

Central Valley Regional Water Quality Control Board

24 December 2014

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East San Joaquin Water Quality Coalition
120 L Street
Modesto, CA 95354

FINAL APPROVAL OF EAST SAN JOAQUIN WATER QUALITY COALITION'S GROUNDWATER QUALITY ASSESSMENT REPORT

Thank you for your 5 November 2014 submittal of the East San Joaquin Water Quality Coalition's (ESJWQC's) Groundwater Quality Assessment Report Addendum (GAR Addendum). The GAR Addendum was submitted in response to my 4 June 2014 Conditional Approval Letter and associated staff review memo that required four main issues to be addressed and the signature and seal of a licensed professional geologist or civil engineer affixed to the GAR before its final approval.

The GAR, in combination with the GAR Addendum, now address all main issues outlined in the Conditional Approval Letter and therefore the GAR is approved and the high and low vulnerability areas and associated prioritization are accepted as proposed. This approval now establishes the submittal date for the ESJWQC's Comprehensive Groundwater Quality Management Plan as the 23 of February 2015, as indicated in Table 1. All other Order related compliance dates remain the same as originally outlined in the 4 June 2014 Conditional Approval Letter. These dates are summarized in Table 1. Table 2 presents the schedule for providing additional information for future deliverables.

Should you have any questions or comments regarding this letter, please contact Glenn Meeks at Glenn.Meeks@waterboards.ca.gov or by phone at 916-464-4701.

Original Signed By Adam Laputz for

Pamela C. Creedon
Executive Officer

Attachments: Table 1 - Compliance Dates in 24 December 2014 Conditional Approval of East San Joaquin Water Quality Coalition's Groundwater Quality Assessment Report

Table 2 - Schedule for Providing Additional Information in Future Deliverables.

22 December 2014 Staff Review Memo of ESJWQC GAR-Addendum

Table 1
Compliance Dates In the 24 December 2014 Final Approval Letter for the
East San Joaquin Water Quality Coalition's
Groundwater Quality Assessment Report

| Due Date* | Requirements |
|------------------|--|
| 23 February 2015 | Comprehensive Groundwater Quality Management Plan (24 December 2014 letter issued by the Executive Officer) |
| 4 June 2015 | Groundwater Quality Trend Monitoring Work Plan (VIII.D.3) and Groundwater Quality Assurance Project Plan (QAPP) for Trend Monitoring (Attach. B. IX) |
| 4 June 2016 | Management Practices Evaluation Program (MPEP) Group Work Plan (VIII.D2.a) and Groundwater QAPP for MPEP (Attach. B IX) |
| 4 June 2019 | Review and confirm or modify vulnerability designations (Attach. B IV.A.4) GAR update |

* Based on the effective dates following the approval of the GAR.

Table 2.
Schedule for Providing Additional Information in Future Deliverables.

| Deliverable | Items Identified in Staff Review |
|--|---|
| Trend Monitoring Work Plan and MPEP Work Plan | Propose plans to address identified geographic and temporal gaps in existing groundwater quality data. |
| | Include a map(s) of agricultural land use in the Peripheral Area. Annual spatial crop data are available from the USDA NASS. |
| | Propose prioritization of wells in the Peripheral Area if there is irrigated agriculture in the vicinity that could impact the well. |
| | Provide detailed contour maps and analyses of local flow conditions for any areas that are monitored or studied, or are addressed by a management plan. |
| | Assess the possibility of data sharing between the data-collecting entity, the third-party, and the Central Valley Water Board for existing monitoring networks. |
| | Determine the merit and feasibility of incorporating existing data collection efforts and well systems for obtaining groundwater quality information. |
| | Include a map(s) and information on tile drains within the Coalition area. The effort to reach out to irrigation districts and growers should be documented. |
| 2019 GAR Update | Categorize wells based on known depth rather than the well type. |
| | Provide rationale for selecting a depth threshold for well classification, and discuss the sensitivity of analyses to depth threshold or classification methodology (e.g. above/below Corcoran Clay). |
| | Include information on hydraulic conductivity of the underlying aquifer as measured through aquifer testing (e.g., pumping tests and slug tests). |
| | Group turf farms appropriately based on nitrogen application rates. |

