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SECRETARY FOR
ENVIRONMENTAL PROTECTION

Central Valley Regional Water Quality Control Board

3 February 2016

Tim Ashlock
Buena Vista Coalition
P.O. Box 756
Buttonwillow, CA 93206

BUENA VISTA COALITION'S GROUNDWATER QUALITY ASSESSMENT REPORT

Thank you for the 4 February 2015 submittal of the Buena Vista Coalition's (Coalition) Groundwater Quality Assessment Report (GAR). The GAR was submitted in response to Waste Discharge Requirements General Order R5-2013-0120 for Growers within the Tulare Lake Basin that are Members of a Third-Party Group (General Order). Central Valley Water Board staff has reviewed the GAR and has noted areas within the report that must be addressed to comply with the General Order.

Attached is the staff review memo, which outlines elements of the GAR that need revision. Please revise the GAR in accordance with the staff review memo and resubmit by **4 April 2016**.

Members within high vulnerability areas (HVAs) identified in the 16 March 2015 Revised High Vulnerability Map and any new HVA identified during GAR revisions will need to comply with the General Order's high vulnerability requirements. The General Order requires the certification of Nitrogen Management Plans by 1 March 2016 and submittal of Nitrogen Management Plan Summary Reports by 1 March 2017 (per Revised Order R5-2014-0143).

If you have any questions regarding this letter, please contact David Sholes at (559) 445-6279 or by email at david.sholes@waterboards.ca.gov .

Sincerely,

Clay L. Rodgers

for Pamela C. Creedon
Executive Officer

Enclosure(s) Central Valley Water Board Staff Review Memo of the Buena Vista Coalition's GAR

cc: Sue McConnell, Central Valley Water Board, Rancho Cordova

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Central Valley Regional Water Quality Control Board

TO: David Sholes, CEG
Senior Engineering Geologist
Irrigated Lands Regulatory Program

FROM: Ryan K. West
Engineering Geologist
Irrigated Lands Regulatory Program

DATE: 3 February 2016

SUBJECT: REVIEW OF THE GROUNDWATER QUALITY ASSESSMENT REPORT FOR THE BUENA VISTA COALITION

On 4 February 2015, the California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) received the Buena Vista Coalition (Coalition) Groundwater Quality Assessment Report (GAR). The GAR provides the foundational information necessary for design of the Management Practices Evaluation Program, the Groundwater Quality Trend Monitoring Program, and the Groundwater Quality Management Plan. Central Valley Water Board staff reviewed the GAR to determine compliance with requirements pursuant to section VIII.D.1 of Waste Discharge Requirements General Order R5-2013-0120 (General Order), and section IV.A of Attachment B (Monitoring and Reporting Program or MRP) to the General Order.

Overall, staff recommends that the GAR be revised to meet the terms and conditions of the General Order.

The objectives of the GAR are to:

- Assess all available, applicable and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation;
- Establish priorities for implementation of monitoring and studies within high vulnerability areas;
- Provide a basis for establishing work plans to assess groundwater quality trends;
- Provide a basis for establishing work plans and priorities to evaluate the effectiveness of agricultural management practices to protect groundwater quality; and
- Provide a basis for establishing groundwater quality management plans in high vulnerability areas and priorities for implementation of those plans.

Table 1 (see pages 9 and 10) provides descriptions of the required Groundwater Quality Assessment Report components from the General Order and MRP and lists the section in the GAR that addresses each component. Recommended revisions/additions for incomplete items are provided below. If an item does not have recommendations provided below, the GAR has met the requirements for that item. The memorandum item numbers correspond to item numbers in Table 1.

Item 1. Assessment of Readily Available, Applicable and Relevant Data and Information to Determine High and Low Vulnerability Areas.

The General Order (Section VIII.D.1) requires that the GAR provide an assessment of all readily available, applicable and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation. While a portion of the available data was discussed in the GAR and referenced by the document, some available information was not identified or evaluated. This has given rise to uncertainties in the evaluation and determination of high and low vulnerability areas. Recommended revisions include the following:

A. The GAR did not provide hydrogeologic information (geologic formations, hydrogeologic units, aquifers, aquitards, geologic structure, etc.) for the Coalition's area. The GAR should provide a clear and detailed description of the unconfined, semi-confined, and confined groundwater systems, where they exist within the Coalition's area, and the interactions between these systems. The GAR should also include a discussion regarding the difference in the depths of well completion that exists across the Coalition's area (completed both above and below the E-Clay or other low permeability units) and how the various depths of completion may affect groundwater quality (e.g.: wells that are completed in different aquifers [shallow unconfined, deeper semi-confined and deep confined aquifers] have different sediment/groundwater chemistries; various depths of wells produce different ages of groundwater; and that groundwater intercepted by the wells may represent different recharge areas).

