November 1, 2013

Mr. Kenneth A Harris Jr., Executive Officer
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401-7906

Dear Mr. Harris,

The Central Coast Groundwater Coalition (CCGC) is submitting the following documents and files as required by the State Water Resources Control Board Order WQ 2013-0101:

- Revised Work Plan for the northern counties – redline version
- Revised Work Plan for the northern counties – clean version
- Work Plan for the southern counties - San Luis Obispo, Santa Barbara, and Ventura Counties
- Shapefiles for the three south counties outlining the region included in the Work Plan activities

The redline version and the clean version of the Work Plan for the four northern counties reflect changes in the dates of sampling and reporting activities that result from the extension of the enrollment period to November 1, 2013. Although the dates for several items scheduled for delivery to the Central Coast Regional Water Quality Control Board over the next few months are being changed, there is no change in the overall project period and all monitoring activities will be completed by September 1, 2014 as required. The title of the Work Plan has been modified to reflect that the monitoring and reporting activities outlined in the document are only applicable to members in Monterey, Santa Clara, Santa Cruz, and San Benito Counties. In addition, a short section has been added to the Work Plan to describe the communications with members associated with the sampling of their wells and the dissemination of results. An addendum with more explanation is added to the end of the Work Plan. The updated Work Plan for the northern counties also includes changes in the name from the Central Coast Cooperative Groundwater Program to the Central Coast Groundwater Coalition and changes in the organization's acronyms. The Disclaimer statement is removed from the Work Plan because it no longer applies.

As required, a second Work Plan for monitoring and reporting activities in San Luis Obispo, Santa Barbara, and Ventura Counties is provided along with the shapefile of the region. All of the changes and modifications in the Work Plan for the northern counties are reflected in the Work Plan for the southern counties. In addition, several statements about forming the governing organization and the required organizational structure are removed from the southern counties Work Plan because they are not

relevant. The CCGC is the governing entity for all groundwater monitoring and reporting activities needed to maintain compliance for its members in the CCRWQCB region. The statements in the southern counties' Work Plan now reflect that the required elements for governance and accountability to which the CCGC has agreed remain in effect for activities carried out in the southern counties.

The CCGC looks forward to working with the CCRWQCB and its staff as it completes the monitoring and reporting activities associated with the work plans being submitted. Please do not hesitate to contact us if there are any questions.

Sincerely,

Parry Klassen
Executive Director

Tim Borel
Chair, Board of Directors

Central Coast Groundwater Coalition Work Plan for San Luis Obispo, Santa Barbara, and Ventura Counties

November 1, 2013

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List of Acronyms

DPH	Department of Public Health
CCGC	Central Coast Groundwater Coalition
GIS	Geographic Information System
L&G	Landowners and Growers
MCL	Maximum Contaminant Level
MRP	Monitoring and Reporting Program
QAPP	Quality Assurance Project Plan
SOP	Standard Operating Procedure

Introduction

The CCRWQCB adopted Order No. R3-2012-0011 Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Conditional Waiver) and associated Monitoring and Reporting Program Orders (MRPs) on March 15, 2012. The Conditional Waiver and the MRPs specify that landowners and growers (here forward referred to as L&Gs) in Tiers 1, 2 and 3 may meet groundwater monitoring requirements by either monitoring groundwater individually on their agricultural operations, or by joining a groundwater cooperative monitoring program. In response to the need for a groundwater cooperative monitoring program, numerous L&G in Santa Clara, San Benito, Santa Cruz, and Monterey counties worked with Western Growers and Grower-Shipper of Central California to form the Central Coast Groundwater Coalition (CCGC). The CCGC developed a work plan which was approved by the Central Coast Regional Water Quality Control Board (CCRWQCB) on July 11, 2013. The CCGC began enrolling members from the four northern counties and initiated the tasks outlined in the CCGC Work Plan.

L&G in San Luis Obispo, Santa Barbara, and Ventura counties did not submit a work plan to the CCRWQCB by the May 31, 2013 deadline and consequently did not form a groundwater cooperative monitoring program. Growers in these counties were required to continue to meet the terms of the Conditional Waiver as individuals as outlined in the MRPs.

After a review of the Conditional Waiver, the State Water Resources Control Board issued Order WQ 2013-0101 allowing growers in San Luis Obispo, Santa Barbara, and Ventura Counties to join the CCGC provided they join by November 1, 2013. The CCRWQCB indicated that involvement of the L&G from the three southern counties could occur only if a separate work plan and Quality Assurance Project Plan (QAPP) were developed for the groundwater monitoring and reporting in the region.

The purpose of this document is to set forth the work plan for the southern region of the CCGC that satisfies the requirements in the Conditional Waiver and MRPs for participating L&Gs in San Luis Obispo, Santa Barbara, and Ventura counties. The steps outlined in this work plan provide a foundation for a CCGC that L&Gs in those counties can support, and that satisfies the requirements as set forth in the MRPs which states, “At a minimum, the cooperative groundwater monitoring effort must include sufficient monitoring to adequately characterize the groundwater aquifer(s) in the local area of the participating Dischargers, characterize the groundwater quality of the uppermost aquifer, and identify and evaluate groundwater used for domestic drinking water purposes.” (Page 9 of the MRP - Tiers 1, 2, 3).

One of its primary purposes of the monitoring and reporting program is to provide the Regional Water Board with information that fills the gaps in the current understanding of groundwater quality throughout the region. Depending on the further development of the Conditional Waiver and its implementation, the program may also eventually provide information to the Water Board on existing farming practices and additional farming practices that will result in improved groundwater quality over time.

Agricultural L&Gs recognize there is a shared responsibility for maintaining acceptable water quality. They recognize that past fertilizer inputs, as well as other historical land use practices, may have contributed to groundwater quality problems, and are focused on finding solutions to address the contribution that may be coming from existing agricultural practices. L&Gs who choose to participate in this coalition are making a commitment to address groundwater quality in the aquifers supplying drinking water. If sample data indicates that the concentration of nitrate in

a domestic supply well is above the MCL identified by the Department of Public Health (DPH) as safe for human consumption, and that water coming from that well is currently being consumed, the CCGC will notify the member by overnight delivery that the well is contaminated and inform the member of their responsibilities as outlined in the State Water Resources Control Board's Order WQ 2013-0101.

Cooperative Program Boundaries

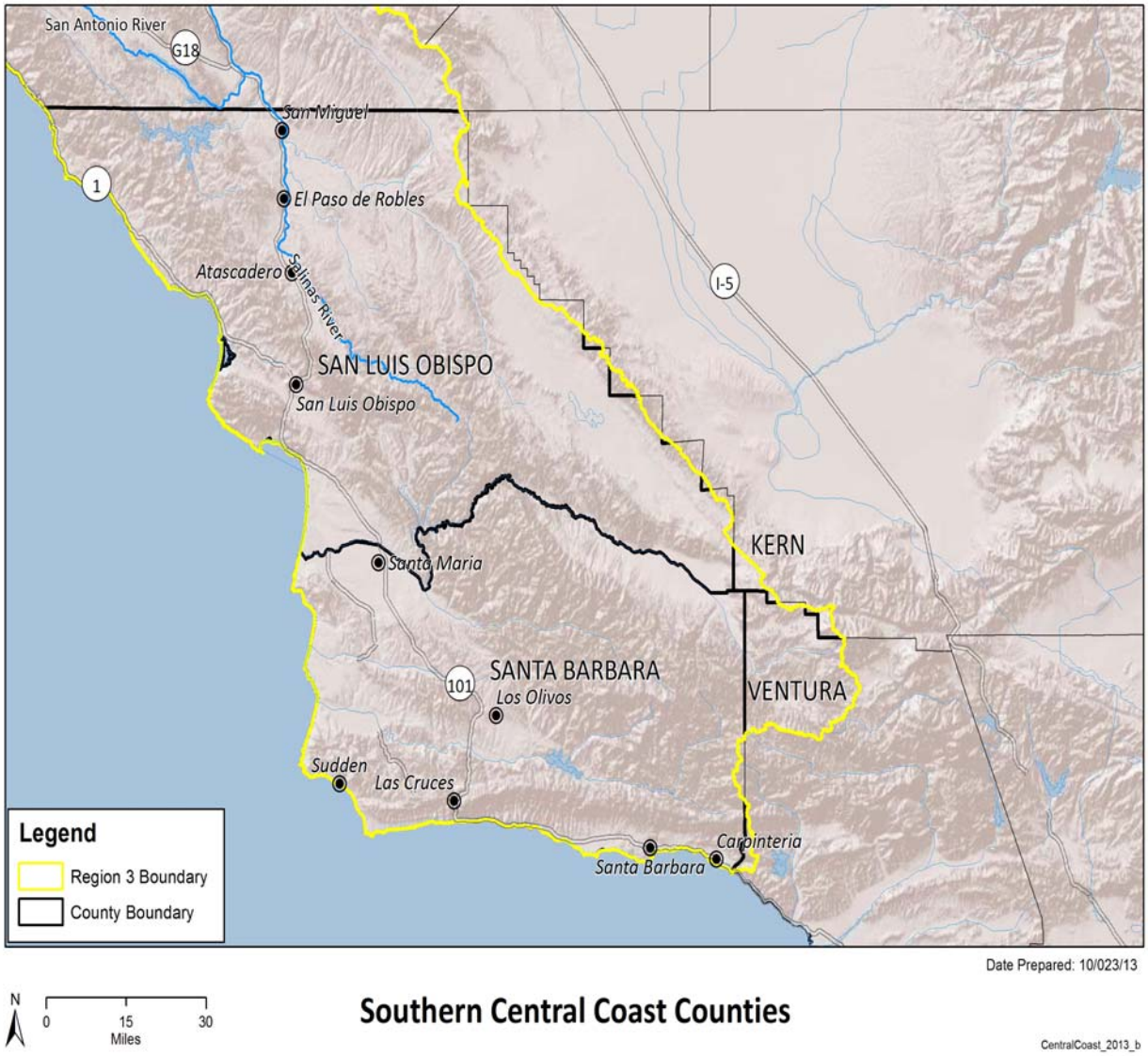
This work plan covers activities taken on behalf of enrolled L&Gs in the southern area of the Central Coast region including San Luis Obispo, Santa Barbara, and Ventura counties (Figure 1). The CCGC is providing a shapefile to the CCRWQCB along with this submission that outlines the outer perimeter of the cooperative program region (Projection – NAD 83, Scale – 1:24,000). The shapefile will include the extent of the agricultural regions in the four counties. Parcels enrolled in the actual cooperative program region will be a subset of this area (see below).

L&Gs in San Luis Obispo, Santa Barbara, and Ventura counties are all potential participants in this program. Because enrollment in the Coalition is unlikely to include all L&Gs in the southern counties, the exact participating parcels and subsequent perimeter boundary will reflect the actual land ownership and lease agreements in place each year. The final CCGC boundaries reflect the agricultural lands of L&Gs within the portions of the three counties that are members in the CCGC region. The membership is likely to be dynamic from year to year as some leases change hands and some land leaves the CCGC and some land enters the program. However, the spatial distribution of the member parcels will not negatively impact the ability of the CCGC to characterize the concentration of nitrate in domestic supply wells, nor will it negatively impact the ability of the CCGC to characterize the domestic drinking water supply and shallow aquifers across the southern counties.

The CCGC will provide to the CCRWQCB on November 15, 2013 a list of members in San Luis Obispo, Santa Barbara, and Ventura counties, and will provide an annual update on September 1 of each subsequent year in conjunction with the list of members submitted for the northern region of the CCGC area. In the first year of the CCGC existence, the CCGC will provide quarterly updates to the list of members as new members may enter the program as they add/drop parcels to their holdings.

The CCGC is providing a separate work plan, QAPP, and SAP for the southern counties as required by the CCRWQCB. However, it is the intent of the CCGC that once the documents have been approved by the CCRWQCB and all sampling and reporting activities for the southern region are complete, all future documents and submissions will include the entire CCGC region.

Figure 1 Geographic area of the south counties in the CCGC.



Task Deliverables

Table 1 Deliverables for Coalition Boundary Delineation.

Deliverable	Elements	Date
Shapefile of external boundaries of CCGC southern region with agricultural regions	ArcGIS shapefile in NAD 83 at 1:24,000 scale; general outline of the CCGC region without individual member landholdings or leases	November 15, 2013
List of members in the southern region who have enrolled and paid fees to the CCGC	Excel spreadsheet of member IDs, member names, member farm operation names, and contact information as specified below in section	November 15, 2013 and annually thereafter on September 1
Shapefile of CCGC southern region on a parcel by parcel basis	ArcGIS shapefile in NAD 83 at 1:24,000 scale; includes the land owned and/or leased by CCGC members at the individual parcel level	February 1, 2014, November 1, 2014, and annually thereafter on November 1

Description of CCGC Technical Activities in the Southern Region

Approach

The CCGC will undertake two related technical tasks; 1) locating and sampling domestic supply wells on member owned/leased land, and 2) characterizing groundwater aquifers in the southern portion of the CCGC region with a focus on shallow groundwater. The domestic supply wells sampled will be those not sampled by the counties and consequently, the concentration of nitrate in the water in those wells is not known. The CCGC will use data generated by the counties, and potentially data submitted to GeoTracker by individual L&Gs to be in compliance with the Conditional Waiver to complete the characterization of the domestic drinking water-supply and shallow groundwater aquifer. The primary focus is characterization of the aquifer providing drinking water to residents.

All sampling activities in the southern portion of the CCGC region will be completed by December 1, 2014. Unlike the schedule for sampling wells in the northern portion of the CCGC region, the sampling in the southern portion of the CCGC region will occur in three phases. Phase I is the sampling of wells for members in the southern portion of the CCGC region to satisfy their obligation for groundwater sampling as individuals. Phase II involves sampling wells belonging to members who do not need to monitor during the spring of 2014, or members who elected to sample their wells without involving the CCGC. Phase III is the identification of any additional wells that the CCGC believes needs to be sampled to characterize the concentration of nitrate in shallow aquifers in the CCGC southern region.

Phase I

Growers who initiated sampling groundwater from wells on their property prior to joining the CCGC must complete the individual sampling required by the Conditional Waiver MRPs. The

CCGC made a commitment to these growers to conduct the sampling and submitting the information to GeoTracker on their behalf. Because the individual monitoring must be completed during either the fall of 2013 or the spring of 2014, Phase I of the monitoring will occur between November and December 2013, or February and May 2014. The CCGC will identify those growers that need their wells sampled by November 15, 2013 and perform the necessary sampling by May 31, 2014.

Phase II

After review of the data generated by the sampling for individual growers in the fall of 2013 and spring of 2014, the CCGC will develop and by September 1, 2014 will submit an additional list of wells to the CCRWQCB. The list will include all domestic supply wells located on member parcels and the subset of those wells that the CCGC intends to sample prior to November 1, 2014. If the list of wells to sample does not include all wells located on member parcels, the CCGC will provide technical justification for any well excluded for sampling.

Phase III

Once the data are received and reviewed, if it is determined that additional wells need to be sampled to adequately characterize the shallow aquifer or provide certainty about the concentration of nitrate in the domestic supply water of any well, a supplemental list of wells to sample will be submitted by November 1, 2014. If no additional wells need to be sampled, the November 1, 2014 submission will document the decision and provide the rationale for not sampling additional wells.

The phasing is required because the process of obtaining well logs and reviewing for information on screening depth(s) (see below) to identify wells for sampling is time consuming. Once a list of candidate wells have been identified, the list must be narrowed to those wells that are located on CCGC member parcels, that are accessible, and that are reasonably certain to provide a valid sample (see below). Until members provide the CCGC with the wells they need to have sampled to be in compliance as individuals, it is not possible to determine if well logs exist for those wells and if there is sufficient information to allow the CCGC to characterize the shallow groundwater basins in the southern portions of the CCGC region. For those individuals needing to complete their individual monitoring requirements, their wells will be sampled regardless of whether well logs exist for those wells. Evaluating the data from Phase I is expected to take up to several weeks as well logs are linked to sampled wells and concentrations of nitrate and other constituents are assigned to the appropriate aquifer. If no logs are available for the wells, or well logs can't be linked unequivocally with specific wells, information from sampling those wells will inform residents about the concentration of nitrate in those wells. But if the screening depth is not known, the CCGC will be limited in their ability to use those data to characterize aquifers.

Locating and Sampling Domestic Supply Wells

The initial list of wells to be sampled will be developed from members who elect to use the CCGC to sample and report to GeoTracker the concentrations of the various constituents listed in Table 3 of the MRP documents. These members will send the CCGC the locations of all wells on their property that require sampling including all domestic supply wells and the main irrigation well(s). All wells will be visited to guarantee that they are suitable for sampling. Experience of CCGC technical consultants indicate that while all wells examined to date in the northern portion of the CCGC region can be sampled, some wells may be on member parcels but provide drinking water to dwellings that cannot be accessed.

The CCGC will gather available well logs that are filed with the Department of Water Resources for all

domestic wells in the southern portion of the CCGC region. Written authorization from the CCRWQCB will be requested when this work plan is approved. Wells identified during Phase I will be linked to well logs if possible to determine the screening depth. Water quality data from those wells with known screening depths can be used to characterize the aquifers.

Once the Phase I wells have been identified and sampled, the CCGC will locate all remaining domestic supply wells on member parcels. The utility of sampling each of these wells will be assessed by determining the availability of well logs and additional information including but not limited to well density in the immediate vicinity and well depth. Wells will be prioritized for sampling based on answers to the following questions.

- Are there reliable and existing data for the depth of the screened interval and immediate area that can provide sufficient information about drinking water quality without sampling the well in question (immediate area is defined by the degree of spatial uncertainty in the available water quality data, see bullet point 3 below)?
- Can the well water be accessed for reliable sampling?
- Is the well head and casing intact and can a reliable water sample be collected?
- Are there obvious potential avenues for surface contamination to enter the well?
- What do the existing data indicate about spatial variability of the water quality in the area?

Based on the analysis of existing data, the level of spatial uncertainty in water quality data in the area surrounding the well will be quantified and for each well, a determination will be made of whether sampling each well can reduce uncertainty. This is an iterative process and the density of wells within a subbasin or area within a subbasin may depend on the concentration of nitrate in the wells that are selected for sampling. It is possible that after the Phase II list of wells to sample is finalized, there could be a need for additional samples. Consequently, Phase III is added that allows additional wells to be identified and sampled if necessary after Phase I and Phase II sampling to allow adequate characterization of drinking water. A list of any new wells that are proposed for sampling will be submitted to the CCRWQCB for Executive Officer approval.

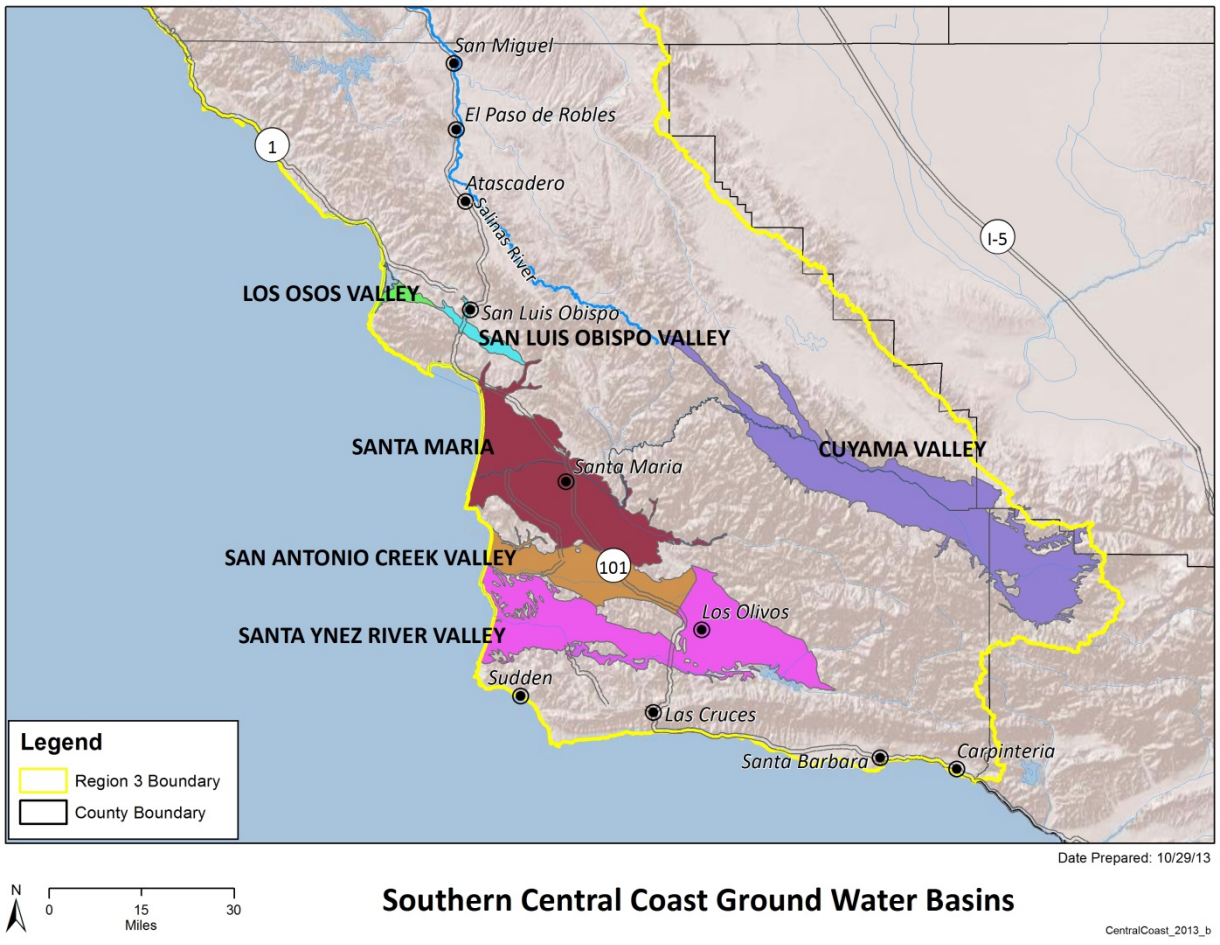
In summary, a phased approach will be used to identify wells for sampling by the CCGC.

- Phase I – Identify and sample domestic drinking water supply wells and irrigation supply wells for members who must submit groundwater quality data to the CCRWQCB as individuals. Well logs will be linked to these wells if possible.
- Phase II – Identify additional wells from members who did not need to sample during the spring of 2014 or who sampled as individuals without using the CCGC. Well logs will be used to determine screening depth if they can be linked to individual wells.
- Phase III – If after Phases I and II, an insufficient number of wells are identified to effectively characterize drinking water quality within a reasonable certainty across the southern portion of the CCGC region, additional wells will be identified for sampling. These wells may be owned by nonmembers and the CCGC will rely on the CCRWQCB to gain access to the wells. In addition, as required by the Order WQ 2013-0101, any well that is estimated by a contour analysis to have a concentration of nitrate within 50% of the MCL will be added to the list of wells to sample.

In addition to the three stages listed above, any well that has a concentration of nitrate within 20% of the MCL (80% of the MCL) will be sampled within a year of the original sample collection date and annually thereafter. The second sample is to determine if seasonal conditions could result in the concentration of nitrate in the well exceeding the MCL.

The approach for determining the adequacy of the number of wells for characterizing domestic drinking water quality is threefold. The CCGC proposes to use standard statistical and geostatistical methods to estimate the spatial distribution of concentration of nitrate and other constituents. Second, the CCGC will use the characterization of the aquifer to assess factors such as soils, subsurface texture, land use, land- and water-management practices, and existing water quality data to provide a causal explanation of the distribution groundwater nitrate concentration. Third, the CCGC will use the assessment and the distribution of existing water quality data from wells identified during Phase I and II to select additional wells for sampling during Phase III as needed. Discussions will be held with the Regional Water Board staff to develop consensus with regard to wells to be sampled. The objective is to identify an optimal number of wells that allow characterization within an acceptable level of variance (uncertainty). The CCGC will endeavor to minimize to the extent possible, the spatial estimation variance and maximize the confidence level associated with nitrate concentrations in the aquifers with existing domestic supply wells.

