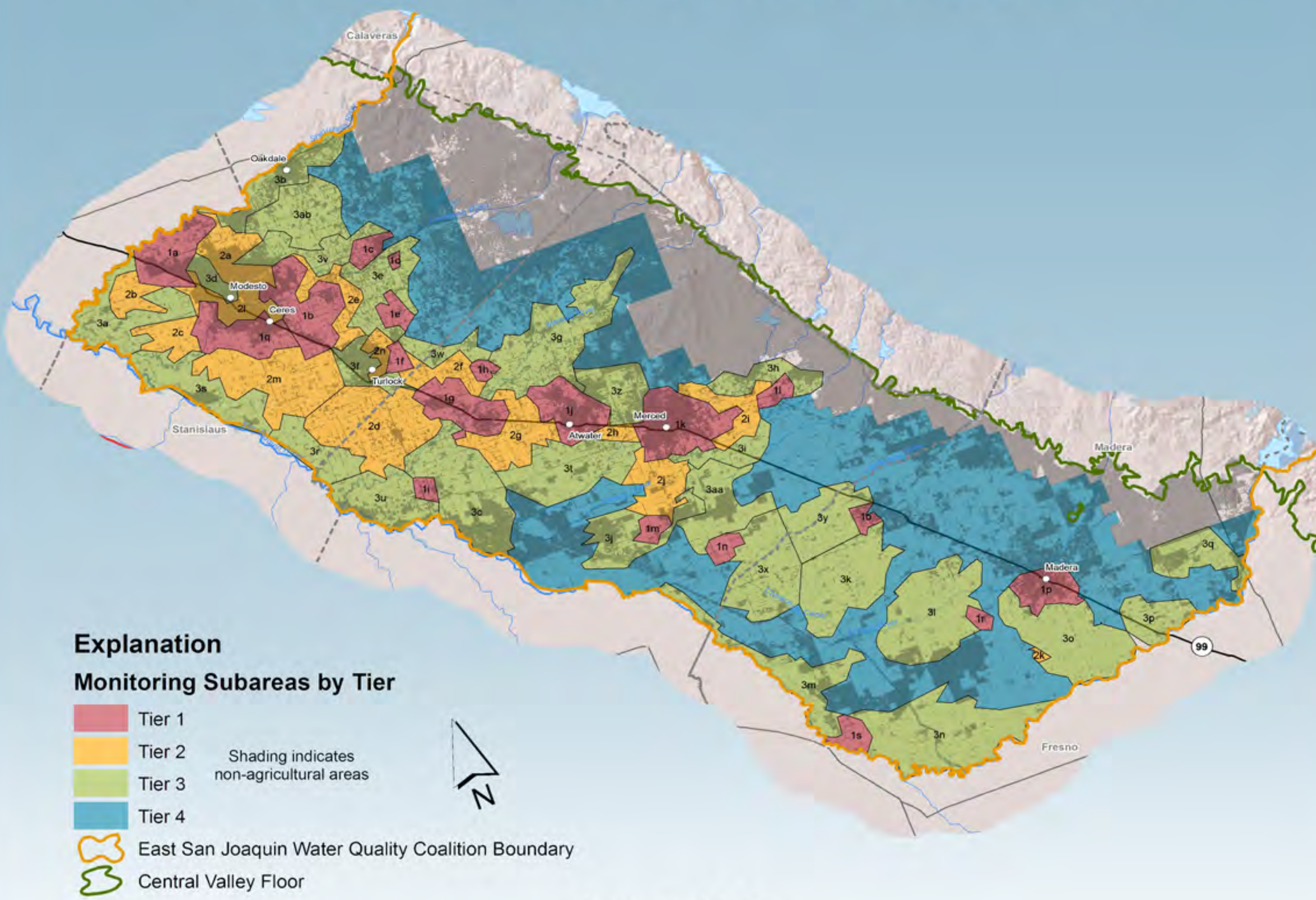


East San Joaquin Water Quality Coalition Groundwater Quality Trend Monitoring Workplan

Phase I - Monitoring Design Approach



June 4, 2015

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Phase I - Monitoring Design Approach

Prepared For
East San Joaquin Water Quality Coalition

East San Joaquin
WATER QUALITY COALITION

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1 Introduction

The East San Joaquin Water Quality Coalition (ESJWQC or Coalition) has prepared this Groundwater Quality Trend Monitoring Workplan (GQTM or Workplan) to address the requirements of the Waste Discharge Requirements General Order (WDRs or Order) for Growers within the Eastern San Joaquin River Watershed (Order No. R5-2012-0116-R2)(CVRWQCB, 2012). This Workplan is Phase I of a two-phase approach to developing the complete Workplan.

1.1 Background

The Central Valley Regional Water Quality Control Board (the Regional Board or CVRWQCB) initiated the Irrigated Lands Program (ILP) in 2003 with the adoption of a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. The ILP, later the Irrigated Lands Regulatory Program (ILRP), was developed to regulate discharges from irrigated agriculture to surface waters. The WDRs for Growers within the Eastern San Joaquin River Watershed, along with other orders to be adopted for the irrigated lands within the Central Valley, constitute the long-term ILRP, an expansion of the initial ILRP.

Following the Regional Board's adoption of the WDRs on December 7, 2012 (revised October 3, 2013, March 27, 2014 and April 17, 2015), the Notice of Applicability (NOA) was approved on January 11, 2013 for ESJWQC. The approval date associated with the NOA started the timeline for several requirements, including submittal of a Notice of Intent (NOI) from entities wishing to join the Coalition and for the Coalition to submit an outline of the Groundwater Assessment Report (GAR) (WDRs, Section IV. A). The GAR provides the basis for the Groundwater Quality Management Plan (GQMP), the Groundwater Quality Trend Monitoring Program (particularly this Workplan Phase I – Monitoring Design Approach) and the Management Practices Evaluation Program (MPEP).

The GAR outline was submitted April 11, 2013 (approved May 6, 2013) and the GAR was submitted January 13, 2014. The Coalition's GAR (LSCE, 2014a) was 'conditionally' approved by the Regional Board on June 4, 2014, with a revised GAR to be submitted by August 11, 2014. A request from ESJWQC for an extension to the submittal date of the revised GAR was approved by the Regional Board's Executive Officer on August 8, 2014. An ESJWQC GAR Addendum (LSCE, 2014b) was submitted November 5, 2014. The CVRWQCB gave final approval of the GAR in combination with the GAR Addendum on December 23, 2014. The CVRWQCB's final approval established the GQMP's required submittal date on February 23, 2015, 60 days after review and approval of the revised GAR and GAR Addendum. The CVRWQCB's final approval also established the required GQTM Workplan submittal date of June 4, 2015, one year after the conditional approval.

The Order requires that a Groundwater Quality Assurance Project Plan (QAPP) be submitted at the same time as the GQTM. The Coalition was granted an extension on June 1, 2015 to submit the Groundwater QAPP within 30 days of Regional Board's approval of the GQTM Workplan.

The Workplan is developed following the requirements listed in the Order and based on the foundational information developed in the GAR, GAR Addendum, and GQMP. Requirements of the

Order and where they can be found within the GQTM Workplan are listed in a checklist provided in **Table 1**. As explained in this Workplan, significant effort is involved in thorough vetting of candidate monitoring wells for the monitoring network prior to official inclusion of these wells in the GQTM program. Therefore, the complete Workplan is being submitted in two phases. Phase I of the GQTM Workplan outlines the rationale and approach to the trend monitoring program and describes the analyses and reporting that will occur as part of the GQTM. Phase I of the Workplan also includes identification and ranking of existing candidate wells to be considered for incorporation as part of the GQTM network. Because of the considerable time required to investigate the suitability of existing wells for inclusion in the GQTM network, including locating the well, confirming well construction details, and coordinating with the well owner or monitoring entity, a second phase of the Workplan (Phase II – Determination of Specific Wells for GQTM) will be conducted to complete the monitoring network design. The required elements of the GQTM Workplan, and the phase under which these will be completed are shown in the checklist in **Table 1**.

1.2 Purpose

The Irrigated Lands Regulatory Program (ILRP) recognizes as a main goal to “ensure that irrigated agricultural discharges do not impair access by Central Valley communities and residents to safe and reliable drinking water.” (WDRs, Attachment A, page 3). As part of achieving the ILRP goals, the program objectives include efforts to “promote coordination with other regulatory and non-regulatory programs associated with agricultural operations (e.g., DPR, the California Department of Public Health [DPH] Drinking Water Program,… State Water Board Groundwater Ambient Monitoring Assessment Program, the U.S. Geological Survey [USGS], and local groundwater programs [SB 1938, Assembly Bill [AB] 3030, and Integrated Regional Water Management Plans]) to minimize duplicative regulatory oversight while ensuring program effectiveness.” (WDRs, Attachment A, page 4).

The objectives of the GQTM as specified in the WDRs (Attachment B, Section C) are 1) to determine current water quality conditions of groundwater relevant to irrigated agriculture, and 2) to develop long-term groundwater quality information that can be used to evaluate the regional effects of irrigated agricultural practices.

The GQTM Workplan outlines the GQTM which is designed to meet the WDR’s objectives and provide information to meet additional objectives identified by the Coalition for the GQTM, including: 1) understanding long-term temporal trends in regional groundwater quality, particularly as they relate to effects from irrigated agriculture on potential sources of drinking water for communities; 2) evaluating groundwater quality conditions in the Coalition area, particularly in the groundwater High Vulnerability Areas (HVA), and identifying differences in water quality spatially between areas and vertically in the aquifer system; and 3) distinguishing water quality changes associated with irrigated agriculture compared to other non-agricultural factors. Long-term monitoring programs benefit from a simple design at the outset. Therefore, the GQTM emphasizes ongoing evaluation of the monitoring program design and incorporation of modifications to the network and program as necessary. This approach will result in more informative results over the long-term.

The GQTM design considers groundwater vulnerability, prioritization of HVAs, areas contributing recharge to communities reliant on groundwater (including disadvantaged communities [DACs] and disadvantaged unincorporated communities [DUCs]), top acreage commodities and other information summarized in previous related studies submitted by the Coalition as part of compliance with the ILRP. Identified HVAs also require a Groundwater Quality Management Plan (GQMP).

1.3 Previous Related Work

1.3.1 Groundwater Quality Assessment Report (GAR)

The GAR is a key element of the ILRP, with the focus on the assessment of groundwater conditions and long-term protection of regional groundwater quality. The GAR documents current groundwater quality in the Coalition region (with an emphasis on nitrate concentrations and trends), evaluates the influence of irrigated agriculture on groundwater quality, and provides a scientifically based classification system for evaluating and determining the relative groundwater vulnerability (higher or lower), especially for the area of the Coalition region within the Central Valley Floor (LSCE, 2014a; LSCE, 2014b).

The GAR evaluates the relative vulnerability of groundwater to irrigated land agricultural impacts based on (1) hydrogeologic sensitivity, (2) overlying land uses and practices, and (3) groundwater quality observations (particularly nitrate but also salt and pesticide concentrations). Hydrogeologic sensitivity is a factor that is tied to the inherent physical characteristics of the geology and soils and underlying hydrogeologic and geologic conditions. Land use (location of cropping and management systems on the landscape, and locations of other non-agricultural land uses) is an indicator of potential groundwater quality stressors. The GAR assesses the spatial relationship between the hydrogeologic sensitivity of an area, the overlying land use, and the proximity of groundwater serving urban and rural communities (particularly recharge areas upgradient of communities that rely on groundwater) for areas within the Central Valley Floor of the Coalition region.

To determine high vulnerability areas (HVAs), a model for assessing groundwater vulnerability for the Eastern San Joaquin River Watershed was developed through statistical approaches and based on observed groundwater quality and hydrogeologic characteristics. HVAs, where irrigated agriculture operations have impacted or are more likely to impact groundwater quality, were identified and prioritized in the GAR submitted on April 11, 2013 (revised on November 5, 2014 and approved December 23, 2014). The GAR must be updated every five years with the next submission due January 13, 2019.

Figure 2 shows the locations of HVAs, including Tentative High Vulnerability Areas where hydrogeologic conditions did not indicate vulnerability, but where well data indicated an exceedance of the water quality objective for nitrate in groundwater. The prioritization of HVAs is shown in **Figure 3**. The prioritization system accounted for factors related to hydrogeologic vulnerability, existing groundwater quality conditions, land use, and other factors such as proximity to communities reliant on groundwater (including disadvantaged communities). An initial identification of existing wells that may assist GQTM efforts to track regional groundwater quality and its relationship with agricultural practices was also conducted as part of the GAR.

Information and results from the GAR form the basis for design of the GQTM and are incorporated and referenced throughout the Workplan. The GAR was also the basis for determining areas requiring a GQMP.

1.3.2 Groundwater Quality Management Plan (GQMP)

The goals of the ESJWQC GQMP are to inform growers about management practices that are protective of groundwater quality, and have the growers implement those practices (ESJWQC, 2015). To achieve those goals, the ESJWQC developed four objectives that will allow the Coalition to identify the specific constituents applied by agriculture that leach to groundwater and result in impaired water quality, identify management practices to prevent/reduce leaching, and identify a process for documenting the implementation of those practices and improvements in groundwater quality.

The objectives of the ESJWQC Groundwater Quality Management Plan Strategy are:

- Identify COCs in the GQMP Zones
- Identify management practices to be implemented that are protective groundwater quality
- Develop a management practice implementation evaluation process and schedule (based on priority)
- Develop management practice performance goals with a schedule (10 year compliance)

The ESJWQC identified COCs based on constituents that were identified in the GAR which have been or have the potential to be found in groundwater as a result of impacts from irrigated agriculture. Constituents of concern identified in the GQMP for the Coalition region include nitrate, total dissolved solids (TDS), diazinon, and simazine (ESJWQC, 2015). The GQTM will provide information relating to long-term regional trends in groundwater quality, particularly related to COCs, which will be useful in evaluating the effectiveness of the GQMP strategy.

2 Criteria for Monitoring Network and Program Design

Design of the GQTM program takes into account multiple considerations including hydrogeologic conditions, groundwater quality characteristics, and land use that were evaluated and summarized in the GAR and used to prioritize areas for monitoring and management. It is advantageous for the GQTM to coordinate with ongoing monitoring and utilize existing wells to meet objectives of the GQTM. An overview of the considerations and criteria for the design of the GQTM with respect to the objectives of the program and requirements of the WDRs are discussed in the following section with expanded Workplan details provided in subsequent sections.