Central Valley Regional Water Quality Control Board

TO: Joe Karkoski, P.E.
Supervising Water Resources Control Engineer
Chief, Irrigated Lands Regulatory Program

Clay Rodgers, P.G.
Assistant Executive Officer

FROM: Glenn Meeks, P.G.
Senior Engineering Geologist
Irrigated Lands Regulatory Program

DATE: 22 December 2014

SUBJECT: REVIEW OF THE NOVEMBER 2014 EAST SAN JOAQUIN WATER QUALITY
COALITION GROUNDWATER QUALITY ASSESSMENT REPORT ADDENDUM

On 5 November 2014, the California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board [CVWB]) received the East San Joaquin Water Quality Coalition (Coalition) Groundwater Quality Assessment Report Addendum (GAR Addendum). The GAR Addendum was submitted in response to a 4 June CVWB letter of conditional approval, along with a 3 June 2014 CVWB staff review memo of the coalition's initial 13 January 2014 GAR submittal and clarifications provided by Central Valley Water Board staff during a 23 July 2014 meeting with the Coalition. On 8 August 2014, the Executive Officer provided the Coalition with additional time (until 10 November 2014) to submit a revised GAR.

The initial staff GAR review was to determine the documents compliance with requirements pursuant to section VIII.D.1 of Waste Discharge Requirements General Order R5-2012-0116-R2 (Order), and section IV.A of Attachment B (Monitoring and Reporting Program) to the Order. The conditional approval letter listed four (4) main staff identified issues that were to be addressed by the Coalition prior to final approval of the GAR by the CVWB's Executive Officer. The letter also indicated compliance dates associated with the conditional approval and required inclusion of any remaining items identified in the staff review memo that were to be submitted in subsequent work plans or during the 2019 GAR update. The purpose of the July 2014 meeting was to discuss those items with the Coalition and clarify the main requirements of the conditional approval.

This memo serves as a review of the Coalitions responses to all CVWB staff comments and suggestions. Overall, the GAR Addendum satisfies the requirements of the Conditional Approval letter. The conditional approval letter requirements and original staff CVWB comments or recommended changes and the Coalitions summarized responses are provided below, along with a review of the adequacy of the responses.

Conditional Approval Letter Requirements

CVWB Comment/Requirement

1. *Include map(s) that show the location of small disadvantaged communities reliant on groundwater through domestic well use or small water systems, where such information is available or can be inferred from existing information.*

Coalition Response

The GAR Addendum included Figure 1 showing the locations of Disadvantaged Communities (DACs) within the Coalitions boundaries that are reliant on groundwater. The DACs were mapped according to locations of Census Designated Places (CDPs) meeting the criteria for disadvantaged or severely disadvantaged status [PRC §75005 (g)] using data for the 5-year median household income from the US Census Bureau 2012 American Community Survey and based on the 2012 statewide median household income (MHI). CDP data are available from the U.S. Census Bureau and have been through an extensive QA/QC process.

Response Adequacy

The Coalition's response adequately addresses Item 1 identified in the Executive Officer's 4 June 2014 Conditional Approval Letter.

CVWB Comment/Requirement

2. *Revise the priorities within high vulnerability areas to ensure small disadvantaged communities reliant on groundwater are the highest priority for implementation of management plans.*

Coalition Response

The DACs, and areas contributing recharge to these communities, have been incorporated in the GAR prioritization matrix (see Section 6.3 of the GAR) and quantitative priority calculations used to inform prioritization in the high vulnerability areas have been updated. Based on recalculated priority values for all cells (30m x 30m) in the ESJHVA, the prioritization rankings (1-3) for areas have been revised (**Figure 2 of the Addendum**). A generalized Priority 1 Area was delineated around cells with high computed priority values (**Figure 3 of the Addendum**).