   A discussion/acknowledgement that well bores may provide potential preferential pathways for vertical migration between aquifers and how this may reflect on groundwater chemistry should be provided in the GAR. As stated by a variety of USGS investigators (Williamson et al. 1989, Bertoldi et al. 1991, Burow et al. 2012), the high density of wells constructed with long perforated sections or multiple well screens provides vertical hydraulic connections within the aquifer system. The presence of tens of thousands of irrigation wells perforated at various levels (Bertoldi, Johnston, and Evenson 1991) within the Central Valley has lead USGS investigators and modelers to the concept of a single heterogeneous aquifer with varying vertical leakage and confinement.

B. Well construction information for groundwater wells that were utilized for collection of groundwater quality data was not provided in the GAR. While some individual well details have been submitted by the Coalition via various methods (emails, meetings, etc.) over

various time periods, the GAR did not contain this information. The GAR should be a stand-alone document that contains well construction information and piezometer construction information that are summarized in a tabular format that is easily interpreted. The GAR should be revised to include this information. A figure needs to be included in the revised GAR that shows the locations of each of the wells and piezometers.

Evaluating groundwater quality data without knowing the depth within the aquifer from which the sample was obtained provides an incomplete picture for purposes of assigning vulnerability. Well construction information should be utilized in the evaluation of water quality data (e.g., well construction details should be compared to the depth to groundwater maps contained in the GAR and the historical maps presented on the California Department of Water Resources website to determine potential differences between shallow and deeper groundwater quality).

Well construction in relation to the depth of first encountered groundwater is particularly important as it has been established by a variety of USGS investigators and academics that nitrate concentrations decline with depth below first encountered groundwater (Burow et al. 2012; Fuhrer et al. 1999). Therefore, areas for which only deep groundwater quality data are available cannot be assumed to be low vulnerability based solely on this data. Additional efforts need be made to obtain shallow groundwater quality data (domestic well data, etc.) to comply with the requirements of the General Order (MRP Section IV. A. 2); there are numerous locations within the Coalition's primary area that could potentially contain domestic supply wells (see Attachment B to this memorandum). A discussion should be developed regarding differences in shallow groundwater concentrations of constituents of concern (COC's) and deeper groundwater chemistry obtained from the same region.

As discussed above, although the GAR did not include well construction details, the Coalition has submitted information on the Buena Vista Water Storage District's (BVWSD) deep monitoring wells in the past and referenced documents in the GAR that include this information. A preliminary review of available data for the BVWSD deep groundwater monitoring wells (DMW1 – DMW12B) indicates that these wells are completed and perforated at the base of the unconfined aquifer immediately above the E-Clay; with the exception of three wells (DMW-10B, DMW-11A, DMW-12A) that appear to be completed and screened below the E-clay. Based on the separation between the water table and the perforations on the deep monitoring wells (200 feet of separation on average), these wells do not appear to be appropriate for obtaining shallow groundwater quality information that is consistent with the groundwater monitoring provisions of the General Order (i.e. required for Trend Monitoring or MPEP studies).

C. On 16 March 2015, the Coalition submitted a letter entitled *Revised High Vulnerability Area* which included a map showing the inclusion of the northeastern portion of the primary area and the southeast corner of the Maples District area. However, in 1989, a nitrate

concentration of 70.8 milligrams per liter was documented in a groundwater sample collected from USGS well 352629119345001 (screened from 5 -20 feet below ground surface), which is located approximately 4 miles south of Lerdo Highway. As shown on a figure (*Shallow Groundwater Piezometers)* in the Coalition's Groundwater Management Plan dated 20 May 2013, there are 18 piezometers south of Lerdo Highway; additional groundwater data may be available for these piezometers and if so should be provided in a revised GAR.

D. An evaluation of pesticide concentrations in groundwater was not provided in the GAR and was not factored into the evaluation and determination of high vulnerability areas. Section II.6.a (Data Summary Pesticides) concluded that there are no areas requiring pesticide monitoring. This conclusion was based on the absence of Department of Pesticide Regulation (DPR) groundwater protection areas (leaching and runoff soils) within the Coalition's area as depicted on a map (Figure 10 of the GAR) produced in cooperation by the Department of Public Health and the State Water Board.

   The lack of DPR defined groundwater protection areas within the Coalition's area is not sufficient to determine that pesticides do not exist in groundwater and that they do not need to be monitored. Chlorpyrifos and diuron have both been detected in Main Drain Canal surface water in concentrations that exceed their respective water quality objective; groundwater recharge from the Main Drain Canal could potential introduce these pesticides into groundwater. Infiltration of canal water alone is 18,000 acre-feet of water per year and the canals only contain water for 90 days a year; the Main Drain Canal contains water ten months out of the year. If pesticide data exists for groundwater within the Coalition's area (BVWSD well data, etc.), then this data needs to be evaluated and incorporated into the high vulnerability analysis.

E. The GAR identifies the sources of groundwater data used by the Coalition to evaluate water quality; however, it does not provide the actual data set used for GAR evaluations. Access to this data set is necessary for Central Valley Water Board staff review of the GAR and to determine if all the readily available data were evaluated. Based on a review of the reference section of the GAR, it appears that a number of relevant documents (some of which contain groundwater data that does not appear to have been included in the GAR data set) were not evaluated as part of the GAR (see Attachment A, Additional References to this memorandum).