2.1 Monitoring Objectives

The primary objectives of the GQTM are:

1) *Determine current water quality conditions of groundwater relevant to irrigated agriculture;*
2) *Develop long-term groundwater quality information that can be used to evaluate the regional effects of irrigated agricultural practices and changes in agricultural practices;*
3) *Understand long-term temporal trends in regional groundwater quality, particularly as they relate to effects from irrigated agriculture on potential sources of drinking water for communities;*
4) *Evaluate groundwater quality conditions in the Coalition area, particularly in the HVA, and identify differences in water quality horizontally and vertically within the Coalition region;*
5) *Distinguish water quality changes associated with irrigated agriculture compared to other non-agricultural factors.*

The first two objectives of the GQTM are specified in the WDRs (Attachment B, Section C) and additional objectives were developed to inform design of the GQTM specific to the ESJWQC.

Characterization of the current groundwater quality conditions relevant to irrigated agriculture was previously accomplished as part of the GAR through the assembly and evaluation of extensive current and historical groundwater quality information for the Coalition region. The GAR summarized recent and historical groundwater quality throughout the Coalition region based on more than 50,000 nitrate concentration groundwater quality test results from more than 6,500 wells and about 20,000 total dissolved solids (TDS) concentration results from than 4,500 wells. These groundwater quality data span a range of dates from the early to mid-1900s through present, although most data are from the time period since 2000. **Figure 4** displays the spatial distribution of nitrate concentration data points by time period of testing, as used to characterize existing groundwater quality in the GAR, and shows the relatively comprehensive coverage of regional groundwater conditions that these data represent. Nitrate and TDS are the most relevant water quality parameters related to irrigated agriculture and nitrate serves as a useful indicator of potential impacts from irrigated agriculture. The importance of focusing groundwater monitoring for the ILRP on nitrate and TDS is recognized in the WDRs. Detailed documentation and summarization of the groundwater quality characterization for the Coalition region are contained within the GAR.

No large data gaps exist in the characterization of groundwater quality conditions relevant to irrigated agriculture. Consequently, the ESJWQC GQTM places primary focus on establishing temporal trend monitoring of groundwater quality for the purposes of evaluating long-term regional effects of agricultural practices. Of particular focus are locations, and within vertical horizons, where groundwater represents a significant source of drinking water supply for communities within the Coalition region. Municipal and domestic water supplies represent an important beneficial use for groundwater in parts of the Coalition region and the protection of this beneficial use is a key goal of the ILRP. The GQTM will incorporate data collected from public supply wells as part of the monitoring program.

Implementation of the GQTM will further the understanding of long-term temporal trends in regional groundwater quality. The regional-scale and long-term trend monitoring program outlined in this Workplan Phase I involve establishing a system through which the groundwater quality within the Coalition region will be monitored on a long-term basis in order to evaluate regional temporal trends and their relationship with irrigated agriculture. In contrast to the Management Practice Evaluation Program (MPEP), which will track the response of groundwater to changing agriculture management practices at a local and site-specific scale, the intent of the GQTM is to evaluate long-term changes in groundwater quality conditions at a regional scale as they relate to aggregated effects of irrigated agriculture and changes in agricultural practices. In conjunction with updating the GAR on an interval of five years, additional readily available groundwater quality data[1] will be acquired at five year intervals and evaluated with respect to current conditions and trends in concentrations. Accordingly, the GQTM will include analysis and reporting of trend monitoring results on an annual basis with more detailed analysis and reporting of monitoring data and additionally acquired data conducted every five years, as described in greater detail below. The proposed GQTM has objectives, methods, and reporting elements that are consistent with and complement the GQMP. Distinguishing groundwater quality trends related to irrigated agriculture from non-agricultural factors (GQTM objective 5) may involve other recommendations should this need arise.

2.2 Spatial Considerations

Various spatial considerations exist in designing the GQTM network. These considerations focus on where and how to representatively monitor groundwater quality trends relative to agricultural activities. Spatial factors relating to the GQTM design include delineation of areas to monitor and specific sites (wells) suitable for use in monitoring.

2.2.1 Prioritization of Monitoring Areas

As part of development of the GAR, the entire Coalition region was evaluated with respect to the vulnerability of groundwater to contamination. That assessment identified high vulnerability area (HVAs) where physical conditions make groundwater more vulnerable to impacts from overlying land use activities. The spatial distribution of HVAs is shown on **Figure 2**. HVAs were prioritized in the GAR for the purpose of focusing management efforts related to agricultural practices. The prioritization of HVAs was based on multiple considerations relating to the intrinsic hydrogeologic characteristics that affect

[1] Data to include publically available groundwater quality data from online sources.

groundwater vulnerability, existing groundwater quality conditions, land use and associated agricultural practices, and other factors, including proximity to areas contributing recharge to communities reliant on groundwater. The prioritization system implemented in the GAR involved a quantitative method of weighting and ranking of factors as illustrated in **Table 2**. The calculated priority values derived from this system are illustrated in **Figure 3** and were used as the basis for identification of areas of focus for trend monitoring for the GQTM. As exhibited in **Table 2**, areas in proximity to and contributing recharge to communities reliant on groundwater were weighted highest in the prioritization of HVAs. A detailed description and discussion of the process for determination and prioritization of HVAs into Priority 1, 2 and 3 is included in the GAR. Lower vulnerability areas were not prioritized in the GAR. In identifying appropriate areas for trend monitoring, additional factors were also considered including the proximity and density of irrigated agriculture and potential for constituent transport both laterally and vertically.

The approach to monitoring for long-term regional groundwater quality trends in the GQTM emphasizes evaluation of trends in wells that are believed to provide a representation of regional trends in areas dominated by irrigated agriculture. The density of the monitoring network across the Coalition region will be variable based on the prioritization of HVAs. Areas of generally higher priority (in the HVAs identified in the GAR) will have a greater density of long-term trend monitoring locations than areas of relatively lower priority. Furthermore, areas of relatively lower vulnerability (those areas not identified as HVAs in the GAR) will have a low density of trend monitoring because hydrogeologic conditions suggest these areas are less vulnerable to contamination. More detail relating to the GQTM design and approach are provided in **Section 3**.

2.2.2 Well and Aquifer Characteristics

Well characteristics (pumping rate and depth) and the aquifer properties in the area also are important considerations in understanding the appropriate density and depth for monitoring of regional trends. Larger-capacity (higher pumping rates) wells such as irrigation wells and public water supply wells, provide a better representation of regional groundwater conditions because these wells have relatively larger groundwater captures zones drawing groundwater from a greater contributing area and minimizing the degree to which a well reflects highly localized groundwater conditions. Groundwater produced from large-capacity wells represents a composite of groundwater from within the larger well contributing area and changes in groundwater quality exhibited by such wells indicate effects on groundwater across the entire contributing area. Smaller-capacity wells will have a smaller capture zone and therefore will be representative of groundwater conditions within a smaller contributing area (i.e., local rather than regional conditions). Well depth is another key element relating to the contributing area for wells and potential time lag associated with groundwater quality observations. Together, these factors associated with the construction and operation of wells in conjunction with the aquifer properties comprise the primary criteria for evaluating the degree to which potential candidate wells are likely to represent regional groundwater quality trends. The characteristics of candidate well capture zones and depth zones and the land uses represented within the contributing area are critical elements in selection of wells for a regional monitoring program.

2.2.3 Staged Implementation

Monitoring conducted as part of the GQTM will be implemented in a staged approach using an initial network of wells selected in Phase II of the Workplan. Subsequent modifications to the monitoring network will be made as needed based on information acquired relating to the characteristics of potential monitoring well candidates and any identified need for additional monitoring of groundwater quality trends. An initial pool of potential candidate wells for monitoring are identified within Phase I of this Workplan. Only a subset of these wells will ultimately be selected for implementation of initial monitoring conducted as part of the GQTM, pending the outcome of the evaluation of well construction characteristics (e.g., well completion reports), the accessibility of wells and willing cooperation of well owners for inclusion in the monitoring program, and the desired spatial distribution and adequacy to provide the information needed to fulfill the objectives of the GQTM. Phase II of the Workplan development will involve investigating candidate wells to determine their suitability for inclusion in the GQTM network. A final list of monitoring network wells will be proposed in the Workplan Phase II. Discussion of the scope and timing of Workplan Phase II are included **Section 5** of this Workplan. During the implementation of the GQTM, the need for additional monitoring locations will be assessed on an annual frequency as part of the annual evaluation and reporting of the trend monitoring results (see **Section 3**). More in depth review of the adequacy of the GQTM network will be conducted every five years thereafter.

2.3 Well Construction Requirements

In accordance with the requirements specified in the WDRs, information relating to wells selected for inclusion as part of the GQTM will be submitted to the Regional Board as part of Phase II of the GQTM Workplan development prior to initiation of monitoring. As indicated above, details relating to the construction of wells included in the GQTM are highly important. These well information data will include the well location (GPS coordinates and physical address); State Well Number, if known; well construction details (total depth, top perforation depth, bottom perforation depth, as available); well drillers log (well completion report), if available; well seal information; and measured depth to water at the time of monitoring implementation. Because of limitations relating to the accessibility and availability of well construction records and the time required to review and coordinate with prospective monitoring network well owners, some of these required details have not yet been determined or acquired for candidate wells. Consequently, these data will be forthcoming in Workplan Phase II as wells selected for inclusion in the GQTM are confirmed and cooperative agreements with well owners are secured (as discussed in **Section 5**). Information relating to well details will be provided for wells selected for the trend monitoring. Required and optional well reporting information is listed by category in **Table 3**.

2.4 Field and Laboratory Methods

Wells selected for trend monitoring will be sampled and tested at an annual frequency for water quality parameters including nitrate as nitrogen (as N), electrical conductivity at 25 °C (EC), pH, dissolved oxygen (DO), and temperature. EC, pH, DO, and temperature will be measured in the field whereas nitrate concentration will be analyzed by a certified laboratory. Every five years, starting with the first monitoring event, wells selected for inclusion in the GQTM will be sampled and tested for additional water quality constituents including total dissolved solids (TDS), major anions (carbonate, bicarbonate, chloride, sulfate), and major cations (boron, calcium, sodium, magnesium, potassium). The testing parameters and monitoring frequency for the GQTM are outlined on **Table 4** and are in accordance with the requirements of the WDR. Although not required by the WDRs, additional potential water quality parameters including oxidation-reduction potential (ORP) and turbidity will be considered for testing when possible, pending the access to these data in cases where wells are being monitored through cooperative arrangements. Field and laboratory methods will be further described in the Groundwater QAPP to be submitted 30 days after approval of the Workplan.

3 Trend Monitoring Network Design

The GQTM design recognizes that a critical aspect of monitoring involves establishing a monitoring program that can evolve through time based on consideration of data derived through implementation of the program. Alley (1993) emphasizes this approach in describing the importance of a dynamically evolving design: "A characteristic of virtually all water-quality sampling programs is that knowledge is attained about a more efficient design after sampling is completed and the results are analyzed. For long-term studies, the anticipation that modifications may be made to the network at a future date favors the utilization of fairly simple designs at the outset."

3.1 Delineation of Monitoring Areas

The primary objective of the GQTM is to monitor long-term trends in regional groundwater quality as they relate to influences from irrigated agriculture and changes in agricultural practices at a regional scale. In designing the monitoring network for the GQTM, factors relating to the vulnerability of groundwater and prioritization of HVAs represent important considerations for focusing locations for groundwater monitoring. The HVAs represent areas where the intrinsic physical properties make groundwater more vulnerable to influences from overlying land use activities; the prioritization of the HVAs considers the relative vulnerability within the HVAs along with additional factors including existing groundwater quality conditions, land use, and other factors such as proximity to communities reliant on groundwater. The prioritization of HVAs conducted as part of the GAR represents the foundation for targeting areas for monitoring as part of the GQTM.

As outlined above and described in detail in the GAR, the prioritization of HVAs accounts for multiple factors of interest for planning of future monitoring and management efforts. The WDR (Attachment A, Section IV, B) identifies several factors to be considered in prioritizing high vulnerability areas, including:

- Identified exceedances of water quality objectives,
- Proximity to areas contributing recharge to urban and rural communities that rely on groundwater as a source of supply,
- Existing field and operational practices identified to be associated with irrigated agricultural waste discharges that are the cause or source of groundwater quality degradation,
- The largest acreage commodity types comprising up to at least 80 percent of irrigated agriculture in the high vulnerability areas,
- Legacy or ambient groundwater conditions,
- Groundwater basins currently proposed to be under review by CV-SALTS
- Identified constituents of concern.

In an effort to objectively incorporate the many factors identified for consideration as part of the prioritization, a numeric system of ranking and weighting of factors was utilized to calculate priority values across the entire HVA. **Table 2** summarizes the system used to prioritize HVAs. Key among the elements incorporated in the prioritization system are factors relating to intrinsic physical vulnerability, existing groundwater quality conditions and temporal trends, land use and associated agricultural practices, and areas contributing recharge to communities reliant on groundwater, including disadvantaged communities.

As part of identifying the most beneficial and representative areas for groundwater quality trend monitoring, generalized areas of relatively higher and lower emphasis for monitoring were identified from the priority calculations to inform the locations selected for groundwater trend monitoring. To produce a regional trend monitoring network with representative wells distributed throughout the Coalition region and to assist in identifying trend monitoring wells to fulfill the objectives of the GQTM, the Coalition region was divided into monitoring subareas based on the vulnerability designation and prioritization of HVAs previously completed as part of the GAR. In delineating the monitoring areas, the following prioritization scheme from the GAR was initially used to subdivide the Coalition into monitoring subareas and tiers in general accordance with varying monitoring emphases:

1) HVA priority 1 (Tier 1 monitoring subareas),
2) HVA priority 2 (Tier 2 monitoring subareas),
3) HVA priority 3, (Tier 3 monitoring subareas) and
4) lower vulnerability areas (Tier 4 monitoring subareas).

Monitoring subareas and their associated tiers were delineated to generalize the priority values calculated in the GAR and recognize different monitoring emphases and objectives in the GQTM. Consideration to prevailing regional groundwater flow direction and extent and density of irrigated agriculture were also given in the delineation of monitoring subareas. Delineation of the monitoring subareas focusses on areas within the Coalition region where irrigated agriculture represents a dominant land use (based on 2012 land use data [USDA, 2012]). As a result, no monitoring subareas are delineated for non-agricultural areas along the eastern margins of the Central Valley Floor and in peripheral areas of the Coalition region. These areas are identified as lower vulnerability and have no or very little irrigated agriculture. Consequently, groundwater quality trend monitoring in these areas is not in alignment with the goals and objectives of the GQTM relating to regional influences from irrigated agriculture. The objectives associated with different monitoring subarea tiers and the approach for meeting the trend monitoring objectives are summarized in **Table 5**. **Figure 5** displays the monitoring subareas delineated for the GQTM by tier.

