the biased and non-unique interpretation of AEM data provided in the Final AEM Report.
15. On page 5 HGC states, "However, the HWG and FEIR/EIS's assertion that these data show only saline water and not the high volume of fresh and slightly brackish groundwater in Dune Sand and upper 180-FTE Aquifers in the project area is contrary not only to the AEM study, but available information from the MPWSP monitoring wells and the best available science." To the contrary, the AEM study does not show a high volume or any volume of fresh water, but rather is focused on showing brackish water that is a part of the sea water intrusion wedge. The best available science results from the construction of control points (monitoring wells) that have allowed the collection of actual past, present, and future water level and water quality data.
16. On page 6 HGC describes a "wedge of fresh water" being delineated by AEM data. This statement appears to describe a sea water intrusion wedge that contains brackish water (not fresh water) in the upper portion of the wedge. These AEM profiles are also misleading in that they neglect to show the geology of the area.
17. At the top of page 7 HGC states, "The borehole geophysical data from the MPWSP monitoring wells located inland of the CEMEX site confirm the AEM data findings." and then refers to HGC's Plate 1. First, the HWG notes that the monitoring wells do not "confirm" AEM data findings, but rather are needed to calibrate AEM data. Second, Plate 1 demonstrates that when HGC (and others) use terms such as "Source of Drinking Water Quality" and "sources of drinking water" those terms actually refer to groundwater containing chloride in excess of the 500 mg/L standard use by MCWRA and others to define the area of sea water intrusion. Elsewhere, HGC (and others) transition from the terms cited above to "fresh water" without ever defining what they mean by fresh water. In reality, the chloride levels in fresh water are on the order of 50 mg/L or less, not in excess of 500 to 1,000 mg/L as defined by HGC and others.
18. HGC states on page 8, "…the final AEM study report supports our prior comments that the HWG's estimates regarding the ocean water percentage (OWP) are likely understated." The HWG notes this statement by HGC suggests the percentage of ocean water extracted by proposed MPWSP slant wells may be greater than calculated in the HWG Final Report.

19. On page 8 HGC states, "…the life of the Project does not account for the fresh water shown in the AEM report." As stated elsewhere, the AEM report does not delineate fresh water; instead, the AEM report attempts to delineate zones of brackish water (i.e., TDS up to 3,000 mg/L that also contains chloride greater than 1,000 mg/L).

20. On page 9 HGC states, "The FEIR/EIS's groundwater analyses continue to use the State recommended levels for drinking water constituents…" and suggest this is somehow the wrong approach. HGC (and others) use their own newly created standards to define fresh and potable water as groundwater with TDS up to 3,000 mg/L and chloride in excess of 1,000 mg/L. There is a good reason the recommended MCLs are 500 mg/L for TDS and 250 mg/L for chloride – at these constituent levels the water tastes salty and consumers will not want to drink water with concentrations over the recommended MCLs, particularly as it approaches the upper limit MCLs of 1,000 mg/L and 500 mg/L for TDS and chloride, respectively. MCWD serves its customers water with TDS concentrations averaging about 400 mg/L and never exceeding 600 mg/L.

21. The potential presence of somewhat less saline water in the inland perched/mounded aquifer or the upper portion of the sea water wedge in the 180-FTE Aquifer is not new information uncovered by the AEM study - this was already known or suspected from previous investigations. However, even this less saline water typically does not meet the definition of fresh/potable water due to elevated TDS (e.g., between 1,000 and 3,000 mg/L) or nitrate in excess of the MCL. To the extent that a pocket exists without elevated TDS, chloride, or nitrate, it cannot be developed for water supply due to limited pumping capacity (perched/mounded aquifer) or because pumping a well perforated in such a pocket will quickly draw in nearby or vertically proximate saline water (180-FTE Aquifer); as illustrated in a report prepared for MCWD (Staal, Gardner & Dunne, 1991).

22. HGC's letter on page 4 states, "The AEM data clearly indicate salt water mounded in the vicinity of the CEMEX site that does not continue inland or further south along the coast where additional intake facilities are proposed to be located." However, data from MCWD's own monitoring wells (Fugro West, 1996) show highly saline water in the aquifer screened by the MPWSP test slant well approximately 0.9 miles south of the test slant well. This real-world data is in direct contrast to the interpreted AEM data and Hopkin's statement above.

23. HGC's letter on page 5 refers to, "…the high volume of fresh and slightly brackish groundwater…" in the project vicinity. As stated above, HGC does not define terms such as "fresh" or "slightly brackish", but clearly HGC is lumping these distinct categories together to make it impossible to distinguish potentially useable fresh/potable water (typically defined as no greater than 1,000 mg/L TDS and often as less than 500 mg/L) from unusable brackish water (typically defined as 1,000 mg/L to 10,000 mg/L or more). The Final AEM Report further blurs the line between fresh/potable water and unusable brackish/saline water by using 3,000 mg/L as a cutoff in maps and volume calculations for terms such as "potential drinking water source."

24. Figure 2 on page 6 presents three small AEM profiles at a scale that is impossible to see any details. The figure legend only states "Resistivity" and thus does not define what resistivity is actually shown in the figures (i.e., bulk vs. groundwater). The associated text makes reference to "fresh water" but neither defines the term relative to TDS nor does HGC define "fresh" in terms of the resistivity scale on the figure. We can only assume HGC's definition of "fresh water" is up to 3,000 mg/L TDS based on other text in the HGC letter and the Final AEM Study, which should be kept in mind regarding all HGC references to "fresh water" compared to standard definitions of fresh water being no more than 500 to 1,000 mg/L for TDS.

25. The first paragraph on page 7 provides a good example of how HGC utilizes confusing terms from obscure references such as "Source of Drinking Water Quality" derived from EPA 1988 in one sentence and then switches to the term "fresh water" in the next sentence. Again, the reader needs to be aware that HGC is redefining the term "fresh water" to be groundwater with TDS of 3,000 mg/L, chloride exceeding 1,000 mg/L, and nitrate in excess of 10 mg/L as N, all far in excess of their respective California MCLs and unable to be served to the public as drinking water or used for irrigation.

26. It is interesting to note on page 7 that while HGC criticizes the HWG for not developing a regression analysis of AEM data vs. water quality, AGF on page 15 of their letter states they have not yet done a regression analysis with data from the Marina area and uses an example of such an analysis done in a completely different hydrogeologic environment in Florida. One would think the project team that collected, interpreted, and made conclusions on water quality from AEM data would be the ones responsible for developing a regression analysis. It is surprising this critical step of converting bulk resistivity to salinity was not documented by the AGF/HGC/Stanford geophysics team prior to presenting preliminary and even final AEM results.