For the purposes of implementation of the Groundwater Quality Management Plan (GQMP), the top crops will be considered in conjunction with the Priority Area rankings for the ESJWQC area. The top three crops for Priority 1 areas are Almonds (47.6%), Corn (8.4%) and Grapes (6%). The prevalence of these three crops within the Priority 1 Area and also within the overall Coalition area make management of agricultural practices associated with these crops an important factor in the Coalition's GQMP approach. Notably, the top three acreage crops to be used in the GQMP do not affect the GAR prioritization approach discussed above. However, while the focus of the future GQMP will be on the top crops in the Coalition area, and especially the generalized Priority 1 Area, the proximity of these crops to the PWS and DAC areas representing communities reliant on groundwater is considered (**Figure 8**).

Summary

The ESJHVAs remains as delineated in the GAR (see Section 6.2.5 of the GAR). The prioritization approach also remained the same as in the GAR but was updated with the additional DACs and the corresponding groundwater recharge contribution areas. Priority values for all areas were recalculated based on this revision to the prioritization matrix. A revised Priority 1 Area was delineated. The priority ranking (1-3) of all areas will be considered for purposes of the trend monitoring network design.

Response Adequacy

The Coalition's response adequately addresses Item 2 identified in the Executive Officer's 4 June 2014 Conditional Approval Letter. DACs have been mapped and added to the priority ranking system with a high priority ranking. Trend monitoring, GQMP and special study areas will be implemented initially focused in these DAC areas.

CVWB Comment/Requirement

- 3. Include map(s) that show the locations of wells with nitrate concentrations between 5 and 10 mg/L.*

Coalition Response

Nitrate concentrations are displayed on several maps within the GAR (Figures 5-4, 5-5, 5-6 of the GAR); these maps show nitrate concentrations separately for shallow wells, deep wells, and wells in the peripheral area. The additionally requested map (**Figure 9 of Addendum**) further conveys this information showing all wells with a maximum historically observed nitrate concentration of 5 mg/L (as N) or greater.

Response Adequacy

A figure showing the locations of wells with Nitrate concentrations greater than 5 mg/L has been included. The Coalition's response adequately addresses Item 3 identified in the Executive Officer's 4 June 2014 Conditional Approval Letter.

CVWB Comment/Requirement

- 4. Include a discussion and rationale for excluding from the proposed East San Joaquin Water Quality Coalition High Vulnerability Area (ESJHVA) all wells with the observed nitrate concentration above 5 mg/L and below 10 mg/L, or include such wells in the methodology for designating the ESJHVA.*

Coalition Response

To the extent possible, the Coalition attempted to retain a scientific basis to the determination of the ESJHVA in the GAR (see Section 6.2 of the GAR). The scientific basis was founded on a conceptual model recognizing intrinsic physical attributes that likely affect vulnerability and further informed through use of statistical analyses as described in the GAR. The ESJHVA proposed in the GAR captures nearly all wells with known historical nitrate exceedances of the maximum contaminant level (MCL) and largely retains the scientific basis from which it originally

evolved. However, during the determination of the ESJHVA, the Coalition extended the area to encapsulate all wells with historical exceedances of the MCL for nitrate, even if the physical attributes did not suggest high vulnerability, in order to recognize and incorporate areas where concentrations are above the groundwater quality objective. Further extending the high vulnerability area to capture all wells with nitrate concentrations above 5 mg/L (as N), without regard for the intrinsic physical properties of the location, would greatly deviate from the scientific basis of the high vulnerability determination and is conceptually flawed. In the context of the conceptual model for groundwater vulnerability used in the GAR, it is believed that wells exhibiting nitrate concentrations between 5 and 10 mg/L are likely to be influenced by groundwater flow paths of greater distance when compared to wells with exceedance concentrations. Furthermore, the depth of wells is variable and commonly not known and locational accuracy, especially for CDPH wells used in the analysis, is uncertain. Consequently, the flow path for groundwater measured in a well is also uncertain. The ESJHVA area also captures a very high percentage (93%) of wells with maximum observed nitrate concentrations between 5 and 10 mg/L and clear spatial associations between the ESJHVA and wells with concentrations of 5 mg/L or greater are apparent, as shown in **Figure 9** and discussed in Section 6.2 of the GAR.