The proposed GQTM program consisting of wells to be identified as part of Phase II of the Workplan, will incorporate trend monitoring within each subarea, although the nature of this trend monitoring will vary in design depending on the monitoring tier assigned to the subarea.

Hydrogeologic and groundwater quality conditions as well as land use were used to adjust the monitoring subareas and tier assignments in accordance with the prioritization completed in the GAR, which accounted for many factors to evaluate the priority of areas. Monitoring tiers assigned to subareas range from 1 to 4 in order of decreasing monitoring emphasis. Subareas having a monitoring tier of 1 or 2 will be targeted for annual monitoring through groundwater quality sampling and analysis in accordance with the WDRs and the specified minimum criteria for water quality parameter testing and well construction. Monitoring subareas designated Tier 3 will rely on cooperative agreements with other monitoring entities conducting ongoing monitoring and will acquire and incorporate these data annually, although the sampling of wells by others in the Tier 3 monitoring subareas may not meet all of the requirements specified in the WDRs related to sampling parameters and procedures. Tier 4 monitoring areas are low vulnerability areas, and many of these areas are located outside of or away from agricultural lands, although considerable non-agricultural land is present within the Tier 4 subarea. Regional trend monitoring in the Tier 4 subarea will be based on acquisition and evaluation of readily available groundwater quality data at an interval of every five years. The five-year interval for monitoring in Tier 4 will be conducted at in interval that aligns with the GAR update (every five years). **Table 5** outlines the approach to accomplishing trend monitoring for different subarea tiers.

The size of subareas is not deterministic, but rather based on land use and hydrogeologic considerations. Disaggregation of some of the larger Tier 1, 2, and 3 monitoring subareas was conducted to emphasize monitoring within select areas. These modifications included splitting some areas to ensure representative monitoring around disadvantaged communities (DUCs and DACs) and other communities. Additional subareas were also further divided because their geometry was long and narrow or large and spanned considerable distance or area, even if hydrogeologic and land use conditions were similar. This process resulted in each tier having multiple monitoring subareas (**Figure 5)**. The spatial relationship between the delineated monitoring subareas and communities reliant on groundwater, including DACs and DUCs, can be seen in **Figure 6**. The characteristics of all monitoring subareas GQTM are summarized in **Table 6**.

The higher Tier (1 and 2) monitoring subareas within the high vulnerability area range in size from one to 54 square miles. The areas of agricultural land within the delineated monitoring subareas are considerably smaller, particularly for the Tier 1 subareas which are concentrated around communities. The Tier 3 monitoring subareas are generally slightly larger with areas between seven and 68 square miles. The Tier 4 monitoring subarea encompassing low vulnerability areas is much larger. Monitoring subareas were generalized to represent and emphasize monitoring in areas with similar overall characteristics. Tier 1 monitoring subareas are composed of highest fractions of Priority 1 areas from the GAR, as shown in **Table 6**. Likewise, Tier 2 monitoring subareas have high percentages of Priority 2 area. Because of the generalized delineation of subareas, many of the monitoring subareas also cover considerable land identified as having lower priority in the GAR (**Table 6)**. For example, there is considerable area within Tier 1 monitoring subareas that is identified as Priority 2 or Priority 3 in the GAR. Size was not a direct consideration in the delineation of monitoring subareas, although spatial distribution and representation was. Initially, one well will be targeted for monitoring within each monitoring subarea. The sizes of Tier 1 and 2 monitoring subareas are generally less than 30 square miles with many Tier 1 monitoring subareas less than 10 square miles (**Table 6**). Tier 3 monitoring subareas are somewhat larger although more than half are still smaller than 30 square miles. The area of agricultural land within all monitoring subareas is notably less than the total subarea size.

Trend monitoring in the Tier 4 subarea characterized as generally lower vulnerability areas (Tier 4 subarea in **Figure 5**) is constrained to areas with irrigated agriculture within the Coalition region. Areas within the Coalition region with less than 15 percent agricultural land use are not included in the prioritized monitoring subareas for trend monitoring. These areas are all located near the eastern edge of the Central Valley or in the peripheral areas within the Coalition region. The Tier 4 monitoring subarea spans a broader range of land use and hydrogeologic conditions although physical characteristics suggest groundwater across the Tier 4 monitoring subarea is less vulnerable to impacts from overlying land use activities than other areas. Consequently, trend monitoring within the Tier 4 monitoring subarea will focus on utilizing existing monitoring by others and acquiring these data every five years to evaluate for groundwater quality trends. Monitoring within the Tier 4 subarea will provide data on background conditions in upgradient non-agricultural areas and provide ongoing monitoring of areas currently identified to be lower vulnerability to provide advance indications of any potential groundwater quality issues of concern.

For comparison, the proposed trend monitoring approach will equate to an overall higher monitoring density than the density of one well for approximately every 30 square miles recommended for the USGS GAMA study of the Central Valley and utilized as a guide for sampling density by Landon et al. (2010) and Shelton et al. (2013) in the GAMA investigations within the Coalition region. The adequacy of the initially proposed monitoring well density and specific monitoring site selection will be reviewed on an annual basis through inspection and qualitative assessment of the time-series monitoring data. Initial review of time-series data will focus on wells with historical data as data from the GQTM are developed. Further review of the monitoring program design and adequacy will occur every five years utilizing more rigorous quantitative assessments of magnitude in trends and spatial relationships in trends. The five-year review will incorporate additional readily available groundwater quality data throughout the Coalition region, which will be used to assist in identifying areas where the trend monitoring program should be modified.

3.2 Selection of Monitoring Sites

Existing larger-capacity wells that are relatively shallow, but not completed in the zone of first-encountered groundwater, will be targeted as the main candidate monitoring wells for the GQTM. First-encountered groundwater is likely to reflect local conditions and influences rather than those at a regional-scale which are of interest in this program; therefore, monitoring within the zone of first-encountered groundwater is not an objective of the GQTM. Relatively shallow wells constructed below the zone of first-encountered groundwater are more likely to exhibit regional groundwater trends that are relevant to agricultural operations on a regional scale because of the greater potential for lateral and vertical constituent transport along longer flow paths with the increased depth. Groundwater produced from wells represents a composite of groundwater from within the well capture zone or contributing area and changes in groundwater quality exhibited in such wells indicate influences on groundwater across the entire contributing area. Therefore, in order to represent trends in regional groundwater conditions, larger-capacity (higher pumping rates) wells such as irrigation wells and public water supply wells, will be preferentially selected for inclusion in the GQTM network. Such wells have relatively larger groundwater captures zones drawing groundwater from more regional contributing areas and minimizing the degree to which selected monitoring wells reflect only localized groundwater conditions around a well. Relatively shallow higher-capacity wells completed below the zone of first-encountered groundwater are the preferred wells for inclusion in the GQTM, although relatively shallow lower-capacity wells such as domestic wells may also be considered for monitoring while recognizing the potential for differences in contributing areas for domestic wells when compared with production wells.

3.2.1 Candidate Well Identification Criteria

There are numerous considerations and criteria involved in identifying existing wells to utilize for regional trend monitoring. In accordance with the WDRs, required information for wells in the GQTM network include accurate locational information; well construction details including depth, perforated interval, and seal characteristics; and an accompanying DWR Well Completion Report, when available. **Table 3** outlines required information relating to GQTM network wells. The required criteria define important considerations in well selection, although additional criteria included in **Table 3** are also important factors for selection of wells. Some exceptions to these requirements will be considered with respect to known information associated with wells (e.g., well construction) recognizing that historical water quality record and other factors associated with a well may make a well a particularly informative trend monitoring well.

3.2.1.1 *Location*

As described above, monitoring subareas were delineated to assist in targeting locations for regional trend monitoring. The locations of existing wells relative to the identified monitoring subareas provide the first indication of potential monitoring well candidates. The locations of all production wells (irrigation or public supply) and domestic wells previously tested for groundwater quality were used as a starting point for identification and ranking of potential candidate GQTM network wells. Wells ultimately selected for inclusion in the GQTM network will require accurate and precise locational information in the form of GPS coordinates and a physical address, if appropriate. Determining an accurate location for wells being considered or selected for inclusion in the GQTM program will be conducted as part of the well vetting process which will occur prior to submitting Phase II of the GQTM Workplan.

3.2.1.2 *Land Use*

The location of wells relative to overlying land uses is also an important factor as it relates to the monitoring objectives of the GQTM and the groundwater conditions and influences reflected in a well. Groundwater quality measured in a well represents the combination of ambient groundwater conditions and influences from land uses present within the contributing recharge area to the well. Consequently, groundwater quality samples collected from wells will reflect both current and historical land uses as well as management practices implemented to reduce the leaching of nitrate to groundwater. Because the objective of the GQTM is to understand and monitor groundwater quality trends relevant to irrigated agriculture and regional changes in agricultural practices, the percent and composition of agricultural land around a well is an important consideration for selection of monitoring wells. The percent of agricultural land within a mile of known wells and percent of agricultural land cultivated for one of the top three agricultural categories (nut trees, grapes, corn) was calculated and used to evaluate potential candidate wells. These top three agricultural categories make up the dominant fraction of agricultural land within Tier 1 and 2 areas as identified in the GAR and have been targeted for education and outreach with the goal of improving groundwater quality or mitigating degradation in these higher tier areas.

Within agricultural areas it is similarly important to evaluate whether observed groundwater quality conditions and trends exhibited in a well are a function of regional changes in agricultural management practices or changing land use composition. Therefore, the percent of agricultural land within one mile of a well that has had the same agricultural category between the mid-1990s (the earliest available land use mapping data from DWR) and 2012 was also determined and considered. A one-mile area around wells was used to evaluate this land use metric, although the contributing area to a well may be larger.

3.2.1.3 *Construction*

Characteristics related to the construction of wells are a highly important consideration in identification of wells suitable for use as part of the GQTM network. Knowledge of well construction characteristics is important for wells selected as part of the GQTM network. Important information relating to well construction including well depth, perforated interval (depth to the top and bottom of perforations), and seal depth and material. Some of these well details are available in public well databases; however, well details should be confirmed through association of a DWR Well Completion Reports with GQTM network wells, whenever possible, or through other reliable means as appropriate. As indicated in **Table 3**, important details related to well construction should be provided for selected network wells, whenever possible, although some exceptions to the requirements specified in the WDRs (**Table 3**) should be considered for wells with characteristics making them particularly beneficial trend monitoring wells (e.g., with long historical water quality record).

The objective of the GQTM is to monitor regional groundwater quality trends. Wells completed in the shallow groundwater zone, but not necessarily the first-encountered groundwater, are more likely to reflect regional groundwater conditions that enables the evaluation of influences from land use practices occurring on the surface over the long term. The water table is very shallow in parts of the Coalition region, especially within the northwestern portion where the water table is less than 20 feet below the ground surface in many areas. Burow et al. (2008) found that groundwater in wells in the Modesto area completed at the water table reflected groundwater generally less than five years old and sometimes less than one year old. Slightly deeper, but still relatively shallow, wells between approximately 100 and 200 feet deep, exhibited groundwater that was generally about 20 to 50 years old (Burow et al., 2008). The positive relationship between well depth and groundwater age observed by Burow et al. (2008) suggests the flowpaths and travel time for groundwater measured in wells increases with well depth and therefore deeper wells produce water from a larger area.

The depth separation of shallow and deep wells used in the USGS GAMA studies conducted within the Coalition region by Landon et al. (2010) and Shelton et al. (2013) was 200 feet in areas north of Chowchilla and 280 feet in the more southern part of the Coalition region. These depths were based off of age-dating of groundwater in wells which suggested that wells shallower than these depths tended to produce a higher fraction of younger groundwater that was recharged after about 1950 (Landon et al., 2010; Shelton et al., 2013). Data provided by DWR (personal communication) for areas directly north of the Coalition region and from professional experience relating to wells and groundwater conditions within the Coalition region suggest that domestic wells throughout much of the Coalition region are likely to be in excess of 200 feet with well depths increasing to the east. Although public supply wells range greatly in depth within the Coalition region, typical well depths are generally greater than 200 feet deep with increasing depths to the east and to the south where public water supply wells are generally greater than 300 or 400 feet deep. Irrigation well depths tend to be similar to public supply well depths and follow similar spatial patterns in depth.

Wells with perforated intervals starting below 100 feet, but not below 400 feet, will be targeted for inclusion in the GQTM network. Such wells provide a representation of groundwater within the upper part of the aquifer system at depths that overlap with the primary zone of production for groundwater supply. These wells are also likely to have contributing areas that represent regional conditions and enable long-term monitoring of groundwater quality trends relevant to irrigated agriculture at an aggregated scale as opposed to site-specific scale. Although wells with longer perforated intervals extending below 400 feet may produce a small fraction of older water from deeper zones, a dominant fraction of water produced by wells perforated across the shallower zones is likely to be relatively young (<60 years) because of the higher productivity of shallower coarse-grained aquifer materials throughout much of the Coalition region. This is consistent with observations made by others for wells in the area (Burow et al., 2008; Landon et al., 2010; Shelton et al., 2013). For the purposes of monitoring of relative changes in groundwater quality related to irrigated agriculture, some wells of deeper construction should be considered as long as the well construction does not exclude water from the upper part of the aquifer system.

3.2.1.4 *Historical Water Quality Record*

The existence and duration of historical water quality data is an important factor in considering candidate trend monitoring wells because such data provide a foundation with which to evaluate long-term trends in concentrations especially as they relate to legacy conditions and changing trends and concentrations resulting from agricultural practices. Primary considerations relating to the historical water quality record for a well consist of the time period (range of dates) and the total number of available water quality results. For the purpose of identifying potential candidate monitoring wells, the availability of historical nitrate and TDS concentration data were considered because these parameters are useful indicators of influences from irrigated agriculture and because they are more widely available than many other water quality parameters.

3.2.1.5 *Monitoring Status*

Cooperative opportunities with ongoing monitoring already being conducted by others is another important consideration in design of the GQTM. Existing monitoring activities by other entities provide an opportunity to incorporate monitoring locations with more extensive historical water quality data to enable a better understanding of long-term groundwater quality trends. Additionally, utilizing monitoring by others minimizes unnecessary redundancy in groundwater monitoring and reduces overall cost of the GQTM, which potentially allows the Coalition to direct additional resources towards addressing and implementing improvements across other elements of the ILRP.