27. HGC makes reference to "slowed or reversed seawater intrusion" in the MPWSP area due to recharge from the perched/mounded aquifer. HGC provides no data or evidence of a reduction in sea water intrusion – such a statement requires historical and recent data such as documented by MCWRA. The latest available MCWRA seawater intrusion maps for 2015 show historical and ongoing encroachment of seawater intrusion.

28. HGC make reference on page 7 to, "…recharge and accumulation of a substantial amount of fresh water in the Dune Sand Aquifer and the 180-FTE Aquifer" inland of the MPWSP project area. Keeping in mind HGC's definition of "fresh water" being 3,000 mg/L TDS without regard to elevated chlorides and nitrate associated with that water, we note that calculations of this purported "substantial" amount of "fresh water" flowing from the perched/mound aquifer to underlying aquifers in the MPWSP vicinity are not provided by HGC.

29. One of HGC's repeated major points (perhaps its primary claim) in this and many of HGC's previous documents is stated in the last sentence on page 7, "…failure to disclose that recharge and accumulation of a substantial amount of fresh water in the Dune Sand Aquifer and 180-FTE

Aquifer…must be corrected…". Notwithstanding HGC's attempts at redefining fresh water to be comprised of water requiring desalination, HGC fails to provide any analyses to support the claim that the project could impact such waters even if they did exist in the MPWSP area. As stated elsewhere by HWG, HGC's statement here only potentially applies to water quality impacts that are limited to flow lines in the MPWSP capture zone that originate from the ocean. Such flowlines do not intersect any fresh water. In fact, the groundwater basin benefits from the proposed MPWSP in multiple ways: a) reduced sea water intrusion inland of the capture zone, b) reduced pumping in the basin via delivery of treated water for irrigation per the return water formula in the Return Water Settlement Agreement; and c) providing an example of the type of project that can ultimately bring the groundwater basin to sustainability under the Sustainable Groundwater Management Act (SGMA).

30. HGC states on page 9 that a municipal system can serve water to the public on a temporary basis (if approved by the State) up to 1,500 mg/L, and that, "Sometimes the temporary period lasts for many years…" HGC provides no supporting evidence or examples to support this statement. Regardless, TDS up to 1,500 is less than half of the 3,000 mg/L TDS definition HGC uses to define fresh water in this letter and the Final AEM Report. In reality, it is extremely rare for a public water system to serve water with TDS exceeding 800 mg/L (e.g., Central Arizona Salinity Study, 2006), as the water is too salty for customers to drink and most will have to buy bottled water instead.

31. HGC admits on page 10 that the AEM study uses a "…source of drinking water standard with a TDS concentration of up to 3,000 mg/L…for quantification analyses." Thus, it is important to recognize that all the interpretations and conclusions regarding "fresh" water and "sources of drinking water" in the AEM study represent water that is neither fresh or suitable for drinking according to applicable definitions and standards in California. These estimates in the AEM study are primarily composed of unpotable brackish water, as indicated by HGC's references to "…large volume of fresh/slightly brackish water in the aquifer system…".

32. HGC's paragraph in the middle of page 10 describes overall basin recharge, implying there is some unaccounted for recharge in the MPWSP vicinity. However, the overall recharge estimate of 117,000 AFY for the Pressure Subarea of the Salinas River Groundwater Basin includes precipitation and stream recharge (Brown and Caldwell, 2015). There is no evidence of additional recharge in the MPWSP vicinity, nor does HGC provide any such data or evidence.

33. At the bottom of page 10/top of page 11, HGC continues to use confusing and undefined terms. On the one hand HGC discusses purported "fresh water dominated areas" and in the next sentence continues the discussion with "fresh water and slightly brackish water." So called "slightly brackish water" comprises the vast majority of HGC's purported "fresh water dominated areas." Water purveyors cannot and do not serve "slightly brackish water" to their customers – it must first be desalinated as proposed in the MPWSP.

34. In the first paragraph on page 10, HGC states, "The DEIR/EIS's focus on the groundwater quality objectives and failure to discuss this standard does not sufficiently inform the public or the decisionmakers of the potential impacts of producing groundwater for the project that is potentially suitable for municipal or domestic uses either through treatment or blending." The "standard" used in the AEM study (TDS up to 3,000 mg/L) and by HGC (and others) is not appropriate for fresh water or drinking water. The inland brackish water delineated by the Final AEM study would require treatment for use and would, if pumped, exacerbate sea water intrusion in these areas caused by historical/current pumping.

35. On page 10, HGC states, "The FEIR/EIS fails to disclose the fresh water wedge containing a source of drinking water indicates significant fresh water recharge is occurring…and is a resource for future beneficial uses to be considered by groundwater basin management." This statement is incorrect, because there is no fresh water wedge. The fresh water referenced in the statement is the brackish water portion of a sea water intrusion wedge caused by historical inland pumping. This brackish water cannot be developed in these inland areas without treatment and further exacerbation of sea water intrusion.

36. In the middle of page 10, HGC makes reference to "…the presence of the large volume of fresh/slightly brackish water in the aquifer system…indicates a source of greater localized recharge, that if enhanced, could be key to future basin management efforts…". This is another example of an unsupported and baseless statement. The location of fresh water is not delineated and cannot be delineated with the AEM study methodology and control points. No data is provided by HGC and there is no basis to support rainfall recharge in this area being any greater than would normally be expected for the local hydrogeologic setting, and rainfall recharge is already accounted for in previous studies.

37. On page 10, HGC states the, "…HWG Report and response to comments repeatedly tries to explain away the fresh water/slightly brackish groundwater (source of drinking water) found in the shallow aquifer units located inland of the proposed MPWSP intake location at the CEMEX site." The HWG Final Report notes the presence of this brackish "source of drinking water"; this water would require treatment if it were to be developed. Unlike the MPWSP, resumed pumping of inland wells in the brackish water areas would lower inland water levels substantially and further exacerbate sea water intrusion.

38. At the bottom of page 10 and used as an example of the claim in the comment directly above, HGC attempts to critique the HWG Report discussion of sea water intrusion chemical signatures in MW-1S/M, MW-3S/M, MW-4S/M, MW-6M(L), MW-7S/M, MW-8S/M, and MW-9S/M with reference to MW-5S(P). However, HGC fails to mention that MW-5S(P) is in the hydraulically disconnected perched/mounded aquifer where one would not expect the source of high salinity to be from seawater intrusion. In addition, while the source of high nitrate in MW-5S(P) that contributes to making this perched/mounded groundwater non-potable (along with elevated TDS and chloride) is not from sea water, it is an agricultural area and nitrate can be present in

locations where groundwater is impacted by seawater intrusion (i.e., presence of nitrate does not equate to lack of seawater intrusion).