F. Members within high vulnerability areas identified in the 16 March 2015 Revised High Vulnerability Map and any new high vulnerability area identified during GAR revisions will need to comply with the General Order's high vulnerability requirements. The General Order requires the certification of Nitrogen Management Plans by 1 March 2016 and submittal of Nitrogen Management Plan Summary Reports by 1 March 2017 (per Revised Order R5-2014-0143). Staff recommends that the Coalition begin informing the members

within the currently identified high vulnerability areas of the General Order's high vulnerability requirements.

Item 2. Establish Priorities for Implementation

The General Order (Section VIII.D.1) requires that the GAR establish priorities for implementation of monitoring and studies within high vulnerability areas. Although Section VI (Prioritizations) of the GAR did provide some information on prioritization, additional information is needed as described below. The GAR should be revised to address these issues and provide the necessary additional information.

A. The GAR does not provide prioritizations for the high vulnerability areas acknowledged in the Revised High Vulnerability map submitted on 16 March 2015. The GAR should be revised to include prioritizations for these high vulnerability areas.

B. The GAR established that the high vulnerability area near the town of Buttonwillow would be a priority with respect to groundwater monitoring and MPEP work. The GAR went on to say that the BVWSD irrigation wells showing high nitrate concentrations in this prioritized high vulnerability area should be able to be managed in a manner to allow for detailed monitoring and follow-up management. However, the GAR did not establish that the BVWSD irrigation wells are suitable (proper depth and screened interval) for monitoring first encountered groundwater. Section VIII.D.2 of the General Order states in part that *"The overall goal of the MPEP is to determine the effects, if any, irrigated agricultural practices have on first encountered groundwater under different conditions that could affect the discharge of waste from irrigated lands to groundwater."* This section of the GAR should be revised to indicate that the well selection for MPEP studies will meet the minimum requirements of Section VIII.D of the General Order.

Item 3. Basis for Establishing Monitoring Work Plans Developed to Assess Groundwater Quality Trends

The General Order (Section VIII.D.1) requires that the GAR provide the basis for establishing workplans to assess groundwater quality trends. No discussion was provided regarding how the Coalition intends to assess groundwater quality trends or how the information provided in the GAR will be used in this effort. The GAR should be revised to include this information.

A. The GAR did not include the foundational information necessary for the development of groundwater monitoring programs required by the General Order. Specifically, the only well construction information made available (see Item 1.B above) was for the BVWSD's deep monitoring wells and shallow piezometers in the northern portion of the Coalition. Based on this available information, the BVWSD's deep monitoring wells do not appear to be constructed to meet the minimum requirements of the General Order. The GAR should be revised to evaluate all available information including, but not limited to, physical and analytical data collected from domestic supply wells and irrigation wells that are not evaluated as part of the BVWSD's routine sampling. A list of sites that could potentially

contain domestic supply wells within the Coalition's primary area is provided as Attachment B to this memorandum.

B. While there may be naturally occurring salts in groundwater within the Coalition's area, the General Order only requires that the GAR assess the influence of irrigated agricultural activities on salinity trends. These agricultural activities include, but are not limited to, the importation of salts in irrigation water, the accumulation of salts in the soil due to evapotranspiration and subsequent leaching of these accumulated salts below the crops root zone, the application of nutrient salts added as fertilizers, and the use of soil amendments. The GAR should be revised to discuss the various agricultural activities related to the importation and/or concentration of salts that may adversely impact groundwater quality and to include an evaluation of the EC/TDS data.

Item 4. Basis for Establishing Work Plans and Priorities to Evaluate the Effectiveness of Agricultural Management Practices to Protect Groundwater Quality

The General Order (Section VIII.D.1) requires that the GAR provide a basis for establishing workplans and priorities to evaluate the effectiveness of agricultural management practices to protect groundwater quality. Although Section IV (Agricultural Management Practices Evaluation) of the GAR did provided an evaluation of the potential for some management practices to impact groundwater quality, additional information is needed. The GAR should be revised to address the following concerns:

A. The GAR identified three components (irrigation method, soil type, and crop type) that have an influence with regard to the potential for management practices to impact groundwater quality. The potential risk for management practices to impact groundwater quality was then calculated using values for the nitrogen hazard index (NHI) for a particular crop type in addition to values for soil type and irrigation method. According to the GAR, if the sum of these component values is 19 or lower, there is a low probability of risk to cause negative impact to the groundwater. The calculated results presented in the GAR were all below 19 and it was concluded that "…agricultural practices within the Coalition's area are not presumed to lead to impacts to the groundwater from irrigation practices." However, use of the NHI alone is insufficient to describe agricultural impacts on groundwater quality or inform future decisions regarding Trend Monitoring or MPEP workplans. The NHI provides a relative scale of the likelihood of impact. It does not provide any assurance that impacts will not occur, even at values of 19 or less. In addition, one of the variables used to calculate the NHI (irrigation method) has yet to be evaluated with regards to groundwater quality protection. Management practices such as irrigation method will be evaluated in the MPEP. Therefore, it is inappropriate to rely on assumptions regarding management practices when evaluating potential impacts to groundwater quality until such a time that the MPEP determines a management practice to be effective.