Recent and/or ongoing monitoring of wells is a helpful indicator of wells that are potentially available and accessible for monitoring as part of the GQTM. Wells throughout the Coalition region have historically been monitored for groundwater quality by various entities including municipalities and public water systems, irrigation districts, governmental entities such as the USGS, DWR, DPR, and counties, and possibly by Coalition members. Monitoring entities that have conducted recent groundwater quality monitoring are summarized in the GAR. Numerous wells recently monitored for groundwater quality are dispersed across much of the Coalition region as shown in **Figure 7**. The suitability of wells being monitored by others for inclusion in the GQTM network, through evaluation of the nature of ongoing monitoring efforts and potential for a cooperative arrangement with the Coalition as part of the GQTM, will be assessed individually for candidate wells as part of Phase II of the Workplan (see additional discussion in **Section 5**).

3.2.1.6 *Identification of Candidate GQTM Network Wells*

To determine their potential suitability as wells for monitoring as part of the GQTM, all known locations for wells monitored for groundwater quality (candidate monitoring wells) were assigned to a monitoring subarea and ranked by their individual characteristics. Wells with known depths less than 100 feet and wells with known top of perforations greater than 400 feet were automatically ranked low because they are not representative of the depth zone of interest for GQTM. Ranking of candidate wells within each monitoring subarea to identify wells for further investigation as potential GQTM network wells. The preliminary ranking of candidate wells as part of the Workplan Phase I was conducted using criteria including the following:

- Fraction of agricultural land in 2012 (USDA, 2012) within 1 mile of the well;
- Fraction of agricultural land that retained same land use category between mid-1990s (DWR Madera 1995, DWR Merced 1995, DWR Stanislaus 1996) and 2012;
- Availability of well depth information;
- Well type;
- Length of the historical period of record for nitrate and TDS tests;
- Historical groundwater quality data available since 2005; and
- The number of historical water quality sample events for the well.

Table 7 summarizes the top 10 ranked candidate wells within each monitoring subarea. The ranking of candidate wells provides a mechanism to initially assess wells for potential consideration as part of the GQTM network. Additional investigation of candidate wells must be undertaken to confirm and evaluate location, condition, construction, accessibility, and other details that should be accounted for in determining the suitability for inclusion in the GQTM network. The number of wells included in the trend monitoring within each monitoring subarea will be variable, as outlined on **Table 5**, according to monitoring tier, objectives of the monitoring, and characteristics of the subarea. Initially one well will be targeted for regional trend monitoring within each subarea for Tiers 1 through 3. Some of these wells will be monitored through coordinated efforts with other entities performing groundwater quality monitoring. Monitoring in Tier 4 subareas will rely on evaluation of readily available data acquired at a less frequent interval. As illustrated in **Table 7**, many of the highly ranked candidate wells are public water supply wells with a longer historical period of groundwater quality data. These wells potentially represent more meaningful monitoring sites for understanding regional and long-term trends in groundwater quality.

3.2.1.7 *Vetting of Candidate Wells*

As mentioned above, a process of vetting candidate wells to identify suitable wells for inclusion in the GQTM network will be conducted during development of Phase II of the Workplan and is described in **Section 5**. This vetting process will include confirming individual well location and existence, evaluating well construction information through review of a DWR Well Completion Report or other comparable documentation of the well construction, determining well accessibility and means of collecting groundwater quality samples and water level measurements, and acquiring permission, as necessary, for inclusion of the well in the GQTM network. Exploration of coordination opportunities with other monitoring entities regarding currently monitored wells will also be conducted. Information obtained through evaluation of coordinating opportunities will ensure that the timing and frequency of existing monitoring activities and the groundwater quality parameters measured by other entities are consistent with the objectives and design of the GQTM. Complete vetting of wells is a considerable undertaking and will require access to information that may only be acquired through confidential data requests and direct communication with well owners. In many cases, a site visit may also be required to determine if a well satisfies the criteria for use in the GQTM network. The complete list and details relating to proposed wells for the monitoring network will be included in the GQTM Workplan Phase II.

3.2.2 Rationale for Specific Site Selection and Monitoring Network Design

Through the ranking of candidate wells described above, known wells possessing the most important characteristics relating to the GQTM are identified and will be further evaluated as part of Phase II of the Workplan. However, regional conditions as they relate to well locations are also an important consideration in selection of GQTM network wells.

3.2.2.1 *Site Selection Considerations*

Numerous factors related to hydrogeologic and land use conditions were incorporated in the process of delineating the monitoring subareas, as discussed above. These subareas are intended to focus monitoring efforts to ensure regional representation of groundwater quality trends by the GQTM. The delineation of the monitoring subareas indirectly considers conditions related to the hydrogeologic vulnerability of groundwater, land use composition and practices, existing groundwater quality conditions and trends, and regional groundwater gradient in relation to communities reliant on groundwater because these factors are part of the prioritization process. However, it is important to also evaluate specific well locations with respect to additional regional hydrologic conditions such as regional groundwater flow conditions and flowpaths. These specific details will also be evaluated as they relate to potential candidate wells within monitoring subareas to ensure that wells selected for the GQTM network help fulfill objectives specific to the monitoring subarea and the overall GQTM (see also discussion in **Section 5**). Concurrent consideration of well and land use characteristics, hydrogeologic conditions, historical data record, and other factors listed in **Table 3** is an important part of selecting monitoring sites. This approach is more appropriate than a random network design because it focusses monitoring effort in areas where impacts from agricultural activities are more likely to manifest in the groundwater because of physical conditions or land use conditions or where there is a heightened interest in monitoring because of the greater reliance on groundwater for beneficial uses.

3.2.2.2 *Monitoring Representation*

In addition to site-selection considerations, wells included in the GQTM network should also provide a representative indication of groundwater conditions within monitoring subareas. Larger-capacity wells are more likely to represent regional groundwater conditions and trends that are the focus of the GQTM. To understand potential well capture areas or recharge contribution areas for wells, basic hydrologic analytical modeling using groundwater flow equations was conducted to estimate the radius of influence under different scenarios of well operation (pumping capacity and duration) and aquifer properties and configuration (hydraulic conductivity, specific storage, saturated thickness). The scenarios evaluated a range of aquifer and well operation parameters based on a variety of larger-capacity public supply wells and irrigation wells in the area and hydrogeology included in the U.S. Geological Survey Central Valley Hydrologic Model (Faunt et al., 2009). These analyses suggest that contributing areas (as indicated by the extent of the pumping cone of depression [>0.5 feet of drawdown]) for large-capacity wells range from about one half mile under aquifer properties representing unconfined conditions in large-capacity wells with relatively smaller production rates to several miles under semi-confined or confined aquifer conditions. Corresponding estimated travel distances to the well (under groundwater level conditions after six months of pumping) within a time horizon of five years range from about one half mile to over one mile and between about 0.6 and two miles for a ten-year travel time. A similarly large contributing recharge area (about 17 square miles) was indicated in numerical modeling of a public supply well in Modesto (Burow et al., 2008).

Public supply wells and irrigation wells which tend to pump higher volumes of water are the preferred well type for the GQTM network because they are more likely to indicate regional conditions and trends in groundwater quality. Such wells completed in the upper part of the aquifer system are likely to provide more regional representation of groundwater quality within a time frame that enables the evaluation of trends in groundwater quality resulting from changes in past and current land use practices. To further ensure that wells selected for the GQTM network provide reasonable indications of regional trends, the degree to which the land use composition within the vicinity of wells represents regional land uses and top agricultural land uses should also be considered.

3.2.2.3 *Stage Implementation*

Because of limitations in access to available well construction information and time required to appropriately investigate potential wells for trend monitoring, initial monitoring will utilize existing wells identified to meet required criteria for the GQTM network while additional suitable wells are identified.

Identification and vetting of potential network wells will initially focus on higher tiered monitoring subareas followed by additional identification of network wells in lower-tiered areas. A timeline for implementation of the GQTM is discussed in **Section 5** of this Workplan. Scheduling details relating to the timing of monitoring will be provided as part of Phase II of the Workplan. Upon implementation of trend monitoring, the spatial representation and sufficiency of the GQTM network will be evaluated on an annual basis with respect to the objectives of the program and recommendations regarding potential additional wells or elimination or substitution of wells will be provided. The adequacy of the GQTM design will be reviewed on an annual basis through inspection and qualitative assessment of the time-series monitoring data. Initial review of time-series data will focus on wells with historical data as data from the GQTM are developed. Further review of the monitoring program design and adequacy will occur every five years utilizing more rigorous quantitative assessments of magnitude in trends and spatial relationships in trends. The five-year review will incorporate additional readily available groundwater quality data throughout the Coalition region, which will be used to assist in identifying areas where the trend monitoring program should be modified.

3.3 Groundwater Quality Sampling

Wells selected for inclusion in the GQTM network will be sampled on an annual interval for select water quality parameters and will also be sampled every five years for a more extensive set of parameters. **Table 4** summarizes the testing and analyses to be conducted and the frequency of testing for each water quality parameter.

3.3.1 Groundwater Quality Analyses

3.3.1.1 *Annual Sampling*

Annual monitoring of GQTM network wells will include sampling and laboratory analysis of nitrate concentration in well water. Nitrate concentrations will be reported in units of milligrams per liter (mg/L) as nitrogen. Additional measurement of select water quality parameters will take place in the field at the time of sampling. Field parameters that should be measured at an annual frequency include electrical conductivity at 25 °C (EC) in µS/cm, ph, temperature (in °C), and dissolved oxygen (DO) in mg/L. The annual testing of wells for these water quality parameters is consistent with sampling requirements specified in the WDRs, as summarized in **Table 4**. Additional field testing for oxidation-reduction potential (ORP or redox potential) may provide information relating to the groundwater quality that is helpful in understanding existing influences on groundwater quality from agricultural operations and potential for future impacts that may impact beneficial uses. Field turbidity in sampled water may indicate issues associated with the sample collection (suspended solids) or other characteristics of the water being tested that may affect the results of laboratory analyses. Although not required by the WDRs, field testing of samples for ORP and turbidity, when possible through coordination with monitoring entities or through sampling by the Coalition, will be included in the annual testing procedures. Public water supply wells represent potential candidate monitoring wells throughout the Coalition region. Where public supply wells are selected as part of the monitoring network, monitoring will be performed through cooperation and coordination with the water supply system operators. Although the annual sampling of GQTM network wells conducted by the Coalition will include collection of the field parameters identified above, monitoring of Tier 3 subareas conducted through coordination with other monitoring entities may not include testing of all of the identified field parameters.

3.3.1.2 *Every Five Years*

Every five years GQTM network wells will be tested for a more extensive set of groundwater quality constituents in addition to the laboratory and field water quality parameters included as part of the annual testing. The constituents to be tested for and analyzed in a laboratory every five years include total dissolved solids (TDS) and major cations such as boron, calcium, sodium, magnesium, and potassium and anions including carbonate, bicarbonate, chloride, and sulfate (**Table 4**). Results from analyses of cations and anions will be reported in mg/L. Groundwater quality testing in Tier 3 monitoring subareas may not align exactly with the frequency of testing for all water quality parameters specified in the WDRs, although coordination efforts with cooperating monitoring entities will focus on establishing a testing program that is consistent and compatible with the monitoring objectives for these subareas.

In conjunction with sampling of GQTM network wells, all publicly available data relating to groundwater quality within the Coalition region will be acquired and evaluated every five years as part of the GQTM. This more comprehensive review of groundwater quality data at a regular interval will provide additional data with which to consider regional groundwater quality conditions and trends related to irrigated agriculture and will provide the basis for monitoring in the Tier 4 subarea. **Figure 7** displays wells recently monitored (since 2005) for groundwater quality, including public-supply wells. The spatial distribution of recent data in **Figure 7** suggest that sufficient spatial and temporal representation likely exists in recently monitored wells for the purpose of monitoring trends in groundwater in the lower vulnerability Tier 4 monitoring subarea.

3.3.2 Network Well Sampling Protocols and Procedures

Sampling of wells as part of the trend monitoring network should follow established protocols and procedures relating to sample timing, well purging, sample collection and handling, and field observations and measurements, to the extent possible, as outlined in the standard operating procedures (SOP) that will be included in the Groundwater QAPP.

3.3.2.1 *Timing*

Consistent timing of sampling of GQTM network wells (to the extent possible) will be coordinated taking into consideration the timing of existing ongoing monitoring by others, timing of historical monitoring of network wells and other wells in the Coalition region, and the seasonality of hydrologic conditions and influences from irrigated agriculture. The approximate timing of sampling is likely to be either in the spring or fall seasons and will be constrained within a designated range of months to ensure temporal consistency. The five-year evaluation of groundwater quality data, which will incorporate all publicly available data, will consider timing of sampling both in terms of seasonality and also by year (within the five year period) as these factors relate to potential climatic or other time-dependent influences.

3.3.2.2 *Sample Collection*

Wells will be sampled in accordance with the Groundwater QAPP. Wells will be appropriately purged in accordance with their type and operational history to ensure that a representative groundwater sample is collected from the well. Wells will be purged for a sufficient time to evacuate water held in casing storage before collecting the water sample. This is important to ensure that water collected from a well is representative of groundwater in the aquifer formation outside the well bore. If possible, three casing volumes will be purged from the well prior to sample collection. Larger-capacity wells may not need purging depending on their operational history. For smaller-capacity wells, such as domestic wells, achieving a three-casing volume purge may not be practical because of operational constraints relating to the well and water distribution system. For domestic wells currently in operation, lengthy purging may not be necessary because wells used for domestic supply typically experience frequent and short pumping cycles that serve the same purpose as purging. In cases where a three-casing volume purge is not achievable, field parameters (EC, pH, temperature, etc.) of the water will be monitored during pumping/purging and a sample will not be collected until the field parameters have sufficiently stabilized in accordance with the sampling SOP.

Well water samples will be collected from a point in the distribution system as near to the wellhead as possible and prior to any filtration or pressure tank, if possible. Water samples collected for laboratory analytical testing will be collected in appropriate laboratory-provided sample containers and stored on ice or in accordance with recommended sample handling procedures indicated by the laboratory and established in the Groundwater QAPP. The sample identification, time, date, and any other informational fields indicated on the sample container label will be clearly provided. The associated laboratory chain of custody for samples will be completed and signed and provided with the samples at the time of delivery of samples to the laboratory for analysis. It is important to verify that sample holding times are not exceeded.