39. On page 10, HGC makes reference to Table 2 (on page 11) and states, "…Monitoring Data show numerous locations where fresh water and slightly brackish water is present." The HWG notes the data provided in Table 2 was developed by Cal Am and made publicly available some time ago. TDS data for the shallow aquifers indicates potentially fresh water at one location (MW-6S) approximately four miles inland. TDS data for the 180-FTE Aquifer indicates potentially fresh water at one location about two miles inland (MW-5M) and is addressed in the HWG Final Report. The remaining shallow to intermediate depth monitoring wells indicate brackish to saline groundwater. The MCWRA mapping correctly depicts the areas of overall sea water intrusion. Installation and pumping of wells in these inland "locations where freshwater and slightly brackish water" are present will result in saline wells after a short pumping duration and further degradation of the aquifer.

40. HGC makes the statement on page 12 that "…the entire area is not intruded by seawater. A substantial portion of the shallower aquifers…" are being "…recharged with freshwater." While it is true that percolating rainfall generally represents freshwater recharge; this recharging rainfall mixes with saline water when it hits the perched or regional water table and the resulting groundwater has elevated salinity that makes it unusable and non-potable. The FEIR/EIS, HWG documents, and other previous studies account for rainfall recharge in their analyses, and there is no new and previously unaccounted for data/information provided by HGC or the AEM study. Furthermore, HGC appears to misunderstand how sea water intrusion manifests itself and attributes presence of less saline water as an indication of recharge; however, the highest salinity will occur in the lower portions of a seawater intrusion wedge and along preferential flow paths to the major inland pumping wells causing sea water intrusion. The salinity may be less in the upper portion and along the edges of the sea water intrusion area, but these areas are still part of the zone of sea water intrusion and pumping from these areas will greatly exacerbate further seawater intrusion. The HWG has correctly identified and documented the chemical signatures of sea water intrusion in the Final HWG Report.

41. On page 12 HGC states, "These data correlate very well with the AEM survey data shown in Figure 4…and define a large freshwater wedge…" HWG notes again here that HGC is referring to brackish water as fresh water, and is referring to the less saline portion of the sea water intrusion wedge as a fresh water wedge. The Final AEM Report does not delineate fresh water and there is no fresh water wedge. Figure 4 actually confirms the presence of brackish water over the top and along the edges of a sea water intrusion wedge, as would be expected. As stated previously, the Final AEM Report has no control points beyond the seven MPWSP boreholes used in the study. Furthermore, we note the title of Figure 4 "Coastal Fresh Water Conditions" is misleading and misrepresents actual groundwater quality conditions, because it does not depict fresh water. In addition, HGC provides no data or support for the flow arrows

depicted on Figure 4. Lastly, HGC has returned to using the misleading legend first used in the August 2017 preliminary AEM study results public presentation using "Log Resistivity" and labeled with "Saline" and "Fresh" to imply groundwater resistivity is being depicted in the profile when it clearly is not; instead the figure is showing bulk resistivity representative of the both the sediments and pore water salinity.

42. On page 13 HGC states, "While the recharge sources of this freshwater…are still under investigation, its presence indicates there is still much to be understood about these coastal conditions that appear to be retarding the movement of seawater into the aquifer system." In this example, "freshwater" is inaccurate because the AEM study does not delineate fresh water, and it is clear from actual data (e.g., MCWRA 2015 sea water intrusion maps) that sea water intrusion movement inland has not been retarded.

43. HGC Table 3 on page 13, derived from the AEM study, is very misleading in that it does not define the term "Source of Drinking Water". Notwithstanding all the technical flaws of the AEM study listed in the previous section of these comments, it is clear the volumes presented in the table represent brackish water and non-potable water. The table appears to imply this brackish/non-potable water is a developable resource; however, it can only be utilized with treatment similar to that proposed for the MPWSP. Furthermore, if groundwater extraction were to occur in the areas shown, it will result is exacerbation of sea water intrusion from pumping wells at inland locations.

44. It should be pointed out that one of HGC's major claims throughout this and previous comments is that a considerable amount of "fresh water" exists within the area of seawater intrusion. However, it must be noted that MPWSP monitoring wells clearly show groundwater exceeding approximately 1,500 mg/L TDS also have chlorides exceeding 500 mg/L, which is the standard applied by MCWRA to map sea water intrusion. Thus, HGC is making an apples to oranges comparison when he uses the AEM study results to claim a lack of seawater intrusion in small pockets of the sea water intruded area mapped by MCWRA. Regarding this point, it should also be noted that MCWRA does not map seawater intrusion in the shallow aquifers because the shallow aquifers have never been developed for water supply; thus, HGC's implication of previously incorrectly mapped "fresh water" in shallow aquifers is wrong.

45. On pages 14-16 (and using Figures 5-7), HGC attempts to characterize groundwater gradients and flow directions without constructing groundwater contour maps. The discussion provided here by HGC is not accurate. In the past, HGC has combined data from wells screened in different aquifers on one groundwater elevation contour map, which resulted in inaccurate depictions of groundwater flow directions. Since that was pointed out previously by HWG, HGC has apparently resorted to not using groundwater elevation contour maps in discussions of groundwater gradients and flow directions. The HWG refer the reader to Appendix E of the HWG Final Report (2017) for groundwater contour maps of the various aquifers, from which groundwater gradients and flow directions for each aquifer can be properly understood.

46. At the bottom of page 16, HGC states, “The result is an increase in freshwater in the cumulative water quality samples collected from MW-4S and the reduction in specific conductance values in the well at the probe depth in the middle of the well screen.” The HWG notes again HGC’s use of the term “freshwater” in reference to brackish water. The HWG Final Report has clearly documented the above average rainfall in 2015/2016 and the very wet year of 2016/2017 having resulted in a reduction in conductivity values in MW-4S. This condition was anticipated when considering climatic conditions over the life of the MPWSP and it is fortunate that the test slant well testing period captured data during very wet years to illustrate how the project will operate under such conditions.

47. On page 17, HGC states, “Some of the groundwater on top of the aquitard likely percolates through the aquitard layer into the underlying Dune Sand/180-FTE-Aquifers as shown in Figure 1.” The HWG notes that this statement is not supported by Figure 1 or any other data, and represents yet another unsupported and undocumented statement/claim by HGC.

48. On page 17, HGC further states, “The remainder of the perched groundwater does not stagnate on top of the aquitard completely disconnected from the underlying aquifer zones, rather it flows laterally to where the aquitard layer ends and where it can flow downward and recharge the Dune Sand and 180-FTE Aquifers…” The HWG notes historical and recent landfill reports show that much of the perched aquifer zone inland of the MPWSP flows in the opposite direction (northeast) to an area along the bluffs along the Salinas River. The portion of the perched water that may migrate west towards the coast has no bearing on the impacts of MPWSP pumping as analyzed by the FEIR/EIS. To the extent this migration of perched water does occur, it will continue on the same way with or without MPWSP pumping, because the aquifers screened by proposed MPWSP slant wells are hydraulically disconnected from inland perched/mounded aquifers.