Figure 2 Groundwater basins in the south counties of the CCGC region.



In addition to nitrate, samples may be analyzed for constituents that will aid in aquifer characterization. A list of constituents is shown in Table 2. Constituents listed in line one of Table 2 (Compliance with Conditional Waiver and MRPs) will be analyzed in all circumstances. Constituents listed in lines 2-5 may be analyzed in situations where doing so would aid in aquifer characterization.

as determined by the CCGC. All wells will be sampled and the groundwater analyzed for at least the constituents specified in line one of Table 2 by the dates detailed in Table 3. The other constituents listed in lines 2-5 of Table 2 may be sampled if it is determined that it is necessary to obtain specific information needed to better characterize the aquifers.

Table 2 Constituents to be monitored to characterize drinking water and the shallow aquifers.

Function	Constituents
Compliance with Conditional Waiver and MRPs[1]	pH, SC, TDS, total alkalinity, Ca, Mg, Na, K, SO4, Cl, NO_3-NO_2
Potential for denitrification	Oxidation-reduction potential, N^{15}, O^{18} isotopes
Nitrogen source analysis	N^{15} and O^{18} isotopes, pharmaceuticals
Age of water in the aquifer	Tritium/He-4, chlorofluorocarbons
Source of the water	Ca, Mg, Na, K, Cl, CO_3, Br, O^{18}, deuterium, N^{15}

[1]From Table 3 of MRP documents

Deliverables and Schedule

All well sampling activities (Table 3) will be concluded by December 1, 2014. The CCGC will provide a short memorandum to the CCRWQCB by December 15, 2014 indicating that all sampling activities were completed by the December 1, 2014 deadline. By April 15, 2015 the CCGC will submit a draft final report to the CCRWQCB summarizing the information obtained during the domestic supply well monitoring program. After receiving comments from the CCRWQCB, the CCGC will submit by June 30, 2015, the final report to the CCRWQCB summarizing the information obtained during the domestic supply well monitoring program. The summary will include the overall distribution of domestic supply wells that are not sampled by the counties, a description of the depths of those wells to the extent known, contour maps of the concentration of nitrate in all wells sampled stratified for different screening depths, and an accounting of the number/percentage of domestic supply wells that are supplying water with concentrations of nitrate above the primary MCL.

Contour Confidence Interval

The analysis by the CCGC will be performed to achieve the highest level of certainty possible using all publicly available well samples and integrating the wells that are selected for sampling by this program. The analysis will explicitly provide the confidence value for any location on a contour map. If wells owned by individuals who are not members of the CCGC can be used to increase the level of confidence, those owners can be contacted to determine if they are willing to allow samples of the water to be collected.

HydroFocus, Inc. is a hydrogeology consulting company retained by the CCGC to provide expertise in developing the groundwater program. HydroFocus was asked to determine the possibility providing high-confidence interval contours by reviewing all of the available nitrate data for the Salinas Valley. Although the analysis was performed for the Salinas Valley, the results are expected to be similar to any analyses that could be performed for the groundwater basins in the southern counties.

HydroFocus plotted the kriging standard error for the concentrations of nitrate (as nitrogen) for 670 well samples from the Salinas Valley. The standard errors ranged from 10% to 20%. Therefore, for

the 670 well samples and a grid spacing of about 1 mile, the estimated concentration of nitrate at any point where there is not a well will theoretically be within approximately plus or minus 20% of the range of the estimated value at points where there are not samples. Therefore for points on the grid where there are no samples, the confidence level for the estimated concentration is 80% to 90%. For a contour interval of 5 mg/L than encompasses known concentrations ranging from 5 to 10 mg/L nitrate as N, an estimated value of 9 mg/L with the 20% standard error would be result actual values being outside the contour range some of the time. For the domestic drinking water supply wells in the Salinas Valley and most probably in the southern counties, even if a sample is collected from every well, the sample size will likely be too small to generate a 90% or 95% confidence interval for all locations. Therefore, the number of available wells dictates that there will be a higher level of uncertainty associated with the contours in certain, but not all, areas.

Notification of Growers

The goal of the member notification system is to identify wells that have a concentration of nitrate above the MCL and make sure the users of the water are notified. The CCGC has developed a notification system that will guarantee that members are notified that the domestic supply well is above the MCL with sufficient time to notify users of the water within the 10 day period specified by the Order WQ 2013-0101. In addition, if the statistical analysis of the available data indicates that there are un-sampled wells with an estimated concentration of nitrate above the MCL, members who own those wells will be notified in a timeframe that will allow users of the water to be notified within 10 days of the statistical analysis.

Notification of members occurs several times during the monitoring and reporting process as described below.

- Outreach to members requesting the location of domestic supply wells on their property
- Notification to growers indicating that their wells were sampled and providing the responsibilities of the grower should the concentration of nitrate in the well exceed the MCL
- Federal Express notification within 36 hours of receipt of the results, informing the member that the concentration of nitrate in their well is above the MCL and providing the standardized notice to give to users of the water
- Mail notification to all remaining growers of the concentration of nitrate in their domestic supply wells and any follow-up activity that will occur
- Federal Express notification sent to member reporting the results of the contour analysis (concentration of nitrate above the MCL)

A brief discussion of each of these steps is provided below.

Outreach to members requesting the location of domestic supply wells on their property

When the CCGC is ready to initiate monitoring of domestic supply wells in a region, the CCGC contacts the member with a request for the location of all wells providing water for domestic use. Members respond with the requested information and a list of wells is developed. The list of wells provided will be compared to the wells listed by the member on their eNOI to guarantee that the wells scheduled for sampling are domestic supply wells. Wells scheduled for sampling are visited to determine the suitability of the well for sampling and to discuss with the member the use of the well to further confirm that all domestic supply wells are identified and available for sampling.

Notification to growers indicating that their wells were sampled

Once the member's wells have been sampled, they are sent a pre-notification letter (see attached) confirming the sampling, providing information about the potential outcomes of the laboratory analysis of the water, and stating that the member will receive one of several types of follow-up notifications determined by the concentration of nitrate in the well. One pre-notification letter per well is sent to the member such that a single member could receive several pre-notification letters depending on the number of wells across their ranches.

Exceedance report to the Regional Board if necessary

All laboratory analyses will be uploaded to GeoTracker by the well, and also sent to the CCGC for review of the quality assurance information. When the CCGC determines that the data meet the data quality objectives outlined in the QAPP, the data are considered validated. Validation is generally performed within 24 hours after receipt of the data from the laboratory. If the results of the laboratory analyses indicate that the concentration of nitrate in the well exceeds the MCL, the CCGC will notify the CCRWQCB within 24 hours of data validation. The notification will include all relevant data including but not limited to well ID, Ranch Name, sample date, and concentration.

Federal Express notification of the member

When the data are validated and it is determined that the concentration of nitrate in a member domestic supply well exceeds the MCL, the member will be notified of the exceedance. A standard notification letter will be sent via Federal Express overnight delivery to every member for every well that is in exceedance. All members will receive the notification letter within 36 hours of the CCGC learning of the exceedance in the member's well. Accompanying the notification letter will be the announcement that the member can provide to users of the well that they are drinking water with a concentration of nitrate above the MCL. The 36 hour delivery allows sufficient time for the member to notify the users of the well within the 10 day period required by Order WQ 2013-0101.

Mail notification to all remaining members of the concentration of nitrate in their domestic supply wells

All members that own domestic supply wells with a concentration of nitrate below the MCL will be notified by regular US Mail of the results of the analysis and any follow-up activity that will occur. If the well has a concentration of nitrate between 80% and 100% of the MCL, the member will be notified that the well will be resampled within a year and annually thereafter for the life of the Conditional Waiver.

Federal Express notification sent to member reporting the results of the contour analysis (concentration of nitrate above the MCL)

When the estimated concentration of nitrate in a member domestic supply well exceeds the MCL, the member will be notified of the exceedance. A standard notification letter will be sent by Federal Express overnight delivery to every member for every well that is estimated to be in exceedance. All members will receive the notification letter within 36 hours of the CCGC learning of the exceedance in the member's well. Accompanying the notification letter will be the announcement that the member can use to notify the users of the well that they are drinking water with a concentration of nitrate above the MCL. The 36 hour delivery allows sufficient time for the member to notify the users of the well within the 10 day period required by Order WQ 2013-0101.

Temporal Variability

The CCGC commits to performing additional sampling after the initial sampling outlined in this program is completed to determine temporal variability in wells in which the first measured concentration of NO_3 is within 80% of the MCL. For those wells, a second sample will be collected within a year and then annually thereafter.

Table 3 Report deliverables and dates for sampling and analyses performed in the south counties of the CCGC region.

Deliverable	Element	Date
List of wells the CCGC will sample to complete individual monitoring and reporting activities for members	List of members for whom the CCGC will sample their wells for compliance with individual reporting requirements	January 30, 2014
Complete list of wells sampled for members for individual reporting	List/location of wells sampled for members for compliance with individual reporting requirements	May 31, 2014
List of wells for sampling in south counties	List/location of wells to be sampled to provide coverage of south county region	September 1, 2014
Supplemental list of wells to sample in south counties	List/location of wells to be sampled to provide coverage of south county region	November 1, 2014
Completion of all sampling in CCGC region	Completion of domestic supply well sampling in both north and south counties	December 1, 2014
Memo detailing completion of sampling activities	Final list of wells sampled	December 15, 2014
Draft final sampling report for south counties	Discussion of sampling results cooperative program region concentration contours, depths of domestic supply wells, number/percentage of wells with NO_3 above the MCL; discussion of any data gaps in knowledge of shallow groundwater quality	April 15, 2015
Final sampling report for south counties	Discussion of sampling results cooperative program region concentration contours, depths of domestic supply wells, number/percentage of wells with NO_3 above the MCL; discussion of any data gaps in knowledge of shallow groundwater quality	June 30, 2015

Characterizing groundwater aquifers with focus on domestic drinking water supply and shallow groundwater

The primary objective for characterizing groundwater aquifers will be to develop 1) a process-level understanding of distribution of nitrate contamination in domestic supply wells with single connections or a small number of connections and 2) identify areas for evaluation of agricultural land- and water-management practices to reduce discharges to groundwater.

The region contains six principle groundwater basins where agriculture is the predominant land use; Los Osos Valley, San Luis Obispo Valley, Santa Maria River Valley, San Antonio Creek Valley, San Ynez Valley, and Cuyama Valley (Figure 2). As the project proceeds, these groundwater basins will be characterized more fully using the known geology and available information for the aquifer. Initially, aquifer characterization will be conducted on two levels. The CCGC will 1) characterize the distribution of nitrate concentrations in aquifers used for domestic drinking water supply, and 2) use existing data to provide information about the source of the nitrates and the age of the groundwater (year of recharge). A more complete characterization, due December 2014, will utilize groundwater data collected by the CCGC to more fully explain the nature of groundwater degradation and its causality.

Summary of Current Knowledge of Aquifer Conditions

The groundwater basins to be evaluated within the framework of this workplan are generally geologically similar. They are intermountain valleys where there is extensive faulting and resultant deep Tertiary and Quaternary alluvial fill and drainage to the Pacific Ocean. The main water bearing formations are deposits of the Holocene and Plio-Pleistocene age. Underlying the water bearing units are Tertiary and Cretaceous non water bearing bed rock[1]. Recharge and inflow to these groundwater basins are primarily due to percolation of precipitation and irrigation, seepage from streams and rivers, subsurface inflow from other basins, urban and agricultural runoff, and percolation of waste water. The following discussion of the basins and subbasins was extracted from the Department of Water Resources Bulletin 118, USGS publications and other publically available reports.

The Los Osos Valley Groundwater basin is an east-west trending syncline consisting of tertiary and quaternary age sediments that overlie Miocene and Jurassic age bedrock of the Pismo and Franciscan Formations. The groundwater basin is bound in the north by Park Ridge, the Irish Hills on the south and Morro Bay on the west[2]. The eastern boundary is a drainage divide which separates the Los Osos Valley from San Luis Valley. Annual precipitation ranges from 15 to 21 inches.

The permeable basin sediments that make up the shallow and deep aquifer zones include Holocene alluvial deposits, sand dunes and the Paso Robles and Careaga formations. Holocene alluvium consists of clayey gravel and sand which ranges in thickness of the alluvium ranges from 20 to 65 feet[3]. Pleistocene dune sands are unconsolidated, fine to medium grained sand with thin clay silt and gravel

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[1] Valentine, D.W., Densmore, J.N., Galloway, D.L., and Amelung, F., 2001, Use of InSAR to identify land-surface displacements caused by aquifer-system compaction in the Paso Robles Area, San Luis Obispo County, California, March to August 1997: U.S. Geological Survey Open-File Report 00-447, 1 p.

[2] Central Coast Hydrologic Region Los Osos Valley Groundwater Basin, http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/3-8.pdf

[3] Yates, E. B., and J. H. Wiese. 1988. *Hydrogeology and Water Resources of the Los Osos Valley Ground-Water Basin, San Luis Obispo County, California.* U.S. Geological Survey Water-Resources Investigations Report 88-4081.

interlayers. The main water producing unit in the basin, the Paso Robles Formation, consists of interbedded clay and clayey, pebbly sand. The thickness is about 300 feet[4]. The groundwater basin is bounded to the north, east, and south by relatively impermeable bedrock formations and to the west where there is discharge to the ocean. The Los Osos fault, which is eastward trending traverses the valley and is exposed along the south eastern Los Osos Valley and is a barrier to groundwater flow.

Recharge and inflow to the Los Osos Basin is derived from percolation of precipitation, irrigation and septic system discharges, seepage from Los Osos Creek and subsurface inflow across basin boundaries. Within the basin, individual aquifer zones may receive recharge directly from the sources stated above or from aquitard leakage from an overlying or underlying aquifer zones. Five aquifer zones have been delineated: 1) the unconfined shallow aquifer zone (Zone A) 2) the upper transitional aquifer (Zone B), 3) the upper main supply aquifer (Zone C) and 4) lower aquifers (Zones D and E). Groundwater discharges from the basin through wells and to the Pacific Ocean.

The shallow aquifer (Zone A) is recharged from precipitation, irrigation and septic tank percolation. Zone B receives recharge through Zone A from areas to the east and parts of downtown Los Osos. Zone C receives recharge from Zone A and B. Zone C is separated from Zone D and E by a continuous clay layer which is reportedly leaky. Inflow to Zone D and E also includes subsurface inflow from bedrock, sea water intrusion and Los Osos creek Valley alluvium. Most of the agriculture and municipal groundwater is currently drawn from lower aquifers, Zones D and E[5]. Zones A and B are tapped by a private wells.

Groundwater flow is generally towards the north and west towards the Pacific Ocean. In the alluvial aquifer, groundwater moves down the valley alignment and northward towards Morro Bay. The highest water levels in the lower aquifer system are located in the Los Osos Creek Valley. The steep hydraulic gradient between the upper creek valley and downtown Los Osos suggests significant impedance to flow which may be fault-related. Recent studies have documented that groundwater elevations in the lower aquifer zones are below sea level over a substantial portion of the basin. The depth to first encountered groundwater ranges from 3 feet to 120 feet.

There are two key groundwater quality issues in the Los Osos Basin; sea water intrusion and nitrogen from fertilization and septic systems. Ammonia and organic nitrogen are also present and likely contributed from septic system return flows. Of the 25 wells sampled in 2012, the average nitrate concentration was 60 mg/L[6].

Southwest of the Los Osos Groundwater Basin and bounded on the northeast by the Santa Lucia Range and San Luis Range on the southwest, the San Luis Obispo Valley Groundwater Basin underlies the San Luis and Edna valleys. On all other sides, it is bounded by impermeable Miocene and Franciscan Group rocks. This basin is drained by San Luis Obispo, Prefumo, and Stenner creeks in the northwest, and tributaries of Pismo and Davenport Creeks in the southeast. Groundwater occurs in Pleistocene to Holocene age sediments. Holocene deposits include unconsolidated gravel, sand, silt, and clay of fluvial origin[7]. These deposits are the main source of groundwater. The Pleistocene Paso

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[4] California Department of Water Resources (DWR). 1989. *Geohydrology and Management of Los Osos Valley Ground Water Basin, San Luis Obispo County: District Report.* 65 p.

[5] Smith, Doughlas, ed. "Can Los Osos Valley Groundwater Basin Provide a Sustainable Water Supply?" *Central Coast Water Shed Studies* (n.d.): 12. Print.

[6] LOS OSOS WATER RECYCLING FACILITY BASELINE GROUNDWATER QUALITY MONITORINGAUGUST 2012." *LOS OSOS WATER RECYCLING FACILITY BASELINE GROUNDWATER QUALITY MONITORING AUGUST 2012* (2012): 7. Print.

[7] Boyle Engineering (Boyle). 1991. City of San Luis Obispo Ground Water Basin Evaluation.

Robles Formation underlies the Holocene alluvium and is composed of poorly sorted, unconsolidated to consolidated conglomerate, sand, silt, gravel, and clay[8]. Recharge is from infiltration of precipitation, applied irrigation water, and streamflow.[20]

Groundwater levels have remained generally stable over the long term. Water levels declined as much as 8 feet during the 1975 through 1977 drought[20] and quickly recovered at the end of that drought. Water levels declined again about 6.5 to 12 feet during the 1986 – 1990 drought [20]. Depth to first encountered groundwater for one well with data in the DWR database in the basin is 5 feet. Available data for the basin do not indicate water quality problems related to agriculture.[9]

The Santa Maria River Valley groundwater basin underlies the Santa Maria Valley in the coastal portion of northern Santa Barbara and southern San Luis Obispo Counties (Figure 2). The basin also underlies Nipomo and Tri-Cities Mesas, Arroyo Grande Plain, and Nipomo, Arroyo Grande and Pismo Creek Valleys[10]. It is bounded on the north by the San Luis and Santa Lucia Ranges, the San Rafael Mountains on the east and on the south by the Solomon Hills and the San Antonio Creek Valley Groundwater Basin. It is bounded by the Pacific Ocean in the west and by the Casmalia Hills on the south west. There are three distinguishable units that appear to have only limited interaction: the Main Basin Unit, the Nipomo Mesa Unit, and the Arroyo Grande Unit. The Santa Maria Valley is drained by the Sisquoc, Cuyama, and Santa Maria rivers and Orcutt Creek. Tri-Cities Mesa and Arroyo Grande Plain are drained by Arroyo Grande and Pismo Creeks. Nipomo Valley is drained by Nipomo Creek into the Santa Maria River. Annual precipitation ranges from 13 to 17 inches, with an average of 15 inches[11].

Groundwater occurs in Holocene alluvium and dune deposits, and the Orcutt, Paso Robles, Pismo, and Careaga formations. Groundwater is unconfined throughout most of the basin except in the coastal portion where it is confined[3]. The average total thickness of the water bearing materials is about 1,000 feet with a maximum thickness of 2,800[12] to 3,000 feet[13]. Based on data for wells within the basin, depth to first encountered groundwater ranges from 3 to 336 feet.

The Holocene alluvium extends to a maximum thickness of 250 feet[14]. Holocene dune deposits are typically found along a coastal belt and attain a maximum thickness of 100 feet[9]. The Pleistocene Orcutt Formation consists of sand and coarse gravel, with minor amounts of silt and clay[15]. The Orcutt Formation can reach a maximum thickness of 225 feet, particularly along the axis of the Santa Maria Valley syncline[12]. Pleistocene deposits found under Tri-Cities Mesa range to about 60 feet thick and those under Nipomo Mesa range to about 300 feet thick[9]

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[8] California Department of Water Resources (DWR). 1979. *Ground water in the Paso Robles Basin***.** 88 p.

[9] Mathany, T.M., Burton, Carmen Al, Land, Michael, and Belitz, Kenneth, 2010, Groundwater-Quality Data in the South Coast Range – Coastal Study Unit, 2008: Results from the California GAMA Program, US Geological Survey Data Series 504

[10]California Department of Water Resources (DWR). 2002. *Water Resources of the Arroyo Grande-Nipomo Mesa Area.* Southern DistrictReport. 166 p.

[11] Central Coast Hydrologic Region Santa Maria River Valley Groundwater Basin, http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/3-12.pdf

[12] Santa Barbara County Water Agency (SBCWA). 1996. *Santa Barbara County 1996 Groundwater Resources Report*. 47 p.

[13] Worts, G. F. Jr. 1951. *Geology and Ground-Water Resources of the Santa Maria Valley Area, California*. U. S. Geological Survey Water-Supply Paper 1000.

[14] Miller, G. A. and R. E. Evenson. 1966. *Utilization of Ground Water in the Santa Maria Valley Area, California.* U. S. Geological Survey Water-Supply Paper 1819-A.

[15] Woodring W. P., and M. N. Bramlette. 1950. *Geology and Paleontology of the Santa Maria District California.* U. S. Geological Survey Professional Paper 222.

The Pliocene-Pleistocene Paso Robles, Careaga and Pismo formations typically consist of unconsolidated to poorly consolidated coarse- to fine-grained gravel, sand, silt, and clay[9]. The Paso Robles Formation ranges from about 40 feet near Pismo Creek[9] to 2,000 feet[14, 12] near Orcutt[12]. The late Pliocene Careaga Formation consists of unconsolidated deposits of fine- to medium-grained, marine sand with some silt[12], and unconsolidated to well consolidated, coarse- to fine-grained sand, gravel, silty sand, silt, and clay[11]. The thickness of this unit ranges from about 150 to 700 feet in the San Luis Obispo County portion of the basin[9] and ranges from 50 to 2,250 feet thick[14] elsewhere in the basin.

The Santa Maria River fault cuts northwestward through the basin in San Luis Obispo County[9]. Water levels at different elevations across some sections of this fault suggest that it is a barrier to groundwater movement in formations below the Pleistocene dune sand deposits[9].

Natural recharge and inflow to the basin is from seepage losses from the major streams, percolation of rainfall, and subsurface flow[9]. Deep percolation of irrigation water is also a key source of recharge. Percolation of flow in Pismo Creek provides recharge for the northern portion of the basin[9]. Percolation of flow in Arroyo Grande Creek, controlled by releases from Lopez Dam, provides recharge for the Tri- Cities Mesa, Arroyo Grande Plain, and Arroyo Grande Valley portions of the basin[9]. Percolation of flow in Santa Maria River, controlled in part by releases from Twitchell Dam, provides recharge for the Santa Maria Valley portion of the basin[9]. Both Twitchell and Lopez dams are operated so as to optimize groundwater recharge for the Santa Maria Groundwater Basin which is adjudicated [11]. Some subsurface inflow comes from consolidated rocks surrounding the basin and also from San Antonio Creek Valley Groundwater Basin[15].

Hydrographs show that water levels near Tri-Cities Mesa generally remained stable in the Paso Robles Formation and the Holocene alluvium from about 1965 through 2000[9]. Groundwater levels beneath Santa Maria Valley generally declined during 1945 through 1977, recovered by about 1986, declined again until about 1992, then recovered to near historic high levels by 1998[9]. Groundwater flow is generally westward toward the Pacific Ocean. A large groundwater depression beneath Nipomo Mesa, in the northern part of the basin, has directed groundwater flow locally toward the depression[9].