3.3.3 **<u>Field Observations and Measurements</u>**

Prior to sampling of a well, the depth to the water in the well will be measured, if possible, and recorded. It may not be possible to measure the water level due to wellhead accessibility or because the well is actively pumping. The well operational status prior to and at the time of sampling will be noted and any other observations at a well site that may potentially relate to the well or groundwater sampling will be described. Field water quality parameters including EC, pH, temperature, and DO, and possibly ORP and turbidity, will be tested during sampling; field parameters should be stable prior to collecting a well water sample. Field parameters will be monitored and recorded at least three times during well pumping/purging. Observed characteristics of the water during sampling such as color, smell, or other visual observations will be documented, if possible. All instruments used to measure field conditions during sampling will be calibrated on a regular basis in accordance with manufacturer guidelines and recommendations or otherwise established in the Groundwater QAPP.

3.3.4 Quality Assurance/Quality Control Protocols and Procedures

To ensure the quality and consistency of data collected as part of the GQTM, specific protocols and procedures relating to well sampling and analytical testing will be adhered to in accordance with the Groundwater QAPP[2]. Data assembled by the Coalition as part of the GQTM will be evaluated through a quality assurance/quality control (QA/QC) procedure involving review of results and data formatting to verify reasonableness and accuracy. Analytical and field data collected by the Coalition through sampling of wells will be evaluated with respect to laboratory and analytical QA/QC metrics. Data collected by others and incorporated as part of the GQTM will undergo a more general QA/QC review to identify potentially erroneous data. More details regarding the QA/QC of GQTM data are included in the QAPP. Adherence to procedures that are aligned with the established protocols and procedures in the SOP and QAPP will be emphasized as part of coordination with cooperating monitoring entities collecting groundwater quality data in Tier 3 subareas.

3.3.5 Data Management

Data generated or acquired as part of the GQTM will be assembled within a data management system to facilitate organization, analysis, and display of the data and to assist the Coalition with meeting objectives of the GQMP. All wells in the data system will be attributed with a unique well identification (ID) and information associated with wells, such as well characteristics and historical hydrologic observations, will be compiled and maintained within the data management system. The structure of the data management system will be compatible with geographic information systems (GIS) and other data formats and will also facilitate submittal of the GQTM data to the Regional Board via uploading of data to Geotracker or otherwise providing the data in accordance with the WDRs.

[2] The QAPP will be provided as separate transmittal.

4 Reporting

4.1 Report Content

Reporting of results of the GQTM will be provided on an annual basis in accordance with the WDRs. The annual reporting will consist of increased compilation and analysis of results every five years as described below and summarized in **Table 8**.

4.1.1 Annual Report

Annual reporting of results related to the GQTM will focus on visual and tabular presentation of data with limited representation of data interpretation. Additional interpretations and conclusions relating to trends and relationships in trends will be conducted as part of reporting every five years, as indicated in **Table 8**. The GQTM network will be reviewed and recommendations for modifications will be provided as needed.

Annual reports will include a map or maps of the wells sampled and monitored as part of the GQTM network. Results from sampling will be provided in a tabulated format consisting of a summary of the results using statistics such as recent, minimum, maximum, and mean result, in addition to a table providing all field and analytical results. Visual presentation of results with some limited interpretation will be provided in the form of maps of patterns in groundwater quality within the aquifer system. These maps will separately present water quality patterns within the shallower part of the aquifer system and patterns in deeper parts of the aquifer system based on observed groundwater quality in the GQTM network wells. These maps are envisioned to be in the form of color gradient maps or similar displays intended to illustrate observed groundwater quality in GQTM network wells.

Graphs of time-series groundwater quality data for all of the wells in the GQTM network will be included in the annual reports. Time-series graphs will include all available historical water quality data relevant to potential influences from irrigated agriculture for network wells, including data that pre-date the GQTM. Finally, groundwater level contours and other representations of groundwater levels within select areas of the Coalition region, as applicable and appropriate relative to the regional monitoring network design, will be generated and provided as part of the annual report. Groundwater level data will be presented as depth to water and groundwater elevation to inform hydrogeologic understanding of areas with shallow groundwater and also regional groundwater flow directions.

4.1.2 Five-Year Report (additional to Annual Report content)

Reporting related to the GQTM will include more extensive analysis at five-year intervals. The five-year report will include all elements in the annual report, as described above, with the additional analyses and presentations described below. **Table 8** summarizes all of the annual report elements and additional reporting elements that will be included in the five-year report.

4.1.2.1 *Additional Groundwater Quality Data Acquisition*

Every five years, all publically available groundwater quality data for water quality constituents relevant to irrigated agriculture will be compiled for the Coalition region in conjunction with updating of the GAR. These data will be in addition to data collected as part of the GQTM network and will include data from numerous public water supply wells sampled at a regular interval throughout the Coalition region. Community water systems are required to report water quality parameters for public water supply wells on a triennial or more frequent schedule, pending location of the system and specific circumstances that may require more frequent testing and reporting. These data are reported to the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) and are publically available, although well locations are obfuscated. Historical DDW data for the Coalition region include 1,235 wells sampled for nitrate and 915 wells tested for TDS. Between 2000 and 2010, there have been 1,160 public supply wells sampled for nitrate and 829 wells sampled for TDS. Most recently, since 2010, there have been 991 public supply wells sampled for nitrate and 598 wells sampled for TDS.

Additional groundwater quality data collected at regulated facilities and from other wells are also updated to the publically accessible Geotracker database. Between 2000 and 2010, there were 1,057 wells sampled for nitrate and 881 wells sampled for TDS within the Coalition region reported in the Geotracker database. Most recently, since 2010, there have been 989 wells sampled for nitrate and 415 for TDS for which data can be found in Geotracker. Most of the public supply wells and wells with data in Geotracker are located within the Central Valley Floor of the Coalition region. The spatial distribution of recent groundwater quality monitoring conducted between 2005 and 2013 is considerable and is presented in the GAR, including the locations of sampled public supply wells.

Groundwater monitoring data for pesticides will also be compiled from the California Department of Pesticide Regulation (DPR) on an interval of every five years. As indicated in the WDRs (Attachment A, p. 17), DPR's current groundwater quality monitoring is believed to be sufficient to track trends in pesticides in groundwater. DPR maintains a database of results from sampling of wells for pesticides that are submitted to DPR from local, county, and state agencies as a requirement of the Pesticide Contamination Prevention Act. A large number of agencies report groundwater testing data to DPR, however, recent data since 2005 for the Coalition region have mostly been from public supply wells reported through DDW. Under the Safe Drinking Water Act, DDW provides regulatory oversight of public water systems, from which results are reported to DPR. In the past, the SWRCB has also collected groundwater quality data through the GAMA program and these results are reported to DPR. Some sampling of wells for pesticides is also conducted by DPR as part of groundwater monitoring programs aimed at delineating Groundwater Protection Areas (GWPAs) and also to determine if pesticides classified as potential contaminants have reached groundwater as a result of legal use of the chemicals.

When DPR receives a result indicating a pesticide detection, DPR investigates the detection to determine if it was the result of legal agricultural practices, and if additional sampling is necessary. When pesticide detections are located outside of the GWPAs, DPR will determine if the GWPAs need to be expanded to include new areas. Data previously provided by DPR for use in the GAR were only available at a spatial resolution accurate to the section in which the well is located. Nevertheless, this spatial resolution is likely sufficient to evaluate regional patterns and trends in pesticides in groundwater.

The spatial distribution of historical and recent pesticide sampling data that have been compiled by DPR is presented in the GAR. Numerous areas throughout the Coalition region have wells with pesticide data since 2005, and several areas of notably higher density of pesticide data exist, particularly in the northwest portion of the Coalition region. Since 2005, DPR has assembled pesticide results for over 1,800 wells. On average, data for between 200 and 300 wells have been collected annually since 2005; data for these wells generally represent between 150 and 200 sections.

4.1.2.2 *Comparison of Regional Groundwater Quality and Trends*

Regional trends in groundwater quality relevant to irrigated agriculture are not likely to change rapidly. Therefore, analysis of groundwater quality trends will be conducted every five years and reported accordingly. Trends in all wells for which data are available (GQTM network well data and other publically available well data) will be analyzed using statistical methods to evaluate the presence and magnitude of groundwater quality trends and investigate relationships with land use conditions and practices. Both non-parametric statistical analyses of temporal trends in concentrations (e.g., Mann-Kendall test) and parametric statistical analyses of temporal trends (e.g., linear regression) will be conducted to compare and contrast any patterns in trends indicated by the different statistical analyses. The results from these statistical trend analyses will be presented spatially in the form of maps and will be evaluated for regional spatial patterns in trends.

A statistical summary of groundwater quality trends will be tabulated and presented by monitoring subarea or other delineated regional area (pending any spatial patterns in trends evident in the data) for the purpose of analyzing potential relationships between land use conditions and groundwater quality trends. Regional trends in concentrations will be evaluated with respect to land use composition and associated management practices. Updated interpretation and mapping of land uses and practices within the Coalition region, particularly as they relate to agricultural lands, will be incorporated in these evaluations. Potential climatic influences on groundwater quality trends will be assessed. Climatic variability can drive changes in groundwater demand (increased groundwater pumping) and the amount of groundwater recharge from water applied as irrigation or falling as precipitation within the region. Such climatic influences could impact groundwater quality conditions and trends and should be considered. Lastly, trends in groundwater quality will also be analyzed by depth zones at selected locations where available well location and construction information allow such comparisons. Comparison of groundwater trends by depth zone may provide useful insights into the rates and paths of groundwater movement.

Utilizing acquired recent groundwater quality data, the five-year report for the GQTM, in conjunction with the GAR update, will include an update of the characterization of groundwater quality conditions within the Coalition region. This updated characterization will focus on groundwater quality parameters relevant to irrigated agriculture and will include visual presentation of recent groundwater quality data, including data from DPR related to recent pesticide monitoring.

Groundwater level data collected through the GQTM will be evaluated to identify groundwater flow patterns and determine if locations of GQTM network wells are appropriate and sufficient to meet the objectives of the GQTM. This assessment will consider the uncertainty relating to trends and concentrations in areas and the existence of data gaps that limit the ability to evaluate regional trends in relation to agricultural practices.

4.2 Report discussion

Both the annual and five-year reports will include discussion of results and findings from the GQTM. As described above, the annual report will focus on graphical and tabulated presentation of monitoring results. The five-year report will incorporate additional data acquisition beyond the sample data collected from GQTM network wells and these data will be analyzed statistically for trends. Findings related to groundwater quality trends, spatial patterns in trends, and statistical associations between trends and land use composition and management practices will be the focus of discussion in the five-year report. A discussion of findings related to data gaps will be included and recommendations regarding addressing data gaps will be provided. The need for refinements to the GQTM design will be assessed and discussed in the report and associated recommendations on modifications to the program design will be provided. Recommendations will be made to improve coordination of the GQTM design with education and outreach efforts being conducted by the Coalition as part of their GQMP.

4.3 Schedule and Report Submittal

Annual reporting of GQTM results and interpretations will be submitted electronically in accordance with requirements specified in the WDRs. Annual reporting will include data submittals to Geotracker in combination with other report submittals. Implementation of the GQTM will be done in stages as suitable wells are identified and incorporated into the GQTM network. Because of limitations in access to available well construction information and time required to appropriately investigate potential wells for trend monitoring, initial monitoring will utilize existing wells identified to meet required criteria for the GQTM while additional network wells are identified. Identification and vetting of potential network wells will focus initially on higher tiered monitoring subareas, although additional identification of network wells in lower-tiered areas will be take place concurrently with implementation of monitoring in lower-tiered subareas potentially being initiated after higher-tiered monitoring subareas. The timing of the initial monitoring in Tiers 1-3 will largely be governed by the timing of coordination and sampling agreements.

5 Workplan Phase II – Determination of Specific Wells for GQTM

Following submittal of this Workplan Phase I, the Coalition will undertake activities related to completion of the Workplan Phase II and implementation of the GQTM program. In this Workplan Phase I, candidate wells have been ranked using the criteria described in **Section 3**. Workplan Phase II efforts will focus on the work needed to select the wells that will compose the GQTM network. **Figure 1** shows a "roadmap" of the process from the development of this Workplan through the preparation of the Phase II Workplan and implementation of the GQTM program.

5.1 Outreach and Coordination with CVRWQCB

Prior to actual monitoring network well selection, the Coalition will engage in outreach to communities where monitoring, either by the Coalition or in coordination with an existing entity, is planned. The Coalition will also be informing its membership of the GQTM process and the potential for recruitment of member wells for inclusion in the program in some areas. Additionally, the Coalition will plan to meet with the CVRWQCB to receive feedback on the Workplan Phase I – Monitoring Design Approach.

5.2 Well Selection Tiers 1-3

The Phase II well selection process involves vetting the candidate wells identified in Phase I to ensure that the required criteria specified in the WDRs (e.g., well construction, location coordinates, etc.) are met, particularly for wells included in monitoring Tiers 1 and 2. Candidate wells have also been ranked for Tier 3, and a similar process will be undertaken to further determine which wells are suitable for inclusion in the GQTM network. **Figure 8** shows a decision tree outlining the process for vetting of wells and selecting GQTM network wells. Since wells of interest for Tier 3 monitoring may already have a long period of record, and the existing monitoring entity may have its own program and set of routine constituents that are regularly monitored, there may be some parameters (particularly field parameters) that may not be monitored at these locations. The Coalition will coordinate with existing monitoring entities to ensure that the arrangement is mutually beneficial to both parties.

The Phase II selection process also entails site visits and setting up coordination agreements with the authorized party, which may include a governmental entity or other entity currently conducting monitoring, the land owner, and/or a Coalition member. Once it is determined which wells are suitable for inclusion in the GQTM network, Phase II of the Workplan will be completed and submitted to the CVRWQCB. **Figures 1 and 9** indicate the timelines accompanying the Phase II well selection process, completion of the Workplan Phase II, and implementation of the monitoring program. It is proposed that a two-month period be allotted for Regional Board review of the Workplan Phase I. Concurrent with the Regional Board review of Workplan Phase I, the Coalition will begin implementing initial steps for Phase II. The proposed deadline for submittal of the Workplan Phase II to the Regional Board, including the selection of the wells to be monitored, is December 4, 2015.

5.3 Tier 4

As described in this Workplan Phase I, many wells are currently monitored in the Coalition area. Wells proposed for monitoring regional groundwater quality conditions in Tier 4 low vulnerability areas include wells already monitored by existing programs. An update of groundwater quality conditions will be conducted on the five-year interval associated with the GAR update. Due to the large number of wells monitored by others within the Coalition region, these wells would not be vetted to the same extent as wells monitored as part of Tiers 1-3. In the future, analysis of the trend monitoring data may lead to recommendations regarding the need for further understanding of groundwater quality conditions and trends in some areas, which may necessitate additional investigation of characteristics for some monitored wells (i.e., well construction information, surrounding land uses).