49. Tables 4 and 5 on pages 18 and 19 and the associated discussion in the text regarding seasonal and annual rainfall improperly uses a calendar year basis instead of the standard California practice of water years to quantify rainfall and streamflow (https://www.water.ca.gov/LegacyFiles/waterconditions/docs/2017/Water%20Year%202017.pdf). The water year runs from October to September, which is important because virtually all rainfall occurs between November and April. The 2016-2017 water year is recognized as being one of the wettest on record. NOAA stated, “The 2016-2017 water year was an incredibly wet year for much of California.” (https://www.climate.gov/file/ca-water-year-2017png). This was particularly valuable for the MPWSP because the time frame of test slant well operation started at the end of a drought and was followed by an above normal rainfall year and then a record wet year. Overall, the time period for test slant well operation included well above normal rainfall, meaning that results were conservative (lower net contribution of ocean water than average) in terms of test slant well water quality. Even the Final AEM Report states, “The especially wet winter of 2016/2017 supplied more recharge to the Dune Sand Aquifer than

normal winters…" (p. 20). However, HGC uses calendar years to tabulate rainfall and describes 2016 and 2017 as "normal" rainfall years. This characterization of rainfall by HGC is not only incorrect in terms of standard hydrogeologic practice in California, but grossly misrepresents the data. Therefore, all of the discussion on pages 18-20 related to Table 4 are invalid due to this misrepresentation of the data.

50. It is unclear what HGC is referring to in Figure 8 and associated discussion on page 20. However, it is quite clear from the figure that a slight reduction in test slant well EC corresponds to heavy seasonal rainfall that occurred in late 2016/early 2017. HGC tries to argue otherwise but data do not support HGC's argument. Furthermore, once the rainfall from the record wet year enters the aquifer system, there will be a time lag for the water to be removed via test slant well pumping, so it is not surprising at all to see a residual slight reduction in EC following the record wet-year rainy season.
51. With respect to HGC's discussion of CEMEX activities and potential impacts on test slant well water quality on pages 21-22, it continues to ignore the actual data and CEMEX operations reported in the HWG Final Report (2017). HGC tries to argue the opposite of what the data and logic would dictate with respect to potential CEMEX impacts on water quality, which are explained in detail in the HWG Final Report (2017). The reader is referred to the actual data, information, and logic presented in the HWG Final Report for comparison to unsupported speculation provided by HGC on this topic in HGC's April 2018 letter and in HGC's previous documents.
52. With respect to CEMEX operations, HGC states the following on page 21, "…the HWG and FEIR/EIS's dismissal of our comments on this point are not consistent with the best available information or science." The HWG's correction of HGC's interpretation of CEMEX impacts in the HWG Final Report (2017) was needed to correct HGC's misunderstanding of CEMEX operations. The test slant well pumping lasted nearly three years with GEOSCIENCE field staff and HWG members becoming quite familiar with operational details of the CEMEX facility. HGC made assumptions and inferences from aerial photos, which turned out to be incorrect.
53. On page 22, HGC states, "the recharge…in the vicinity of MW-7S elevated groundwater levels…and creates a seaward groundwater gradient…" HGC refers to its Figure 4 on page 12 as evidence of this statement, but the arrows drawn on Figure 4 to purportedly represent groundwater flow directions are not supported by any actual data. Therefore, at best the arrows can only be illustrative of HGC's conceptual interpretation since they are not based on actual groundwater levels in the aquifers. The HWG Final Report provides groundwater contour maps based on actual data, which show landward gradients for aquifers screened by the test slant well and no recharge impacts on the underlying aquifer from the perched aquifers. HGC does not provide groundwater elevation contours to support HGC's opinion. Furthermore, even with the increase in groundwater levels at MW-7S after a record wet year, data indicate ongoing

seawater intrusion in the 180-FTE Aquifer. Therefore, the brackish water recharge from the perched aquifers is not inhibiting sea water intrusion.

54. On page 22, HGC states, "…the FEIR/EIS fails to address the evidence that the TSW water quality will change and become fresher when the CEMEX operations are terminated…" This statement is incorrect as documented in the HWG Final Report. Dredge pond salinity is similar to groundwater salinity along the coastline (both are very near seawater salinity), including beneath the percolation ponds near the test slant well. However, the CEMEX well water is approximately half of sea water salinity and is used to wash sand during CEMEX operations followed by discharge of this water to the percolation ponds, thereby lowering the overall salinity of water percolating in the ponds. The net effect of the percolation pond water is to lower salinity in the test slant well. Again, this operation is described in detail in the HWG Final Report.

55. HGC makes a key acknowledgement at the top of page 22 stating, "…pumping of the proposed MPWSP wells will not impact the water on top of the semi-perching aquitard layer…" This reference is to what HGC and others are calling the "Dune Sand Aquifer" inland of MW-7 (but more appropriately referred to as the "A" Aquifer and 35-Foot Aquifer). HGC's statement corresponds to what has been stated by HWG for quite some time, and this acknowledgement negates many of HGC's other arguments presented here and in previous documents (e.g., that the MPWSP will somehow negatively impact purported fresh water pockets in the Dune Sand Aquifer).

56. In discussing capture zones as described in the FEIR/EIS on page 22, HGC states, "By omission, the conceptual illustration without the flow paths that by pass the area of production indicate that the MPWSP would act as a seawater intrusion barrier and only affect the area within the capture zone. The Project, as designed, is not a seawater intrusion barrier…" This statement essentially acknowledges the capture zone discussion and its implications as stated by both the FEIR/EIS and the HWG are correct; HGC's only point is that FEIR/EIS did not discuss flow paths just outside of the capture zone that continue beyond the capture zone. However, these flow paths outside the capture zone would continue inland anyway along the entire coastline without the MPWSP; thus, the project is not impacting the ultimate fate of these flow paths. On the other hand, all the flow paths within the capture zone will be captured by MPWSP wells and will no longer continue inland as they do without the MPWSP. Hence, there is an overall reduction in net sea water intrusion that occurs with implementation of the MPWSP. Similar conclusions were reached in a study done for a proposed MCWD desalination facility (Hydrometrics, 2006). Therefore, the FEIR/EIS has analyzed the capture zone dynamics correctly. In fact, the MPWSP capture zone will act as a sea water intrusion barrier, whether or not it was designed to do so.

57. In Figures 11, 12, and 13 on pages 24-26 HGC presents graphics with flow paths that clearly appear to be computer-generated. Such flow paths are heavily dependent on many variables and assumptions along with the computer program used to generate the flow paths. HGC does

not document important details of the methodology, values assigned to key variables, and assumptions that went into this analysis. This contrasts with the level of documentation provided in the HWG Final Report (e.g., Appendix H). Nonetheless, it is clear that HGC's figures and associated discussion are inaccurate because they don't account for the ocean as a recharge boundary.