Salinity and nitrate are key water quality issues. Total dissolved solids concentrations vary throughout the basin, but tend to increase from east to west[16, 17] and increase toward the center of the basin beneath the cities of Santa Maria and Guadalupe[18]. Total dissolved solids concentrations also increase southward, away from the recharge area of the Santa Maria River[16, 17]. Nitrate concentrations have increased from less than 30 mg/l in the 1950s to over 100 mg/l in the 1990s in some parts of the basin. There is a significant difference in water quality between shallow and deep groundwater[19]. The shallow groundwater has higher nitrate concentrations. Analytical results for samples collected by the US Geological Survey as part of the Groundwater Ambient Monitoring Assessment in 2008 indicated nitrate concentrations range from less than 5 to over 157 mg/L[20].

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[16] Santa Barbara County Water Agency (SBCWA). 1999. *Santa Barbara County 1999 Groundwater Report*. 63 p.
[17] Santa Barbara County Water Agency (SBCWA). 2001. *2000 Santa Barbara Groundwater Report*. 53 p.
[18] California Department of Water Resources (DWR). 1964. *Water Quality Objectives, Santa Maria River Valley.* Southern District Report. 53 p.
[19] "Public Works Department Water Resources Division Water Agency." *Santa Barbara County 2011 Ground Water Report* (2012): 81. Print.
[20] Mathany, T.M., Burton, Carmen Al, Land, Michael, and Belitz, Kenneth, 2010, Groundwater-Quality Data in the South Coast Range – Coastal Study Unit, 2008: Results from the California GAMA Program, US Geological Survey Data Series 504

The San Antonio Creek Groundwater Basin is bounded by the Casmalia Hills and the Solomon Hills in the north, the Purisma Hills to the south, Burton Mesa in the west and the western most flank of the San Rafael Mountains to the East[21]. The ground water basin within the valley is about 110 mi^2 with an average rainfall of about 15 inches. Groundwater is found in alluvium, dune sand, terrace deposits, and the Orcutt, Paso Robles, and Careaga formations. The alluvium, Paso Robles and Careaga formations yield significant amounts of groundwater for irrigation. Groundwater is the primary source of irrigation water. Dune sand, terrace deposits, and the Orcutt Formation are also potential sources of groundwater. Consolidated rocks underlie water-bearing deposits and surface about seven miles east of the Pacific Ocean, forcing groundwater to the surface.

Holocene alluvium consists of unconsolidated sand, clay, silt and gravel of fluvial origin. The maximum thickness of the alluvium is about 100 feet and the average thickness is about 80 feet[22]. Dune sand consists of unconsolidated, fine- to coarse-grained, well rounded sand. The thickness of the dune sand is unknown, but it is probably no more than 100 feet[21]. Pleistocene terrace deposits (Orcutt and Paso Robles formations) are comprised of unconsolidated sand, gravel and clay of fluvial and marine origin. Their maximum thickness is about 75 feet[21]. The Orcutt Formation consists of unconsolidated sand and clay interbedded with gravel and extends to a maximum thickness of about 150 feet[21]. The Paso Robles Formation which is the main water bearing unit is about 2,000 feet thick and consists of unconsolidated gravel, sand, silt and clay of non-marine origin[3]. The Pliocene Careaga Formation, which is loosely consolidated fine to medium grained sand with some silt and gravel of marine origin[21] extends to a maximum thickness of about 1,425 feet in the Purisma Hills and thins down to about 700 feet under the Solomon and Casmalia Hills.

Precipitation and irrigation are the primary sources of groundwater recharge. Groundwater discharges from the basin through well extractions for irrigation and surface outflow to the Pacific Ocean. Groundwater levels have declined as much as 50 feet since the 1960s. First encountered groundwater ranges from 3 feet to 220 feet.

Water quality studies conducted by the USGS in the late 1970's indicated an average TDS concentration within the basin of 710 mg/L, with concentrations generally increasing westward toward the ocean along the Valley floor. The cause of the westward water quality degradation appears to be accumulation of lower quality water from agricultural return flow and the dissolution of soluble minerals. The highest TDS concentration (3,780 mg/L) was found in the extreme western end of the Valley; the lowest concentration (263 mg/L) was found at the extreme eastern end. Analyses compiled for samples collected between 1958 and 1978 indicate that groundwater quality remained fairly stable during that period. Analyses of samples collected in 1993 for several wells showed slight increases since the previous study. Recently collected data by the US Geological Survey indicate that nitrate concentrations are generally below the MCL[23].

The Santa Ynez River Valley Groundwater Basin is immediately south of the San Antonio Creek Basin and is bounded by the Purisima Hills on the northwest, the San Rafael Mountains on the northeast, the Santa Ynez Mountains on the south, and the Pacific Ocean on the west. On the east and underlying the groundwater basin, the basin is bounded by consolidated non water-bearing rocks of Tertiary

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[21] Central Coast Hydrologic Region San Antonio Creek Groundwater Basin, http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/3-14.pdf

[22] Muir, K.S. 1964. Geology and Ground Water of San Antonio Creek Valley, Santa Barbara County, California. U.S. Geological Survey Water-Supply Paper 1664.

[23] Mathany, T.M., Burton, Carmen Al, Land, Michael, and Belitz, Kenneth, 2010, Groundwater-Quality Data in the South Coast Range – Coastal Study Unit, 2008: Results from the California GAMA Program, US Geological Survey Data Series 504

age[24]. East-west oriented folds and faults of the region control the shape and location of these subbasins. In addition, formation of the basins has been influenced by the former stages and flow of the Santa Ynez River that created terraces and uplands that contain some of the primary aquifers. Previous reports have divided the basin into the Santa Ynez Uplands, Lompoc Plain, Lompoc Terrace, Lompoc Uplands and the Buellton Upland. Precipitation across the valley ranges from 15 to 21 inches, with an average of 17 inches.

Ground water for irrigation and human consumption occurs primarily in the Orcutt, Careaga and Paso Robles formations. In the eastern part of the basin, the maximum thickness of the water bearing materials is about 3,000 feet[25]. The Orcutt Formation consists of continental deposits of sand interbedded with coarse gravel and minor amounts of silt and clay[26]. Its greatest known thickness is about 200 feet in the central part of the basin[27]. Pliocene deposits include the Paso Robles and Careaga formations. The Paso Robles Formation consists of fluvial sand deposits and gravel interbedded with clay and silt in discontinuous bodies. This unit is about 700 feet thick in the Santa Rita Valley and thins westward[25]. The Pliocene age Careaga Formation consists of unconsolidated deposits of fine- to medium-grained, marine sand with some silt[28]. They range in thickness from 450 to 1,000 feet[25]. The Lompoc-Solvang fault, also called the Santa Ynez River fault, occurs along the southern perimeter of the western portion of the basin and is a barrier to groundwater flow[29].

Recharge includes precipitation, stream flows, and percolation of irrigation water and wastewater[30]. Stream seepage and rainfall are the primary sources of recharge to the basin. Groundwater is in direct hydraulic communication with the river. There is also Inflow into the basin due to underflow from the Santa Ynez and Buellton uplands, and percolation form wastewater ponds in Solvang and Buellton. Depending on water levels in the monitoring wells, water is released from Cachuma Reservoir to recharge the basin. In the Buellton Uplands Groundwater Basin, recharge occurs due to deep percolation of rainfall, stream seepage, and return flow from agriculture and underflow from adjacent basins[3]. The water released from Lake Cachuma, also recharges the eastern portion of the Lompoc Plain.

During the 1990s, the water levels increased significantly due to Cachuma operations and have since stabilized. In the Lompoc Plain, the alluvium is divided into an upper and a lower aquifer. The upper aquifer is sub-divided into three different units: the shallow zone, the middle zone and the main zone. Based on previous hydrologic and water quality studies, these zones have only limited points of hydrologic continuity and exchange within the western and central Lompoc Plain, but they are well

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[24] Wilson, H. D., Jr. 1959. *Ground-Water Appraisal of Santa Ynez River Basin, Santa Barbara County, California, 1945-52.* U. S. Geological Survey Water-Supply Paper 1467.

[25] Stetson Engineers, Inc. 1995. *Seventeenth Annual Engineering and Survey Report on Water Supply Conditions of the Santa Ynez River Water Conservation District, 1994-98.* San Rafael, California. Quoted in Santa Barbara County. *Santa Barbara County 1996 Groundwater Resources Report*. (Santa Barbara, California. 1996).

[26] Woodring W. P., and M. N. Bramlette. 1950. *Geology and Paleontology of the Santa Maria District California.* U. S. Geological Survey Professional Paper 222.

[27] Hamlin, S. N. 1985. *Ground-Water Quality in the Santa Rita, Buellton, and Los Olivos Hydrologic Subareas of the Santa Ynez River basin, Santa Barbara County, California.*U.S. Geological Survey Water-Resources Investigations Report 84-4131.

[28] Worts, G. F. Jr., and H. G. Thomasson, Jr. 1951. *Geology and Ground-Water Resources ofthe Santa Maria Valley Area, California*. U. S. Geological Survey Water-Supply Paper1000.

[29] California Department of Water Resources (DWR). 1999. *Evaluation of Groundwater Overdraft in the Southern Central Coast Region,Part 2.* Technical Information Record SD-99-2, 116 p.

[30] Miller, G. A. 1976. *Ground-Water Resources in the Lompoc Area, Santa Barbara County.* U. S. Geological Survey Open-File Report 76-183.

connected within the eastern Lompoc Plain[31]. The general direction of groundwater flow is from east to west and parallel to the Santa Ynez River. Depth to first encountered groundwater ranges from about 5 feet to 337 feet.

Salinity is the key water quality issue and varies throughout different zones in the upper and lower aquifers. In the eastern Lompoc Plain, TDS concentrations are generally lower than 1,000 mg/L. In the western Lompoc Plain, TDS concentrations range from 4,000 to 8,000 mg/L. The quality of groundwater in the Lompoc Terrace and Lompoc Uplands areas is of better quality and TDS values average about 700 mg/L. According to data collected from state well 7N/30W-33M1. The average concentration of nitrates has increased since 1990, from 11 mg/L to about 26 mg/L in 2012. Historical water quality data from wells in the Los Olivos/Ballard area indicate elevated nitrate concentrations that exceed the MCL. Septic systems are suspected of being a source of the increasing nitrates in the area[32]. Recent data collected by the US Geological Survey indicate that nitrate concentrations are generally less than the MCL[33].

The Cuyama Valley Groundwater Basin is bound in the north by the Caliente Range and by the Sierra Madre Mountains in the southwest. The Cuyama River drains the valley and the average precipitation is about 7 to 15 inches per year. Groundwater occurs in the Holocene age alluvium and older deposits and it is mainly unconfined.

The thickness of the Holocene age alluvium is about 150 to 250 feet[34]. In the western part of the basin, the alluvium is the primary water-bearing formation and consists of thick sand and gravel alternating with beds of clay. In the south central part, it is mainly sand and silt with some beds of gravel and clay. In the southeastern part of the basin, the alluvium consists of coarse gravel and sand[35]. Underlying older terrestrial deposits In the southeastern part of the basin, the Pliocene age Cuyama or Morales formations are the main water-bearing units in the basin for irrigation and human consumption. These deposits consist of large and large zones of poorly consolidated clay, silt, and gravel[30]. The main source of recharge is seepage from the Cuyama River[36]. Groundwater movement is to the northwest, parallel to the Cuyama River. Based on data from wells in the basin, depth to first encountered groundwater ranges from about 30 feet to about 530 feet.

The groundwater TDS ranges from 1,500 mg/L to 1,800 mg/L. We were unable to find information about nitrogen in groundwater.

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[31] Central Coast Hydrologic Region Santa Ynez River Valley Groundwater Basin, http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/3-15.pdf

[32] Santa Barbara County Environmental Health Services, Los Olivos Wastewater Management Plan, 2010.

[33] Mathany, T.M., Burton, Carmen Al, Land, Michael, and Belitz, Kenneth, 2010, Groundwater-Quality Data in the South Coast Range – Coastal Study Unit, 2008: Results from the California GAMA Program, US Geological Survey Data Series 504

[34] Upson, J.E., and G. F. Worts, Jr. 1951. *Ground Water in the Cuyama Valley, California*. U.S. Geological Survey Water-Supply Paper 1110-B.

[35] Central Coast Hydrologic Region Cuyama Valley Groundwater Basin, http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/3-13.pdf

[36] Santa Barbara County Planning and Development Department (SBCPDC). 1994. *Santa Barbara County Comprehensive Plan.* 77 p.

Quality Assurance Project Plan/Sampling Analysis Plan

Quality Assurance

A Surface Water Ambient Monitoring Program (SWAMP) comparable Quality Assurance Program Plan (QAPP) will be developed for the project. The QAPP will include all 24 elements found in the SWAMP checklist. Analytes covered in the QAPP are from Table 3 of MRP documents (MRP No. R3-2012-0011-01, MRP No. R3-2012-0011-02, and MRP No. R3-2012-0011-03) and Table 2 above.

Briefly, the QAPP will include but is not limited to:

- Project organizational structure;
- A discussion of the field methods to be used;
- Meter maintenance and calibration;
- Sample collection methods;
- Chain of custody form;
- Field and laboratory SOPs;
- Sample containers; and
- Sample processing and preservation methods.

Field parameters and analytes will be listed and the laboratory method(s) of analysis will be provided. Data quality objectives will be provided and the quality control samples (e.g. duplicates, blanks) needed to meet those objectives will be discussed. The laboratory identified to perform the analysis will be provided and the analytical methods used will be described. Laboratory SOPs will be included as well as the laboratory QA/QC measures (e.g. spikes, blanks). The QAPP will be circulated for approval prior to initiation of sampling and analysis. The QAPP will be provided to the Water Board by November 30, 2013.

Sampling and Analysis Plan

A sampling plan for the domestic supply wells will be developed and submitted to the CCRWQCB prior to the initiation of sampling. The
Sampling Plan will:

- Develop the logistical details of field sampling, e.g., timing;
- Identify who will perform sampling;
- Describe how sampling will be coordinated with landowners and tenants;
- Identify wells to be sampled and timing of sampling;
- Describe type of well (domestic supply, agricultural supply, monitoring); and
- Provide map of wells using same NAD 83 and 1:24,000 scale as provided for the cooperative program boundary

Third Party Implementation

Member Organization and Member Responsibilities

The CCGC is a non-profit organization formed to direct and administer the activities of the program and its contractors. The purpose of the CCGC's organizational structure is to consolidate agricultural L&Gs to support cooperative program activities, and to conduct the monitoring, reporting, and outreach activities. The governance structure is fully explained in the Work Plan submitted for the north

counties in the CCGC region. The portions relevant to the southern region are summarized here including requirements and responsibilities of the CCGC and its members that members of the CCGC in the southern counties need to understand.

CCGC organization responsibilities include:

- Tracking members and reporting required member information to CCRWQCB;
- Collect fees to operate program;
- Manage communications and notifications to members and CCRWQCB;
- Conduct sampling to remain in compliance with the MRP requirements;
- Manage water quality monitoring data;
- Manage contracts for technical work;
- Interpret data;
- Submit reports to CCRWQCB on behalf of members;
- Document its organizational and management structure; and
- Provide members with annual summaries of expenditures of revenue.

One of the CCGC's long-term goals is to inform L&Gs about their responsibility to use farming practices that are protective of groundwater resources. This goal needs to be accomplished with a cost effective data collection program to properly characterize groundwater quality, and to assist L&Gs in implementing effective practices to protect groundwater quality.

Participating in the CCGC will carry responsibilities for members including:

- Paying dues necessary to fund CCGC activities (monitoring, reporting, outreach); and
- Completing any required reports/forms requested by the CCGC.

Enrollment forms will include a signed provision allowing the CCRWQCB to provide the CCGC with information on the eNOI. Failure to meet membership responsibilities will result in dismissal from the CCGC. Once a grower is dismissed from the CCGC, their name is no longer included in the annual member list provided to the CCRWQCB by the CCGC organization. These responsibilities provide assurances to the CCRWQCB and stakeholders that membership in the CCGC provides for the proper characterization of local groundwater conditions and a commitment on the part of members to be protective of groundwater quality.

Cooperative Program Responsibilities

The CCGC will insure that there is sufficient financial support to implement the program and will include the approximate cost to implement the program and identification of resources available (e.g., the fees and number of participating L&Gs to generate the funds necessary to meet the budgeted costs) to fully implement all technical and administrative aspects of the program.

The CCGC will insure sampling is conducted by dates established in this work plan (see Table 5).

The CCGC will insure data and reports are submitted to the CCRWQCB in format specified and by dates established in Table 5.

The CCGC will insure all participating L&Gs are providing any required information and are taking necessary steps to address any obstacles, or issues that arise to implementing the

cooperative monitoring program.

The CCGC will insure that any activities conducted on behalf of the third-party by other groups meet the terms and requirements of the program. The CCGC is responsible for any activities conducted on its behalf.

As outlined in the July 11, 2013 Work Plan for the northern counties, the CCGC will continue to conduct governance:

i. As a non-profit entity;
ii. With a governing structure that includes a governing board of directors composed in whole or in part of participating L&Gs, and that provides participating L&Gs with a mechanism to direct or influence the governance of the third party through appropriate by-laws.
iii. With appropriate authorization from participating L&Gs to access individual grower eNOI information in GeoTracker (e.g., AW#, current contact information);
iv. The CCGC will describe and provide evidence for i-iii, above.

The CCGC will provide the following information and reports to the CCRWQCB and participating L&Gs, on the dates specified:

- By November 15, 2013, the list of participating L&Gs, and quarterly, thereafter, the list of new enrollees, as follows:
    - Participating grower information in Microsoft Access or Excel format, including AW#, Ranch Name and GeoTracker global ID for each participating grower, physical mailing address, and email address. Information provided must be accurate and consistent with that reported in the electronic-Notice of Intent (eNOI);

The CCGC must also provide to the CCRWQCB, confirmation that the following information was provided to participating L&Gs;

- On November 15, 2013, in the Draft Final Report by April 15, 2015, and the Final Report by June 30, 2015, the annual summaries of expenditures of fees and revenues. The CCGC must also provide to the CCRWQCB, confirmation that this information was provided to the participating L&Gs;

- By November 15, 2013 and annually on September 1 thereafter, notification to participating L&Gs of the following, and provide confirmation to the CCRWQCB of such notification to participating L&Gs:
    - Participating L&Gs, as enrolled L&Gs in the Agricultural Order, are individually responsible for the successful implementation of the program and that this individual responsibility has two consequences if the CCGC is not successfully implemented: 1) The CCRWQCB or Executive Officer will require individual dischargers to conduct individual monitoring per the requirements of the Agricultural Order, 2) The CCRWQCB may take enforcement action against individual dischargers. The failure of a third party group to successfully implement an approved program cannot be used as an excuse for lack of individual discharger compliance;

- Quarterly if the third-party group is unable to implement any aspect of the program that could result in a violation of the program's monitoring or reporting requirements, notification describing the inability to implement and the possible violations. The CCGC must also provide to the CCRWQCB, confirmation that this information was provided to participating L&Gs;

- Quarterly notification to participating L&Gs of any changes to the program approved by the Executive Officer or the CCRWQCB and confirmation to the CCRWQCB that this notification was provided to participating L&G's.

Table 4. Cooperative Program administrative deliverables.

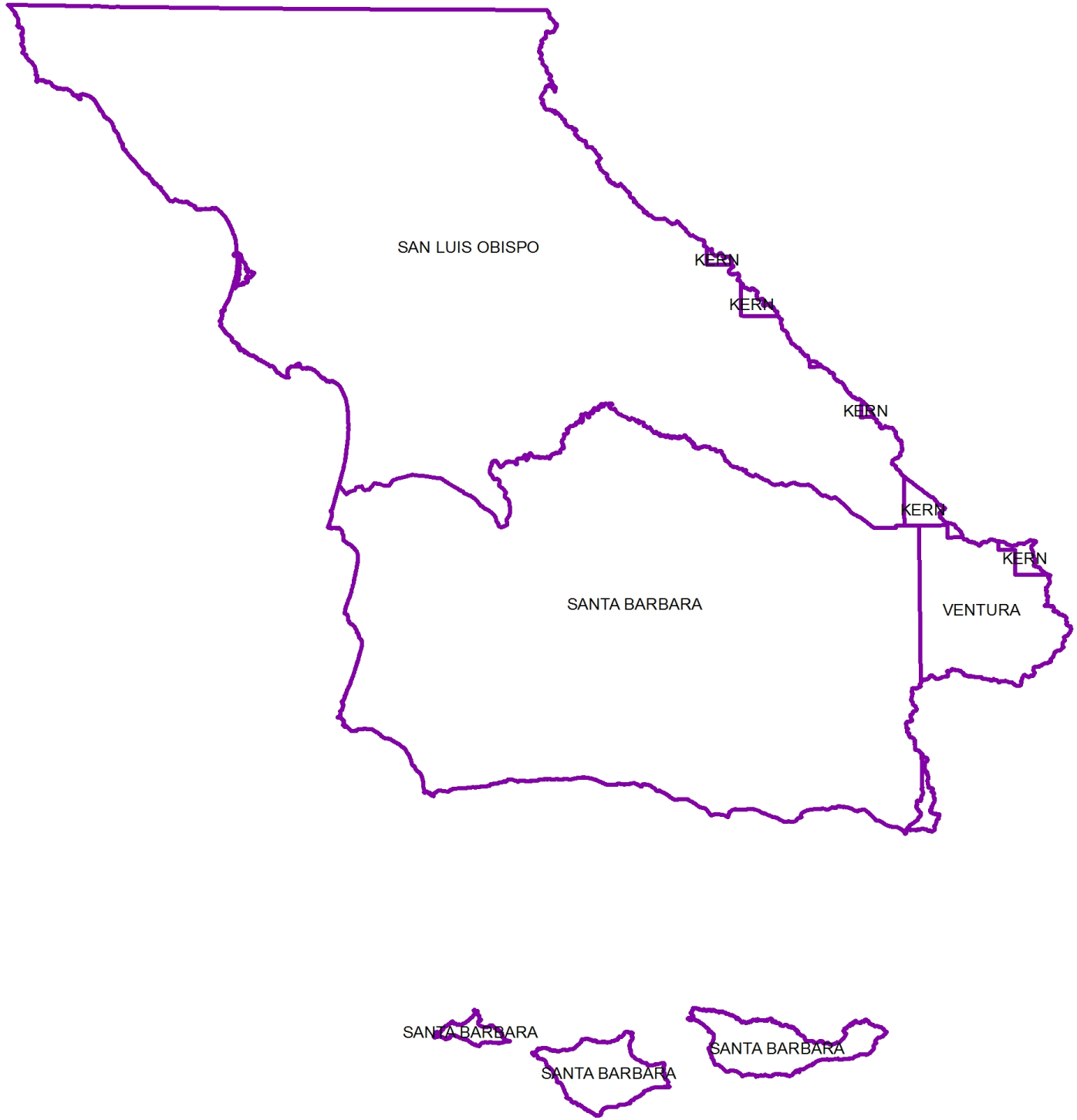
Deliverable	Elements	Date
Work Plan	Outlines monitoring and reporting activities for south counties	November 1, 2013
List of participating L&Gs	List of members in good standing	November 15, 2013
Member parcel map specifying exact CCGC area	GIS shapefile of geographical boundary of program based upon member parcels	February 1, 2014 and annually thereafter
Quarterly update of member list	List of members who enrolled in last quarter, in Access or Excel format	January 1, 2014; April 1, 2014, July 1, 2014, October 1, 2014
Member notification of responsibilities as a discharger	Consequences to members for not accepting member responsibilities; CCRWQCB notification that members have been contacted	December 1, 2013
Notice of inability to successfully conduct business as required by the CCRWQCB	Confirmation of member notification	Quarterly as necessary starting 90 days after formation of cooperative program organization

Summary

Table 5 Chronology of all submissions to the Central Coast CCRWQCB by the CCGC on behalf of its members in the south counties.