   Nitrate exceedances in both shallow and deeper groundwater suggest that agricultural practices have contributed to impacts to groundwater quality within the Coalition's area.

Other management practices than irrigation method can affect groundwater quality (e.g. deep ripping, irrigation ponds, canals, well head protection and well construction issues, etc.) which are not accounted for in the GARs evaluation of agricultural management practices that could impact water quality. These factors, as well as intrinsic factors (depth to groundwater, sandy zones beneath shallow clays, lack of shallow clays south of Lerdo Highway, etc.) should be evaluated in the GAR. The GAR should be revised to include an evaluation of other management practices and intrinsic factors, including those described above.

B. Use of reclaimed tailwater from the Main Drain Canal for irrigation was discussed in Section IV.1 of the GAR. However, a discussion of the potential for this management practice to impact groundwater quality was not discussed. Based on surface water quality data provided by the Coalition, exceedances of water quality objectives for arsenic, boron, molybdenum, electrical conductivity (EC), total dissolved solids (TDS), pH, dissolved oxygen, chlorpyrifos, diuron, and fecal coliform have been documented in the tailwater. Percolation of tailwater within the Main Drain Canal and the recirculation of this tailwater within the unlined canals, which lose approximately 34% of water to groundwater recharge, has the potential to introduce these constituents to groundwater. Therefore, the GAR should be revised to indicate that the operation of the Main Drain Canal as a tailwater return system and the recirculation of tailwater to unlined distribution canals have the potential to adversely impact groundwater quality. These issues will need to be evaluated in the MPEP.

Item 5. Basis for Establishing Groundwater Quality Management Plans in High Vulnerability Areas and Priorities for Implementation

Section VIII. I. 1 of the General Order requires that the third party (Coalition) submit a groundwater quality management plan when field or laboratory results document an exceedance of a water quality objective. The GAR did not provide information on how groundwater quality management plans would be established in high vulnerability areas and did not establish priorities for implementation of groundwater quality management plans.
A comprehensive groundwater quality management plan has not been submitted. The Coalition needs to submit a groundwater quality management plan for currently identified high vulnerability areas.

Item 8. Identification of Groundwater Recharge and Disadvantaged Communities

The General Order requires that the GAR provide readily available groundwater recharge information, including identification of areas contributing recharge to urban and rural communities where groundwater serves as a significant source of supply. Although Section II.3 of the GAR did include some information on groundwater recharge, review of this material has identified issues (detailed below) and additional information is needed. The GAR should be revised to address these issues and provide the necessary additional information.

A. The distribution of irrigation water in unlined canals was identified in the GAR as a significant source of recharge to groundwater. There are four primary supply canals in the

primary area (East Side Canal, West Side Canal, Eighty Foot Canal, Arizona Canal) and one primary supply canal (Maples Canal) in the Maples Service Area. The Coalition estimates that approximately 34% of the volume of water transported in the unlined canals is lost to groundwater recharge; this equates to 18,000 acre-feet of water per year.

The GAR stated that the Main Drain Canal, which receives irrigation run-off, "…is unlikely to have enough volume to significantly impact the groundwater table or groundwater quality." However, if the unlined canals (mentioned above) lose approximately 34% of irrigation water to groundwater recharge, it is reasonable to postulate that the Main Drain Canal also contributes to groundwater recharge. Especially considering that the Main Drain Canal contains water ten months out of the year and the other unlined canals only contain water 90 days a year. Seepage loss from the Main Drain Canal should be identified and as a source of groundwater recharge and seepage losses from the canal should be quantified.

B. The GAR does not acknowledge irrigation as a source of groundwater recharge. Diffuse recharge from surface applied water can be a significant source of aquifer recharge and the GAR should be revised to include discussion regarding the significance of irrigation on groundwater recharge.

C. An area referred to as "the Palms," is planned as a future groundwater recharge area (1,100 acres) and is currently under environmental review. The location of the Palms recharge area was not provided in the GAR and needs to be provided.

D. The GAR must identify areas contributing recharge to urban and rural communities where groundwater serves as a significant supply. The GAR must also identify Disadvantaged Communities (DACs) reliant on groundwater as a significant source of drinking water and lie within or are subject to potential impacts from HVAs. The GAR identifies the town of Buttonwillow as a DAC and discusses the groundwater treatment system used for the Spicer City area. However, the GAR should be revised to include an assessment of the source of water for small family homes, farm labor camps, etc. that exist within the Coalition's area, and determine if recharge from agricultural sources could affect their water supply.

Item 9. Soil Survey Information

Section II.3 of the GAR provides a discussion of soils but does not include all the required elements necessary to meet the General Order's requirements. Specifically, the GAR does not discuss the soil properties that affect the potential for groundwater impacts from irrigated agriculture. These soil properties include, but are not limited to, soil hydraulic conductivity, presence or absence of a hardpan, and soil drainage class. In addition, the GAR does not discuss areas of high salinity, alkalinity and acidity within the Coalition's area. Section II.3 of the GAR should be revised to include discussion that addresses these issues. The data sources for the soil information should also be provided.