Additionally all wells with concentrations between 5 and 10 mg/L and with significant increasing temporal trend Nitrate concentrations are within ¼ mile of the ESJHVAs. Further analysis by the Coalition's consultant, Luhdorff and Scalmanini Consulting Engineers, has shown that 98% of these wells are within the delineated HVAs and that only two wells fall outside, but are still within ¼ mile of the HVA and 99.6% of the wells are located appropriately relative to the HVAs in relation to both increasing and decreasing trends.

Response Adequacy

Based on the most recent analysis (see attached e-mail dated 3 December 2014), showing that 98% of wells with Nitrate concentrations between 5 and 10 mg/L are located within the HVAs, the Coalition's response adequately addresses Item 4 identified in the Executive Officer's 4 June 2014 Conditional Approval Letter.

CVWB Staff Memo Comments

Item 1. Land use and management practices information.

CVWB Comment/Requirement

Staff generally concurs with the methods and conclusions generated for this component, although the USGS fertilizer use estimations only include data through 2006. Recommended revisions under item 1 are discussed next.

- a. *Turf farms are grouped under Grasses land use category with alfalfa, pasture, and clover (Table 4-1). Section 4.2.3 states that crops were grouped into 12 categories based in part on similarities in estimated typical nitrogen (N) application rates (pounds per acre per year). However, Rosenstock et al. 2013 estimates N applications to turf at 90-260 pounds, while alfalfa (20 pounds) and clover (11 pounds) have much lower application rates. It would be more appropriate to group turf farms with Vegetables or Grains due to similar N application*

rates. Because turf farms comprise a small percentage (less than 2%) of the Valley Floor area, this grouping change would not likely affect the final vulnerability designations. Staff is therefore not recommending this change for the 2014 GAR. However, this change should be made in the five-year GAR update if still applicable.

- b. A map(s) of agricultural land use in the Peripheral Area should be submitted with the trend monitoring work plan. Additionally, the information on the Peripheral Area should be included in the 2019 GAR, as the GAR should address the entire coalition area, including agricultural lands above the Valley Floor. Annual spatial crop data are available from the USDA NASS.*

Coalition Response

No direct responses were addressed to these issues, but responses can and should be addressed in the 2019, five-year GAR update, if still applicable.

CVWB Comment/Requirement

Item 2. Groundwater contour maps and flow directions.

Groundwater level contour maps were developed for the GAR using a hierarchical approach, starting with the most recent groundwater elevation data and using older data where needed to fill in spatial gaps. The information was interpolated across the region. The GAR Executive Summary provides a good summary of conclusions:

“Contours of the calculated recent spring and fall groundwater elevations within the Central Valley Floor area show a steeper groundwater surface with greater hydraulic gradients in the eastern part of the Central Valley Floor area with the presence of some notable local groundwater depressions, particularly in the vicinity of Chowchilla, between Merced and Madera, and east of Turlock. The hydraulic gradient of the groundwater surface generally flattens to the west, particularly in the northern and western part of the Coalition region. Both spring and fall groundwater elevation contours indicate that groundwater generally flows in a southwestern direction away from the hills and mountains to the northeast.”

The spatial resolution of the groundwater contour maps covers the entire coalition area, so it is a very generalized description. There are many areas on figures 3-16 and 3-17 that likely do not represent local conditions. Staff’s recommendations are below.

- a. Section 3.3.1.4 states that “[i]n an effort to represent more regional flow paths rather than more localized anomalies, the depth to groundwater raster and DEM raster were both smoothed prior to performing this calculation.” Local flow conditions may differ significantly from regional flow paths and therefore more detailed analyses may be needed to address local studies that will be conducted for the trend monitoring workplan, the MPEP, or to address other data needs.*
- b. The MPEP Work Plan should include maps and information on tile drains within the coalition region. Figure 3-8 is a map of tile drains based on DWR water quality sampling points, but none of the locations are within the coalition area. Section 3.2.3 states that “[t]ile drains apparently exist along the western edge of the coalition region, although specific locations for*

these features are not known.” Irrigation districts and growers should be approached regarding maps of tile drainage properties. If irrigation districts and growers are approached and are not able to provide information, this effort should be documented.

Coalition Response

No direct responses were addressed to these issues, but responses can and should be addressed in future deliverables, such as the Management Practices Evaluation Program (MPEP) Work Plan, Trend Monitoring Work Plan or other future work to address local data needs.