Deliverable	Date
Work Plan including shapefile of southern CCGC region	November 1, 2013
List of participating L&Gs and list of wells to be sampled in the fall of 2013 for members needing to complete individual monitoring activities	November 15, 2013
QAPP for south county monitoring	November 30, 2013
Member notification of responsibilities as a discharger	December 1, 2013
Submission of QAPP for south county sampling	December 1, 2013
Quarterly update of member list	January 1, 2014; April 1, 2014, July 1, 2014, October 1, 2014
Submit list of wells sampled during fall 2013	January 15, 2014
List of wells the CCGC will sample to complete individual monitoring and reporting activities for members	January 30, 2014
Member parcel map specifying exact CCGC area	February 1, 2014 and annually thereafter
Complete list of wells sampled for members for individual reporting during spring 2014	May 31, 2014
List of wells for sampling in south counties	September 1, 2014
Supplemental list of wells to sample	November 1, 2014

Deliverable	Date
Completion of all sampling in CCGC region	December 1, 2014
Memo detailing completion of sampling activities	December 15, 2014
Draft final sampling report for south counties	April 15, 2015
Final sampling report for south counties	June 30, 2015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Central Coast ~~Cooperative~~ Groundwater ~~Program~~ Coalition Work Plan for Monterey, Santa Clara, Santa Cruz, and San Benito Counties

~~Central Coast Groundwater Task Force~~
~~Presented by~~
~~Grower-Shipper Association of Central California~~
~~Monterey County Farm Bureau San Benito County Farm Bureau Santa Clara Farm Bureau~~
~~Santa Cruz County Farm Bureau~~
~~Western Growers~~

Updated ~~July 11~~ November 1, 2013

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List of Acronyms

DPH	Department of Public Health
~~CCCGP~~	~~Groundwater Cooperative Program~~
CCGC	Central Coast Groundwater Coalition
GIS	Geographic Information System
MCL	Maximum Contaminant Level
MRP	Monitoring and Reporting Program
~~CCCGP~~	~~Central Coast Cooperative Groundwater Program~~
QAPP	Quality Assurance Project Plan
SOP	Standard Operating Procedure

~~Disclaimer~~

~~The dates of completion, implementation, and all deliverables are based upon notification by July 12, 2013 of program acceptance by the Central Coast Regional Water Quality Control Board ("CCRWQCB"). Notification of final proposal approval beyond July 12th will extend proposed timelines by one day for each day of delay after that date.~~

~~This proposal is intended to respond to the requests for a revised workplan and additional information requested in correspondence and meetings with the Board and Staff. All references to uploading data to GeoTracker in this document are made under the condition that any data loaded would remain on the regulatory-only side of GeoTracker for the duration of the existing waiver and any extensions of that waiver.~~

~~As the CCRWQCB evaluates and approves a future order (Waiver or WDR) that applies to this program's participants, we request that the agency consider retaining these data on the regulatory-only side of GeoTracker. In the event that data in question is moved to the public side of GeoTracker, an action we strongly contend will be a disincentive to continued participation in the program, the location of any data point will be shown with an uncertainty by at least one (1) mile squared. When responding to public records act requests for the data uploaded to GeoTracker, CCRWQCB staff will blur case well location coordinates by one (1) mile squared due to public safety concerns. When responding to public records act requests for information regarding well logs, well location and/or data submitted directly to CCRWQCB staff by the cooperative (a requirement before sampling is conducted) the CCRWQCB will blur case well location coordinates by one (1) mile squared due to public safety concerns.~~

~~Consistent with the same practice used to protect public drinking water supply wells regulated by the California Department of Public Health, we acknowledge the verbal commitment made by the CCRWQCB staff and State Water Resources Control Board staff to revise the Central Coast waiver and its Monitoring and Reporting Plan (MRP) to show with an uncertainty of the precise locations of groundwater wells sampled in this program to one square mile. We acknowledge the verbal commitment made to us by the CCRWQCB staff that this show with an uncertainty by one mile squared will be made of any and all well locations reported as part of this program.~~

~~The agreement to withhold the display of individual wells sampled by the cooperative program on maps on the public side of GeoTracker for the term of the waiver only pertains to the display of individual wells on maps. It does not affect the ability of the CCRWQCB staff to provide summaries of groundwater quality data from individual wells to the public through reports developed using information from the~~

~~regulatory side of GeoTracker (e.g. tabulated results in response to public queries). Additionally, it does not affect the CCRWQCB staff's ability to publish, present or use individual well data in any summary reports or presentations. In all cases, we acknowledge here the verbal commitment of the CCRWQCB staff to show with an uncertainty of the precise locations of groundwater wells by one mile squared as described above.~~

~~The deadlines and commitments are conditioned on reaching an agreement on these issues, per our discussion with State Water Board and CCRWQCB staff members on May 23, 2013 and subsequent conversations through July 10, 2013. In the absence of agreement, this proposal is for discussion purposes only.~~

Introduction

The CCRWQCB adopted Order No. R3-2012-0011 Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Conditional Waiver) and associated Monitoring and Reporting Program Orders (MRPs) on March 15, 2012. The Conditional Waiver and the MRPs specify that landowners and growers (here forward referred to as L&Gs) in Tiers 1, 2 and 3 may meet groundwater monitoring requirements by either monitoring groundwater individually on their agricultural operations, or by joining a groundwater cooperative monitoring program. The purpose of this document is to set forth the plan for a ~~Central Coast Cooperative Groundwater Program~~ Central Coast Groundwater Coalition (~~CCCGP~~ CCGC) that satisfies the requirements in the Conditional Waiver and MRPs for participating L&Gs in Monterey, Santa Cruz, Santa Clara, and San Benito Counties. The steps outlined in this work plan provide a foundation for a ~~CCCGP~~ CCGC that L&Gs can support, and that satisfies the requirements as set forth in the MRPs which states, "At a minimum, the cooperative groundwater monitoring effort must include sufficient monitoring to adequately characterize the groundwater aquifer(s) in the local area of the participating Dischargers, characterize the groundwater quality of the uppermost aquifer, and identify and evaluate groundwater used for domestic drinking water purposes." (Page 9 of the MRP - Tiers 1, 2, 3).

One of its primary purposes is to provide the Water Board with information that fills the gaps in the current understanding of groundwater quality throughout the region. Depending on the further development of the Conditional Waiver and its implementation, the program may also eventually provide information to the Water Board on existing farming practices and additional farming practices that will result in improved groundwater quality over time.

Agricultural landowners and growers recognize there is a shared responsibility for maintaining acceptable water quality. They recognize that past fertilizer inputs, as well as other historical land use practices, may have contributed to groundwater quality problems, and are focused on finding solutions to address the contribution that may be coming from existing agricultural practices. L&Gs who choose to participate in this coalition are making a commitment to address groundwater quality in the aquifers supplying drinking water. If sample data indicates that nitrates are above the MCL identified by the Department of Public Health (DPH) as safe for human consumption, and that water coming from that well is currently being consumed, the ~~CCCGP~~ CCGC will notify the grower/landowner ~~aware so that they may take immediate steps to address the problem~~ immediately. The notification will allow the member to notify users of the water within 10 days of confirmation that the data provided by the laboratory meet the data quality objectives outlined in the QAPP. ~~Additionally, many growers/landowners have and continue to provide alternate supplies of drinking water or have stopped using the well for domestic drinking water purposes. If a member of the cooperative program agrees, we will inform the CCRWQCB when the member provides a replacement water source or~~

~~discontinues use of a domestic well for drinking water purposes. Responsibility for follow-up with any grower/landowner shall be the sole responsibility of the Board, and not the CCCGP.~~

~~Cooperative Program~~ CCGC Boundaries

The ~~CCCGP~~ CCGC covers enrolled L&Gs in the northern part of the Central Coast region including portions of Santa Cruz County, Santa Clara County, San Benito County, and Monterey County (Figure 1). The ~~cooperative program~~ Coalition is providing a shapefile to the Water Board along with this submission that outlines the outer perimeter of the cooperative program region (Projection – NAD 83, Scale – 1:24,000). The shapefile will include the extent of the agricultural regions in the four counties. Parcels enrolled in the actual ~~cooperative program~~ Coalition region will be a subset of this area (see below).

L&Gs in the four counties are all potential participants in this program. Over 1,500 L&Gs have indicated that they will join a ~~cooperative~~ Coalition monitoring and reporting program but there are numerous other L&Gs that selected individual reporting as the preferred method of compliance with the Conditional Waiver. Because enrollment in the ~~cooperative program~~ Coalition is unlikely to include all L&Gs in the northern region, the exact participating parcels and subsequent perimeter boundary will reflect the actual land ownership and lease agreements in place each year. The final ~~cooperative program~~ Coalition boundaries reflect the agricultural lands of L&Gs within the portions of the four counties that are members the ~~cooperative program~~ Coalition region. The membership region is likely to be dynamic from year to year as some leases change hands and some land leaves the ~~cooperative program~~ Coalition and some land enters the program. However, the spatial distribution of the member parcels will not negatively impact the ability of the ~~CCCGP~~ CCGC to characterize the concentration of nitrate in domestic supply wells, nor will it negatively impact the ability of the ~~CCCGP~~ CCGC to characterize the domestic drinking water supply and shallow aquifers across the ~~cooperative program~~ Coalition region.

Figure 1. Geographic area of the ~~CCCGP~~ CCGC.

The ~~cooperative program~~ Coalition will provide to the CCRWQCB a list of members on ~~September 1~~ November 15, 2013, and will provide an annual update on September 1 of each year. In the first year of the ~~CCCGP~~ CCGC existence, the CCCGP will provide quarterly updates to the list of members as new members may enter the program as they become aware of its existence. Because a number of leases change hands during October, the Coalition will provide an annual update shapefile of the ~~cooperative program~~ Coalition land area by November ~~1~~ 15 of 2013 and on November 1 of each year beginning in 2013.

Task Deliverables

Table 1. Deliverables for Coalition Boundary Delineation.

Deliverable	Elements	Date
Shapefile of external boundaries of ~~cooperative program~~ Coalition region	ArcGIS shapefile in NAD 83 at 1:24,000 scale; general outline of the ~~cooperative program~~ Coalition region without individual member landholdings or leases	May 31, 2013
List of members who have enrolled and paid fees to the ~~cooperative program~~ Coalition	Excel spreadsheet of member IDs, member names, member farm operation names, and contact information as specified below in section	~~September 1~~ November 15, 2013 and annually thereafter on September 1
Shapefile of ~~cooperative program~~ Coalition region on a parcel by parcel basis	ArcGIS shapefile in NAD 83 at 1:24,000 scale; includes the land owned and/or leased by ~~cooperative program~~ Coalition members at the individual parcel	November ~~1~~ 15, 2013 and annually thereafter on November 1

Description of Cooperative Program Coalition Technical Activities

Approach

The ~~cooperative program~~ Coalition will undertake two related technical tasks; locating and sampling domestic supply wells on member owned/leased land, and characterizing groundwater aquifers in the ~~CCCGP~~ CCGC region with a focus on shallow groundwater. The domestic supply wells sampled will be those not sampled by the counties and consequently, the concentration of nitrate in the water in those wells is not known. The ~~CCCGP~~ CCGC will use data generated by the counties, as well as data submitted to GeoTracker by individual L&Gs to be in compliance with the Conditional Waiver to complete the characterization of the domestic drinking water-supply and shallow groundwater aquifer. The primary focus is characterization of the domestic drinking water-supply aquifer.

Domestic supply well identification and sampling from the start of the ~~cooperative program~~ Coalition to September 1, 2014, and will be completed in three (3) phases. Each phase consists of identifying a subset of wells to sample from a specific geographic area within the ~~cooperative program~~ Coalition region and then conducting sampling of those wells. Sampling involved in all three phases will be completed by September 1, 2014

The location and sampling of wells on member parcels will occur in three phases during 14 months with

activities beginning during the summer of 2013. Phasing will occur by basin as follows. During Phase I wells in the Salinas Valley and Lockwood Valley will be located and sampled. Phase II will focus on locating and sampling wells in the Pajaro Valley, and Phase III will focus on locating and sampling wells in the Gilroy-Hollister area. Figure 2 shows the location of the phased areas. Using maps and lists of member parcels, we will identify all wells that can be potentially sampled within each basin. These will include domestic wells with single and double connections. These wells will be identified via a combination of Google Earth maps overlaid on a map of member parcels.

The phasing is required because the process of obtaining well logs and reviewing for information on screening depth(s) (see below) to identify wells for sampling is time consuming. Once a list of candidate wells have been identified, the list must be narrowed to those wells that are located on ~~CCCGP~~ CCGC member parcels, that are accessible, and that are reasonably certain to provide a valid sample (see below). This process is expected to take up to several weeks as individual members are contacted, arrangements are made to visit the wells, and samples are collected.

Based on recent information (see reports cited below and the recent report released by Harter et al. 2012), it appears that groundwater conditions in the Salinas Valley/Lockwood Valley may be the lowest quality in the ~~CCCGP~~ CCGC region, and those valleys may have the largest number of unsampled domestic supply wells. Consequently, the ~~CCCGP~~ CCGC will initiate its sampling and characterization efforts in those areas, moving to the Pajaro Valley, and finally the Gilroy-Hollister area last. The three phases are overlapping in that once the list of wells is finalized and arrangements are made for sampling, work on developing the next list will be initiated.

Locating and Sampling Domestic Supply Wells

The ~~CCCGP~~ CCGC will gather available well logs for all domestic wells that are filed with the Department of Water Resources with written authorization from the CCRWQCB. Because of the time-sensitive nature of this project, in order for the ~~CCCGP~~ CCGC to meet the deadlines, the CCRWQCB has agreed to authorize the ~~CCCGP~~ CCGC and its consultants to obtain the well logs from the Department of Water Resources upon final approval of this groundwater program. Wells that do not have a well log will be assigned low priority for sampling. For wells with well logs, the utility of sampling each well will be assessed using additional information including but not limited to well density in the immediate vicinity and well depth. These criteria will be used to prioritize wells to be sampled based on answers to the following questions.

- Based on the depth and screened interval for each domestic well, are there reliable and existing data for the depth interval and immediate area that can provide sufficient information about drinking water quality without sampling the well in question (immediate area is defined by the degree of spatial uncertainty in the available water quality data, see bullet point 3 below)?
- Can the well water be accessed for reliable sampling?
    - That is, is the well head and casing intact and can a reliable water sample be collected?
    - Are there obvious potential avenues for surface contamination to enter the well?
- What do the existing data indicate about spatial variability of the water quality in the area?

Based on the analysis of existing data, the level of spatial uncertainty in water quality data in the area surrounding the well will be quantified and for each well, a determination will be made of how sampling each well can reduce uncertainty. This is an iterative process and the density of wells within a subbasin or area within a subbasin may depend on the concentration of nitrate in the wells that are selected for sampling. It is possible that after the list of wells to sample is finalized, there could be a need for additional samples. Consequently, a step in each phase has been added that allows additional wells to be identified and sampled to allow adequate characterization of drinking water. A list of any new wells that

are proposed for sampling will be submitted to the CCRWQCB for Executive Officer approval. Except as provided in the section entitled "Deliverables and Schedule", all referred to well lists in this document would be available only through a valid public records act request, in which case well coordinates would be shown with an uncertainty by one mile squared.

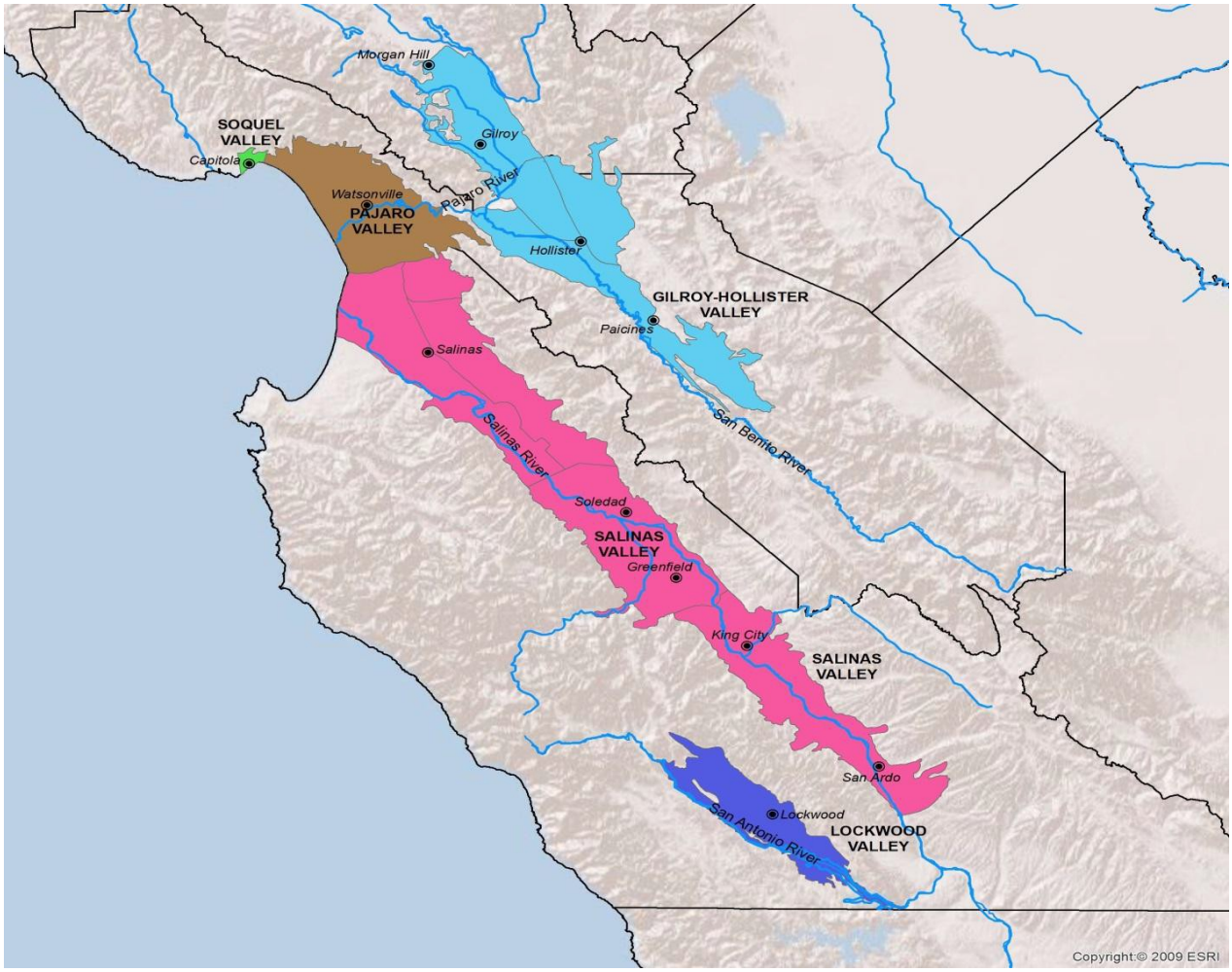
In summary, a staged approach will be used to identify wells for sampling within member parcels.

- Stage 1 – domestic drinking water supply wells with depth and screened interval information. Within those wells identified in Stage 1, wells will be selected that 1) provide essential information about the quality of drinking water based on the analysis of existing data, 2) are accessible and 3) will provide good quality groundwater samples.
- Stage 2 – If there are wells with depth and screened interval information on non-member parcels, this will greatly improve the certainty in the characterization of domestic drinking water quality, we will work with Water Board staff to gain access and sample these wells.
- Stage 3 – if after Stages 1 and 2 an insufficient number of wells are identified to effectively characterize drinking water quality within reasonable certainty in specific areas, domestic water supply wells without depth and screened interval information will be sampled. In addition, as required by the Order WQ 2013-0101, any well that is estimated by a contour analysis to have a concentration of nitrate within 50% of the MCL will be added to the list of wells to sample.

In addition to the three stages listed above, any well that has a concentration of nitrate within 20% of the MCL (80% of the MCL) will be sampled within a year of the original sample collection date and annually thereafter. The second sample is to determine if seasonal conditions could result in the concentration of nitrate in the well exceeding the MCL.

The approach for determining the adequacy of the number of wells for characterizing domestic drinking water quality is threefold. First, the existing data will be used to estimate the spatial variability of groundwater nitrate concentrations at various depths. The ~~CCCGP~~ CCGC proposes to use standard statistical and geostatistical methods to estimate based on the existing data, the number of samples required to represent a value for the central tendency (mean or median) for different levels of variance. Second, the ~~CCCGP~~ CCGC will use the characterization of the aquifer to assess factors such as soils, subsurface texture, land use and land- and water-management practices and existing water quality data to provide causal explanation of groundwater nitrate concentration distributions. Third, the ~~CCCGP~~ CCGC will use this assessment and the distribution of existing water quality data to select wells identified during Stage 1 and 2 for sampling based on this analysis and discussions with the Water Board staff to develop consensus with regard to wells to be sampled and the criteria used to develop the list of wells. The objective is to identify an optimal number of wells that allow characterization within an acceptable level of variance. The ~~CCCGP~~ CCGC will endeavor to minimize to the extent possible, the spatial estimation variance and maximize the confidence level with existing domestic supply wells.

Figure 2. Groundwater basins in the CCCGP region.



The ~~CCCGP~~ CCGC expects to identify a sufficient number of wells in the first two stages that when combined with existing data, will result in adequate characterization of drinking water quality. However, as indicated above if any well is estimated to have a concentration of nitrate at 50% of the MCL that well will be added for sampling during the third stage. As described above, the initial list of wells selected for sampling will necessarily be larger than the number of wells eventually sampled because many wells may not be accessible, may not be located on member parcels, or will not provide groundwater quality samples that can contribute to characterizing the concentration of nitrate in domestic supply wells. In addition to nitrate, samples may be analyzed for constituents that will aid in aquifer characterization. A list of constituents is shown in Table 2. Constituents listed in line one of Table 2 (Compliance with Conditional Waiver and MRPS) will be analyzed in all circumstances. Constituents listed in lines 2-5 may be analyzed in situations where doing so would aid in aquifer characterization, as determined by the ~~CCCGP~~ CCGC. All wells will be sampled and the groundwater analyzed for at least the constituents specified in line one of Table 2 by the dates detailed in Table 3. The other constituents listed in lines 2-5 of Table 2 may be sampled if it is determined that it is necessary to obtain specific information needed to better characterize the aquifers.

Table 2. Constituents to be monitored to characterize drinking water and the shallow aquifers.

Function	Constituents
1. Compliance with Conditional Waiver and MRPs[1]	pH, SC, TDS, total alkalinity, CA, Mg, Na, K, SO_4, Cl, NO_3-NO_2
2. Potential for denitrification	Oxidation-reduction potential, N^{15} and O^{18} isotopes
3. Nitrogen source analysis	N^{15} and O^{18} isotopes, pharmaceuticals
4. Age of water in aquifer	Tritium/H4, chlorofluorocarbons[2]
5. Source of water	Ca, Mg, Na, K, Cl, CO_3, SO_4, Br, O^{18}, deuterium, N^{15}

[1]From Table 3 of MRP documents.

Deliverables and Schedule

Table 3. Phase I deliverables and dates for sampling and analysis performed on samples collected in the Salinas Valley/Lockwood Valley.