58. Notwithstanding the comment above about the overall validity of HGC's Figures 11-13, some important technical points need to be made about these figures. First, Figure 11 (along with Figure 12 and 13) is labeled "Approximate Portion of Capture Zone in Ocean." This label fails to recognize the remaining portion of the capture zone is comprised of flow lines originating from the ocean (i.e., the entire capture zone is comprised of flow lines from the ocean). Second, Figure 12 fails to note that an extremely high percentage of water entering MPWSP wells still originates from the ocean under a flat gradient scenario, and that the size of capture areas from the ocean vs. inland does not equate to the proportion of water entering MPWSP wells from the ocean vs. inland. Third, HGC's Figure 13 is extremely misleading because it completely ignores the ocean being a massive recharge boundary and draws a capture zone for a purported seaward gradient as if the ocean doesn't exist above and adjacent to MPWSP intake wells. In fact, HGC's Figure 13 shows no flow lines originating from the ocean, which is where a majority of the water will still come from even under a seaward gradient.

59. With respect to HGC's (and others) comment regarding capture zones for the MPWSP, reference can be made to another study of capture zones completed for an MCWD proposed desalination facility (Hydrometrics, 2006). This study delineates capture zones for a variety of gradients for vertical pumping wells located 800 feet from the shoreline (i.e., screens much further from ocean compared to proposed MPWSP wells). Conclusions from the study include: a) for the inland gradient condition, "All pathlines begin at the ocean indicating that source all water flowing into the extraction wells is the ocean."; b) for the flat gradient condition, "All water extracted by the project wells is still captured from the ocean."; c) for the oceanward gradient, results of the study indicate a majority of water extracted by the wells still comes from the ocean; d) in addition, for the inland gradient, study results showed, "The project wells have a net beneficial impact on seawater intrusion because they capture intrusion that would otherwise flow inland."; and e) even for the flat gradient case, "The interception of seawater and reduced area of seawater intrusion are beneficial impacts of the project on seawater intrusion."

60. It should be recognized that HGC's Figure 14 on page 27 does not show the same areas in the top and bottom graphics in the figure; this is easy to see from the size of the ocean in each figure plus the different lengths/widths of each figure. The different areas and sizes of the figures make the model vs. observed levels appear more different than is really the case.

61. At the bottom of page 28 HGC makes the statement, "The primary cause of groundwater conditions in the Subbasin that has led to seawater intrusion is groundwater production." While we generally concur with this statement, we note the statement does not include pumping at the ocean shoreline. It is pumping further inland such as at former MCWD and Fort Ord production well locations, along with other inland municipal/domestic and agricultural pumping, that caused and sustains sea water intrusion. Now HGC and others are suggesting that purported "freshwater/slightly brackish water" allegedly present in pockets within the sea water intrusion zone could be developed for potable water supplies. HGC does not acknowledge that installation and pumping of a well within these zones will immediately or very quickly result in highly saline water flowing into the wells from the surrounding area of the sea water intruded aquifer. In effect, HGC is proposing to do the very thing that caused sea water intrusion in the first place (over pumping wells at inland locations).
62. On page 29 HGC alleges that the FEIR/EIS failed to evaluate cumulative effects of SGMA projects on the basin. While this is more appropriately an FEIR/EIS team response item, our understanding is that EIRs are only required to address reasonably foreseeable projects in the cumulative analysis. As the Groundwater Sustainability Plan (GSP) effort is just underway, currently unknown SGMA projects likely don't qualify as reasonably foreseeable. That being said, it seems clear that the MPWSP is one example of a potential SGMA project that could be important in helping the basin become sustainable. Meanwhile, the recommendation by HGC to pump brackish water (TDS up to 3,000 mg/L), either within or at the leading edge of the sea water intrusion zone, would cause further degradation of groundwater quality and is contrary to the intent of SGMA.
63. On pages 29 and 30 HGC refers to a MCWRA report's recommendation suggesting a moratorium on pumping from 180-Foot and 400-Foot Aquifer wells within a certain area; however, this MCWRA report is not evaluating wells screened at the ocean shoreline (such as proposed MPWSP slant wells) in its evaluation and recommendations. The MPWSP will comply with the MCWRA recommendations, and it will result in an additional source of potable water without further degrading the underlying aquifers.
64. At the top of page 31, HGC has a headline that states, "The FEIR/EIS's analysis of the MPWSP's impacts on groundwater quality within the slant well pumping area of influence must be revised." HGC's summary points in this section and in the conclusion section have been addressed in the responses above.
65. On page 31 HGC refers to TDS in MW-4S being below 3,000 mg/L. However, a review of all the available TDS data for MW-4S from 2015 to 2018 reveals TDS has never been less than about 8,000 mg/L (Table 2 in Monthly Monitoring Report). Thus, HGC's statement is simply not accurate. We also note that TDS in MW-7S exceeds the fresh water upper limit for TDS.

66. While HGC's discussion of SGMA and groundwater dependent ecosystem (GDE) issues is generally irrelevant to the FEIR/EIS, we note there is no indication a significant decrease in groundwater levels would occur beneath the Salinas River related to implementation of the MPWSP.

Comments on Jacobson James & Associates TM for City of Marina dated April 16, 2018

1. On pages 2 and 3 Jacobson James repeat their DEIR/EIS comments from a year ago and then express disagreement with the answers provided to those questions in the FEIR/EIS. Mere disagreement with the FEIR/EIS conclusions does not make the FEIR/EIS inadequate.
2. On page 4 Jacobson James refers to so called "chloride islands" in the 400-Foot Aquifer based on 2015 MCWRA mapping, and goes on to discuss potential gaps in the 180/400-Foot Aquitard. In this discussion, Jacobson James fails to mention the "chloride islands" shown on MCWRA maps are located four to seven miles inland from the CEMEX site and very far outside of the potential zone of water quality impacts related to ocean sourced groundwater flow paths for the MPWSP. In addition, we understand that rigorous review by MCWRA revealed the chloride islands are primarily associated with wells perforated in both aquifers as opposed to gaps in the aquitard.
3. On page 4, Jacobson James makes the statement, "Data gaps were identified in the understanding of the nature, continuity and competence of the aquitard overlying the deeper aquifer system"; however, the referenced MCWRA report does not say this. Even if the report did say this, having a data gap is not evidence of a discontinuity in the aquitard above the Deep Aquifer. If the potential implied gaps did exist in the aquitard above the Deep Aquifer, problems with increasing salinity in the Deep Aquifer would have occurred long ago. It is also noteworthy that Deep Aquifer geophysical and lithologic logs in the project vicinity show hundreds of feet of clay overlying the Deep Aquifer zones (e.g., Hanson, et.al., 2002; MCWD wells 10, 11, and 12).
4. Sections 2.2, 2.3, and 3.1 on pages 4 through 10 attempt to use AEM results to support various statements. We refer the reader to our comments above on the AEM Final Report. In addition, many of these arguments mirror HGC's Letter and we also refer the reader to our comments above on the HGC Letter.
5. On page 8 Jacobson James makes the statement that groundwater with TDS of 1,000 to 1,500 mg/L, "…may be, and frequently is, used by municipal water supply systems in California." No examples or documentation to support this statement are provided. To the contrary, groundwater in Arizona with TDS exceeding 800 mg/L is subject to desalination before being served to customers (Central Arizona Salinity Study, 2006). Indeed, it is rare for water purveyors to serve customers water with TDS exceeding 800 mg/L, as this requires customers to purchase bottled water due to taste issues. Furthermore, the California recommended MCL for TDS is 500 mg/L, with an upper limit TDS MCL of 1,000 mg/L.