Item 10. Shallow Groundwater Constituent Concentrations from Existing Monitoring Networks

With the exception of shallow water quality data obtained from piezometers (perched groundwater) in the northern portion of the Coalition's primary area, the GAR did not provide shallow water quality data from first encountered groundwater within the unconfined aquifer. Section III of the GAR (pg. 22) states that there is little data, if any, showing water samples at first encountered groundwater. If shallow groundwater data (domestic supply wells, etc.) from the unconfined aquifer exists within the Coalition's area, it needs to be provided in a revised GAR.

Item 11. Existing Groundwater Data Collection and Analysis Efforts

The groundwater data compilation and review must include all readily accessible information relevant to the General Order on existing monitoring well networks, individual well details, and monitored parameters. The GAR should be revised to include individual monitoring well construction details, identify the COCs monitored, the QA/QC methods used to validate the data, and specify which data set corresponds to specific or general geographical areas within the Coalition's boundaries (e.g., data distributed across the entire area or only a portion of the area) (see Items 1.B and 1.E above).

Item 13. Feasibility of Incorporating Existing Groundwater Data and Their Corresponding Monitoring Well Systems.

While the GAR indicated that the Coalition could utilize BVWSD wells (deep monitoring wells, supply wells, piezometers, etc.) for groundwater monitoring, the GAR does not include an evaluation of any other monitoring well systems or existing groundwater data within the Coalition area. Section IV.C.2 of the Monitoring and Reporting Program states that groundwater quality trend monitoring needs to employ shallow wells, but not necessarily wells completed in the uppermost zone of first encountered groundwater. The GAR should be revised to evaluate all available information (domestic supply wells, etc) as it relates to the feasibility of incorporating existing wells into the monitoring programs required by the General Order and specify that the trend monitoring program will utilize shallow wells when available as required by the Monitoring and Reporting Program.

Item 14. Ranking of High Vulnerability Areas

Section IV.A.3 of the General Order's MRP requires that the GAR prepare a ranking of high vulnerability areas to provide a basis for prioritization of work plan activities. While the GAR did indicate that the high vulnerability area near the town of Buttonwillow would be a high priority and the high vulnerability area near Spicer City would not be a high priority, no definitive ranking of high vulnerability areas was discussed or provided in the GAR. The GAR should be revised to include a definitive ranking of high vulnerability areas, including those areas presented on the Revised High Vulnerability map submitted on 16 March 2015.

Item 15. Describe pertinent geologic and hydrogeologic information for the third-party area(s) and utilize GIS mapping applications

The GAR did not discuss pertinent geologic and hydrogeologic information for the Coalition's area (see Items 1.A and 4.A above). The GAR should be revised to include this information and where appropriate, the information should be represented graphically in order to clearly convey pertinent data, support data analysis, and show results (e.g., geologic and hydrogeologic information could be displayed in cross section in combination with depth to groundwater data, well completion data, and groundwater quality data in order to clearly convey the relationships of each of the datasets to each other and to the subsurface geology).

Item 17. 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," "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."*

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 needs to be included. While the GAR was signed by Tim Ashlock, PE, the document did not include Mr. Ashlock's license number and was not stamped. The revised GAR must contain the appropriate signature and license number.

Table 1. Components of the Groundwater Quality Assessment Report

Item No.	Required Component	Location in Report
GAR Objectives – MRP section		
1	Provide an assessment of all available, applicable and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation.	Throughout, Section V, Revised HVA map (3/16/15)
2	Establish priorities for implementation of monitoring and studies within high vulnerability or data gap areas.	Section VI
3	Provide a basis for establishing workplans to assess groundwater quality trends.	Not provided
4	Provide a basis for establishing workplans and priorities to evaluate the effectiveness of agricultural management practices to protect groundwater quality.	Section IV.3
5	Provide a basis for establishing groundwater quality management plans (GQMP) in high vulnerability areas and priorities for implementation of those plans.	Not provided
Required GAR Components – MRP section		
6	Detailed land use information with emphasis on land uses associated with irrigated agricultural operations. The information shall identify the largest acreage commodity types in the third-party area, including the most prevalent commodities comprising up to at least 80% of the irrigated agricultural acreage in the third-party area.	Section II.2, Figure 6 Table 2
7	Information regarding depth to groundwater, provided as a contour map(s),	Section II.1, Figures 3 & 4
8	Groundwater recharge information including identification of areas contributing recharge to urban and rural communities where groundwater serves as a significant source of supply.	Section II.3, Figure 7
9	Soil survey information, including significant areas of high salinity, alkalinity and acidity.	Section II.3 , Figure 8
10	Shallow groundwater constituent concentrations (potential constituents of concern include any material applied as part of the agricultural operation, including constituents in irrigation supply water [e.g., pesticides, fertilizers, soil amendments, etc.] that could impact beneficial uses or cause degradation).	Sections II & III