Deliverable	Elements	Date
Salinas Valley/Lockwood Valley list of wells[1], sampling schedule and initiation of sampling	Initial list of wells to sample and initiation of sampling[2]; list will include all wells on member owned, leased, or operated lands as best the CCCGP can determine as of that date	September 1, 2013
Salinas Valley/Lockwood Valley final list of wells	including justification for wells selected and wells excluded; discussion of final list with CCRWQCB staff if desired	~~November 1~~ December 15, 2013
Data entry to regulatory side of GeoTracker	Complete uploading of groundwater quality data from Salinas Valley/Lockwood Valley	February 28, 2014[3] (Completion of data entry from wells identified in November 1, 2013 list)
Develop supplemental list of wells for sampling (if necessary)	List of wells needed to complete characterization of nitrate concentrations in domestic drinking water supply and shallow groundwater	March 1, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Salinas Valley/ Lockwood Valley	Finalize data upload to GeoTracker, discussion of sampling results including contour map and shapefile of nitrate concentrations	April 30, 2014

[1] Except as provided in this section, all referred to well lists in this document would be available only through a valid public records act request, in which case well coordinates would be shown with an uncertainty by one mile squared.

[2] Because the list of wells to sample must be approved by the Executive Officer, sampling will begin as soon as approval is received including possibly September 2, 2013.

[3] Data entry will begin within 30 days of sample delivery to the laboratory as required. Dates provided in these rows indicate when the groundwater quality data entry into the regulatory-only side of GeoTracker, where it will remain, for at least the term of the Agricultural Order which expires on March 14, 2017.

Table 4. Phase II deliverables and dates for sampling and analysis performed on samples collected in the Pajaro Valley.

Deliverable	Elements	Date
Pajaro Valley list of wells[1], Initial list of wells to sample; schedule and initiation of sampling	Initial list of wells to sample; list will include all wells on member owned, leased, or operated lands	~~January 2, 2014~~ December 1, 2013
Pajaro Valley final list of wells	Final list of wells to sample including justification for wells selected and wells excluded; discussion of final list with CCRWQCB staff if desired; sampling begins upon approval of list from Executive Officer	February, 1 2014
Data entry to regulatory side of GeoTracker	Uploading of groundwater quality data from ~~Salinas Valley/ Lockwood~~ Pajaro Valley	April 30, 2014[2] (Completion of data entry from wells identified in November 1, 2013 list)
Develop supplemental list of wells for sampling (if necessary)	List of wells needed to complete characterization of nitrate concentrations in domestic drinking water supply and shallow groundwater	June 1, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Pajaro Valley	Finalize data upload to GeoTracker, discussion of sampling results including contour map and shapefile of nitrate concentrations	July 31, 2014

[1] Except as provided in this section, all referred to well lists in this document would be available only through a valid public records act request, in which case well coordinates would be shown with an uncertainty by one mile squared.

[2] Data entry will begin within 30 days of sample delivery to the laboratory as required. Dates provided in these rows indicate when the groundwater quality data entry into the regulatory-only side of GeoTracker, where it will remain, for at least the term of the Agricultural Order which expires on March 14, 2017.

Table 5. Phase III deliverables and dates for sampling and analysis performed on samples collected in the Gilroy-Hollister area.

Deliverable	Elements	Date
Gilroy-Hollister list of wells, 2014 sampling schedule and initiation wells on member of sampling[1]	Initial list of wells to sample; list owned, leased, or operated	February 1, will include all
Final list of wells to sample selected and wells excluded; discussion of final list with CCRWQCB staff if desired	March 31, 2014 including justification for wells	
Data entry to regulatory side of quality data from Gilroy-Hollister	Uploading of groundwater data entry from wells identified in November 1, 2013 list)	July 31, 2014[2] (Completion of
Develop supplemental list of 2014 wells for sampling (if necessary)	List of wells needed to complete characterization of nitrate concentrations in domestic drinking water supply and shallow groundwater	August 1,
Technical Memo on 2014 concentration of nitrates in domestic supply wells in the contour map and shapefile of nitrate	Finalize data upload to GeoTracker, discussion of sampling results including concentrations	October 31,

[1] Except as provided in this section, all referred to well lists in this document would be available only through a valid public records act request, in which case well coordinates would be shown with an uncertainty by one mile squared.

[2] Data entry will begin within 30 days of sample delivery to the laboratory as required. Dates provided in these rows indicate when the groundwater quality data entry into the regulatory-only side of GeoTracker, where it will remain, for at least the term of the Agricultural Order which expires on March 14, 2017.

All well sampling activities will be concluded by August 31, 2014. The ~~CCCGP~~ CCGC will provide a short memorandum to the CCRWQCB by September 15, 2014 indicating that all sampling activities were completed by the September 1, 2014 deadline. By December 15, 2014, the ~~CCCGP~~ CCGC will submit a detailed report to the CCRWQCB summarizing the information obtained during the domestic supply well monitoring program. The summary will include the overall distribution of domestic supply wells that are not sampled by the counties, a description of the depths of those wells to the extent known, contour maps of the concentration of nitrate in all wells sampled stratified for different screening depths, and an accounting of the number/percentage of domestic supply wells that are supplying water with concentrations of nitrate above the primary MCL.

The ~~cooperative program~~ Coalition participants have significant concerns and objections to displaying individual well locations to the public on maps available on the Internet using GeoTracker. Instead of displaying individual well locations to the public, the CCRWQCB agrees to display ~~cooperative program~~ Coalition data as contour maps on GeoTracker after January 1, 2015[1], as long as 1) the contour maps

[1] Note that the delay of display of data on GeoTracker until January 1, 2015 does not affect the immediate availability of information to the public in response to a PRAR.

meet the conditions described in Conditions 10 through 13 contained in the June 10, 2013 Conditional Approval Letter from the Central Coast Regional Water Quality Control Board to Abby Taylor-Silva, representing the ~~Central Coast Cooperative Groundwater Program~~ Central Coast Groundwater Coalition, and are approved by the Executive Officer, and 2) the State Water Resources Control Board makes the necessary modifications to GeoTracker so that it can properly display the contour maps with other existing data currently in GeoTracker.

If by January 1, 2015, the functionality does not exist in GeoTracker to properly display the approved contour maps, the ~~cooperative program~~ Coalition has the option to submit static images (e.g. pdf, bitmap) of the contour maps by March 15, 2015; If the ~~cooperative program~~ Coalition does not choose to submit static images of the contour maps or if the ~~cooperative program~~ Coalition does not submit contour maps that meet Conditions 10 through 13 as described above, then the data will be displayed as individual wells on GeoTracker and the well location and data will only be referenced within a one-mile square of the actual well location, using the existing mapping functionality for CDPH wells in GeoTracker.

Contour Confidence Interval

The analysis by the ~~CCCGP~~ CCGC will be performed to achieve the highest level of certainty possible using all publicly available well samples and integrating the wells that are selected for sampling by this program, and that the analysis will explicitly provide the confidence value for any location on the map. If wells owned by individuals who are not members of the ~~CCCGP~~ CCGC can be used to increase the level of confidence, those owners can be contacted to determine if they are willing to allow samples of the water to be collected.

HydroFocus is a hydrogeology consulting company retained by the ~~CCCGP~~ CCGC to provide expertise in developing the groundwater program. HydroFocus was asked to determine the possibility providing high-confidence interval contours by reviewing all of the available nitrate data for the Salinas Valley. They plotted the kriging standard error for the concentrations of nitrate as N for 670 well samples from the Salinas Valley. The standard errors range from 10% to 20%. Therefore, for the 670 well samples and a grid spacing of about 1 mile, the estimated concentration of nitrate at any point where there is not a well will theoretically be within approximately plus or minus 20% of the range of the estimated value at points where there are not samples. Therefore for points on the grid where there are no samples, the confidence level for the estimated concentration is 80% to 90%. For a contour interval of 5 mg/L than encompasses known concentrations ranging from 5 to 10 mg/L nitrate as N, an estimated value of 9 mg/L with the 20% standard error would be result actual values being outside the contour range some of the time.

The analysis performed by HydroFocus used data for 670 well samples. HydroFocus has been searching for potential domestic drinking water supply wells in the Salinas Valley and has identified about 500 locations where domestic supply wells may exist. Across the northern region, the Salinas Valley is assumed to be the most densely populated region within the ~~CCCGP~~ CCGC region. Consequently, for the domestic drinking water supply wells in the Salinas Valley and most probably in the entire region, even if a sample is collected from every well, the sample size will likely be too small to generate a 90% or 95% confidence interval for all locations. Therefore, the number of available wells dictates that there will be a higher level of uncertainty associated with the contours in certain, but not all, areas.

Temporal Variability

The ~~cooperative program~~ Coalition commits to the CCRWQCB to perform additional sampling after the initial sampling outlined in this program is completed to determine temporal variability in wells determined by the ~~CCCGP~~ CCGC and the CCRWQCB to be high priority.

Table 6. Report deliverables and dates.

Deliverable	Elements	Date
Memo to CCRWQCB documenting the completion of groundwater sampling	Final list of wells sampled	September 15, ~~2013~~ 2014
Initial characterization of the shallow groundwater aquifer	Aquifer characterization using information known about geology and water quality in the ~~CCCGP~~ CCGC region	December 15, ~~2013~~ 2014
Draft final report on concentration of nitrates in domestic supply wells across the ~~cooperative program~~ Coalition region	Discussion of sampling results December 15, 2014 concentration of nitrates in including contour maps and domestic supply wells across the shapefiles of nitrate concentration contours, depths of domestic supply wells, number/percentage of wells with NO3 above the MCL; discussion of any data gaps in knowledge of shallow groundwater quality	December 15, 2014
Final report incorporating Water Board comments	Discussion of sampling results including contour maps and shapefiles of nitrate concentration contours, depths of domestic supply wells, number/percentage of wells with NO3 above the MCL	March 15, 2015

Characterizing groundwater aquifers with focus on domestic drinking water supply and shallow groundwater

The primary objective for characterizing groundwater aquifers will be to develop 1) a process-level understanding of distribution of nitrate contamination in domestic supply wells with single connections or a small number of connections and 2) identify regions for evaluation of agricultural land- and water-management practices to reduce discharges to groundwater. The ~~CCCGP~~ CCGC covers enrolled L&Gs in the northern part of the Central Coast region including portions of Santa Cruz County, Santa Clara County, San Benito County, and Monterey County (Figure 1).

The region contains three principle groundwater basins where agriculture is the predominant land use; Pajaro Valley, Salinas Valley and the Gilroy-Hollister basins (Figure 2). As the project proceeds, these groundwater basins will be characterized more fully using the known geology and available information for the aquifer. For the initial characterization to be completed by December 15, 2013, the ~~CCCGP~~ CCGC will focus on describing the groundwater quality in each aquifer based on the existing data and hydrogeologic conditions.

Initially, aquifer characterization will be conducted on two levels. The ~~CCCGP~~ CCGC will 1) characterize the distribution of nitrate concentrations in aquifers used for domestic drinking water supply, and 2) use existing data to provide information about the source of the nitrates and the age of the groundwater (year of recharge). A more complete characterization, due December 2014, will utilize groundwater data collected by the ~~CCCGP~~ CCGC to more fully explain the nature of groundwater degradation and its causality.

Notification of Growers

The goal of the member notification system is to identify wells that have a concentration of nitrate above the MCL and make sure the users of the water are notified. The CCGC has developed a notification system that will guarantee that members are notified that the domestic supply well is above the MCL with sufficient time to notify users of the water within the 10 day period specified by the Order WQ 2013-0101. In addition, if the statistical analysis of the available data indicates that there are un-sampled wells with an estimated concentration of nitrate above the MCL, members who own those wells will be notified in a timeframe that will allow users of the water to be notified within 10 days of the statistical analysis. A more detailed description is included in the addendum at the end of the work plan.

Current knowledge of aquifer conditions

The groundwater basins to be evaluated within the framework of this workplan are generally geologically similar. They are intermountain valleys where there is extensive faulting and resultant deep Tertiary and Quaternary alluvial fill and drainage to the Pacific Ocean. Water bearing units include unconsolidated and semi-consolidated alluvial fan and river deposits interbedded with marine clays. Episodic changes in sea level during the Miocene through Pleistocene led to alternating deposition between coarse grained materials in riverine and alluvial fan environments, and fine grained sediments in estuarine and marine environments. The following discussion of the basins and subbasins was extracted from the Department of Water Resources Bulletin 118, USGS publications and consultant reports.

The Pajaro Valley basin contains water-bearing geologic units that include from oldest to youngest, the Purisima Formation, the Aromas Sand Formation, Terrace Deposits, Quaternary alluvium, and Dune Deposits. The Purisima Formation is mainly of marine origin, and contains a thick sequence of highly variable sediments ranging from shale beds near the base to continental deposits in the upper portion. The sediments

are poorly consolidated, moderately permeable gravel, sands, silts, and silty clays. The Aromas Sand is considered the primary water-bearing unit of the basin and consists of upper eolian and lower fluvial sand units that are separated by confining layers of interbedded clays and silty clay. The Terrace Deposits consist of unconsolidated gravel, sand, silt, and clay overlain by alluvium. The alluvium is composed of Pleistocene terrace materials that are overlain by Holocene alluvium, consisting of sand, gravel, and clay deposited by the Pajaro River, and dune sands, with an average thickness of 50 to 300 ft.

South of the Pajaro Valley Basin, in the Monterey Bay and the Salinas Valley area, the Langley Area and 180/400-Foot subbasins include from oldest to youngest, the Pliocene to Pleistocene Paso Robles Formation, the Pleistocene Aromas Sands, Quaternary terrace deposits, Holocene alluvium, and sand dunes. The 180/400-Foot subbasin includes three water-bearing units, the 180-Foot, the 400-Foot, and the 900-Foot aquifers, named for the average depths of each aquifer. The confined 180-Foot Aquifer occurs only in this subbasin, as its confining blue clay layer thins and disappears east and south of the subbasin and does not extend into the Eastside Aquifer subbasin.

The 180-Foot Aquifer consists of interconnected sand, gravel, and clay lenses, and ranges in thickness from 50 to 150 ft. The 180-Foot Aquifer is separated from the 400-Foot Aquifer by a zone of less coarse- grained strata and confining units that range in thickness from 10 to 70 feet. The 400-Foot Aquifer is about 200-ft thick and consists of sands, gravels, and clay lenses. The upper portion of the aquifer appears to be correlated with the Aromas Sand and the lower portion with the upper part of the Paso Robles Formation. The 900-Foot Aquifer, present in the lower (northern) Salinas Valley, consists of alternating layers of sand, gravels and clays and is separated from the 400-Foot Aquifer by a blue marine clay-confining unit.

The Corral de Tierra Area subbasin includes the following water-bearing units, from oldest to youngest: the Miocene and Pliocene Santa Margarita Formation, the Pliocene Paso Robles Formation, the Pleistocene Aromas Formation, and Pleistocene and Holocene age alluvial deposits. The Paso Robles Formation is the primary water-bearing unit in the area and consists of sand, gravel, and clay interbedded with some minor calcareous beds. The East Side subarea includes a narrow strip on the eastern half of the valley. It is similar in geologic structure as the 180/400-Foot Aquifer subbasin except that the confining blue clay layer thins and disappears east of the subbasin.

The upper Salinas Valley contains the Forebay Aquifer and Upper Valley Aquifer subbasins. The Forebay subarea encompasses the entire width of the unconsolidated alluvial fill between Gonzales and the bluff line two miles south of Greenfield. The primary water-bearing units of this subbasin are the same units that produce water in the adjacent 180/400-Foot Aquifer Subbasin; 180-Foot Aquifer and the 400-Foot Aquifer. However, the near-surface confining unit of the 180/400-Foot Aquifer Subbasin does not extend into the Forebay subbasin. Groundwater in the Forebay Aquifer subbasin is unconfined and occurs in lenses of sand and gravel that are interbedded with finer grained material.

The Upper Valley subarea includes the entire alluvial fill in the valley floor between the bluff line two miles south of Greenfield to the southern end of the San Ardo Valley. The primary aquifer is unconfined and deposits range from unconsolidated to semi-consolidated. It consists of inter-bedded gravel, sand, and silt of the Paso Robles Formation, alluvial fan and river deposits. These deposits are equivalent to the 180-Foot and 400-Foot Aquifer units of the lower Salinas Valley. However, confining units comparable to those separating aquifers in the lower Salinas Valley are present. Groundwater is unconfined and is replenished primarily with water from the Salinas River and its tributaries.

Recharge in the Salinas and Pajaro valleys occurs from infiltration from the Salinas River and deep percolation of irrigation water. Flow in the Salinas River is seasonally controlled for conjunctive use.

Precipitation, subsurface and boundary inflow, and seawater intrusion are other sources of recharge of lesser importance. The Salinas Valley and Pajaro Valley groundwater basins are drained by the Salinas and the Pajaro rivers. Directions of groundwater flow generally follow the topography of the basins, from high altitudes towards the drainages, and down valleys towards Monterey Bay. Major water supply and water quality issues include overdraft of aquifers and contamination by nitrate.

Concentrations of nitrate in groundwater vary temporally and spatially. Primary sources of data include irrigation, public supply, and monitoring wells. Concentrations of nitrate above 100 mg/L and up to several hundred mg/L are observed sporadically in all of the Salinas Valley subbasins. Kulongoski and Belitz[2] used a non-parametric statistical analysis to examine the relationship between nitrate and potential explanatory factors including land use, well construction, groundwater age, and geochemical condition. Nitrate concentrations were slightly higher in wells with groundwater ages classified as modern or mixed compared to wells classified as pre-modern.

The Gilroy-Hollister Basin in San Benito and Santa Clara counties includes the Llagas, Bolsa, Hollister, and San Juan Bautista groundwater subbasins. The Llagas subbasin extends from the groundwater divide at Cochran Road near Morgan Hill in the north to the Pájaro River in the south in Santa Clara County. It is drained to the south by tributaries of the Pájaro River, including Uvas and Llagas creeks. The water bearing formations include Pliocene to Holocene age continental deposits of unconsolidated to semi- consolidated gravel, sand, silt and clay. Recharge to the Llagas subbasin occurs from a variety of sources: natural recharge from streams, principally Uvas and Llagas Creeks; percolation of precipitation and irrigation water, and artificial recharge. Nitrate in groundwater is a key water quality issue in this subbasin. Since 1997, more than 600 wells in south Santa Clara County including the Llagas and Coyote subbasins have been tested for nitrate. More than half exceed the federal safe drinking standard for nitrate.

Todd Engineers[3] summarized the water quality data for the remaining subbasins in San Benito County. Key constituents of concern include boron, chloride, hardness, metals, nitrate, sulfate, potassium, and TDS. In some parts of the Basin, concentrations of these constituents do not meet water quality standards necessary to support drinking water beneficial uses (MUN). In most areas of the Basin in San Benito County, concentrations of key constituents of concern remained relatively unchanged from 2005 – 2010. In the eastern portion of northern San Juan Subbasin, nitrate and chloride concentrations have decreased over time owing to land use and groundwater-level changes. Concentration of nitrate in shallow groundwater is generally higher than the concentration of nitrate in deeper groundwater. Average nitrate concentrations in all subbasins in San Benito County are below the MCL.

The Bolsa Area subbasin lies within the northwest portion of the Gilroy-Hollister Valley Groundwater Basin, and is bounded on the north by the Pajaro River, to the southwest by the Flint Hills. The aquifer consists mainly of clay, silt, sand, and gravel ranging in age from Tertiary to Holocene. Holocene alluvium consists of unconsolidated lenticular beds of gravel, sand, silt, and clay deposited by streams as flood plain, alluvial-fan, slope-wash, and terrace deposits. Thickness generally ranges from 0 to 300 feet. The Purisima Formation while lithologically similar to the overlying alluvium is generally more consolidated and less permeable. The Purisima Formation ranges from the surface in some areas to several thousand feet. Vertical groundwater

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[2] Justin T. Kulongoski and Kenneth Belitz. 2005. Program Status and Understanding of Groundwater Quality in the Monterey Bay and Salinas Valley Basins, 2005: California GAMA Priority Basin Project, US Geological Investigations Report 2011 – 5058.

[3] Todd Engineers. 2012. Technical Memorandum 1, Hydrogeologic Conceptual Model for Northern San Benito County Salt and Nutrient Management Plan.

flow is restricted by an extensive clay confining layer. The water quality constituents of greatest concern are salinity, nitrate, boron, hardness, and trace elements that occasionally exceed drinking water standards.

The Hollister Area subbasin lies within the northeast portion of the Gilroy-Hollister Valley Groundwater Basin. The Calaveras fault is the western boundary and abuts the Bolsa Area subbasin. The northern portion of the subbasin drains toward Monterey Bay by the Pajaro River and its tributaries. The southern portion is drained by the San Benito River and its tributaries. Groundwater occurs in the alluvium of Holocene age and older alluvium. The aquifers consist of clay, silt, sand, and gravel, and poorly consolidated sandstone. The unconsolidated or poorly consolidated Tertiary or Quaternary rocks underlying the alluvium have been divided into three units which consist of a thick sequence of clay, silt, sand and gravel. Most recharge to the subbasin is derived from rainfall and stream flow from creeks entering the basin. Pacheco Pass Water District operates North Fork Dam on Pacheco Creek for the primary purpose of supplying groundwater recharge to the northeast portion of the subbasin. Water levels have generally risen since 1987 when surface water was delivered. The water quality constituents of greatest concern are salinity, nitrate, boron, hardness, and trace elements that occasionally exceed drinking water standards.

The San Juan Bautista Area subbasin lies within the southwest portion of the Gilroy-Hollister Valley Groundwater Basin, is bounded on the north by Sargent Fault and Sargent anticline and abuts the Bolsa Area subbasin. Groundwater occurs in the alluvium of Holocene age, and the Purisima Formation of Pliocene age. The subbasin is drained primarily by the San Benito River and its tributary creeks. The Pajaro River drains the northern boundary. The primary source of recharge is the San Benito River which is managed to provide groundwater recharge. Groundwater level measurements since 1913 indicate significant declines from early in the century to the 1970's. Water levels have risen over 100 feet since 1976 due to the construction of Hernandez Reservoir on the San Benito River in 1961 and the delivery of imported surface water beginning in 1987.

Quality Assurance Project Plan/Sampling Analysis Plan

Quality Assurance

A Surface Water Ambient Monitoring Program (SWAMP) comparable Quality Assurance Program Plan (QAPP) will be developed for the project. The QAPP will include all 24 elements found in the SWAMP checklist. Analytes covered in the QAPP are from Table 3 of MRP documents (MRP No. R3-2012-0011-01, MRP No. R3-2012-0011-02, and MRP No. R3-2012-0011-03) and Table 2 above.

Briefly, the QAPP will include but is not limited to:

- Project organizational structure;
- A discussion of the field methods to be used;
- Meter maintenance and calibration;
- Sample collection methods;
- Chain of custody form;
- Field and laboratory SOPs;
- Sample containers; and
- Sample processing and preservation methods.

Field parameters and analytes will be listed and the laboratory method(s) of analysis will be provided. Data quality objectives will be provided and the quality control samples (e.g. duplicates, blanks) needed to meet those objectives will be discussed. The laboratory identified to perform the analysis will be provided and the analytical methods used will be described. Laboratory SOPs will be included as well as the laboratory QA/QC measures (e.g. spikes, blanks). The QAPP will be circulated for approval prior to initiation of sampling and analysis. The QAPP will be provided to the Water Board by August 15, 2013.

Sampling and Analysis Plan

A sampling plan for the domestic supply wells will be developed and submitted to the CCRWQCB. The Sampling Plan will:

- Develop the logistical details of field sampling, e.g., timing;
- Identify who will perform sampling;
- Describe how sampling will be coordinated with landowners and tenants;
- Identify wells to be sampled and timing of sampling;
- Describe type of well (domestic supply, agricultural supply, monitoring); and
- Provide map of wells using same NAD 83 and 1:24,000 scale as provided for the cooperative program boundary

Third Party Implementation

Member Organization and Member Responsibilities

The ~~CCCGP~~ CCGC will form a non-profit organization to direct and administer the activities of the program and its contractors. The purpose of the ~~cooperative program~~ Coalition's organizational structure is to organize agricultural L&Gs to support ~~cooperative program~~ Coalition activities, and to conduct the monitoring, reporting, and outreach activities. The program anticipates forming a non-profit organization immediately after acceptance of the work plan. The organization will be functional within 75 days after initiation of the paperwork needed to file for non-profit status.