6. Many of the statements and claims made by Jacobson James are similar to those presented by HGC (e.g., discussion of "recharge of fresh water" on page 9), and we refer the reader to our responses above to HGC comments.
7. On page 9 Jacobson James first bullet towards the bottom of the page discusses the 180-Foot Aquifer and references water quality trends in MW-4S ("groundwater in the shallow zone of monitoring well MW-4") as supporting evidence. However, MW-4S is located in the Dune Sand Aquifer and not the 180-FTE Aquifer. Furthermore, MW-4M is located in the 180-FTE Aquifer and shows the opposite trend as MW-4S, thereby negating the argument being made here.
8. On page 9 the second bullet towards the bottom expresses concern that the MPWSP will extract water from a purported "fresh water wedge". Presumably they are referring to the less saline upper portion of a sea water intrusion wedge. Regardless, while there is no evidence that MPWSP pumping will impact any true fresh water zones, it is interesting that MCWD and its consultants are proposing to develop purported "fresh water" pockets despite saying that doing so "may remove a potential barrier to further inland migration of the saline water wedge."
9. In the bullet at top of page 10 Jacobson James make the statement, "As saline water is drawn into the area surrounding the slant wells in the 180-Foot Aquifer, the heavier saline water could migrate through the gap in the 180/400-Foot Aquitard…" This statement is wholly unsupported. The actual data from borehole drilling, lithologic logging, geophysical logging, groundwater level fluctuations, and pumping test data all lead to the conclusion that no aquitard gap is present in this area. It is interesting that the only data available to calibrate the AEM data (MPWSP boreholes and monitoring wells) shows the opposite conclusion compared to the AEM data, indicating that the AEM calibration approach and methods need to be revisited. Also, it is important to note that even in the best case scenario of unbiased interpretation of AEM data with sufficient calibration data points, AEM data is merely one of multiple tools that could be used by the hydrogeologist. AEM data does not replace or substitute for more reliable data obtained by borehole drilling and monitoring well construction, and it certainly does not make sense to rely upon AEM data interpretations that are at odds with physical borehole data that served as the only AEM data calibration points.
10. Figure 3 and the associated discussion on page 11 are invalid, because the figure does not account for the ocean being a recharge boundary. The capture zones shown on Figure 3 assume the ocean does not exist. Thus, the discussion and conclusions regarding capture zones under different gradient scenarios must be disregarded.
11. The discussion regarding particle tracking at the top of page 12 states that particles (representing sea water intrusion) outside the capture zone of MPWSP wells will continue inland. However, these same particles would continue inland without implementation of the MPWSP project. Therefore, the net effect of implementing the MPWSP is reduced sea water

intrusion due to the fact that particles within the MPWSP well capture zone will not be allowed to continue flowing inland as they currently do without the MPWSP.

12. Jacobson James discusses in Section 3.3 on pages 12-13 potential for impacts from MPWSP on the Deep Aquifer system, in part, claiming the aquitard overlying the Deep Aquifer is not well characterized. However, geophysical and lithologic logs are available for three MCWD wells screened in the Deep Aquifer, the USGS nested Deep Aquifer monitoring well near the coast in Marina, and for other Deep Aquifer wells in the region. These logs for Deep Aquifer wells in the Marina area show hundreds of feet of clay separating the 400-Foot Aquifer from the Deep Aquifers. In addition, implementation of the MPWSP will result in a reduced vertical gradient and less potential for vertical migration of saline groundwater. Competence of the aquitard is also demonstrated by the fact that many years of heavy pumping from the Deep Aquifers by MCWD wells, which has resulted in Deep Aquifer groundwater levels more than 50 feet lower than groundwater levels in the 400-Foot Aquifer, has not yet resulted in migration of saline water from the overlying seawater intruded 400-Foot Aquifer.

13. On page 13 Jacobson James make the statement, "As shown by Dr. Knight's work and the recent MCWRA report, vertical migration of degraded water in the aquifer system occurs through preferential pathways where aquitards are thin or absent." First, we refer the reader to our comments above on the AEM study. Second, we note that in the MPWSP area, claims of gaps in the aquitard are clearly not valid as demonstrated by borehole drilling, lithologic logs, borehole geophysical logs, groundwater level fluctuations, and pumping test data. Third, there will be a reduced vertical gradient for vertical flow with implementation of the MPWSP. Fourth, potential for gaps in the aquitard are irrelevant to the MPWSP project outside of the area where flow paths from the ocean enter MPWSP wells.

14. On Section 3.5 on pages 13 through 16, Jacobson James make several comments regarding the groundwater modeling work conducted for the DEIR/EIS. These model comments have been addressed previously - most notably in the FEIR/EIS. Some additional responses to these types of groundwater model comments were also provided by GeoSyntec (August 2017), the HWG Response to Final HWG Report Comments (January 2018), and in other portions of the current HWG submittal (e.g., potential gaps in the 180/400-Foot Aquitard).

Response to EKI Memo dated April 17, 2018

Based on review of EKI's April 17, 2018 Memo, the HWG has the following comments:

1. EKI's memo suffers from the same blending of ill-defined terms as the HGC's Letter and other documents prepared by MCWD and City of Marina consultants. For example, on page 2 EKI essentially defines fresh water as up to 3,000 mg/L TDS. EKI mentions the MPWSP monitoring wells but fails to point out that TDS greater than 1,500 is associated with chlorides in excess of 500 mg/L and TDS of 3,000 is associated with chlorides exceeding 1,000 mg/L. Thus, EKI (along

with HGC and others) attempt to claim a portion of the sea water intruded zone defined by MCWRA using a 500 mg/L chloride threshold as "fresh water" by defining fresh water to contain chlorides up to double the standard used by MCWRA to define sea water intrusion in the first place.

2. EKI claims in summary point 1 on page 2 that the Final EIR/EIS, "Mischaracterizes water quality and hydrogeologic conditions within the Dune Sand Aquifer and 180-Foot Aquifer in the vicinity of the Project." While this is a vague statement lacking any specific examples, we note the FEIR/EIS relied on the same MPWSP water quality data being used as control points for the AEM study and is the most recent site specific data for the Dune Sand Aquifer, 180-FTE Aquifer and the 400-FT Aquifer as evidenced in usage in the AEM study. EKI is relying on same MPWSP data, and have provided no new data to support its opinion.