11	Information on existing groundwater data collection and analysis efforts relevant to this Order (e.g., Department of Pesticide Regulation [DPR], United States Geological Survey [USGS], State Water Board Groundwater Ambient Monitoring and Assessment [GAMA], California Department of Public Health, local groundwater management plans, etc.). This groundwater data compilation and review shall include all readily accessible information relevant to the Order on existing monitoring well networks, individual well details, and monitored parameters. For existing monitoring networks (or portions thereof) and/or relevant data sets, the third-party should assess the possibility of data sharing between the data-collecting entity, the third-party, and the Central Valley Water Board.	Section II.6
GAR Data Review and Analysis – MRP section		
12	Determine where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor or where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities.	Section III, Revised HVA map (3/16/15)
13	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 this Order. This shall include specific findings and conclusions and provide the rationale for conclusions.	Section II.6
14	Prepare a ranking of high vulnerability areas to provide a basis for prioritization of work plan activities.	Section VI.1
15	Discuss pertinent geologic and hydrogeologic information for the third-party area(s) and utilize GIS mapping applications, graphics, and tables, as appropriate, in order to clearly convey pertinent data, support data analysis, and show results.	Not provided
Groundwater Vulnerability Designations – MRP section		
16	The GAR shall designate high/low vulnerability areas for groundwater in consideration of high and low vulnerability definitions provided in Attachment E of the Order. The vulnerability designations will be made using a combination of physical properties (soil type, depth to groundwater, known agricultural impacts to beneficial uses, etc.) and management practices (e.g., irrigation method, crop type, nitrogen application and removal rates, extent of implementation, etc.). The third-party shall provide the rationale for proposed vulnerability determinations.	Section III, Revised HVA map (3/16/15)
Other		
17	Section 7835 of the California Geologist and Geophysicist Act 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."	License number not provided; stamp not provided

Attachment A
Additional References

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Attachment B
Sites that could potentially contain Domestic Supply Wells within the Coalition's Primary Area

Sites	Latitude	Longitude	Location	Description
1	35.614942	-119.616142	S HWY 46, E Main Drain Rd.	Facility with pipes?
2	35.586308	-119.581641	S Carmel Rd, W Corcoran Rd	Single building
3	35.584224	-119.590121	S Carmel Rd, E Main Drain Rd	Facility with gypsum?
4	35.584953	-119.599062	S Carmel Rd, E Main Drain Rd	Facility with multiple buildings
5	35.558478	-119.629001	0.6 mile W Main Drain Rd., SW I5	Facility
6	35.557627	-119.628669	0.6 mile W of Main Drain Rd., SW I5	Facility
7	35.564584	-119.580827	1 mile E of I5	2 buildings
8	35.500883	-119.604499	N Lerdo HWY, W Main Drain Rd	Facility
9	35.514383	-119.60511	N Cord Rd, E Main Drain Rd	Facility
10	35.533313	-119.608951	N Delfino Rd, E Main Drain Rd	Facility next to ag
11	35.512816	-119.60441	S Cord Rd, E Main Drain Rd	Abandoned Facility?
12	35.500101	-119.591575	N Lerdo HWY, E Main Drain Rd	Facility with 2 tanks?
13	35.502633	-119.582854	N Lerdo Hwy, E Main Drain Rd	Facility
14	35.499793	-119.582417	N Lerdo Hwy, E Main Drain Rd	Facility with multiple houses?
15	35.471324	-119.542209	N Perral St, W I5	Facility with a house
16	35.47515	-119.528034	W I5	Facility
17	35.471773	-119.523933	W I5, SE of site 16	2 buildings facility
18	35.470989	-119.55976	N Perral St, E Milan Rd	Facility
19	35.477192	-119.558575	N Perral St, E Milan Rd	Facility
20	35.485595	-119.597256	N Vlasnik Rd, W Main Drain Rd	Facility
21	35.478419	-119.578095	S Vlasnik Rd, E Main Drain Rd	Facility
22	35.471497	-119.588997	N Perral Rd, W Main Drain Rd	Facility
23	35.471231	-119.595961	N Perral Rd, W Main Drain Rd	Facility
24	35.442151	-119.574711	N 7th Standard Rd, W Main Drain Rd	Facility
25	35.443732	-119.560568	N 7th Standard Rd, W Main Drain Rd	Facility
26	35.457541	-119.565398	NE Main Drain Rd, W Milan Rd	Facility
27	35.460889	-119.56442	N Imperial St, E Milan Rd	Single building
28	35.461709	-119.565427	N Imperial St, W Milan Rd	Facility next to pond & ag
29	35.470705	-119.55155	S Perral St, E Milan Rd	Facility?
30	35.456695	-119.55188	N Imperial St, E Milan Rd	Facility/Residential
31	35.455919	-119.540724	S Imperial St, E Milan Rd	Abandoned Facility?
32	35.455821	-119.521222	S Imperial St, W Corn Camp Rd	Facility
33	35.451177	-119.522797	S Imperial St, W Corn Camp Rd	Facility
34	35.451306	-119.526158	S Imperial St, W Corn Camp Rd	Facility
35	35.449122	-119.539312	S Imperial St, E Main Drain Rd	Abandoned Facility?
36	35.442366	-119.539587	N 7th Standard Rd, E Main Drain Rd	Facility
37	35.442518	-119.518857	N 7th Standard Rd, W Corn Camp Rd	Facility
38	35.448472	-119.509976	N 7th Standard Rd, E Corn Camp Rd	Facility
39	35.441023	-119.532163	S 7th Standard Rd, W Corn Camp Rd	Facility
40	35.441581	-119.535384	S 7th Standard Rd, W Corn Camp Rd	Residential
41	35.438171	-119.518673	S 7th Standard Rd, W Corn Camp Rd	Facility & Residential
42	35.434044	-119.519084	S 7th Standard Rd, W Corn Camp Rd	Facility