CVWB Comment/Requirement

Item 3. Identify recharge areas upgradient of communities where groundwater serves as a significant supply source.

Section 3 of the GAR identifies public water systems that are reliant on groundwater, if the public water system’s boundaries were available in the California Department of Public Health (DPH) California Environmental Health Tracking Program’s (CEHTP) Public Water Systems Boundary Tool. The GAR preparers then used GIS hydrology tools to estimate upgradient contributing recharge areas (GAR page 18).

The GAR provides information on recharge areas upgradient to a small portion of existing public water systems. The GAR does not address any small disadvantaged communities reliant on groundwater through domestic well use or small water systems. The current GAR should identify these communities on maps and should include these communities in the High Priority Areas where water quality is impacted (see Item 10 below). Below are some suggestions on how to address these issues to the extent feasible with the limited data that are available.

Public water systems

- a. *DPH’s Drinking Water Source Assessment and Protection Program (DWSAP) provides a list of public water systems in California called Completed Assessments and List of Sources¹. This 2004 list contains 531 public water systems in Madera, Merced, and Stanislaus counties, although some of these systems in Merced and Stanislaus counties are likely west of the San Joaquin River and thus not within the boundaries of this GAR. The CEHTP Public Water Systems Boundary Tool provides mapped boundaries for 25 of these 531 public water systems (these are the 25 systems that are mapped in the GAR)².*

The GAR preparers could attempt to map the 531 public water systems mentioned above (or the subset of those within the coalition boundary area) with a more manual

¹ At the time that the 3 June 2014 memo was prepared, this document was available online at <http://www.cdph.ca.gov/certlic/drinkingwater/Pages/DWSAP.aspx>

² DPH defines “public water system” as a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.

electronic process (e.g., searching for the name of the entity/location online), and then run the GIS hydrology tools to estimate upgradient contributing recharge areas.

- b. The GAR preparers could estimate upgradient contributing recharge areas to each square-mile section of land that contains a DPH well result. This would require identification/evaluation of local groundwater flow directions in the vicinity of the targeted DPH wells (see Item 2A above).*

Domestic wells and small systems

There does not appear to be an existing source of data showing spatial distribution of domestic wells and small systems. However, it is likely that people living outside of public supply areas are using domestic wells or small systems.

- c. The GAR should recognize that there are likely many thousands of people using domestic wells or small water systems within the coalition area. There may be estimates in reports from USGS, DPH, and/or the State Water Board that could be referenced.*
- d. The GAR could estimate the areas outside of public systems (by using the estimates from (a) or (b) above).*
- e. Staff recommends that the GAR should document attempts made to obtain domestic well data from the counties.*

Coalition Response

No direct responses have been addressed to these issues, other than DACs having been added to the GAR, as indicated previously. Further responses can and should be addresses in conjunction with future trend monitoring, MPEP implementation of other local data studies or during the GAR update.

CVWB Comment/Requirement

Item 4. Soil Survey.

Section 3.2 (Surface and Shallow Subsurface Sediments Characterization) of the GAR provides detailed information on shallow soil hydraulic conductivity, soil chemistry, and the Corcoran Clay, and staff concurs with the characterization of the area. The GAR identifies significant areas of high salinity, alkalinity and acidic soils. Refer to page ES-3 for a good summary of the findings and conclusions for this item.

It should be noted that the shallow soil hydraulic conductivity and vertical hydraulic conductivity information provided is not the same as the hydraulic conductivity of the underlying aquifer as measured through aquifer testing (e.g., pumping tests and slug tests). The GAR does not include information on this deeper hydraulic conductivity, which can vary vertically. If such information is readily available, it should be provided in any updates to the GAR.

Coalition Response

No direct response has been addressed to this issue. Further responses can and should be addresses in the GAR update.

CVWB Comment/Requirement

Item 5. Groundwater Quality Data.

Based on the Order requirement to analyze shallow groundwater constituent concentrations, the coalition attempted to group each water quality monitoring result as either “shallow” or “deep.” In many cases, detailed information on the well that would facilitate easy classification of depth category does not exist or is not available. This lack of information required the coalition to make some assumptions and interpretations in order to compile a shallow groundwater quality dataset.