5.4 Proposed Monitoring and Reporting Schedule

The Coalition is proposing to begin monitoring in spring 2016. This may be adjusted pending discussions that the Coalition has with existing monitoring entities and their established monitoring schedules. The Coalition's WDRs require an Annual Monitoring Report be submitted on May 1 of each year. These Annual Reports will include data collected for the prior water year, from October 1 to September 30. Since groundwater trend monitoring is not planned to begin until Spring 2016, the May 2016 report will include a status report on the implementation of the GQTM program (i.e., the selected network, wells sampled and/or about to be sampled, and other pertinent information).

Because the first Annual Monitoring Report for groundwater trend monitoring is proposed to be submitted on May 1, 2017, the five-year GAR update, which is scheduled for January 2019, will not be aligned with five years of trend monitoring. Both the GAR update and the proposed GQTM design incorporate compilation and evaluation of all readily available data at five year intervals. Therefore, the Coalition proposes to conduct the first Five-Year Monitoring Report for the GQTM on a slightly accelerated schedule to align with the GAR update. A deadline of May 1, 2019 is proposed for submittal of the first Five-Year Monitoring Report.

6 Future Design Considerations

A fundamental element of the GQTM is the initiation of the monitoring program with ongoing review and assessment of trend monitoring data and consideration of results in relation to the GQTM design.

6.1 Adaptive Phasing and Modification

Design of the GQTM and selected network wells is designed to be dynamic. The design includes a process for revisiting and modifying design elements to address evolving questions relevant to the trend monitoring program. This is an important part of long-term water quality monitoring programs (Alley, 1993). The initial design and implementation of the GQTM will be reviewed during the course of annual reporting and analysis of results of the GQTM. This review will assess the adequacy of the GQTM network and design to meet the objectives of the program. An initial period of baseline GQTM data collection will be required before meaningful conclusions can be developed regarding the adequacy of the GQTM design. Emphasis will be placed on the review of regional groundwater quality trends at a five-year interval to identify temporal or spatial data gaps that warrant addressing through modification of the GQTM design. Specific attention will focus on the adequacy of the GQTM in areas where the direction and magnitude of temporal trends in groundwater quality suggest a consistent pattern that is likely to be attributable to influences from irrigated agriculture.

6.2 Coordination

The GQTM will benefit from cooperation and coordination with monitoring entities and stakeholders throughout the Coalition region. Coordinated efforts related to data sharing will benefit the GQTM and the ILRP. Data sharing will minimize unnecessary redundancy in groundwater monitoring efforts within the Coalition region, keep stakeholders informed of groundwater quality conditions and trends, and enable a better understanding of relationships between land use practices and groundwater quality conditions.

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TABLES

TABLE 1
Groundwater Quality Trend Monitoring (GQTM) Workplan Items Identified in WDRs

GQTM Workplan Items Identified in Monitoring and Reporting Program (Appendix B) of the WDR General Order	Where in Workplan		How Addressed in Workplan
	Phase I	*Phase II*	
1. Workplan Approach			
Discussion of the rationale for the number of proposed wells to be monitored and their locations	X	x	Phase I: Rationale for delineation of monitoring subarea tiers, guidelines for target well depth, and proposed monitoring emphasis and approach based on numerous factors considered in GAR prioritization; candidate wells ranked considering additional factors Phase II: Specific site selection depending on candidate well vetting process
A. Consideration of variety of agricultural commodities produced within the third-party's boundaries	X	x	
B. Consideration of conditions discussed/identified in the GAR related to the vulnerability prioritization	X	x	
C. Consideration of areas identified in GAR as contributing significant recharge to urban and rural communities where groundwater serves as a significant source of supply	X	x	
2. Well Details			
Details for well proposed for trend monitoring		X	Phase II: Vetting of candidate wells and selection of wells for monitoring network
A. GPS coordinates		X	
B. Physical address of the property on which the well is situated (if available)		X	
C. California State well number (if known)		X	
D. Well depth		X	
E. Top and bottom perforation depths		X	
F. Copy of DWR Well Completion Report (water well drillers log), if available		X	
G. Depth of standing water (static water level), if available (may be obtained after implementing program)		X	
H. Well seal information (type of material, length of seal)		X	
3. Proposed Sampling Schedule			
Trend monitoring wells to be sampled, at a minimum, annually at the same time of year for indicator parameters (parameters identified in Table 3 of WDRs, Att. B).	X	X	Phase I: Proposed approach to monitoring variable based on monitoring emphases for delineated subareas; frequency of sampling by constituent depending on monitoring emphasis; reporting schedule Phase II: Specific timing of sampling to depend on vetting of wells and determined in conjunction with existing monitoring by others; timing associated with monitoring implementation
4. Workplan Implementation and Analysis			
Proposed methods to be used to evaluate trends in the groundwater monitoring data over time.	X	X	Phase I: Discussion of methods proposed to present results and evaluate temporal trends and spatial patterns in trends Phase II: Completion of monitoring network design; finalize monitoring and reporting schedule

TABLE 2
System for Prioritization of High Vulnerability Areas

Prioritization Component Category	Prioritization Component Identified in the WDRs (Att. B)	Description of Component Used in Prioritization Method	Ranking Factors		Component Weighting	
			Ranking Metric	Range of Ranking	Percent	Comments
Hydrogeologic Groundwater Vulnerability	Additional component not directly specified in order for prioritization purposes	**Groundwater Vulnerability Percentile** Includes evaluation and ranking of areas according to hydeogeologic groundwater vulnerability percentile.	Vulnerability percentile	0 to 10 (low to high) based on groundwater vulnerability percentile; (percentile: 0-10=0, 10-20=1, 20-30=2, 30-40=3, 40-50=4, 50-60=5, 60-75=8, 75-100=10)	15%	High - Represents weighting of importance of hydrogeologic characteristics
Existing Groundwater Quality Conditions	Legacy or ambient conditions of the groundwater.	**Observed Groundwater Quality Concentrations** Includes an evaluation and ranking of areas based on recent observed groundwater NO3 concentrations.	Average concentration for location based on wells within 1/2 mile	0 to 10 (low to high) based on average concentration; 5 (neutral) for locations without any concentration data within 1/2 mile; (NO3 [mg/L as N]: <1=0, 1-2=1, 2-3=2, 3-4=3, 4-5=4, 5-6=5, 6-7=6, 7-8=7, 8-9=8, 9-10=9, >10=10)	15%	High
		Temporal Trend in Groundwater Quality Includes evaluation and ranking of areas based on recent trend (degrading, improving, etc.) in groundwater NO3 concentration.	Average trend for location based on wells within 1/2 mile	0 to 10 (low to high) based on average water quality trend; 5 (neutral) for locations without any trend data within 1/2 mile (mg/L/yr: <-1=0, -1--0.5=1, -0.5--0.1=2, -0.1-0.1=5, 0.1-0.5=8, 0.5-1=9, >1=10)	10%	Moderate
	Identified exceedances of water quality objectives for which agricultural waste discharges are the cause, or a contributing source.	**MCL Exceedances** Includes evaluation and ranking of areas according to presence/absence of NO3 concentrations observations that are above the drinking water MCL.	Distance from nearest NO3 MCL Exceedance	0 to 10 (low to high) inversely related to distance from nearest NO3 exceedance; 5 (neutral) for locations without any WQ observations within specified distance; (miles: >2=0, 1.5-2=2, 1-1.5=4, 0.5-1=6, 0.25-0.5=8, <0.25=10)	2.5%	Low - weighting is low to avoid double-counting since measured concentration is considered in ambient water quality component
	Identified constituents of concern.	**Pesticide Detections** Includes evaluation and ranking of areas based on presence/absence of detectable concentrations of pesticides in groundwater samples.	Percent of wells with a pesticide detection within a section	0 to 10 (low to high) based on percent of wells with a pesticide detection; 5 (neutral) for sections without any pesticide observations; (percent: 0%=0, 0.1-10%=2, 10-20%=4, 20-30%=6, 30-40%=8, >40=10)	2.5%	Low - Pesticide detection data from DPR are at coarse spatial accuracy
Land Use	Existing field or operational practices identified to be associated with irrigated agriculture water discharges that are the cause, or a contributing source.	**Typical Nitrogen Application Rate** Includes evaluation and ranking of areas based on typical nitrogen application rates for land uses (Rosenstock and others, 2013; Viers and others, 2012) using 2012 USDA land use designation.	Typical nitrogen application rate for land use	0 to 10 based on typical nitrogen application rate; (lbs/ac/yr: <50=0, 50-100=3, 100-150=7, >150=10)	7.5%	Low-Moderate
		Typical Irrigation Method Includes ranking of areas based on typical irrigation method for land uses (using 2012 USDA land use designation) in accordance with irrigation method statistics derived from DWR land use survey irrigation method data (2001-2004) and Coalition membership irrigation method data.	Typical irrigation method for land use	0 to 10 based on typical irrigation method; (micro=3, sprinkler=6, gravity=10)	12.5%	Moderate-High
	The largest acreage commodity types comprising up to at least 80% of the irrigated agricultural acreage in the high vulnerability areas and the irrigation and fertilization practices employed by these commodities.	**Top Commodities** Includes evaluation and ranking of areas based on percent of land area that is of a land use category comprising 80% of the high vulnerability (based on 2012 USDA land use designation).	Presence/absence of top 80% land use category	0 = Absent 10 = Present; (Top 80% land use category=10, Other land use category=0)	2.5%	Low
Other Factors	Proximity of high vulnerability areas to areas contributing recharge to urban and rural communities where groundwater serves as a significant source of supply.	**Proximity to Public Groundwater Supply** Includes evaluation and ranking of areas by proximity from public water systems reliant on groundwater as identified with CDPH's Drinking Water Systems Geographic Reporting Tool (http://www.ehib.org/page.jsp?page_key=61).	Distance, within 1 mile, from public drinking water system relatiant on groundwater Within Contributing Area/Not Within Contributing Area	0 to 10 (low to high) inversely related to distance from public supply system reliant on groundwater; multiplier of 1 for locations within contributing area and multiplier of 0.5 for locations outside of contributing area; (miles: >2=0, 1.5-2=2, 1-1.5=4, 0.5-1=6, 0.25-0.5=8, <0.25=10)	30%	High
	Groundwater basins currently or proposed to be under review by CV-SALTS.	**CV-SALTS Priority Areas** Includes Initial Analysis Zones (IAZ) that were identified by CV-SALTS as being high priority with respect to nitrate in groundwater.	Location within or not within IAZ identified as high priority by CV-SALTS	0 = Not within priority IAZ 10 = Within priority IAZ	2.5%	Low

TABLE 3
Well Detail Reporting Information

Category of Well Information	Description of Well Detail	Required[1] or Optional	Comment
Unique Well Identification	State well number	Required	If known
	GQTMP well ID	Optional	
	Monitoring entity	Optional	
Well Location	GPS coordinates	Required	Latitude and longitude in decimal degrees (datum NAD83, minimum of five decimal places
	Physical address	Required	As applicable or available
	PLSS coordinates (T/R/S)	Optional	
Well Construction	Total well depth	Required	
	Depth to top of perforations	Required	
	Depth to bottom of perforations	Required	
	Well seal depth/length	Required	
	Well seal material	Required	
	DWR Well Completion Report (water well drillers log)	Required	Provide copy, if available
	Well construction date	Optional	
Well Characteristics	Depth to standing water (static water level)	Required	Collected annually at time of well sampling, if available/accessible
	Estimated ground surface elevation	Optional	Feet above mean sea level from National Elevation Dataset (NED) digital elevation model (DEM)
	Water level measurement reference point	Optional	Feet above ground surface
	Well pumping rate	Optional	
	Well operation	Optional	Typical pumping cycles; annual pumping duration
Historical Well Testing	Period of available historical water quality record	Optional	Range of years (first/last year)
	Number of historical water quality tests	Optional	
Characteristics of Well Vicinity	Land use composition in vicinity of well	Optional	Percent agriculture by commodity
	GQTMP monitoring subarea	Optional	

[1] Required well construction details will be included for wells selected for trend monitoring of Tier 1, 2, and 3 monitoring subareas, with some potential exceptions in cases where well construction information is not available for a well determined to represent a particularly informative monitoring site for various other reasons (e.g., historical period of record). Detailed well construction information will likely not be available for wells monitored in Tier 4 monitoring subareas, which will rely on available public monitoring data.

TABLE 4
Water Quality Testing Requirements

Water Quality Constituent	Reporting Units	Testing Frequency	Required or Optional[1]	Field or Laboratory Analysis	Comment
Nitrate as nitrogen	mg/L (as N)	Annual	Required	Laboratory	Should be part of trend monitoring in Tier 1-3 monitoring subareas
Electrical conductivity (EC)	µS/cm	Annual	Required	Field	at 25 °C
pH	pH units	Annual	Required	Field	
Dissolved oxygen (DO)	mg/L	Annual	Required	Field	
Temperature	°C	Annual	Required	Field	
Oxidation-reduction potential (ORP)	mV	Annual	Optional	Field	
Turbidity	NTU	Annual	Optional	Field	
Total dissolved solids (TDS)	mg/L	Five years	Required	Laboratory	Should be part of trend monitoring in Tier 1-3 monitoring subareas
Anions					
Carbonate	mg/L	Five years	Required	Laboratory	
Bicarbonate	mg/L	Five years	Required	Laboratory	
Chloride	mg/L	Five years	Required	Laboratory	
Sulfate	mg/L	Five years	Required	Laboratory	
Cations					
Boron	mg/L	Five years	Required	Laboratory	
Calcium	mg/L	Five years	Required	Laboratory	
Sodium	mg/L	Five years	Required	Laboratory	
Magnesium	mg/L	Five years	Required	Laboratory	
Potassium	mg/L	Five years	Required	Laboratory	

[1] Required Water quality constituents will be included in trend monitoring of Tier 1 and Tier 2 monitoring subareas. Not all required constituents will necessarily be included in trend monitoring in Tier 3 monitoring subareas depending on the cooperation with existing monitoring entities in these Tier 3 subareas. Groundwater analyses in Tier 4 monitoring subareas will be based on available public monitoring data.