3. EKI claims in summary point 2 the FEIR/EIS, "Fails to acknowledge that slant well capture zones will extend into areas where Total Dissolved Solids ("TDS") concentrations in groundwater are less than 3,000 milligrams per liter ("mg/L"), which are considered suitable, or potentially suitable, for municipal or domestic water supply under the provisions of SWRCB Resolution No. 88-63;" The HWG notes MPWSP water quality data and other data (including MCWRA sea water intrusion maps) are available to assess the distribution of water quality, and are incorporated into the FEIR/EIS. EKI notes (Footnote 1 on page 3) the conditions associated with the definitions of "suitable" or "potentially suitable" for municipal or domestic water supply". However, EKI fails to note that extraction and treatment of such water at the inland locations mapped by the AEM study will generate additional seawater intrusion and harm the basin. Pumping in these aquifers was halted decades ago because of sea water intrusion. Pumping at the coast by projects such as the MPWSP and the former regional project supported by MCWD will serve to neutralize or reverse sea water intrusion in the well capture zone.

4. EKI claims in summary point 3 the FEIR/EIS, "Fails to demonstrate that the Project will not affect groundwater water quality outside of the capture zone of the slant wells…" The HWG notes for many years the flow in the 180-FTE Aquifer has been in an inland direction. As documented in the FEIR/EIS and HWG Final Report, the MPWSP will result in a net reduction in sea water intrusion by capturing and treating saline/brackish water through the MPWSP slant well system. The opinion that MPWSP pumping will lead to inland flow of saline water outside of the capture zone is inaccurate, because this inland flow of saline groundwater occurs without the MPWSP.

5. EKI claims in summary point 4 the FEIR/EIS, "Fails to assess groundwater quality impacts from the cumulative effects of slant well extraction and foreseeable decreases in inland hydraulic gradients, which are causing ongoing saltwater intrusion and must be addressed under the Sustainable Groundwater Management Act (SGMA) over the next 20 years." The HWG notes that the SGMA Groundwater Sustainability Plan will most likely document the causes of historical seawater intrusion as inland pumping by MCWD and others in the 180-FTE Aquifer and the 400-Foot Aquifer and will most likely document that the Deep Aquifer now being used by

MCWD is potentially being overdrafted.   A significant reduction in inland pumping and/or a series of injection wells or extraction wells will likely be required as SGMA projects to mitigate on-going sea water intrusion. Other basins have elected to build seawater barriers while adding imported water or recycled water to the basin to increase basin safe yield. The MPWSP will serve to increase local water supply as well as provide some mitigation for sea water intrusion, thereby contributing to long-term basin sustainability under SGMA.

6. EKI, like HGC and others, relies heavily on AEM results – please see HWG comments on the AEM study above.

7. At the bottom of pages 2 and 4, EKI states MW-4S TDS concentrations have declined to less than 3,000 mg/L in recent months. Yet examination of Table 2 in MPWSP test slant well monthly monitoring reports shows that TDS has not dropped below approximately 8,000 mg/L. However, it is clear that MW-4S TDS concentrations have been impacted by significantly wetter than normal rainfall conditions in the 2015-16 and 2016-2017 water years.

8. On page 4, EKI makes claims about groundwater flow paths outside of the capture zone with no supporting calculations or documentation. As discuss above, EKI fails to acknowledge that these flow lines outside the capture zone would occur and continue inland without implementation of the MPWSP. EKI also fails to note there will be a net reduction of sea water intrusion with implementation of the MPWSP due to capture of flow paths within the capture zone that would continue inland without the project. The FEIR/EIS correctly documents the net benefit of the MPWSP in this regard.

9. EKI's discussion on pages 5 and 6 of capture zones under various gradients is misleading and incorrect. EKI fails to recognize the ocean remains a massive recharge boundary under any gradient condition and still provides the vast majority of water to the MPWSP wells. In addition, the only portion of the capture zone that will become more saline is that portion containing flow lines originating from the ocean. These two fundamental concepts are ignored by EKI and result in an extremely flawed discussion of capture zones. Again, no actual data or analyses are provided to support EKI's flawed conclusions.

10. Regarding EKI Figure 5, the HWG notes this figure and associated text on page 4 do not describe that flowlines in the 180-FTE Aquifer are currently and historically inland because of inland pumping without any MPWSP pumping, and that flowlines outside the MPWSP capture zone will continue inland with or without the MPWSP. However, the inland gradient will be halted within the MPWSP capture zone and provide some mitigation of sea water intrusion.

Response to GeoHydros' Letter to MCWD dated April 17, 2018

Based on review of GeoHydros' April 17, 2018 Letter, the HWG has the following comments:

1. On page 1 of the cover letter GeoHydros states, "Contrary to the Final EIR-EIS's suggestion, however, we did not alter or create a separate model. We simply ran the model provided by the California Public Utilities Commission (CPUC)." First, it is important to note that GeoHydros did alter the model by adding slant wells and assigning pumping to the model that was not included in the CPUC model version of $NMGWM^{2016}$, and GeoHydros did not provide documentation of this modification to the model or make their modified model files available for review by others. Second, in his evidentiary testimony on November 3, 2017, Curtis Hopkins noted that GeoHydros added slant wells to the model and it was, "…very difficult to do that with the way that the model is currently set up." (page 4874, lines 1-3). However, there is no way for others to verify the model modifications (which apparently were quite challenging for GeoHydros to implement) and validate results obtained by GeoHydros because of the lack of documentation and lack of model files being made available to others for review.
2. On page 1 of the cover letter GeoHydros denies their modified version of $NMGWM^{2016}$ was flawed in regard to providing a comparison to superposition results reported in the DEIR/EIS, as explained in the FEIR/EIR response to DEIR/EIS comments. In addition, the first paragraph on page 3 of Summary states, "GeoHydros did not make a mistake in our application of the $NMGWM^{2016}$." However, GeoHydros' did not report making the necessary changes to $NMGWM^{2016}$ needed to properly represent stream-aquifer interaction for comparison to superposition model results. Applications of NMGWM have historically obtained input data related to stream-aquifer interaction from SVIGSM; however, as the superposition model did not involve use of SVIGSM input the stream-aquifer interaction model feature was directly added to the superposition model. Therefore, the comparison described by GeoHydros' in their March 27, 2017 letter of their modified version of $NMGWM^{2016}$ drawdown contours to superposition model drawdown contours is not valid.
3. Page 2 of the cover letter and page 3 under Summary make reference to, "…the Hydrologic Working Group's original version of the NMGWM…" It should be noted the NMGWM was not a HWG work product.
4. Much of page 3 under Summary is devoted to claims regarding the NMGWM not adequately representing perched groundwater conditions. It is important to note here that perched aquifers are typically not represented in groundwater models, because they are hydraulically disconnected from the regional aquifer system as is the case in this model. To the extent the perched aquifers are represented in the NMGWM and superposition models, MPWSP impacts in the perched aquifers will be overpredicted (i.e., actual project impacts will be less than predicted by model). In fact, there will be no impacts in the perched aquifers, as is

acknowledged by HGC on page 22 of its April 17, 2018 letter to MCWD, "…pumping of the proposed MPWSP wells will not impact the water on top of the semi-perching aquitard layer…"