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43	35.427868	-119.517501	N Snow Rd, E Corn Camp Rd	Facility
44	35.426541	-119.518854	S Snow Rd, W Corn Camp Rd	Facility
45	35.426375	-119.518348	S Snow Rd, E Corn Camp Rd	Facility
46	35.425862	-119.508945	S Snow Rd, E Corn Camp Rd	Facility
47	35.428152	-119.487893	N Snow Rd, W Buttonwillow Dr	Facility
48	35.42708	-119.486718	S Snow Rd, W Buttonwillow Dr	Facility
49	35.413568	-119.517519	N Sullivan Rd, E Main Drain Rd	Facility
50	35.413478	-119.50064	N Delfern Rd, W Corn Camp Rd	Residential
51	35.411856	-119.483498	NE Del Fern Rd, W Palomas Rd	Facility & Residential
52	35.407838	-119.483437	NE Watkins Ln, W Palomas Rd	Residential
53	35.407591	-119.486032	S Watkins Ln, W Palomas Rd	Facility/Residential
54	35.406259	-119.483502	S Watkins Ln, W Palomas Rd	Facility
55	35.406158	-119.482615	N Williams Rd, E Palomas Rd	Residential?
56	35.405517	-119.482603	S Williams Rd, E Palomas Rd	Facility/Residential
57	35.405265	-119.486503	S Williams Rd, E Eighty Foot Ditch	2 Residential
58	35.413023	-119.475273	S Canal Rd, W Buttonwillow Dr	Abandoned Facility?
59	35.406799	-119.517343	S Sullivan Rd, E Corn Camp Rd	Facility
60	35.440934	-119.581806	S 7th Standard Rd, W Main Drain Rd	Facility
61	35.441258	-119.562603	S 7th Standard Rd, W Main Drain Rd	Facility/Residential next to ag
62	35.441404	-119.555982	S 7th Standard Rd, W Main Drain Rd	Facility/Residential next to ag
63	35.430153	-119.563035	N Dargatz Rd, W Main Drain Rd	Residential
64	35.427297	-119.54874	N Dargatz Rd, W Main Drain Rd	Residential
65	35.427845	-119.544783	N Dargatz Rd, W Main Drain Rd	Facility/Residential next to ag
66	35.413176	-119.530987	N Delfern Rd, W Main Drain Rd	Facility
67	35.40762	-119.518983	S Delfern Rd, W Corn Camp Rd	Facility
68	35.399758	-119.515105	N McKittrick Hwy (CA 58), E Corn Camp Rd	Facility/Residential
69	35.399667	-119.51158	N McKittrick Hwy (CA 58), E Corn Camp Rd	Residential
70	35.399978	-119.509515	N McKittrick Hwy (CA 58), E Corn Camp Rd	Facilities/Residential
71	35.399919	-119.501206	N McKittrick Hwy (CA 58), W Eighty Foot Ditch	Facilities/Residential
72	35.399718	-119.498774	N McKittrick Hwy (CA 58), W Eighty Foot Ditch	Residential
73	35.399692	-119.496786	N McKittrick Hwy (CA 58), W Eighty Foot Ditch	Residential
74	35.399842	-119.494319	N McKittrick Hwy (CA 58), W Eighty Foot Ditch	Facilities/Residential
75	35.39988	-119.4871	N McKittrick Hwy (CA 58), E Eighty Foot Ditch	Facilities/Residential
76	35.399606	-119.483583	N McKittrick Hwy (CA 58), W Palomas Rd	Residential
77	35.400714	-119.482689	N McKittrick Hwy (CA 58), E Palomas Rd	Facility/Residential
78	35.399563	-119.481437	N McKittrick Hwy (CA 58), E Palomas Rd	Residential
79	35.399569	-119.47926	N McKittrick Hwy (CA 58), E Palomas Rd	Facilities
80	35.401272	-119.47519	N McKittrick Hwy (CA 58), W Buttonwillow Dr	Residential/School
81	35.401293	-119.466995	N McKittrick Hwy (CA 58), E Buttonwillow Dr	Residential/School/ Facilities