Well Depth Categories

Section 5.1 (p.26) states that “...groundwater quality data were differentiated by interpreted depth category.” Wells with known depths of less than 200 feet were categorized as “shallow”, but the GAR does not include information on how this depth was determined to be an appropriate cutoff. Lockhart et al (2013) categorized wells within the GAR study area as shallow at 70 feet or less depth.

Section 5.1 (p. 26) states that “Deep wells included wells with depths greater than 200 feet and also municipal wells, irrigation wells, or other well uses...” This sentence seems to indicate that even if an irrigation well depth is known to be less than 200 feet, the well will still be categorized as deep. Water Board staff notes that irrigation wells, particularly older wells, may have multiple screened intervals or be gravel packed to the near surface or surface. Additionally, irrigation wells installed by cable tool drilling in areas with high hydraulic conductivity are often less than 200 feet in depth.

Section 3.2.2.2 states that the Corcoran Clay is “generally believed to divide deeper groundwater zones from shallow groundwater zones” and unconfined or semi-confined groundwater from confined groundwater. It also states that the Corcoran Clay depth and thickness varies across the coalition region, with the depth to the top of the clay ranging from less than 50 feet to more than 300 feet. If shallow wells are defined as less than 200 feet in depth to interpret groundwater chemistry, flow directions, and vulnerability; then the results of these interpretations are a mixture of wells completed both above and below the Corcoran Clay.

- a. *At a minimum, wells with known depths should be categorized based on their depth rather than the well type in the future GAR updates.*
- b. *The GAR update should provide an explanation as to how the 200 foot depth cutoff was selected, whether choosing such a cutoff resulted in categorizing wells both above and below the Corcoran Clay as shallow (or deep), and the sensitivity of the analysis to depth cutoff or methodology (e.g., selecting a shallower depth for cutoff or using above/below the Corcoran Clay to define shallow/deep wells). If it is more justified to use*

the Corcoran Clay layer as the general dividing line between shallow groundwater and deep groundwater, the next GAR update should reflect the change. Well depth categorizations would be refined depending on the depth to the Corcoran Clay at each well.

It should also be noted that section 5 of the GAR identifies geographic and temporal deficiencies in available groundwater quality data. The trend monitoring work plan, or another technical report, should specifically address these deficiencies with plans to fill the needed data gaps.

Coalition Response

No direct responses were addressed to these issues, but responses can and should be addressed in the GAR update, Trend Monitoring Work Plan and/or in future work to address data gaps.

CVWB Comment/Requirement

Item 6. Information on existing groundwater monitoring programs.

Section 7 of the GAR provides a good description of existing groundwater monitoring programs throughout the coalition region in order to “preliminarily assess the distribution of existing monitoring wells that may potentially be used for purposes of the Coalition’s trend monitoring program.” These include groundwater monitoring programs at DWR, DPR, DPH, State and Regional Water Boards, USGS, Merced Irrigation District, Turlock Irrigation District, Oakdale Irrigation District, and local groundwater management plans. The GAR concludes that “...the coverage of existing wells...appears to include wells located in the Priority 1 areas, other high vulnerability areas, and also low vulnerability areas. It appears that there is a large pool of existing, already monitored wells that can serve as potential candidate wells for the trend monitoring network.” The trend monitoring workplan and the MPEP Workplan should:

- a. Assess the possibility of data sharing between the data-collecting entity, the third-party, and the Central Valley Water Board for existing monitoring networks (or portions thereof) and/or relevant data sets.*
- b. Determine the merit and feasibility of incorporating existing groundwater data collection efforts, and their corresponding monitoring well systems for obtaining appropriate groundwater quality information to achieve the objectives of and support groundwater monitoring activities under the Order.*

Coalition Response

No direct responses were addressed to these issues, but responses can and should be addressed in the Trend Monitoring Work Plan, MPEP Work Plan and/or in future work to address data gaps.

CVWB Comment/Requirement

Item 7. Determine where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor.