TABLE 5
Monitoring Objectives and Approaches for Monitoring Subarea Tiers

Monitoring Subarea Tier	Primary Monitoring Objectives	Level of Monitoring Emphasis	Approach to Meeting Monitoring Objectives	Monitoring Frequency
Tier 1 Monitoring Subareas	Monitoring regional trends in groundwater quality relevant to irrigated agriculture in or around Priority 1 HVAs; primarily in close proximity to and within contributing recharge areas for communities reliant on groundwater.	Highest	Sampling of GQTM network wells by the Coalition, or through coordination with other monitoring entities, in accordance with WDR required criteria for water quality testing and well construction information (also in Tables 2 and 3 of Workplan); analysis of data.	Annual
Tier 2 Monitoring Subareas	Monitoring regional trends in groundwater quality relevant to irrigated agriculture in or around Priority 2 HVAs; primarily in areas where groundwater quality conditions are poor or trending towards degradation; also includes monitoring in areas upgradient from, but not immediately adjacent to communities reliant on groundwater.	High	Sampling of GQTM network wells by the Coalition, or through coordination with other monitoring entities, in accordance with WDR criteria for water quality testings and well construction information (also in Tables 2 and 3 of Workplan); analysis of data.	Annual
Tier 3 Monitoring Subareas	Monitoring regional trends in groundwater quality relevant to irrigated agriculture in or around Priority 3 HVAs; primarily in areas where groundwater quality conditions are generally degraded or trending towards degradation; also includes monitoring in areas upgradient from, but not immediately adjacent to communities reliant on groundwater.	Moderate	Acquisition and analysis of data for GQTM network wells from other monitoring entities although available water quality testing and well construction data may not completely align with specified criteria in the WDRs.	Annual
Tier 4 Monitoring Subarea	Monitoring regional trends in groundwater quality in low vulnerability agricultural and non-agricultural areas; background monitoring of areas unimpacted by irrigated agriculture; identification of potential future groundwater quality issues in downgradient areas	Low	Acquisition and evaluation of all readily available groundwater quality data relevant to potential agricultural influences	Five-Year

TABLE 6
Characteristics of Monitoring Subareas

Monitoring Subarea	Area (sq miles)	Percent Agricultural Area	Percent Coalition-Member Land Area	Number of Member Parcels or Portions	Percent Top Crop Land Area (Nut trees, grapes, corn)	Number of Candidate Wells	Number of DDW Wells	Percent Priority 1 Land Area	Percent Priority 2 Land Area	Percent Priority 3 Land Area	Percent Low Vulnerability Land Area
1a	24	61%	49%	296	46%	105	24	16%	71%	11%	1%
1b	31	60%	49%	534	47%	157	68	42%	55%	3%	0%
1c	6	44%	45%	110	27%	33	9	3%	55%	39%	3%
1d	1	46%	49%	20	33%	5	3	8%	72%	20%	0%
1e	6	80%	57%	114	53%	36	2	7%	67%	25%	1%
1f	4	80%	70%	104	58%	20	6	20%	75%	5%	0%
1g	24	61%	44%	319	50%	88	28	36%	58%	6%	0%
1h	3	69%	81%	81	64%	7	2	32%	62%	6%	0%
1i	3	66%	24%	30	33%	12	2	24%	66%	9%	0%
1j	23	42%	35%	253	32%	115	48	24%	70%	4%	2%
1k	35	32%	25%	256	18%	127	39	9%	56%	6%	29%
1l	5	67%	38%	45	53%	35	7	22%	61%	9%	9%
1m	5	73%	45%	10	39%	14	2	5%	53%	42%	0%
1n	6	89%	28%	21	34%	43	5	29%	56%	10%	5%
1o	4	47%	17%	40	35%	16	5	3%	61%	34%	3%
1p	16	38%	19%	86	32%	96	25	5%	64%	29%	2%
1q	24	58%	41%	275	45%	139	42	39%	59%	2%	0%
1r	3	83%	60%	33	77%	1	0	2%	58%	16%	24%
1s	7	87%	8%	5	68%	24	12	2%	44%	34%	20%
2a	20	30%	22%	146	21%	208	69	0%	69%	25%	6%
2b	11	89%	63%	204	60%	78	1	0%	55%	45%	0%
2c	13	90%	58%	157	70%	96	9	0%	69%	31%	0%
2d	54	83%	39%	584	60%	515	17	0%	73%	27%	0%
2e	14	74%	62%	303	59%	21	7	0%	62%	38%	0%
2f	12	82%	79%	260	75%	29	0	0%	80%	20%	0%
2g	26	83%	75%	551	72%	55	10	0%	68%	32%	0%
2h	5	66%	49%	72	43%	26	1	0%	64%	35%	2%
2i	16	82%	67%	298	53%	17	0	0%	64%	18%	18%
2j	20	82%	59%	72	36%	18	0	8%	51%	19%	22%
2k	1	93%	84%	28	88%	3	2	1%	76%	12%	11%
2l	15	9%	7%	57	7%	187	66	0%	88%	11%	0%
2m	48	89%	45%	511	51%	397	19	0%	78%	22%	0%
2n	6	26%	9%	30	15%	43	23	0%	80%	20%	0%

TABLE 6
Characteristics of Monitoring Subareas

Monitoring Subarea	Area (sq miles)	Percent Agricultural Area	Percent Coalition-Member Land Area	Number of Member Parcels or Portions	Percent Top Crop Land Area (Nut trees, grapes, corn)	Number of Candidate Wells	Number of DDW Wells	Percent Priority 1 Land Area	Percent Priority 2 Land Area	Percent Priority 3 Land Area	Percent Low Vulnerability Land Area
3a	33	82%	59%	377	43%	100	3	0%	7%	85%	9%
3b	25	35%	30%	166	20%	135	54	0%	1%	93%	7%
3c	53	58%	57%	284	42%	157	9	0%	14%	68%	18%
3d	7	2%	1%	8	1%	116	21	0%	9%	91%	0%
3e	27	66%	64%	450	46%	74	7	0%	13%	85%	2%
3f	14	27%	13%	96	17%	70	34	0%	16%	84%	0%
3g	57	68%	56%	433	50%	112	7	0%	12%	83%	5%
3h	16	53%	55%	102	36%	15	0	0%	7%	88%	5%
3i	13	83%	49%	101	54%	30	1	0%	21%	70%	9%
3j	26	46%	13%	15	10%	43	0	0%	8%	72%	20%
3k	46	92%	60%	423	64%	92	6	0%	3%	96%	1%
3l	55	85%	47%	279	63%	62	4	0%	4%	90%	6%
3m	34	74%	34%	65	30%	58	0	0%	2%	77%	22%
3n	68	88%	55%	108	77%	63	0	0%	0%	24%	76%
3o	49	94%	78%	515	92%	82	29	0%	4%	92%	4%
3p	17	83%	76%	146	80%	19	2	0%	4%	67%	29%
3q	23	61%	51%	99	56%	42	18	0%	1%	13%	86%
3r	20	87%	38%	124	52%	69	0	0%	21%	73%	6%
3s	33	76%	36%	138	40%	61	3	0%	16%	75%	9%
3t	42	79%	51%	302	53%	91	4	0%	10%	87%	3%
3u	30	66%	16%	126	36%	104	1	0%	12%	79%	9%
3v	20	58%	45%	252	34%	65	11	0%	11%	79%	10%
3w	11	74%	62%	119	44%	32	0	0%	9%	90%	0%
3x	43	85%	47%	223	52%	138	5	0%	4%	95%	1%
3y	29.3	92%	51%	178	54%	70	5	0%	3%	96%	1%
3z	21.0	42%	40%	116	26%	49	11	0%	1%	1%	97%
3aa	30.9	74%	28%	58	27%	66	0	0%	0%	1%	98%
3ab	32	75%	46%	234	20%	81	13	0%	0%	2%	98%
Tier 4	785	54%	46%	3564	32%	795	117	0%	2%	11%	87%

TABLE 7
Top Ranked Monitoring Network Candidate Wells by Subarea

Monitoring Subarea	Well Rank Within Subarea	Estimated Total Well Depth (feet)	Percent Agricultural Land in Vicinity (within 1 mile)	Percent Same Land Use as 1995 in Vicinity (within 1 mile)	Dominant Land Use Category in Vicinity (within 1 mile)	Monitoring Entity[1] (acronyms defined on last page of table)	Well Type	First Year Sampled	Last Year Sampled	Number of Historical Water Quality Tests	Maximum Interval Between NO3 Tests (years)	Average Interval Between NO3 Tests (years)	Maximum Interval Between TDS Tests (years)	Average Interval Between TDS Tests (years)
1a	1	200 - 400	92	45	Nut Trees	DDW	PUBLIC SUPPLY	2003	2015	23	1.3	0.5	3.1	2.3
1a	2	100 - 200	12	84	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	44	3.4	0.7	5.9	2.3
1a	3	> 400	14	86	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2013	49	3.0	0.6	8.8	2.8
1a	4	> 400	16	86	Non Agricultural	DDW	PUBLIC SUPPLY	1993	2015	61	2.7	0.4	6.0	2.6
1a	5	200 - 400	8	92	Non Agricultural	DDW	PUBLIC SUPPLY	1995	2014	29	1.9	0.7	4.1	2.1
1a	6	200 - 400	14	78	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	76	3.4	0.4	3.4	2.1
1a	7	100 - 200	25	81	Non Agricultural	DDW	PUBLIC SUPPLY	2003	2014	12	7.6	1.6	8.2	0.8
1a	8	200 - 400	0	91	Non Agricultural	DDW	PUBLIC SUPPLY	1992	2014	28	3.2	0.8	3.2	2.6
1a	9	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	24	3.0	1.2	3.0	2.3
1a	10	200 - 400	70	48	Nut Trees	DDW	PUBLIC SUPPLY	2003	2005	3	1.0	0.7	N/A	0.0
1b	1	100 - 200	84	31	Nut Trees	DDW	PUBLIC SUPPLY	2001	2014	59	0.9	0.2	3.2	2.0
1b	2	100 - 200	94	34	Nut Trees	GAMA	PUBLIC SUPPLY	2013	2013	1	N/A	0.0	N/A	0.0
1b	3	200 - 400	48	53	Non Agricultural	DDW	PUBLIC SUPPLY	1998	2015	54	1.6	0.3	3.0	2.0
1b	4	200 - 400	55	39	Non Agricultural	DDW	PUBLIC SUPPLY	1996	2011	118	1.3	0.1	3.6	1.9
1b	5	200 - 400	75	39	Nut Trees	DDW	PUBLIC SUPPLY	2003	2014	12	2.0	0.9	3.0	2.0
1b	6	200 - 400	12	88	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	45	3.5	0.6	3.8	2.0
1b	7	100 - 200	92	48	Nut Trees	DDW	PUBLIC SUPPLY	2003	2005	4	1.0	0.5	N/A	0.0
1b	8	100 - 200	64	56	Nut Trees	DDW	PUBLIC SUPPLY	2003	2014	36	1.0	0.3	3.0	2.3
1b	9	100 - 200	86	66	Nut Trees	TID	OTHER	2009	2009	1	N/A	0.0	N/A	0.0
1b	10	200 - 400	62	31	Nut Trees	DDW	PUBLIC SUPPLY	1995	2015	32	1.8	0.6	3.0	1.6
1c	1	200 - 400	14	83	Non Agricultural	DDW	PUBLIC SUPPLY	1991	2015	310	3.0	0.1	5.0	2.9
1c	2	200 - 400	31	47	Non Agricultural	DDW	PUBLIC SUPPLY	1984	2014	29	3.1	1.0	6.0	2.3
1c	3	200 - 400	19	58	Non Agricultural	DDW	PUBLIC SUPPLY	1991	2014	26	4.0	0.9	4.0	2.3
1c	4	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	35	6.6	0.8	10.0	2.5
1c	5	100 - 200	2	98	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2013	36	3.6	0.8	10.1	3.7
1c	6	100 - 200	67	52	Nut Trees	USGS	UNKNOWN	1994	2001	4	7.0	3.5	7.0	1.8
1c	7	100 - 200	53	33	Non Agricultural	USGS	UNKNOWN	1995	2002	4	7.2	3.5	7.2	1.8
1c	8	100 - 200	45	22	Non Agricultural	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	N/A	N/A	0.0
1c	9	100 - 200	2	98	Non Agricultural	USGS	UNKNOWN	2001	2001	4	N/A	N/A	N/A	0.0
1c	10	100 - 200	42	38	Non Agricultural	GAMA	PUBLIC SUPPLY	2001	2001	2	N/A	N/A	N/A	0.0
1d	1	200 - 400	38	58	Non Agricultural	DDW	PUBLIC SUPPLY	1996	2015	139	2.1	0.1	3.1	2.0
1d	2	100 - 200	42	52	Non Agricultural	DDW	PUBLIC SUPPLY	1986	1995	6	3.7	1.5	3.7	1.8
1d	3	100 - 200	50	48	Non Agricultural	GAMA	PUBLIC SUPPLY	2001	2001	2	N/A	N/A	N/A	0.0
1d	4	100 - 200	41	34	Non Agricultural	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	N/A	N/A	0.0
1d	5	100 - 200	38	58	Non Agricultural	DDW	PUBLIC SUPPLY	2004	2015	280	0.2	0.0	N/A	N/A
1e	1	100 - 200	83	67	Nut Trees	USGS	UNKNOWN	2001	2012	15	8.0	1.8	8.0	0.7
1e	2	100 - 200	84	70	Nut Trees	USGS	UNKNOWN	1994	2002	7	7.2	3.5	7.2	1.1
1e	3	100 - 200	83	42	Nut Trees	GAMA	PUBLIC SUPPLY	1994	2010	7	12.0	4.0	12.0	2.3
1e	4	100 - 200	70	38	Grains/Cotton	TID	OTHER	2009	2009	1	N/A	0.0	N/A	0.0
1e	5	100 - 200	77	38	Nut Trees	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	0.0	N/A	0.0
1e	6	100 - 200	81	53	Nut Trees	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	0.0	N/A	0.0
1e	7	100 - 200	84	42	Nut Trees	GAMA	PUBLIC SUPPLY	1994	1994	2	N/A	0.0	N/A	0.0
1e	8	100 - 200	86	56	Nut Trees	DWR	UNKNOWN	1948	1948	1	N/A	N/A	N/A	0.0
1e	9	100 - 200	77	56	Nut Trees	GAMA	PUBLIC SUPPLY	2002	2002	1	N/A	N/A	N/A	0.0
1e	10	100 - 200	84	50	Nut Trees	DDW	PUBLIC SUPPLY	2003	2015	45	0.5	0.3	N/A	N/A