5. Page 4 under Summary states that application of particle tracking to evaluate net impacts to water quality is a flawed methodology, and some other unspecified "technology" must be used. On the contrary, particle tracking is a standard approach and commonly used technology to evaluate water quality issues and is appropriate for its purpose in the DEIR/EIS. This same technology was used by Hydrometrics (2006) to evaluate a potential desalination facility for supplemental water supply for MCWD. This study revealed very similar conclusions as stated in the FEIR/EIS, and simulated well screens several hundred feet further inland than the proposed MPWSP slant well screens.

6. On page 10 regarding GH-31, GeoHydros states that, "…water budget analyses we performed and reported are valid…" Notwithstanding the lack of properly accounting for groundwater – surface water interaction and lack of proper model documentation by GeoHydros, it should be noted that other MCWD consultants have misreported GeoHydros' water budget analyses. For example, in Curtis Hopkins evidentiary testimony on November 3, 2017, he stated the GeoHydros' water budget model results showed the proposed MPWSP would extract 22% groundwater from the Dune Sand Aquifer and 3.5% groundwater from the 180-FTE Aquifer during the initial time step. When asked the duration of the initial time step, Mr. Hopkins testified, "…the first year." (p. 4877, line 3). In fact, Table 3 of GeoHydros March 27, 2017 DEIR/EIS model comment letter from which Hopkins obtained the water budget numbers shows the cited groundwater percentages are for one month of MPWSP well pumping and not one year, which is a major difference. The MPWSP well groundwater percentages simulated by GeoHydros after one year are 3.6% for the Dune Sand Aquifer and 4.9% for the 180-Foot Aquifer.

Comments on Hydrogeologic Conditions at Armstrong Ranch Property

MCWD and their consultants have often made reference to a potential water supply project at the Armstrong Ranch property in public forums. The Armstrong Ranch property is located approximately 2.5 miles inland and east of the proposed MPWSP wells and ocean shoreline (see attached Figure 2) and the Monterey Peninsula Landfill borders Armstrong Ranch to the north. Groundwater sources adjacent to landfills all across the State have been degraded and subject to monitoring and clean-ups. Therefore, we do not recommend construction of a recharge project adjacent to a landfill. Ground surface elevations vary across the Armstrong Ranch property but generally range from about 100 to 160 feet above mean sea level (MSL). The land surface slopes steeply on the east side of the property towards the Salinas River to a surface elevation of approximately 10 to 20 feet MSL within about 700 to 1,000 feet of the eastern edge of the property. The FO-SVA Aquitard is present beneath the property with the perched/mounded aquifer known as the 35-Foot Aquifer above the FO-SVA. The top elevation of the FO-SVA is variable but generally is approximately 10 to 20 feet MSL. Available data indicate perched/mounded aquifer groundwater levels beneath the property likely range from approximately 25 to 40 feet MSL with a groundwater flow direction towards the Salinas River to the northeast and east.

Our understanding of the hypothetical project at Armstrong Ranch is that water would be diverted from the Salinas River, and treated to comply with the surface water treatment rule requirements for delivery to the MCWD system. When surplus supply is available this water would be banked in an engineered subsurface storage facility (stored in the shallow perched/mounded aquifer beneath Armstrong Ranch) to be recovered when needed. A deep slurry wall would be constructed on the north and east sides of Armstrong Ranch and tied into the SVA Aquitard to retain the water in the perched/mounded shallow aquifer, and numerous recovery wells would be installed to pump out the stored water. Although only limited details of the hypothetical Armstrong Ranch project have been made available to the HWG, there are many constraints that would likely preclude development of a water supply project at Armstrong Ranch including:

- Presence of poor quality water beneath the adjacent landfill;
- Limited groundwater storage above the 35-ft Aquifer.
- The water supply project cannot operate without a ½ mile long and very deep (100-150 feet) slurry wall, which would be difficult to construct and extremely expensive;
- Low transmissivity of the perched/mounded aquifer sediments means low recovery rates;
- Low recovery rates require numerous recovery wells and associated infrastructure;
- Some of the recharged water will be lost to seeps and evaporation;
- Clean recharge water derived from the river will mix with native groundwater and be contaminated with high nitrate from agricultural fields. Treatment of this water for potable use will require an additional treatment system;
- There will likely be a very low total net recovery of stored water;
- Considering the costs of the slurry wall, recovery wells, and treatment processes, the water will likely cost more than ocean desalination;
- Seismicity of the area and potential for earthquakes would result in liquefaction damage if ground water is less than 50 feet from the surface. The damage includes differential settlement, quick conditions, and large-scale lateral spreading, resulting in damage to nearby structures, the proposed slurry wall, and landfill grading and infrastructure;
- Damage to the slurry wall or gaps included during construction could lead to contamination by landfill leachate or seepage flow to the landfill.

In addition to the constraints listed above, the HWG notes the location of Armstrong Ranch (2.5 miles inland of the proposed MPWSP wells) and plans for use of the perched/mounded aquifer to store water will preclude the Armstrong Ranch from any potential impacts related to implementation of the MPWSP. Even though a recharge project at Armstrong Ranch is both highly speculative and not recommended for the reasons listed above, the MPWSP will not prevent MCWD from utilizing the "Dune Sand Aquifer" (more specifically, the perched/mounded aquifer known as the 35-Foot Aquifer) for storage and/or augmentation of groundwater supplies and the MPWSP will have no impact on a surface water recharge project at Armstrong Ranch.

Comments on Other Related Documents

Dr. Rosemary Knight provided comments in a brief letter to MCWD dated April 24, 2018. All of Dr. Knight's main points in her letter were addressed in the previous HWG Response to HWG Final Report comments (January 2018) and/or in responses to other documents described above in this letter.

Sincerely,

The Hydrogeologic Working Group (Dennis Williams, Tim Durbin, Martin Feeney, Peter Leffler)

Dennis Williams

Tim Durbin

Martin Feeney

Peter Leffler

Attachments

Table 1. Wells with TDS above the Secondary Maximum Contaminant Level for TDS, City of Marina Area, California

Figure 1. AEM Study Results and Water Quality Conditions

Figure 2. Fatal Flaws of Armstrong Ranch Recharge Project

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