The GAR provides an extensive analysis of existing, readily available groundwater quality data and where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities in sections 5 and 6. The GAR analyzes data for nitrate, TDS, and pesticides, and accurately and appropriately compares the results to water quality thresholds listed in SWRCB's Water Quality Goals Online Database. Section ES 4.4 provides a good summary of this section, starting with a general conclusion that high concentrations of nitrate are found in shallow groundwater throughout much of the western part of the Central Valley Floor.

The maps for nitrate data focus on exceedances of the nitrate Maximum Contaminant Level (MCL) rather than groundwater quality impacts from nitrate, which would include concentrations above naturally occurring levels. Section 6.2.6.1 of the GAR indicates that the proposed East San Joaquin High Vulnerability Area (ESJHVA) captures 93 percent of wells with a most recent observed nitrate concentration at 5 mg/L or above.

- a. *The current GAR should include a map showing the locations of wells with observed nitrate concentrations between 5 and 10 mg/L in the Order area.*

Coalition Response

Addressed in Item 1 of the Conditional Approval Letter Response Section.

CVWB Comment/Requirement

Item 8. Hydrogeologic information, GIS, graphics.

The GAR includes information on the geologic and hydrogeologic settings, sediments characterizations, soil chemistry, hydraulic conductivity, Corcoran Clay, depth to groundwater, groundwater flow directions, and recharge (some of which were previously mentioned in this memo). The coalition appropriately utilized GIS extensively in the GAR development, and there are numerous figures and tables included that are well done, clearly convey the information, and support the data analyses.

Coalition Response

No response necessary.

CVWB Comment/Requirement

Item 9.a. Designate high vulnerability groundwater areas.

The GAR utilizes a multiple linear regression analysis based on the developed conceptual model to determine the East San Joaquin Water Quality Coalition High Vulnerability Area (ESJHVA). Section 6 provides information on some other approaches that have been used in other studies, as well as a discussion on why multiple linear regression was chosen for this effort. For the GAR, the statistical model was developed using observed groundwater quality,

land use and hydrogeologic characteristics. Staff recommends the following changes or information be provided for the current GAR.

- i. Section 6.2.6.2 of the GAR states “[o]f the total area of sections in which a pesticide exceedance has been reported, 96 percent of the total area of these sections falls within the ESJHVA.” Since the location of wells monitored by the Department of Pesticide Regulation is given to the section resolution with the actual well location unknown, the ESJHVA should be extended to include the complete section where there has been a pesticide exceedance.*
- ii. Section 6.2.6.1 of the GAR indicates that the proposed ESJHVA captures 93 percent of wells with a most recent observed nitrate concentration between 5 and 10 mg/L. An explanation should be provided on why the ESJHVA does not include the additional seven percent of wells between 5 and 10 mg/L.*
- iii. The proposed ESJHVA includes a one-half mile buffer around the Hydrogeologic High Vulnerability Area (HHVA) to include an exceedance well when there is an exceedance well outside of the HHVA but near the HHVA. Section 6.2.5 of the GAR describes the “...gradational nature (transition from coarse to fine deposits) and intrinsic heterogeneity and discontinuity of the alluvial channel and fan deposits...” in the HHVAs, “...where the vulnerability might not be as well characterized by mapped shallow and surficial geologic materials alone. Areas with alluvial deposits from migrating channels and fans are less likely to have major continuous layers that would prevent or greatly impede the vertical movement of a contaminant into the groundwater, even if the surficial soils and sediments suggest a lower vulnerability.” These conclusions seem to suggest the buffer should be extended around the entire HHVA, or those portions of the HHVA that are known to have the aforementioned characteristics, regardless of proximity to an exceedance well. An explanation as to why the buffer was not extended in these areas should be added.*

Coalition Response

Addressed in Item 4 of the Conditional Approval Letter Response Section.