To perform the ~~CCCGP~~ CCGC tasks, it is necessary to have an organization in place to:

- Collect and manage the funds to pay for required activities;
- Conduct outreach, implement, and assume responsibility for the tasks to be completed; and
- Coordinate with the CCRWQCB to resolve issues that may arise.

Organization responsibilities include:

- Tracking members and reporting required member information to CCRWQCB;
- Collect fees to operate program;
- Manage communications and notifications to members and CCRWQCB;
- Conduct sampling to remain in compliance with the MRP requirements;
- Manage water quality monitoring data;
- Manage contracts for technical work;
- Interpret data;
- Submit reports to CCRWQCB on behalf of members;
- Document its organizational and management structure; and
- Provide members with annual summaries of expenditures of revenue.

One of the ~~CCCGP's~~ CCGC's long-term goals is to inform L&Gs about their responsibility to use farming practices that are protective of groundwater resources. This goal needs to be accomplished with a cost effective data collection program to properly characterize groundwater quality, and to assist L&Gs in implementing effective practices to protect groundwater quality.

Participating in the ~~CCCGP~~ CCGC will carry responsibilities for members including:

- Paying dues necessary to fund ~~CCCGP~~ CCGC activities (monitoring, reporting, outreach); and
- Completing any required reports/forms requested by the ~~CCCGP~~ CCGC.

Enrollment forms will include a signed provision allowing the CCRWQCB to provide the ~~CCCGP~~ CCGC with information on the eNOI. Failure to meet membership responsibilities will result in dismissal from the ~~CCCGP~~ CCGC. Once a grower is dismissed from the ~~CCCGP~~ CCGC, their name is no longer included in the annual member list provided to the CCRWQCB by the ~~CCCGP~~ CCGC organization. These responsibilities provide assurances to the CCRWQCB and stakeholders that membership in the ~~CCCGP~~ CCGC provides for the proper characterization of local groundwater conditions and a commitment on the part of members to be protective of groundwater quality.

~~Cooperative Program~~ Coalition Responsibilities

The ~~CCCGP~~ CCGC will insure that there is sufficient financial support to implement the program and will include the approximate cost to implement the program and identification of resources available (e.g., the fees and number of participating L&Gs to generate the funds necessary to meet the budgeted costs) to fully implement all technical and administrative aspects of the program.

The ~~CCCGP~~ CCGC will insure sampling is conducted by dates established in the ~~cooperative program~~ Coalition program, sampling schedule (see Table 8).

The ~~CCCGP~~ CCGC will insure data and reports are submitted to the CCRWQCB in format specified and by dates established in Table 8.

The ~~CCCGP~~ CCGC will insure all participating L&Gs are providing any required information and are taking necessary steps to address any obstacles, or issues that arise to implementing the ~~cooperative~~

~~program~~ Coalition program.

The ~~CCCGP~~ CCGC will insure that any activities conducted on behalf of the third-party by other groups meet the terms and requirements of the program. The ~~CCCGP~~ CCGC is responsible for any activities conducted on its behalf.

The ~~CCCGP~~ CCGC will establish and conduct governance, including but not limited to:
i. As a legally defined entity (i.e. non-profit corporation; local or state government; Joint Powers Authority) or have a binding agreement among multiple entities that clearly describes the mechanisms in place to ensure accountability to participating L&Gs;
ii. With a governing structure that includes a governing board of directors composed in whole or in part of participating L&Gs, and that provides participating L&Gs with a mechanism to direct or influence the governance of the third party through appropriate by-laws.
iii. With appropriate authorization from participating L&Gs to access individual grower eNOI information in GeoTracker (e.g., AW#, current contact information);
iv. The ~~CCCGP~~ CCGC will describe and provide evidence for i-iii, above.

The ~~CCCGP~~ CCGC will provide the following information and reports to the CCRWQCB and participating L&Gs, on the dates specified:

- By September 1, 2013 the documentation of its organizational or management structure and its by-laws or operating procedures. The documentation shall identify persons responsible for ensuring that the program is implemented as approved. The ~~CCCGP~~ CCGC must also provide to the CCRWQCB confirmation that this information was provided to participating L&Gs;
- By September 1, 2013, the list of participating L&Gs, and quarterly, thereafter, the list of new enrollees, as follows:
- Participating grower information in Microsoft Access or Excel format, including AW#, Ranch Name and GeoTracker global ID for each participating grower, physical mailing address, and email address. Information provided must be accurate and consistent with that reported in the electronic-Notice of Intent (eNOI);

The ~~CCCGP~~ CCGC must also provide to the CCRWQCB, confirmation that the following information was provided to participating L&Gs;

- On September 1, 2013, in the Draft Final Report by December 15, 2014, and the Final Report by March 15, 2015, the annual summaries of expenditures of fees and revenues. The ~~CCCGP~~ CCGC must also provide to the CCRWQCB, confirmation that this information was provided to the participating L&Gs;
- By September 1, 2013 and annually thereafter, notification to participating L&Gs of the following, and provide confirmation to the CCRWQCB of such notification to participating L&Gs:
- Participating L&Gs, as enrolled L&Gs in the Agricultural Order, are individually responsible for the successful implementation of the program and that this individual responsibility has two consequences if the ~~CCCGP~~ CCGC is not successfully implemented: 1) The CCRWQCB or Executive Officer will require individual dischargers to conduct individual monitoring per the requirements of the Agricultural Order, 2) The CCRWQCB may take enforcement action against individual dischargers. The failure of a third party group to successfully implement an approved program cannot be used as an excuse for lack of individual discharger compliance;
- Quarterly, beginning within three months of notice of approval, if the third-party group is unable to implement any aspect of the program that could result in a violation of the program's

monitoring or reporting requirements, notification describing the inability to implement and the possible violations. The ~~CCCGP~~ CCGC must also provide to the CCRWQCB, confirmation that this information was provided to participating L&Gs;

- Quarterly, beginning within three months of notice of approval, notification to participating L&Gs of any changes to the program approved by the Executive Officer or the CCRWQCB and confirmation to the CCRWQCB that this notification was provided to participating L&Gs.

Table 7. ~~Cooperative Program~~ Coalition administrative deliverables.

Deliverable	Elements	Date
List of participating L&Gs	List of members in good standing	~~September 1~~ November 15, 2013
Member parcel map specifying exact ~~CCCGP~~ CCGC area	GIS shapefile of geographical boundary of program based upon member parcels	November ~~1~~ 15, 2013 and annually thereafter
Quarterly update of member list	List of members who enrolled in last quarter, in Access or Excel format	January 1, 2014; April 1, 2014, July 1, 2014, October 1, 2014
Organizational/administrative structure	Category, names of Board of Directors, Executive Director, Contractors as appropriate; operating procedures; fees and expenditures, confirmation of member notification	September 1, 2013; December 15, 2014; March 15, 2015 and annually thereafter
Member notification of responsibilities as a discharger	Consequences to members for not accepting member responsibilities; CCRWQCB notification that members have been contacted	September 1, 2013
Notice of inability to successfully conduct business as required by the CCRWQCB	Confirmation of member notification	Quarterly as necessary starting 90 days after formation of cooperative program organization

Summary

Table 8. Chronology of all submissions to the Central Coast Regional Water Board by the ~~CCCGP~~ CCGC on behalf of its members.

Deliverable	Date
Shapefile of external boundaries of Coalition ~~cooperative program~~ region May 31, 2013	May 31, 2013
QAPP provided to the CCRWQCB	August 15, 2013
List of members who have enrolled and paid fees to the ~~cooperative program~~ Coalition September 1, 2013 and annually thereafter on September 1	September 1, 2013 and annually thereafter on September 1
Salinas Valley/Lockwood Valley list of wells[1], sampling schedule, and initiation of sampling September 1, 2013	September 1, 2013
List of participating L&Gs September 1, 2013	~~September 1~~ November 15, 2013
Organizational/administrative structure September 1, 2013; December 15, 2014; March 15,	September 1, 2013; December 15, 2014; March 15, 2015 and annually thereafter 2015 and annually thereafter
Member notification of responsibilities as a discharger September 1, 2013	September 1, 2013
Shapefile of cooperative program region including thereafter on individual parcels owned or operated by all members November 1, 2013 and annually thereafter on individual parcels owned or operated by all members November 1	November ~~1~~ 15, 2013 and annually
Salinas Valley/Lockwood Valley final list of wells November 1, 2013	wells November 1, 2013
Initial characterization of the shallow groundwater aquifer	December 15, 2013
Quarterly update of member list	January 2, 2014; April 1, 2014, July 1, 2014, October 1,
Pajaro Valley list of wells, sampling schedule and initiation of sampling January 2, 2014 – June 30, 2014 initiation of sampling	January 2, 2014 – June 30, 2014
Gilroy-Hollister list of wells, sampling schedule, and initiation of sampling February 1, 2014 initiation of sampling	February 1, 2014
Pajaro Valley final list of wells February 1, 2014	February 1, 2014
Begin Salinas Valley/Lockwood Valley data entry to regulatory side of GeoTracker February 28, 20142 (Completion of data entry from regulatory side of GeoTracker wells identified in November 1, 2013 list)	February 28, 2014[2] (Completion of data entry from wells identified in November 1, 2013 list)
Develop supplemental list of wells for sampling in Salinas Valley/Lockwood Valley (if necessary) March 1, 2014	March 1, 2014

Gilroy-Hollister final list of wells March 31, 2014	March 31, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Salinas Valley/Lockwood Valley	April 30, 2014
Begin Pajaro Valley data entry to regulatory side of GeoTracker April 30, 2014	April 30, 2014
Develop supplemental list of wells for sampling in Pajaro Valley (if necessary) June 1, 2014	June 1, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Pajaro Valley July 31, 2014 domestic supply wells in the Pajaro Valley	July 31, 2014
Begin Gilroy-Hollister data entry to regulatory side of GeoTracker July 31, 2014 (Completion of data entry from wells	July 31, 2014 (Completion of data entry from wells identified in November 1, 2013 list)
Develop Gilroy-Hollister supplemental list of wells for sampling (if necessary) August 1, 2014 sampling (if necessary)	August 1, 2014
Memo to CCRWQCB confirming the completion of groundwater sampling September 15, 2014 groundwater sampling	September 15, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Gilroy-Hollister October 31, 2014 domestic supply wells in the Gilroy-Hollister	October 31, 2014
Draft final report on concentration of nitrates in domestic supply wells across the ~~cooperative program~~ Coalition region December 15, 2014 domestic supply wells across the cooperative program	December 15, 2014
Final report incorporating CCRWQCB comments March 15, 2015	March 15, 2015
Notice of inability to successfully conduct business as required by the CCRWQCB Quarterly as necessary starting 90 days after notice of required by the CCRWQCB approval of cooperative program organization	Quarterly as necessary starting 90 days after notice of approval of cooperative program organization

[1] Except as provided in the section entitled "Deliverables and Schedule", all referred to well lists in this document would be available only through a valid public records act request, in which case well coordinates would be shown with an uncertainty by one mile squared.

[2] Data entry will begin within 30 days of sample delivery to the laboratory as required. Dates provided in these rows indicate when the groundwater quality data entry into the regulatory-only side of GeoTracker, , where it will remain, for at least the term of the Agricultural Order which expires on March 14, 2017.

Addendum – Member Notification

Notification of Members

The goal of the member notification system is to identify wells that have a concentration of nitrate above the MCL and make sure the users of the water are notified. The CCGC has developed a notification system that will guarantee that members are notified that the domestic supply well is above the MCL with sufficient time to notify users of the water within the 10 day period specified by Order WQ 2013-0101. In addition, if the statistical analysis of the available data indicates that there are un-sampled wells with an estimated concentration of nitrate above the MCL, members who own those wells will be notified in a timeframe that will allow users of the water to be notified within 10 days of the statistical analysis.

Notification of members occurs several times during the monitoring and reporting process as described below.

- Outreach to members requesting the location of domestic supply wells on their property
- Notification to growers indicating that their wells were sampled and providing the responsibilities of the grower should the concentration of nitrate in the well exceed the MCL
- Federal Express notification within 36 hours of receipt of the results, informing the member that the concentration of nitrate in their well is above the MCL and providing the standardized notice to give to users of the water
- Mail notification to all remaining growers of the concentration of nitrate in their domestic supply wells and any follow-up activity that will occur
- Federal Express notification sent to member reporting the results of the contour analysis (concentration of nitrate above the MCL)

A brief discussion of each of these steps is provided below.

Outreach to members requesting the location of domestic supply wells on their property

When the CCGC is ready to initiate monitoring of domestic supply wells in a region, the CCGC contacts the member with a request for the location of all wells providing water for domestic use. Members respond with the requested information and a list of wells is developed. The list of wells provided will be compared to the wells listed by the member on their eNOI to guarantee that the wells scheduled for sampling are domestic supply wells. Wells scheduled for sampling are visited to determine the suitability of the well for sampling and to discuss with the member the use of the well to further confirm that all domestic supply wells are identified and available for sampling.

Notification to growers indicating that their wells were sampled

Once the member's wells have been sampled, they are sent a pre-notification letter confirming the sampling, providing information about the potential outcomes of the laboratory analysis of the water, and stating that the member will receive one of several types of follow-up notifications determined by the concentration of nitrate in the well. One pre-notification letter per well is sent to the member such that a single member could receive several pre-notification letters depending on the number of wells across their ranches.

Exceedance report to the Regional Board if necessary

All laboratory analyses will be uploaded to GeoTracker by the well, and also sent to the CCGC for review of the quality assurance information. When the CCGC determines that the data meet the data quality objectives outlined in the QAPP, the data are considered validated. Validation is generally performed within 24 hours after receipt of the data from the laboratory. If the results of the laboratory analyses indicate that

the concentration of nitrate in the well exceeds the MCL, the CCGC will notify the CCRWQCB within 24 hours of data validation. The notification will include all relevant data including but not limited to well ID, Ranch Name, sample date, and concentration.

Federal Express notification of the member

When the data are validated and it is determined that the concentration of nitrate in a member domestic supply well exceeds the MCL, the member will be notified of the exceedance. A standard notification letter will be sent via Federal Express overnight delivery to every member for every well that is in exceedance. All members will receive the notification letter within 36 hours of the CCGC learning of the exceedance in the member's well. Accompanying the notification letter will be the announcement that the member can provide to users of the well that they are drinking water with a concentration of nitrate above the MCL. The 36 hour delivery allows sufficient time for the member to notify the users of the well within the 10 day period required by Order WQ 2013-0101.

Mail notification to all remaining members of the concentration of nitrate in their domestic supply wells

All members that own domestic supply wells with a concentration of nitrate below the MCL will be notified by regular US Mail of the results of the analysis and any follow-up activity that will occur. If the well has a concentration of nitrate between 80% and 100% of the MCL, the member will be notified that the well will be resampled within a year and annually thereafter for the life of the Conditional Waiver.

Federal Express notification sent to member reporting the results of the contour analysis (concentration of nitrate above the MCL)

When the estimated concentration of nitrate in a member domestic supply well exceeds the MCL, the member will be notified of the exceedance. A standard notification letter will be sent by Federal Express overnight delivery to every member for every well that is estimated to be in exceedance. All members will receive the notification letter within 36 hours of the CCGC learning of the exceedance in the member's well. Accompanying the notification letter will be the announcement that the member can use to notify the users of the well that they are drinking water with a concentration of nitrate above the MCL. The 36 hour delivery allows sufficient time for the member to notify the users of the well within the 10 day period required by the Conditional Waiver.

Central Coast Groundwater Coalition Work Plan for Monterey, Santa Clara, Santa Cruz, and San Benito Counties

Updated November 1, 2013

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List of Acronyms

DPH	Department of Public Health
CCGC	Central Coast Groundwater Coalition
GIS	Geographic Information System
MCL	Maximum Contaminant Level
MRP	Monitoring and Reporting Program
QAPP	Quality Assurance Project Plan
SOP	Standard Operating Procedure

Introduction

The CCRWQCB adopted Order No. R3-2012-0011 Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Conditional Waiver) and associated Monitoring and Reporting Program Orders (MRPs) on March 15, 2012. The Conditional Waiver and the MRPs specify that landowners and growers (here forward referred to as L&Gs) in Tiers 1, 2 and 3 may meet groundwater monitoring requirements by either monitoring groundwater individually on their agricultural operations, or by joining a groundwater cooperative monitoring program. The purpose of this document is to set forth the plan for a Central Coast Groundwater Coalition (CCGC) that satisfies the requirements in the Conditional Waiver and MRPs for participating L&Gs in Monterey, Santa Cruz, Santa Clara, and San Benito Counties. The steps outlined in this work plan provide a foundation for a CCGC that L&Gs can support, and that satisfies the requirements as set forth in the MRPs which states, "At a minimum, the cooperative groundwater monitoring effort must include sufficient monitoring to adequately characterize the groundwater aquifer(s) in the local area of the participating Dischargers, characterize the groundwater quality of the uppermost aquifer, and identify and evaluate groundwater used for domestic drinking water purposes." (Page 9 of the MRP - Tiers 1, 2, 3).

One of its primary purposes is to provide the Water Board with information that fills the gaps in the current understanding of groundwater quality throughout the region. Depending on the further development of the Conditional Waiver and its implementation, the program may also eventually provide information to the Water Board on existing farming practices and additional farming practices that will result in improved groundwater quality over time.

Agricultural landowners and growers recognize there is a shared responsibility for maintaining acceptable water quality. They recognize that past fertilizer inputs, as well as other historical land use practices, may have contributed to groundwater quality problems, and are focused on finding solutions to address the contribution that may be coming from existing agricultural practices. L&Gs who choose to participate in this coalition are making a commitment to address groundwater quality in the aquifers supplying drinking water. If sample data indicates that nitrates are above the MCL identified by the Department of Public Health (DPH) as safe for human consumption, and that water coming from that well is currently being consumed, the CCGC will notify the grower/landowner immediately. The notification will allow the member to notify users of the water within 10 days of confirmation that the data provided by the laboratory meet the data quality objectives outlined in the QAPP.

CCGC Boundaries

The CCGC covers enrolled L&Gs in the northern part of the Central Coast region including portions of Santa Cruz County, Santa Clara County, San Benito County, and Monterey County (Figure 1). The Coalition is providing a shapefile to the Water Board along with this submission that outlines the outer perimeter of the cooperative program region (Projection – NAD 83, Scale – 1:24,000). The shapefile will include the extent of the agricultural regions in the four counties. Parcels enrolled in the actual Coalition region will be a subset of this area (see below).

L&Gs in the four counties are all potential participants in this program. Over 1,500 L&Gs have indicated that they will join a Coalition monitoring and reporting program but there are numerous other L&Gs that selected individual reporting as the preferred method of compliance with the Conditional Waiver. Because enrollment in the Coalition is unlikely to include all L&Gs in the northern region, the exact participating

parcels and subsequent perimeter boundary will reflect the actual land ownership and lease agreements in place each year. The final Coalition boundaries reflect the agricultural lands of L&Gs within the portions of the four counties that are members the Coalition region. The membership region is likely to be dynamic from year to year as some leases change hands and some land leaves the Coalition and some land enters the program. However, the spatial distribution of the member parcels will not negatively impact the ability of the CCGC to characterize the concentration of nitrate in domestic supply wells, nor will it negatively impact the ability of the CCGC to characterize the domestic drinking water supply and shallow aquifers across the Coalition region.

Figure 1. Geographic area of the CCGC.

The Coalition will provide to the CCRWQCB a list of members on ~~September 1~~ November 15, 2013, and will provide an annual update on September 1 of each year. In the first year of the CCGC existence, the CCCGP will provide quarterly updates to the list of members as new members may enter the program as they become aware of its existence. Because a number of leases change hands during October, the Coalition will provide an annual update shapefile of the Coalition land area by November ~~1~~ 15 of 2013 and on November 1 of each year beginning in ~~2013~~ 2014.

Task Deliverables

Table 1. Deliverables for Coalition Boundary Delineation.

Deliverable	Elements	Date
Shapefile of external boundaries of Coalition region	ArcGIS shapefile in NAD 83 at 1:24,000 scale; general outline of the Coalition region without individual member landholdings or leases	May 31, 2013
List of members who have enrolled and paid fees to the Coalition	Excel spreadsheet of member IDs, member names, member farm operation names, and contact information as specified below in section	~~September 1~~ November 15, 2013 and annually thereafter on September 1
Shapefile of Coalition region on a parcel by parcel basis	ArcGIS shapefile in NAD 83 at 1:24,000 scale; includes the land owned and/or leased by Coalition members at the individual parcel level	November ~~1~~ 15, 2013 and annually thereafter on November 1

Description of Cooperative Program Coalition Technical Activities

Approach

The Coalition will undertake two related technical tasks; locating and sampling domestic supply wells on member owned/leased land, and characterizing groundwater aquifers in the CCGC region with a focus on shallow groundwater. The domestic supply wells sampled will be those not sampled by the counties and consequently, the concentration of nitrate in the water in those wells is not known. The CCGC will use data generated by the counties, as well as data submitted to GeoTracker by individual L&Gs to be in compliance with the Conditional Waiver to complete the characterization of the domestic drinking water-supply and shallow groundwater aquifer. The primary focus is characterization of the domestic drinking water-supply aquifer.

Domestic supply well identification and sampling from the start of the Coalition to September 1, 2014, and will be completed in three (3) phases. Each phase consists of identifying a subset of wells to sample from a specific geographic area within the Coalition region and then conducting sampling of those wells. Sampling involved in all three phases will be completed by September 1, 2014

The location and sampling of wells on member parcels will occur in three phases during 14 months with activities beginning during the summer of 2013. Phasing will occur by basin as follows. During Phase I wells in the Salinas Valley and Lockwood Valley will be located and sampled. Phase II will focus on

locating and sampling wells in the Pajaro Valley, and Phase III will focus on locating and sampling wells in the Gilroy-Hollister area. Figure 2 shows the location of the phased areas. Using maps and lists of member parcels, we will identify all wells that can be potentially sampled within each basin. These will include domestic wells with single and double connections. These wells will be identified via a combination of Google Earth maps overlaid on a map of member parcels.

The phasing is required because the process of obtaining well logs and reviewing for information on screening depth(s) (see below) to identify wells for sampling is time consuming. Once a list of candidate wells have been identified, the list must be narrowed to those wells that are located on CCGC member parcels, that are accessible, and that are reasonably certain to provide a valid sample (see below). This process is expected to take up to several weeks as individual members are contacted, arrangements are made to visit the wells, and samples are collected.

Based on recent information (see reports cited below and the recent report released by Harter et al. 2012), it appears that groundwater conditions in the Salinas Valley/Lockwood Valley may be the lowest quality in the CCGC region, and those valleys may have the largest number of unsampled domestic supply wells. Consequently, the CCGC will initiate its sampling and characterization efforts in those areas, moving to the Pajaro Valley, and finally the Gilroy-Hollister area last. The three phases are overlapping in that once the list of wells is finalized and arrangements are made for sampling, work on developing the next list will be initiated.

Locating and Sampling Domestic Supply Wells

The CCGC will gather available well logs for all domestic wells that are filed with the Department of Water Resources with written authorization from the CCRWQCB. Because of the time-sensitive nature of this project, in order for the CCGC to meet the deadlines, the CCRWQCB has agreed to authorize the CCGC and its consultants to obtain the well logs from the Department of Water Resources upon final approval of this groundwater program. Wells that do not have a well log will be assigned low priority for sampling. For wells with well logs, the utility of sampling each well will be assessed using additional information including but not limited to well density in the immediate vicinity and well depth. These criteria will be used to prioritize wells to be sampled based on answers to the following questions.