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82	35.397879	-119.472003	S McKittrick Hwy (CA 58), E Buttonwillow Dr	Facility
83	35.386804	-119.470212	N Buerkle Rd, W Mirasol Ave	Facility/Residential
84	35.38409	-119.468719	N Buerkle Rd, W Mirasol Ave	Residential
85	35.390818	-119.460271	N Buerkle Rd, E Mirasol Ave	Facility
86	35.384289	-119.458342	N Buerkle Rd, E Mirasol Ave	Residential
87	35.383702	-119.458934	S Buerkle Rd, E Mirasol Ave	Residential
88	35.384356	-119.455565	N Buerkle Rd, W Wasco Way	Facility/Residential
89	35.391064	-119.448289	N Buerkle Rd, W Wasco Way	Facility/Residential
90	35.384309	-119.434935	N Buerkle Rd, E Wasco Way	Facility
91	35.38415	-119.422191	N Buerkle Rd, E Wasco Way	Facility/Residential
92	35.391449	-119.501261	S Mckittrick Hwy (CA 58), W Elk Grove Rd	Facility/Residential
93	35.381484	-119.467902	S Buerkle Rd, W Mirasol Ave	Facility/Residential
94	35.374693	-119.468733	N Weed Ditch Island, W Mirasol Ave	Facility/Residential
95	35.368864	-119.474658	S Brite Rd, W Buttonwillow Dr	Residential
96	35.368599	-119.473836	S Brite Rd, E Buttonwillow Dr	Residential
97	35.379486	-119.448267	S Buerkle Rd, W Wasco Way	Facility
98	35.369746	-119.45465	N Brite Rd, W Wasco Way	Residential
99	35.383003	-119.443103	S Buerkle Rd, E Wasco Way	Residential
100	35.383573	-119.439156	S Buerkle Rd, E Wasco Way	Residential
101	35.380128	-119.443043	S Buerkle Rd, E Wasco Way	Trailer
102	35.37929	-119.44321	S Buerkle Rd, E Wasco Way	Facility/Residential
103	35.377808	-119.440467	S Buerkle Rd, E Wasco Way	Facility/Residential
104	35.369501	-119.440728	N Brite Rd, E Wasco Way	Residential
105	35.369462	-119.434991	N Brite Rd, E Wasco Way	Facility/Residential
106	35.368734	-119.43523	S Brite Rd, E Wasco Way	Facility/Residential
107	35.369499	-119.430955	N Brite Rd, E Wasco Way	Residential
108	35.372422	-119.426177	N Brite Rd, W Parsons St	Facility/Residential
109	35.369669	-119.416061	N Brite Rd, E Parsons St	Facility
110	35.361628	-119.448927	N Stockdale Hwy, W Wasco Way	Facility/Residential
111	35.357592	-119.448323	N Stockdale Hwy, W Wasco Way	Facility/Residential
112	35.353987	-119.458976	S Stockdale Hwy, W Wasco Way	Facility
113	35.361591	-119.446964	N Stockdale Hwy, E Wasco Way	Residential
114	35.354132	-119.447138	S Stockdale Hwy, E Wasco Way	Single building
115	35.350667	-119.446569	S Stockdale Hwy, E Wasco Way	Facility
116	35.347115	-119.446289	S Stockdale Hwy, E Wasco Way	Facility
117	35.342408	-119.430123	S Wasco Way, W Freeborn Rd	Facility
118	35.33984	-119.425831	S Adohr Rd, W Dairy Rd	Residential
119	35.358046	-119.429663	N Stockdale Hwy, W Dunford Rd	Residential
120	35.357735	-119.42143	N Stockdale Hwy, W Dunford Rd	Facility/Residential
121	35.355354	-119.420711	N Stockdale Hwy, W Dunford Rd	Residential
122	35.35489	-119.417848	N Stockdale Hwy, W Dunford Rd	Residential
123	35.353557	-119.420539	S Stockdale Hwy, W Dunford Rd	Facilities/Residential
124	35.357813	-119.411674	N Stockdale Hwy, E Dunford Rd	Residential

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Sites that could potentially contain Domestic Supply Wells within the Coalition's Primary Area

125	35.35522	-119.406504	N Stockdale Hwy, E Dunford Rd	Residential
126	35.355268	-119.405232	N Stockdale Hwy, E Dunford Rd	Residential
127	35.355685	-119.395354	N Stockdale Hwy, E Dunford Rd	Single building
128	35.354214	-119.383653	S Stockdale Hwy, E Dairy Rd	Facility/Residential
129	35.351328	-119.383701	S Stockdale Hwy, E Dairy Rd	Residential
130	35.343972	-119.383484	N Adohr Rd, E Dairy Rd	Facility
131	35.338434	-119.392349	S Adohr Rd, E Dairy Rd	Facility/Residential
132	35.332446	-119.372004	S Station Rd, E Tule Park Rd	Residential
133	35.513062	-119.59773	S Cord Rd, E Main Drain Rd	Abandoned Facility?