CVWB Comment/Requirement

Item 9.b. Information used to designate HHVAs

The Coalition met the requirement to propose vulnerability designations by using a multiple linear regression model that considered physical properties (soil type, depth to groundwater, known agricultural impacts to beneficial uses, etc.) and management practices (irrigation method, crop type, nitrogen application and removal rates, etc.) to derive vulnerability scores. Higher vulnerability scores were classified as high vulnerability areas. In the selected modeling approach, only the most recent nitrate concentration for any given well was used to assemble the dependent variable data. Future revisions to the GAR should reconsider the use of only the most recent nitrate concentration, since seasonal or periodic changes in groundwater chemistry may occur and the most recent result may not be representative. While Board staff might have chosen other approaches, the outcome of the proposed HVAs seems reasonable, provided that recommended changes are made.

- i. Table 6-4 gives results for each of the hydrogeologic variables (coefficient and associated p-value), but the results for the overlying land use control variables that were*

used in modeling are omitted. Because of the categorical nature and a large number of the land use variables, the results are important to assess how the models performed and those results should be provided in the revised GAR.

Coalition Response

Item 5. Of the GAR Addendum provides the requested land use variables.

Adequacy

The response complies with the request and is therefore adequate.

CVWB Comment/Requirement

Item 9c. Rationale for proposed vulnerability designations.

The GAR provides good rationale for the proposed vulnerability designations. The rationale should be expanded as needed in the revised GAR due to recommended changes to items 9.a and 9.b above.

Coalition Response

No response was addressed to this issue. But none appears needed.

CVWB Comment/Requirement

Item 10. Prioritize high vulnerability areas.

Section 6.3 describes how the High Vulnerability Areas were prioritized into three groups using a GIS statistical prioritization matrix and weighting factors. Please see figure ES-4 for the proposed prioritization outcome. The following changes should be made in the current GAR.

- i. Small disadvantaged communities reliant on groundwater in high vulnerability areas should be identified as High Priority Areas. See Item 3 above.*
- ii. The GAR proposes a three-tier prioritization system of the ESJHVAs including High, Moderate, and Low Priority Areas. Staff recommends that the names be changed to Priority 1 Area, Priority 2 Area, and Priority 3 Area to avoid labeling some high vulnerability areas as Low Priority. All high vulnerability areas are a priority in the ILRP, and the label Low Priority for a High Vulnerability Area may lead to confusion.*
- iii. Prioritization of impacted wells in the Peripheral Area if there is irrigated agriculture in the vicinity that could impact the well should be proposed in the trend monitoring and MPEP workplans.*

Coalition Response

Addressed in Item 2 of the Conditional Approval Letter Response Section.

CVWB Comment/Requirement

Item 11. Compliance with Sections 6735(a) and 7835 of the California Business and Professions Code.

Section 7835 of the California Business and Professions Code states that "All geologic plans, specifications, reports, or documents shall be prepared by a professional geologist or registered certified specialty geologist, or by a subordinate employee under his or her direction. In addition, they shall be signed by the professional geologist or registered certified specialty geologist or stamped with his or her seal, either of which shall indicate his or her responsibility for them."

Section 6735(a) of the California Business and Professions Code states that "All civil (including structural and geotechnical) engineering plans, calculations, specifications, and reports (hereinafter referred to as "documents") shall be prepared by, or under the responsible charge of, a licensed civil engineer and shall include his or her name and license number. Interim documents shall include a notation as to the intended purpose of the document, such as "preliminary," "not for construction," "for plan check only," or "for review only." All civil engineering plans and specifications that are permitted or that are to be released for construction shall bear the signature and seal or stamp of the licensee and the date of signing and sealing or stamping. All final civil engineering calculations and reports shall bear the signature and seal or stamp of the licensee, and the date of signing and sealing or stamping. If civil engineering plans are required to be signed and sealed or stamped and have multiple sheets, the signature, seal or stamp, and date of signing and sealing or stamping shall appear on each sheet of the plans. If civil engineering specifications, calculations, and reports are required to be signed and sealed or stamped and have multiple pages, the signature, seal or stamp, and date of signing and sealing or stamping shall appear at a minimum on the title sheet, cover sheet, or signature sheet."

Although not specified as a requirement in the Order, the GAR contains information that is consistent with the requirement of the aforementioned sections of the California Business and Professions Code, and, therefore, the appropriate signature or stamp should be included.

Coalition Response

The GAR Addendum has been signed and stamped by Nicholas Watterson, Professional Geologist License No. 9076.