- Based on the depth and screened interval for each domestic well, are there reliable and existing data for the depth interval and immediate area that can provide sufficient information about drinking water quality without sampling the well in question (immediate area is defined by the degree of spatial uncertainty in the available water quality data, see bullet point 3 below)?
- Can the well water be accessed for reliable sampling?
    - That is, is the well head and casing intact and can a reliable water sample be collected?
    - Are there obvious potential avenues for surface contamination to enter the well?
- What do the existing data indicate about spatial variability of the water quality in the area?

Based on the analysis of existing data, the level of spatial uncertainty in water quality data in the area surrounding the well will be quantified and for each well, a determination will be made of how sampling each well can reduce uncertainty. This is an iterative process and the density of wells within a subbasin or area within a subbasin may depend on the concentration of nitrate in the wells that are selected for sampling. It is possible that after the list of wells to sample is finalized, there could be a need for additional samples. Consequently, a step in each phase has been added that allows additional wells to be identified and sampled to allow adequate characterization of drinking water. A list of any new wells that are proposed for sampling will be submitted to the CCRWQCB for Executive Officer approval.
Except as provided in the section entitled “Deliverables and Schedule”, all referred to well lists in this document would be available only through a valid public records act request, in which case well

coordinates would be shown with an uncertainty by one mile squared.

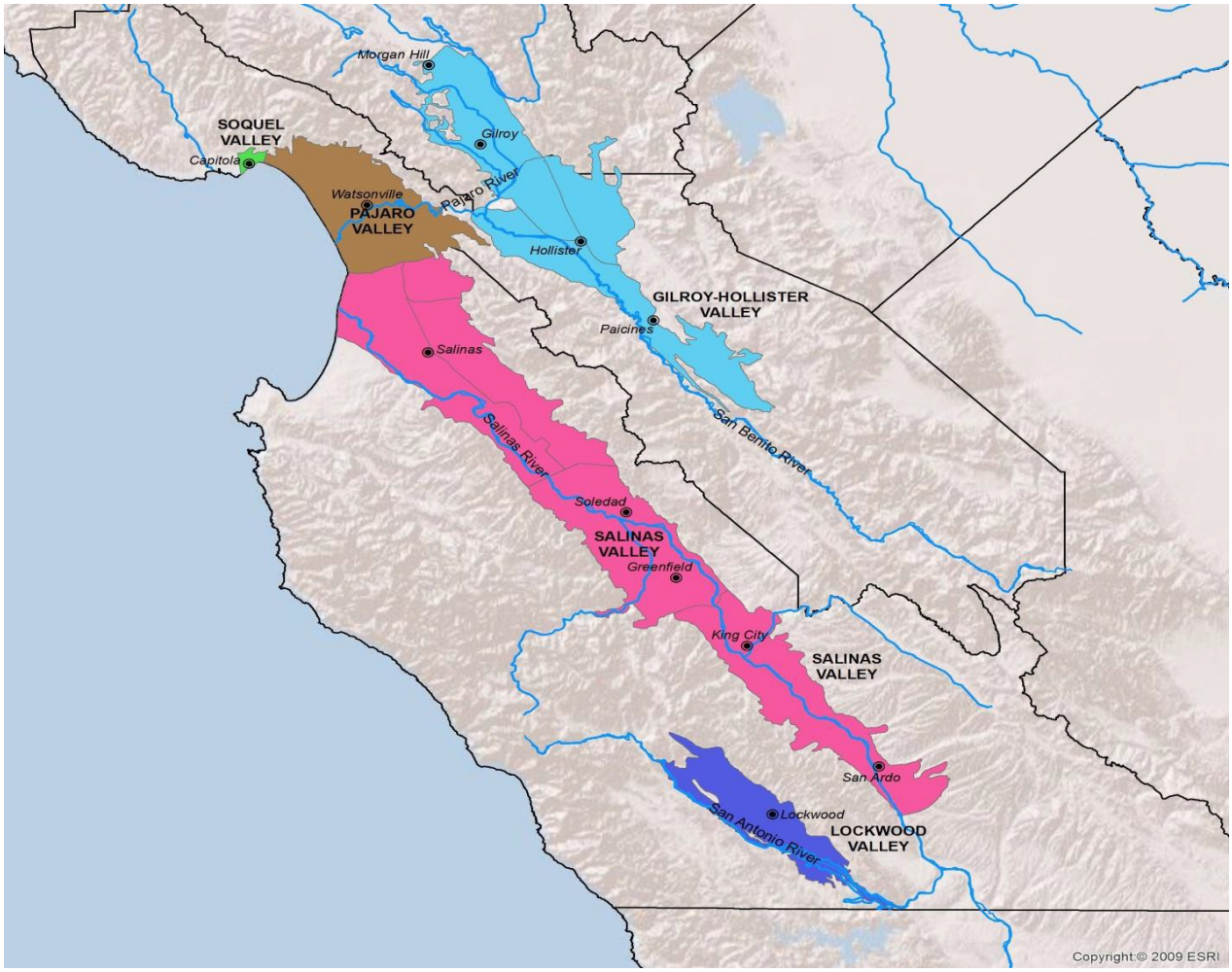
In summary, a staged approach will be used to identify wells for sampling within member parcels.

- Stage 1 – domestic drinking water supply wells with depth and screened interval information. Within those wells identified in Stage 1, wells will be selected that 1) provide essential information about the quality of drinking water based on the analysis of existing data, 2) are accessible and 3) will provide good quality groundwater samples.
- Stage 2 – If there are wells with depth and screened interval information on non-member parcels, this will greatly improve the certainty in the characterization of domestic drinking water quality, we will work with Water Board staff to gain access and sample these wells.
- Stage 3 – if after Stages 1 and 2 an insufficient number of wells are identified to effectively characterize drinking water quality within reasonable certainty in specific areas, domestic water supply wells without depth and screened interval information will be sampled. In addition, as required by Order WQ 2013-0101, any well that is estimated by a contour analysis to have a concentration of nitrate within 50% of the MCL will be added to the list of wells to sample.

In addition to the three stages listed above, any well that has a concentration of nitrate within 20% of the MCL (80% of the MCL) will be sampled within a year of the original sample collection date and annually thereafter. The second sample is to determine if seasonal conditions could result in the concentration of nitrate in the well exceeding the MCL.

The approach for determining the adequacy of the number of wells for characterizing domestic drinking water quality is threefold. First, the existing data will be used to estimate the spatial variability of groundwater nitrate concentrations at various depths. The CCGC proposes to use standard statistical and geostatistical methods to estimate based on the existing data, the number of samples required to represent a value for the central tendency (mean or median) for different levels of variance. Second, the CCGC will use the characterization of the aquifer to assess factors such as soils, subsurface texture, land use and land- and water-management practices and existing water quality data to provide causal explanation of groundwater nitrate concentration distributions. Third, the CCGC will use this assessment and the distribution of existing water quality data to select wells identified during Stage 1 and 2 for sampling based on this analysis and discussions with the Water Board staff to develop consensus with regard to wells to be sampled and the criteria used to develop the list of wells. The objective is to identify an optimal number of wells that allow characterization within an acceptable level of variance. The CCGC will endeavor to minimize to the extent possible, the spatial estimation variance and maximize the confidence level with existing domestic supply wells.

Figure 2. Groundwater basins in the CCCGP region.



The CCGC expects to identify a sufficient number of wells in the first two stages that when combined with existing data, will result in adequate characterization of drinking water quality. However, as indicated above if any well is estimated to have a concentration of nitrate at 50% of the MCL that well will be added for sampling during the third stage. As described above, the initial list of wells selected for sampling will necessarily be larger than the number of wells eventually sampled because many wells may not be accessible, may not be located on member parcels, or will not provide groundwater quality samples that can contribute to characterizing the concentration of nitrate in domestic supply wells. In addition to nitrate, samples may be analyzed for constituents that will aid in aquifer characterization. A list of constituents is shown in Table 2. Constituents listed in line one of Table 2 (Compliance with Conditional Waiver and MRPS) will be analyzed in all circumstances. Constituents listed in lines 2-5 may be analyzed in situations where doing so would aid in aquifer characterization, as determined by the CCGC. All wells will be sampled and the groundwater analyzed for at least the constituents specified in line one of Table 2 by the dates detailed in Table 3. The other constituents listed in lines 2-5 of Table 2 may be sampled if it is determined that it is necessary to obtain specific information needed to better characterize the aquifers.

Table 2. Constituents to be monitored to characterize drinking water and the shallow aquifers.

Function	Constituents
1. Compliance with Conditional Waiver and MRPs[1]	pH, SC, TDS, total alkalinity, CA, Mg, Na, K, SO_4, Cl, NO_3-NO_2
2. Potential for denitrification	Oxidation-reduction potential, N^{15} and O^{18} isotopes
3. Nitrogen source analysis	N^{15} and O^{18} isotopes, pharmaceuticals
4. Age of water in aquifer	Tritium/H4, chlorofluorocarbons[2]
5. Source of water	Ca, Mg, Na, K, Cl, CO_3, SO_4, Br, O^{18}, deuterium, N^{15}

[1]From Table 3 of MRP documents.

Deliverables and Schedule

Table 3. Phase I deliverables and dates for sampling and analysis performed on samples collected in the Salinas Valley/Lockwood Valley.

Deliverable	Elements	Date
Salinas Valley/Lockwood Valley list of wells[1], sampling schedule and initiation of sampling	Initial list of wells to sample and initiation of sampling[2]; list will include all wells on member owned, leased, or operated lands as best the CCCGP can determine as of that date	September 1, 2013
Salinas Valley/Lockwood Valley final list of wells	including justification for wells selected and wells excluded; discussion of final list with CCRWQCB staff if desired	~~November 1~~ December 15, 2013
Data entry to regulatory side of GeoTracker	Complete uploading of groundwater quality data from Salinas Valley/Lockwood Valley	February 28, 2014[3] (Completion of data entry from wells identified in November 1, 2013 list)
Develop supplemental list of wells for sampling (if necessary)	List of wells needed to complete characterization of nitrate concentrations in domestic drinking water supply and shallow groundwater	March 1, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Salinas Valley/ Lockwood Valley	Finalize data upload to GeoTracker, discussion of sampling results including contour map and shapefile of nitrate concentrations	April 30, 2014

[1] Except as provided in this section, all referred to well lists in this document would be available only through a valid public records act request, in which case well coordinates would be shown with an uncertainty by one mile squared.

[2] Because the list of wells to sample must be approved by the Executive Officer, sampling will begin as soon as approval is received including possibly September 2, 2013.

[3] Data entry will begin within 30 days of sample delivery to the laboratory as required. Dates provided in these rows indicate when the groundwater quality data entry into the regulatory-only side of GeoTracker, where it will remain, for at least the term of the Agricultural Order which expires on March 14, 2017.

Table 4. Phase II deliverables and dates for sampling and analysis performed on samples collected in the Pajaro Valley.

Deliverable	Elements	Date
Pajaro Valley list of wells[1], Initial list of wells to sample; schedule and initiation of sampling	Initial list of wells to sample; list will include all wells on member owned, leased, or operated lands	~~January 2, 2014~~ December 1, 2013
Pajaro Valley final list of wells	Final list of wells to sample including justification for wells selected and wells excluded; discussion of final list with CCRWQCB staff if desired; sampling begins upon approval of list from Executive Officer	February, 1 2014
Data entry to regulatory side of GeoTracker	Uploading of groundwater quality data from Pajaro Valley	April 30, 2014[2] (Completion of data entry from wells identified in November 1, 2013 list)
Develop supplemental list of wells for sampling (if necessary)	List of wells needed to complete characterization of nitrate concentrations in domestic drinking water supply and shallow groundwater	June 1, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Pajaro Valley	Finalize data upload to GeoTracker, discussion of sampling results including contour map and shapefile of nitrate concentrations	July 31, 2014

[1] Except as provided in this section, all referred to well lists in this document would be available only through a valid public records act request, in which case well coordinates would be shown with an uncertainty by one mile squared.

[2] Data entry will begin within 30 days of sample delivery to the laboratory as required. Dates provided in these rows indicate when the groundwater quality data entry into the regulatory-only side of GeoTracker, where it will remain, for at least the term of the Agricultural Order which expires on March 14, 2017.

Table 5. Phase III deliverables and dates for sampling and analysis performed on samples collected in the Gilroy-Hollister area.

Deliverable	Elements	Date
Gilroy-Hollister list of wells, 2014 sampling schedule and initiation wells on member of sampling[1]	Initial list of wells to sample; list owned, leased, or operated	February 1, will include all
Final list of wells to sample selected and wells excluded; discussion of final list with CCRWQCB staff if desired	March 31, 2014 including justification for wells	
Data entry to regulatory side of quality data from Gilroy-Hollister	Uploading of groundwater data entry from wells identified in	July 31, 2014[2] (Completion of November 1, 2013 list)
Develop supplemental list of 2014 wells for sampling (if necessary)	List of wells needed to complete characterization of nitrate concentrations in domestic drinking water supply and shallow groundwater	August 1,
Technical Memo on 2014 concentration of nitrates in domestic supply wells in the contour map and shapefile of nitrate	Finalize data upload to GeoTracker, discussion of sampling results including concentrations	October 31,

[1] Except as provided in this section, all referred to well lists in this document would be available only through a valid public records act request, in which case well coordinates would be shown with an uncertainty by one mile squared.

[2] Data entry will begin within 30 days of sample delivery to the laboratory as required. Dates provided in these rows indicate when the groundwater quality data entry into the regulatory-only side of GeoTracker, where it will remain, for at least the term of the Agricultural Order which expires on March 14, 2017.

All well sampling activities will be concluded by August 31, 2014. The CCGC will provide a short memorandum to the CCRWQCB by September 15, 2014 indicating that all sampling activities were completed by the September 1, 2014 deadline. By December 15, 2014, the CCGC will submit a detailed report to the CCRWQCB summarizing the information obtained during the domestic supply well monitoring program. The summary will include the overall distribution of domestic supply wells that are not sampled by the counties, a description of the depths of those wells to the extent known, contour maps of the concentration of nitrate in all wells sampled stratified for different screening depths, and an accounting of the number/percentage of domestic supply wells that are supplying water with concentrations of nitrate above the primary MCL.

The Coalition participants have significant concerns and objections to displaying individual well locations to the public on maps available on the Internet using GeoTracker. Instead of displaying individual well locations to the public, the CCRWQCB agrees to display Coalition data as contour maps on GeoTracker after January 1, 2015[1], as long as 1) the contour maps meet the conditions described in

[1] Note that the delay of display of data on GeoTracker until January 1, 2015 does not affect the immediate availability of information to the public in response to a PRAR.

Conditions 10 through 13 contained in the June 10, 2013 Conditional Approval Letter from the Central Coast Regional Water Quality Control Board to Abby Taylor-Silva, representing the Central Coast Groundwater Coalition, and are approved by the Executive Officer, and 2) the State Water Resources Control Board makes the necessary modifications to GeoTracker so that it can properly display the contour maps with other existing data currently in GeoTracker.

If by January 1, 2015, the functionality does not exist in GeoTracker to properly display the approved contour maps, the Coalition has the option to submit static images (e.g. pdf, bitmap) of the contour maps by March 15, 2015; If the Coalition does not choose to submit static images of the contour maps or if the Coalition does not submit contour maps that meet Conditions 10 through 13 as described above, then the data will be displayed as individual wells on GeoTracker and the well location and data will only be referenced within a one-mile square of the actual well location, using the existing mapping functionality for CDPH wells in GeoTracker.

Contour Confidence Interval

The analysis by the CCGC will be performed to achieve the highest level of certainty possible using all publicly available well samples and integrating the wells that are selected for sampling by this program, and that the analysis will explicitly provide the confidence value for any location on the map. If wells owned by individuals who are not members of the CCGC can be used to increase the level of confidence, those owners can be contacted to determine if they are willing to allow samples of the water to be collected.

HydroFocus is a hydrogeology consulting company retained by the CCGC to provide expertise in developing the groundwater program. HydroFocus was asked to determine the possibility providing high-confidence interval contours by reviewing all of the available nitrate data for the Salinas Valley. They plotted the kriging standard error for the concentrations of nitrate as N for 670 well samples from the Salinas Valley. The standard errors range from 10% to 20%. Therefore, for the 670 well samples and a grid spacing of about 1 mile, the estimated concentration of nitrate at any point where there is not a well will theoretically be within approximately plus or minus 20% of the range of the estimated value at points where there are not samples. Therefore for points on the grid where there are no samples, the confidence level for the estimated concentration is 80% to 90%. For a contour interval of 5 mg/L than encompasses known concentrations ranging from 5 to 10 mg/L nitrate as N, an estimated value of 9 mg/L with the 20% standard error would be result actual values being outside the contour range some of the time.

The analysis performed by HydroFocus used data for 670 well samples. HydroFocus has been searching for potential domestic drinking water supply wells in the Salinas Valley and has identified about 500 locations where domestic supply wells may exist. Across the northern region, the Salinas Valley is assumed to be the most densely populated region within the CCGC region. Consequently, for the domestic drinking water supply wells in the Salinas Valley and most probably in the entire region, even if a sample is collected from every well, the sample size will likely be too small to generate a 90% or 95% confidence interval for all locations. Therefore, the number of available wells dictates that there will be a higher level of uncertainty associated with the contours in certain, but not all, areas.

Temporal Variability

The Coalition commits to the CCRWQCB to perform additional sampling after the initial sampling outlined in this program is completed to determine temporal variability in wells determined by the CCGC and the CCRWQCB to be high priority.

Table 6. Report deliverables and dates.

Deliverable	Elements	Date
Memo to CCRWQCB documenting the completion of groundwater sampling	Final list of wells sampled	September 15, ~~2013~~ 2014
Initial characterization of the shallow groundwater aquifer	Aquifer characterization using information known about geology and water quality in the CCGC region	December 15, ~~2013~~ 2014
Draft final report on concentration of nitrates in domestic supply wells across the Coalition region	Discussion of sampling results December 15, 2014 concentration of nitrates in including contour maps and domestic supply wells across the shapefiles of nitrate concentration contours, depths of domestic supply wells, number/percentage of wells with NO3 above the MCL; discussion of any data gaps in knowledge of shallow groundwater quality	December 15, 2014
Final report incorporating Water Board comments	Discussion of sampling results including contour maps and shapefiles of nitrate concentration contours, depths of domestic supply wells, number/percentage of wells with NO3 above the MCL	March 15, 2015

Characterizing groundwater aquifers with focus on domestic drinking water supply and shallow groundwater

The primary objective for characterizing groundwater aquifers will be to develop 1) a process-level understanding of distribution of nitrate contamination in domestic supply wells with single connections or a small number of connections and 2) identify regions for evaluation of agricultural land- and water-management practices to reduce discharges to groundwater. The CCGC covers enrolled L&Gs in the northern part of the Central Coast region including portions of Santa Cruz County, Santa Clara County, San Benito County, and Monterey County (Figure 1).

The region contains three principle groundwater basins where agriculture is the predominant land use; Pajaro Valley, Salinas Valley and the Gilroy-Hollister basins (Figure 2). As the project proceeds, these groundwater basins will be characterized more fully using the known geology and available information for the aquifer. For the initial characterization to be completed by December 15, 2013, the CCGC will focus on describing the groundwater quality in each aquifer based on the existing data and hydrogeologic conditions.

Initially, aquifer characterization will be conducted on two levels. The CCGC will 1) characterize the distribution of nitrate concentrations in aquifers used for domestic drinking water supply, and 2) use existing data to provide information about the source of the nitrates and the age of the groundwater (year of recharge). A more complete characterization, due December 2014, will utilize groundwater data collected by the CCGC to more fully explain the nature of groundwater degradation and its causality.

Notification of Growers

The goal of the member notification system is to identify wells that have a concentration of nitrate above the MCL and make sure the users of the water are notified. The CCGC has developed a notification system that will guarantee that members are notified that the domestic supply well is above the MCL with sufficient time to notify users of the water within the 10 day period specified by Order WQ 2013-0101. In addition, if the statistical analysis of the available data indicates that there are un-sampled wells with an estimated concentration of nitrate above the MCL, members who own those wells will be notified in a timeframe that will allow users of the water to be notified within 10 days of the statistical analysis. A more detailed description is included in the addendum at the end of the work plan.

Current knowledge of aquifer conditions

The groundwater basins to be evaluated within the framework of this workplan are generally geologically similar. They are intermountain valleys where there is extensive faulting and resultant deep Tertiary and Quaternary alluvial fill and drainage to the Pacific Ocean. Water bearing units include unconsolidated and semi-consolidated alluvial fan and river deposits interbedded with marine clays. Episodic changes in sea level during the Miocene through Pleistocene led to alternating deposition between coarse grained materials in riverine and alluvial fan environments, and fine grained sediments in estuarine and marine environments. The following discussion of the basins and subbasins was extracted from the Department of Water Resources Bulletin 118, USGS publications and consultant reports.

The Pajaro Valley basin contains water-bearing geologic units that include from oldest to youngest, the Purisima Formation, the Aromas Sand Formation, Terrace Deposits, Quaternary alluvium, and Dune Deposits. The Purisima Formation is mainly of marine origin, and contains a thick sequence of highly variable sediments ranging from shale beds near the base to continental deposits in the upper portion. The sediments are poorly consolidated, moderately permeable gravel, sands, silts, and silty clays. The Aromas Sand is considered the primary water-bearing unit of the basin and consists of upper eolian and lower fluvial sand

units that are separated by confining layers of interbedded clays and silty clay. The Terrace Deposits consist of unconsolidated gravel, sand, silt, and clay overlain by alluvium. The alluvium is composed of Pleistocene terrace materials that are overlain by Holocene alluvium, consisting of sand, gravel, and clay deposited by the Pajaro River, and dune sands, with an average thickness of 50 to 300 ft.

South of the Pajaro Valley Basin, in the Monterey Bay and the Salinas Valley area, the Langley Area and 180/400-Foot subbasins include from oldest to youngest, the Pliocene to Pleistocene Paso Robles Formation, the Pleistocene Aromas Sands, Quaternary terrace deposits, Holocene alluvium, and sand dunes. The 180/400-Foot subbasin includes three water-bearing units, the 180-Foot, the 400-Foot, and the 900-Foot aquifers, named for the average depths of each aquifer. The confined 180-Foot Aquifer occurs only in this subbasin, as its confining blue clay layer thins and disappears east and south of the subbasin and does not extend into the Eastside Aquifer subbasin.

The 180-Foot Aquifer consists of interconnected sand, gravel, and clay lenses, and ranges in thickness from 50 to 150 ft. The 180-Foot Aquifer is separated from the 400-Foot Aquifer by a zone of less coarse- grained strata and confining units that range in thickness from 10 to 70 feet. The 400-Foot Aquifer is about 200-ft thick and consists of sands, gravels, and clay lenses. The upper portion of the aquifer appears to be correlated with the Aromas Sand and the lower portion with the upper part of the Paso Robles Formation. The 900-Foot Aquifer, present in the lower (northern) Salinas Valley, consists of alternating layers of sand, gravels and clays and is separated from the 400-Foot Aquifer by a blue marine clay-confining unit.

The Corral de Tierra Area subbasin includes the following water-bearing units, from oldest to youngest: the Miocene and Pliocene Santa Margarita Formation, the Pliocene Paso Robles Formation, the Pleistocene Aromas Formation, and Pleistocene and Holocene age alluvial deposits. The Paso Robles Formation is the primary water-bearing unit in the area and consists of sand, gravel, and clay interbedded with some minor calcareous beds. The East Side subarea includes a narrow strip on the eastern half of the valley. It is similar in geologic structure as the 180/400-Foot Aquifer subbasin except that the confining blue clay layer thins and disappears east of the subbasin.

The upper Salinas Valley contains the Forebay Aquifer and Upper Valley Aquifer subbasins. The Forebay subarea encompasses the entire width of the unconsolidated alluvial fill between Gonzales and the bluff line two miles south of Greenfield. The primary water-bearing units of this subbasin are the same units that produce water in the adjacent 180/400-Foot Aquifer Subbasin; 180-Foot Aquifer and the 400-Foot Aquifer. However, the near-surface confining unit of the 180/400-Foot Aquifer Subbasin does not extend into the Forebay subbasin. Groundwater in the Forebay Aquifer subbasin is unconfined and occurs in lenses of sand and gravel that are interbedded with finer grained material.

The Upper Valley subarea includes the entire alluvial fill in the valley floor between the bluff line two miles south of Greenfield to the southern end of the San Ardo Valley. The primary aquifer is unconfined and deposits range from unconsolidated to semi-consolidated. It consists of inter-bedded gravel, sand, and silt of the Paso Robles Formation, alluvial fan and river deposits. These deposits are equivalent to the 180-Foot and 400-Foot Aquifer units of the lower Salinas Valley. However, confining units comparable to those separating aquifers in the lower Salinas Valley are present. Groundwater is unconfined and is replenished primarily with water from the Salinas River and its tributaries.

Recharge in the Salinas and Pajaro valleys occurs from infiltration from the Salinas River and deep percolation of irrigation water. Flow in the Salinas River is seasonally controlled for conjunctive use. Precipitation, subsurface and boundary inflow, and seawater intrusion are other sources of recharge of lesser importance. The Salinas Valley and Pajaro Valley groundwater basins are drained by the Salinas and

the Pajaro rivers. Directions of groundwater flow generally follow the topography of the basins, from high altitudes towards the drainages, and down valleys towards Monterey Bay. Major water supply and water quality issues include overdraft of aquifers and contamination by nitrate.

Concentrations of nitrate in groundwater vary temporally and spatially. Primary sources of data include irrigation, public supply, and monitoring wells. Concentrations of nitrate above 100 mg/L and up to several hundred mg/L are observed sporadically in all of the Salinas Valley subbasins. Kulongoski and Belitz[2] used a non-parametric statistical analysis to examine the relationship between nitrate and potential explanatory factors including land use, well construction, groundwater age, and geochemical condition. Nitrate concentrations were slightly higher in wells with groundwater ages classified as modern or mixed compared to wells classified as pre-modern.

The Gilroy-Hollister Basin in San Benito and Santa Clara counties includes the Llagas, Bolsa, Hollister, and San Juan Bautista groundwater subbasins. The Llagas subbasin extends from the groundwater divide at Cochran Road near Morgan Hill in the north to the Pájaro River in the south in Santa Clara County. It is drained to the south by tributaries of the Pájaro River, including Uvas and Llagas creeks. The water bearing formations include Pliocene to Holocene age continental deposits of unconsolidated to semi- consolidated gravel, sand, silt and clay. Recharge to the Llagas subbasin occurs from a variety of sources: natural recharge from streams, principally Uvas and Llagas Creeks; percolation of precipitation and irrigation water, and artificial recharge. Nitrate in groundwater is a key water quality issue in this subbasin. Since 1997, more than 600 wells in south Santa Clara County including the Llagas and Coyote subbasins have been tested for nitrate. More than half exceed the federal safe drinking standard for nitrate.

Todd Engineers[3] summarized the water quality data for the remaining subbasins in San Benito County. Key constituents of concern include boron, chloride, hardness, metals, nitrate, sulfate, potassium, and TDS. In some parts of the Basin, concentrations of these constituents do not meet water quality standards necessary to support drinking water beneficial uses (MUN). In most areas of the Basin in San Benito County, concentrations of key constituents of concern remained relatively unchanged from 2005 – 2010. In the eastern portion of northern San Juan Subbasin, nitrate and chloride concentrations have decreased over time owing to land use and groundwater-level changes. Concentration of nitrate in shallow groundwater is generally higher than the concentration of nitrate in deeper groundwater. Average nitrate concentrations in all subbasins in San Benito County are below the MCL.

The Bolsa Area subbasin lies within the northwest portion of the Gilroy-Hollister Valley Groundwater Basin, and is bounded on the north by the Pajaro River, to the southwest by the Flint Hills. The aquifer consists mainly of clay, silt, sand, and gravel ranging in age from Tertiary to Holocene. Holocene alluvium consists of unconsolidated lenticular beds of gravel, sand, silt, and clay deposited by streams as flood plain, alluvial-fan, slope-wash, and terrace deposits. Thickness generally ranges from 0 to 300 feet. The Purisima Formation while lithologically similar to the overlying alluvium is generally more consolidated and less permeable. The Purisima Formation ranges from the surface in some areas to several thousand feet. Vertical groundwater flow is restricted by an extensive clay confining layer. The water quality constituents of greatest concern are salinity, nitrate, boron, hardness, and trace elements that occasionally exceed drinking water standards.

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[2] Justin T. Kulongoski and Kenneth Belitz. 2005. Program Status and Understanding of Groundwater Quality in the Monterey Bay and Salinas Valley Basins, 2005: California GAMA Priority Basin Project, US Geological Investigations Report 2011 – 5058.

[3] Todd Engineers. 2012. Technical Memorandum 1, Hydrogeologic Conceptual Model for Northern San Benito County Salt and Nutrient Management Plan.

The Hollister Area subbasin lies within the northeast portion of the Gilroy-Hollister Valley Groundwater Basin. The Calaveras fault is the western boundary and abuts the Bolsa Area subbasin. The northern portion of the subbasin drains toward Monterey Bay by the Pajaro River and its tributaries. The southern portion is drained by the San Benito River and its tributaries. Groundwater occurs in the alluvium of Holocene age and older alluvium. The aquifers consist of clay, silt, sand, and gravel, and poorly consolidated sandstone. The unconsolidated or poorly consolidated Tertiary or Quaternary rocks underlying the alluvium have been divided into three units which consist of a thick sequence of clay, silt, sand and gravel. Most recharge to the subbasin is derived from rainfall and stream flow from creeks entering the basin. Pacheco Pass Water District operates North Fork Dam on Pacheco Creek for the primary purpose of supplying groundwater recharge to the northeast portion of the subbasin. Water levels have generally risen since 1987 when surface water was delivered. The water quality constituents of greatest concern are salinity, nitrate, boron, hardness, and trace elements that occasionally exceed drinking water standards.

The San Juan Bautista Area subbasin lies within the southwest portion of the Gilroy-Hollister Valley Groundwater Basin, is bounded on the north by Sargent Fault and Sargent anticline and abuts the Bolsa Area subbasin. Groundwater occurs in the alluvium of Holocene age, and the Purisima Formation of Pliocene age. The subbasin is drained primarily by the San Benito River and its tributary creeks. The Pajaro River drains the northern boundary. The primary source of recharge is the San Benito River which is managed to provide groundwater recharge. Groundwater level measurements since 1913 indicate significant declines from early in the century to the 1970's. Water levels have risen over 100 feet since 1976 due to the construction of Hernandez Reservoir on the San Benito River in 1961 and the delivery of imported surface water beginning in 1987.

Quality Assurance Project Plan/Sampling Analysis Plan

Quality Assurance

A Surface Water Ambient Monitoring Program (SWAMP) comparable Quality Assurance Program Plan (QAPP) will be developed for the project. The QAPP will include all 24 elements found in the SWAMP checklist. Analytes covered in the QAPP are from Table 3 of MRP documents (MRP No. R3-2012-0011-01, MRP No. R3-2012-0011-02, and MRP No. R3-2012-0011-03) and Table 2 above.

Briefly, the QAPP will include but is not limited to:

- Project organizational structure;
- A discussion of the field methods to be used;
- Meter maintenance and calibration;
- Sample collection methods;
- Chain of custody form;
- Field and laboratory SOPs;
- Sample containers; and
- Sample processing and preservation methods.

Field parameters and analytes will be listed and the laboratory method(s) of analysis will be provided. Data quality objectives will be provided and the quality control samples (e.g. duplicates, blanks) needed to meet those objectives will be discussed. The laboratory identified to perform the analysis will be provided and the analytical methods used will be described. Laboratory SOPs will be included as well as the laboratory QA/QC measures (e.g. spikes, blanks). The QAPP will be circulated for approval prior to initiation of sampling and analysis. The QAPP will be provided to the Water Board by August 15, 2013.

Sampling and Analysis Plan

A sampling plan for the domestic supply wells will be developed and submitted to the CCRWQCB. The Sampling Plan will:

- Develop the logistical details of field sampling, e.g., timing;
- Identify who will perform sampling;
- Describe how sampling will be coordinated with landowners and tenants;
- Identify wells to be sampled and timing of sampling;
- Describe type of well (domestic supply, agricultural supply, monitoring); and
- Provide map of wells using same NAD 83 and 1:24,000 scale as provided for the cooperative program boundary

Third Party Implementation

Member Organization and Member Responsibilities

The CCGC will form a non-profit organization to direct and administer the activities of the program and its contractors. The purpose of the Coalition's organizational structure is to organize agricultural L&Gs to support Coalition activities, and to conduct the monitoring, reporting, and outreach activities. The program anticipates forming a non-profit organization immediately after acceptance of the work plan. The organization will be functional within 75 days after initiation of the paperwork needed to file for non-profit status.

To perform the CCGC tasks, it is necessary to have an organization in place to:

- Collect and manage the funds to pay for required activities;
- Conduct outreach, implement, and assume responsibility for the tasks to be completed; and
- Coordinate with the CCRWQCB to resolve issues that may arise.

Organization responsibilities include:

- Tracking members and reporting required member information to CCRWQCB;
- Collect fees to operate program;
- Manage communications and notifications to members and CCRWQCB;
- Conduct sampling to remain in compliance with the MRP requirements;
- Manage water quality monitoring data;
- Manage contracts for technical work;
- Interpret data;
- Submit reports to CCRWQCB on behalf of members;
- Document its organizational and management structure; and
- Provide members with annual summaries of expenditures of revenue.

One of the CCGC's long-term goals is to inform L&Gs about their responsibility to use farming practices that are protective of groundwater resources. This goal needs to be accomplished with a cost effective data collection program to properly characterize groundwater quality, and to assist L&Gs in implementing effective practices to protect groundwater quality.

Participating in the CCGC will carry responsibilities for members including:

- Paying dues necessary to fund CCGC activities (monitoring, reporting, outreach); and

- Completing any required reports/forms requested by the CCGC.

Enrollment forms will include a signed provision allowing the CCRWQCB to provide the CCGC with information on the eNOI. Failure to meet membership responsibilities will result in dismissal from the CCGC. Once a grower is dismissed from the CCGC, their name is no longer included in the annual member list provided to the CCRWQCB by the CCGC organization. These responsibilities provide assurances to the CCRWQCB and stakeholders that membership in the CCGC provides for the proper characterization of local groundwater conditions and a commitment on the part of members to be protective of groundwater quality.

Coalition Responsibilities

The CCGC will insure that there is sufficient financial support to implement the program and will include the approximate cost to implement the program and identification of resources available (e.g., the fees and number of participating L&Gs to generate the funds necessary to meet the budgeted costs) to fully implement all technical and administrative aspects of the program.

The CCGC will insure sampling is conducted by dates established in the Coalition program, sampling schedule (see Table 8).

The CCGC will insure data and reports are submitted to the CCRWQCB in format specified and by dates established in Table 8.

The CCGC will insure all participating L&Gs are providing any required information and are taking necessary steps to address any obstacles, or issues that arise to implementing the Coalition program.

The CCGC will insure that any activities conducted on behalf of the third-party by other groups meet the terms and requirements of the program. The CCGC is responsible for any activities conducted on its behalf.

The CCGC will establish and conduct governance, including but not limited to:
i. As a legally defined entity (i.e. non-profit corporation; local or state government; Joint Powers Authority) or have a binding agreement among multiple entities that clearly describes the mechanisms in place to ensure accountability to participating L&Gs;
ii. With a governing structure that includes a governing board of directors composed in whole or in part of participating L&Gs, and that provides participating L&Gs with a mechanism to direct or influence the governance of the third party through appropriate by-laws.
iii. With appropriate authorization from participating L&Gs to access individual grower eNOI information in GeoTracker (e.g., AW#, current contact information);
iv. The CCGC will describe and provide evidence for i-iii, above.

The CCGC will provide the following information and reports to the CCRWQCB and participating L&Gs, on the dates specified:

- By September 1, 2013 the documentation of its organizational or management structure and its by-laws or operating procedures. The documentation shall identify persons responsible for ensuring that the program is implemented as approved. The CCGC must also provide to the CCRWQCB confirmation that this information was provided to participating L&Gs;
- By September 1, 2013, the list of participating L&Gs, and quarterly, thereafter, the list of new

enrollees, as follows:

- Participating grower information in Microsoft Access or Excel format, including AW#, Ranch Name and GeoTracker global ID for each participating grower, physical mailing address, and email address. Information provided must be accurate and consistent with that reported in the electronic-Notice of Intent (eNOI);

The CCGC must also provide to the CCRWQCB, confirmation that the following information was provided to participating L&Gs;

- On September 1, 2013, in the Draft Final Report by December 15, 2014, and the Final Report by March 15, 2015, the annual summaries of expenditures of fees and revenues. The CCGC must also provide to the CCRWQCB, confirmation that this information was provided to the participating L&Gs;
- By September 1, 2013 and annually thereafter, notification to participating L&Gs of the following, and provide confirmation to the CCRWQCB of such notification to participating L&Gs:
- Participating L&Gs, as enrolled L&Gs in the Agricultural Order, are individually responsible for the successful implementation of the program and that this individual responsibility has two consequences if the CCGC is not successfully implemented: 1) The CCRWQCB or Executive Officer will require individual dischargers to conduct individual monitoring per the requirements of the Agricultural Order, 2) The CCRWQCB may take enforcement action against individual dischargers. The failure of a third party group to successfully implement an approved program cannot be used as an excuse for lack of individual discharger compliance;
- Quarterly, beginning within three months of notice of approval, if the third-party group is unable to implement any aspect of the program that could result in a violation of the program's monitoring or reporting requirements, notification describing the inability to implement and the possible violations. The CCGC must also provide to the CCRWQCB, confirmation that this information was provided to participating L&Gs;
- Quarterly, beginning within three months of notice of approval, notification to participating L&Gs of any changes to the program approved by the Executive Officer or the CCRWQCB and confirmation to the CCRWQCB that this notification was provided to participating L&Gs.

Table 7. Coalition administrative deliverables.

Deliverable	Elements	Date
List of participating L&Gs	List of members in good standing	~~September 1~~ November 15, 2013
Member parcel map specifying exact CCGC area	GIS shapefile of geographical boundary of program based upon member parcels	November ~~1~~ 15, 2013 and annually thereafter
Quarterly update of member list	List of members who enrolled in last quarter, in Access or Excel format	January 1, 2014; April 1, 2014, July 1, 2014, October 1, 2014
Organizational/administrative structure	Category, names of Board of Directors, Executive Director, Contractors as appropriate; operating procedures; fees and expenditures, confirmation of member notification	September 1, 2013; December 15, 2014; March 15, 2015 and annually thereafter

Member notification of responsibilities as a discharger	Consequences to members for not accepting member responsibilities; CCRWQCB notification that members have been contacted	September 1, 2013
Notice of inability to successfully conduct business as required by the CCRWQCB	Confirmation of member notification	Quarterly as necessary starting 90 days after formation of cooperative program organization

Summary

Table 8. Chronology of all submissions to the Central Coast Regional Water Board by the CCGC on behalf of its members.

Deliverable	Date
Shapefile of external boundaries of Coalition region May 31, 2013	May 31, 2013
QAPP provided to the CCRWQCB	August 15, 2013
List of members who have enrolled and paid fees to the Coalition September 1, 2013 and annually thereafter on September 1	September 1, 2013 and annually thereafter on September 1
Salinas Valley/Lockwood Valley list of wells[1], sampling schedule, and initiation of sampling September 1, 2013	September 1, 2013
List of participating L&Gs September 1, 2013	~~September 1~~ November 15, 2013
Organizational/administrative structure September 1, 2013; December 15, 2014; March 15,	September 1, 2013; December 15, 2014; March 15, 2015 and annually thereafter 2015 and annually thereafter
Member notification of responsibilities as a discharger September 1, 2013	September 1, 2013
Shapefile of cooperative program region including thereafter on individual parcels owned or operated by all members November 1, 2013 and annually thereafter on individual parcels owned or operated by all members November 1	November ~~1~~ 15, 2013 and annually
Salinas Valley/Lockwood Valley final list of wells November 1, 2013	wells November 1, 2013
Initial characterization of the shallow groundwater aquifer	December 15, 2013
Quarterly update of member list	January 2, 2014; April 1, 2014, July 1, 2014, October 1, 2014
Pajaro Valley list of wells, sampling schedule and initiation of sampling January 2, 2014 – June 30, 2014 initiation of sampling	January 2, 2014 – June 30, 2014
Gilroy-Hollister list of wells, sampling schedule, and initiation of sampling February 1, 2014 initiation of sampling	February 1, 2014
Pajaro Valley final list of wells February 1, 2014	February 1, 2014
Begin Salinas Valley/Lockwood Valley data entry to regulatory side of GeoTracker February 28, 20142 (Completion of data entry from regulatory side of GeoTracker wells identified in November 1, 2013 list)	February 28, 2014[2] (Completion of data entry from wells identified in November 1, 2013 list)
Develop supplemental list of wells for sampling in Salinas Valley/Lockwood Valley (if necessary) March 1, 2014	March 1, 2014

Gilroy-Hollister final list of wells March 31, 2014	March 31, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Salinas Valley/Lockwood Valley	April 30, 2014
Begin Pajaro Valley data entry to regulatory side of GeoTracker April 30, 2014	April 30, 2014
Develop supplemental list of wells for sampling in Pajaro Valley (if necessary) June 1, 2014	June 1, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Pajaro Valley July 31, 2014 domestic supply wells in the Pajaro Valley	July 31, 2014
Begin Gilroy-Hollister data entry to regulatory side of GeoTracker July 31, 2014 (Completion of data entry from wells	July 31, 2014 (Completion of data entry from wells identified in November 1, 2013 list)
Develop Gilroy-Hollister supplemental list of wells for sampling (if necessary) August 1, 2014 sampling (if necessary)	August 1, 2014
Memo to CCRWQCB confirming the completion of groundwater sampling September 15, 2014 groundwater sampling	September 15, 2014
Technical Memo on concentration of nitrates in domestic supply wells in the Gilroy-Hollister October 31, 2014 domestic supply wells in the Gilroy-Hollister	October 31, 2014
Draft final report on concentration of nitrates in domestic supply wells across the Coalition region December 15, 2014 domestic supply wells across the cooperative program	December 15, 2014
Final report incorporating CCRWQCB comments March 15, 2015	March 15, 2015
Notice of inability to successfully conduct business as required by the CCRWQCB Quarterly as necessary starting 90 days after notice of required by the CCRWQCB approval of cooperative program organization	Quarterly as necessary starting 90 days after notice of approval of cooperative program organization

[1] Except as provided in the section entitled "Deliverables and Schedule", all referred to well lists in this document would be available only through a valid public records act request, in which case well coordinates would be shown with an uncertainty by one mile squared.

[2] Data entry will begin within 30 days of sample delivery to the laboratory as required. Dates provided in these rows indicate when the groundwater quality data entry into the regulatory-only side of GeoTracker, , where it will remain, for at least the term of the Agricultural Order which expires on March 14, 2017.

Addendum – Member Notification

Notification of Members

The goal of the member notification system is to identify wells that have a concentration of nitrate above the MCL and make sure the users of the water are notified. The CCGC has developed a notification system that will guarantee that members are notified that the domestic supply well is above the MCL with sufficient time to notify users of the water within the 10 day period specified by Order 2013-0101. In addition, if the statistical analysis of the available data indicates that there are un-sampled wells with an estimated concentration of nitrate above the MCL, members who own those wells will be notified in a timeframe that will allow users of the water to be notified within 10 days of the statistical analysis.

Notification of members occurs several times during the monitoring and reporting process as described below.

- Outreach to members requesting the location of domestic supply wells on their property
- Notification to growers indicating that their wells were sampled and providing the responsibilities of the grower should the concentration of nitrate in the well exceed the MCL
- Federal Express notification within 36 hours of receipt of the results, informing the member that the concentration of nitrate in their well is above the MCL and providing the standardized notice to give to users of the water
- Mail notification to all remaining growers of the concentration of nitrate in their domestic supply wells and any follow-up activity that will occur
- Federal Express notification sent to member reporting the results of the contour analysis (concentration of nitrate above the MCL)

A brief discussion of each of these steps is provided below.

Outreach to members requesting the location of domestic supply wells on their property

When the CCGC is ready to initiate monitoring of domestic supply wells in a region, the CCGC contacts the member with a request for the location of all wells providing water for domestic use. Members respond with the requested information and a list of wells is developed. The list of wells provided will be compared to the wells listed by the member on their eNOI to guarantee that the wells scheduled for sampling are domestic supply wells. Wells scheduled for sampling are visited to determine the suitability of the well for sampling and to discuss with the member the use of the well to further confirm that all domestic supply wells are identified and available for sampling.

Notification to growers indicating that their wells were sampled

Once the member's wells have been sampled, they are sent a pre-notification letter confirming the sampling, providing information about the potential outcomes of the laboratory analysis of the water, and stating that the member will receive one of several types of follow-up notifications determined by the concentration of nitrate in the well. One pre-notification letter per well is sent to the member such that a single member could receive several pre-notification letters depending on the number of wells across their ranches.

Exceedance report to the Regional Board if necessary

All laboratory analyses will be uploaded to GeoTracker by the well, and also sent to the CCGC for review of the quality assurance information. When the CCGC determines that the data meet the data quality objectives outlined in the QAPP, the data are considered validated. Validation is generally performed within

24 hours after receipt of the data from the laboratory. If the results of the laboratory analyses indicate that the concentration of nitrate in the well exceeds the MCL, the CCGC will notify the CCRWQCB within 24 hours of data validation. The notification will include all relevant data including but not limited to well ID, Ranch Name, sample date, and concentration.

Federal Express notification of the member

When the data are validated and it is determined that the concentration of nitrate in a member domestic supply well exceeds the MCL, the member will be notified of the exceedance. A standard notification letter will be sent via Federal Express overnight delivery to every member for every well that is in exceedance. All members will receive the notification letter within 36 hours of the CCGC learning of the exceedance in the member's well. Accompanying the notification letter will be the announcement that the member can provide to users of the well that they are drinking water with a concentration of nitrate above the MCL. The 36 hour delivery allows sufficient time for the member to notify the users of the well within the 10 day period required by Order WQ 2013-0101.

Mail notification to all remaining members of the concentration of nitrate in their domestic supply wells

All members that own domestic supply wells with a concentration of nitrate below the MCL will be notified by regular US Mail of the results of the analysis and any follow-up activity that will occur. If the well has a concentration of nitrate between 80% and 100% of the MCL, the member will be notified that the well will be resampled within a year and annually thereafter for the life of the Conditional Waiver.

Federal Express notification sent to member reporting the results of the contour analysis (concentration of nitrate above the MCL)

When the estimated concentration of nitrate in a member domestic supply well exceeds the MCL, the member will be notified of the exceedance. A standard notification letter will be sent by Federal Express overnight delivery to every member for every well that is estimated to be in exceedance. All members will receive the notification letter within 36 hours of the CCGC learning of the exceedance in the member's well. Accompanying the notification letter will be the announcement that the member can use to notify the users of the well that they are drinking water with a concentration of nitrate above the MCL. The 36 hour delivery allows sufficient time for the member to notify the users of the well within the 10 day period required by the Conditional Waiver.