TABLE 7
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Monitoring Subarea	Well Rank Within Subarea	Estimated Total Well Depth (feet)	Percent Agricultural Land in Vicinity (within 1 mile)	Percent Same Land Use as 1995 in Vicinity (within 1 mile)	Dominant Land Use Category in Vicinity (within 1 mile)	Monitoring Entity[1] (acronyms defined on last page of table)	Well Type	First Year Sampled	Last Year Sampled	Number of Historical Water Quality Tests	Maximum Interval Between NO3 Tests (years)	Average Interval Between NO3 Tests (years)	Maximum Interval Between TDS Tests (years)	Average Interval Between TDS Tests (years)
1f	1	100 - 200	95	20	Double Crops	DDW	PUBLIC SUPPLY	2001	2015	58	0.5	0.2	3.0	2.0
1f	2	200 - 400	78	41	Nut Trees	DDW	PUBLIC SUPPLY	1986	2014	23	3.6	1.2	3.6	2.5
1f	3	200 - 400	83	56	Nut Trees	DDW	PUBLIC SUPPLY	2004	2015	37	0.9	0.3	N/A	0.0
1f	4	100 - 200	44	27	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2006	18	6.4	1.2	6.4	3.8
1f	5	200 - 400	77	44	Nut Trees	USGS	UNKNOWN	1958	1965	7	3.8	1.4	1.8	1.0
1f	6	100 - 200	92	36	Nut Trees	GAMA	PUBLIC SUPPLY	2001	2012	2	0.3	0.0	N/A	0.0
1f	7	100 - 200	58	39	Non Agricultural	DDW	PUBLIC SUPPLY	1986	1999	21	3.7	0.6	3.7	2.5
1f	8	100 - 200	78	45	Nut Trees	DWR	UNKNOWN	1957	1965	9	3.8	1.3	1.8	0.9
1f	9	100 - 200	92	36	Nut Trees	GAMA	PUBLIC SUPPLY	1986	1999	21	3.7	0.6	3.7	2.5
1f	10	100 - 200	81	19	Double Crops	GAMA	PUBLIC SUPPLY	1958	1965	8	3.8	1.4	1.8	0.9
1g	1	100 - 200	75	36	Nut Trees	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
1g	2	200 - 400	55	56	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	99	6.5	0.3	6.5	2.8
1g	3	200 - 400	39	62	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	65	4.0	0.4	4.5	2.7
1g	4	200 - 400	52	28	Non Agricultural	DDW	PUBLIC SUPPLY	1996	2014	59	2.3	0.3	3.7	2.1
1g	5	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1987	2014	63	6.5	0.4	6.5	2.7
1g	6	200 - 400	41	47	Non Agricultural	DDW	PUBLIC SUPPLY	1989	2014	22	3.3	1.1	3.8	2.4
1g	7	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	39	4.0	0.7	4.0	2.5
1g	8	200 - 400	8	78	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2012	60	3.4	0.4	5.9	2.4
1g	9	100 - 200	98	91	Nut Trees	GAMA	PUBLIC SUPPLY	1957	1960	5	1.1	0.8	1.1	0.6
1g	10	200 - 400	34	36	Non Agricultural	DDW	PUBLIC SUPPLY	1990	2014	24	2.8	1.0	3.7	2.0
1h	1	100 - 200	72	55	Nut Trees	GAMA	PUBLIC SUPPLY	1958	1966	9	2.8	1.3	1.9	0.9
1h	2	200 - 400	75	39	Nut Trees	USGS	UNKNOWN	1994	2001	5	7.1	3.5	7.1	1.4
1h	3	200 - 400	80	50	Nut Trees	USGS	UNKNOWN	1958	1966	7	2.8	1.3	1.9	1.1
1h	4	100 - 200	80	50	Nut Trees	DWR	UNKNOWN	1954	1966	8	2.8	1.3	4.6	1.5
1h	5	> 400	23	55	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2015	26	2.0	0.5	N/A	0.0
1h	6	100 - 200	64	56	Nut Trees	GAMA	PUBLIC SUPPLY	1959	1965	3	1.2	0.5	4.8	2.0
1h	7	> 400	23	55	Non Agricultural	DDW	PUBLIC SUPPLY	2004	2014	6	7.5	1.7	8.7	4.0
1i	1	100 - 200	72	22	Non Agricultural	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	N/A	N/A	0.0
1i	2	100 - 200	53	20	Non Agricultural	DWR	UNKNOWN	1975	1975	1	N/A	0.0	N/A	0.0
1i	3	100 - 200	67	23	Non Agricultural	USGS	UNKNOWN	1985	1985	1	N/A	0.0	N/A	0.0
1i	4	100 - 200	80	36	Non Agricultural	DDW	PUBLIC SUPPLY	2007	2015	15	1.0	0.5	N/A	N/A
1i	5	100 - 200	75	9	Grasses	GAMA	PUBLIC SUPPLY	2013	2013	1	N/A	0.0	N/A	N/A
1i	6	100 - 200	75	31	Grains/Cotton	Dairy	RESIDENTIAL	2007	2007	1	N/A	0.0	N/A	N/A
1i	7	100 - 200	75	9	Grasses	GAMA	PUBLIC SUPPLY	2013	2013	1	N/A	0.0	N/A	N/A
1i	8	100 - 200	56	31	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2014	12	3.6	1.0	N/A	N/A
1i	9	100 - 200	62	11	Non Agricultural	Dairy	RESIDENTIAL	2007	2007	1	N/A	0.0	N/A	N/A
1i	10	100 - 200	75	31	Grains/Cotton	Dairy	RESIDENTIAL	2007	2007	1	N/A	0.0	N/A	N/A
1j	1	100 - 200	72	61	Nut Trees	MID	UNKNOWN	2005	2007	2	1.8	1.0	1.8	1.0
1j	2	100 - 200	72	69	Nut Trees	MID	UNKNOWN	2005	2005	1	N/A	0.0	N/A	0.0
1j	3	100 - 200	41	27	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
1j	4	100 - 200	19	75	Non Agricultural	MID	UNKNOWN	2008	2008	1	N/A	0.0	N/A	0.0
1j	5	200 - 400	8	86	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2013	48	5.3	0.6	6.0	3.4
1j	6	200 - 400	27	70	Non Agricultural	DDW	PUBLIC SUPPLY	1992	2014	24	2.3	0.9	3.0	2.4
1j	7	200 - 400	2	98	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2013	69	5.3	0.4	6.0	3.4
1j	8	100 - 200	91	70	Nut Trees	GAMA	PUBLIC SUPPLY	2008	2010	3	2.0	1.0	2.0	0.7
1j	9	200 - 400	77	67	Nut Trees	USGS	UNKNOWN	1983	1985	6	N/A	N/A	1.0	0.3
1j	10	100 - 200	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2006	42	5.3	0.5	6.0	3.5

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1k	1	100 - 200	95	17	Nut Trees	MID	UNKNOWN	2008	2008	1	N/A	0.0	N/A	0.0
1k	2	100 - 200	67	58	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
1k	3	100 - 200	53	52	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
1k	4	100 - 200	25	77	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
1k	5	100 - 200	53	47	Non Agricultural	MID	UNKNOWN	2008	2008	1	N/A	0.0	N/A	0.0
1k	6	100 - 200	42	52	Non Agricultural	MID	UNKNOWN	2008	2008	2	0.3	0.0	0.3	0.0
1k	7	100 - 200	36	47	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2015	25	2.0	0.5	N/A	0.0
1k	8	100 - 200	92	67	Vegetables	USGS	UNKNOWN	1957	1966	8	4.8	1.5	2.8	1.1
1k	9	100 - 200	0	98	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	26	4.1	1.2	6.4	2.9
1k	10	200 - 400	28	39	Non Agricultural	DDW	PUBLIC SUPPLY	1992	2015	24	2.1	0.9	6.4	2.8
1l	1	100 - 200	5	95	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	23	6.1	1.3	6.1	2.9
1l	2	100 - 200	77	8	Double Crops	DDW	PUBLIC SUPPLY	2002	2004	3	1.0	0.7	N/A	0.0
1l	3	100 - 200	78	67	Grasses	GAMA	PUBLIC SUPPLY	1995	1995	2	N/A	0.0	N/A	0.0
1l	4	100 - 200	67	55	Nut Trees	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	N/A	N/A	0.0
1l	5	100 - 200	44	50	Non Agricultural	GAMA	PUBLIC SUPPLY	1950	1966	7	11.2	4.0	10.3	2.3
1l	6	100 - 200	31	83	Non Agricultural	USGS	UNKNOWN	1985	1985	2	N/A	N/A	N/A	0.0
1l	7	100 - 200	100	48	Grasses	GAMA	PUBLIC SUPPLY	1985	1991	2	5.9	3.0	5.9	3.0
1l	8	100 - 200	42	45	Non Agricultural	DDW	PUBLIC SUPPLY	1985	1991	2	5.9	3.0	5.9	3.0
1l	9	100 - 200	33	48	Non Agricultural	GAMA	PUBLIC SUPPLY	1966	1966	2	N/A	0.0	N/A	0.0
1l	10	100 - 200	34	64	Non Agricultural	DWR	UNKNOWN	1950	1966	4	11.2	4.0	10.3	4.0
1m	1	100 - 200	58	30	Non Agricultural	DDW	PUBLIC SUPPLY	2004	2014	12	2.6	0.8	3.8	2.0
1m	2	100 - 200	39	52	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2015	6	5.6	2.2	5.6	2.3
1m	3	100 - 200	8	92	Non Agricultural	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	N/A	N/A	0.0
1m	4	100 - 200	75	22	Double Crops	Dairy	RESIDENTIAL	2007	2007	1	N/A	0.0	N/A	N/A
1m	5	100 - 200	75	22	Double Crops	Dairy	IRRIGATION	2007	2007	1	N/A	0.0	N/A	N/A
1m	6	100 - 200	75	22	Double Crops	Dairy	RESIDENTIAL	2007	2007	1	N/A	0.0	N/A	N/A
1m	7	100 - 200	75	22	Double Crops	Dairy	RESIDENTIAL	2007	2007	1	N/A	0.0	N/A	N/A
1m	8	100 - 200	75	22	Double Crops	Dairy	IRRIGATION	2007	2007	1	N/A	0.0	N/A	N/A
1m	9	100 - 200	75	22	Double Crops	Dairy	IRRIGATION	2007	2007	1	N/A	0.0	N/A	N/A
1m	10	100 - 200	75	22	Double Crops	Dairy	IRRIGATION	2007	2007	1	N/A	0.0	N/A	N/A
1n	1	100 - 200	86	30	Grains/Cotton	GAMA	PUBLIC SUPPLY	1992	2006	45	9.7	0.3	N/A	0.0
1n	2	200 - 400	67	33	Non Agricultural	DDW	PUBLIC SUPPLY	1992	2006	45	9.7	0.3	N/A	0.0
1n	3	100 - 200	95	42	Grains/Cotton	DWR	UNKNOWN	1961	1965	3	3.2	1.3	3.2	1.3
1n	4	200 - 400	81	17	Grains/Cotton	USGS	UNKNOWN	1961	1965	3	3.2	1.3	3.2	1.3
1n	5	> 400	91	19	Double Crops	USGS	UNKNOWN	1985	1985	2	N/A	N/A	N/A	0.0
1n	6	100 - 200	95	34	Grains/Cotton	GAMA	PUBLIC SUPPLY	1961	1965	4	3.2	1.3	3.2	1.0
1n	7	100 - 200	94	12	Nut Trees	DWR	UNKNOWN	1961	1961	1	N/A	N/A	N/A	0.0
1n	8	100 - 200	75	11	Non Agricultural	GAMA	PUBLIC SUPPLY	2008	2008	1	N/A	0.0	N/A	0.0
1n	9	100 - 200	94	0	Double Crops	DWR	UNKNOWN	1961	1961	1	N/A	N/A	N/A	0.0
1n	10	100 - 200	70	47	Grains/Cotton	DWR	UNKNOWN	1977	1977	1	N/A	0.0	N/A	0.0

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1o	1	> 400	31	69	Non Agricultural	DDW	PUBLIC SUPPLY	1994	2014	42	3.0	0.5	3.0	1.5
1o	2	100 - 200	80	19	Nut Trees	GAMA	PUBLIC SUPPLY	2008	2008	1	N/A	0.0	N/A	0.0
1o	3	100 - 200	50	44	Non Agricultural	GAMA	PUBLIC SUPPLY	1966	1966	1	N/A	0.0	N/A	0.0
1o	4	100 - 200	47	42	Non Agricultural	DWR	UNKNOWN	1965	1971	2	6.2	3.0	6.2	3.0
1o	5	100 - 200	61	36	Non Agricultural	DWR	UNKNOWN	1971	1971	1	N/A	0.0	N/A	0.0
1o	6	> 400	52	34	Non Agricultural	USGS	UNKNOWN	1987	1987	1	N/A	0.0	N/A	0.0
1o	7	100 - 200	52	34	Non Agricultural	DDW	PUBLIC SUPPLY	1985	1994	5	3.6	1.8	3.6	2.3
1o	8	100 - 200	45	50	Non Agricultural	GAMA	PUBLIC SUPPLY	1966	1966	1	N/A	0.0	N/A	0.0
1o	9	100 - 200	38	62	Non Agricultural	DDW	PUBLIC SUPPLY	1985	1991	2	6.5	3.0	6.5	3.0
1o	10	100 - 200	38	62	Non Agricultural	DWR	UNKNOWN	1965	1965	1	N/A	0.0	N/A	0.0
1p	1	> 400	27	75	Non Agricultural	DDW	PUBLIC SUPPLY	1987	2014	20	9.2	1.4	9.2	4.0
1p	2	100 - 200	67	20	Grapes	GAMA	PUBLIC SUPPLY	2013	2013	1	N/A	0.0	N/A	0.0
1p	3	200 - 400	44	58	Non Agricultural	DDW	PUBLIC SUPPLY	1987	2011	18	9.2	1.3	9.2	3.5
1p	4	200 - 400	64	36	Nut Trees	DDW	PUBLIC SUPPLY	2002	2014	12	2.1	1.0	N/A	0.0
1p	5	> 400	3	97	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2013	23	4.9	1.2	4.9	2.8
1p	6	200 - 400	23	77	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	28	4.6	1.0	4.6	1.9
1p	7	200 - 400	12	84	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	24	2.9	1.2	3.0	2.5
1p	8	> 400	19	69	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	32	2.9	0.9	3.0	2.5
1p	9	> 400	17	83	Non Agricultural	DDW	PUBLIC SUPPLY	1995	2015	20	2.0	1.0	3.1	1.9
1p	10	200 - 400	3	97	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	28	2.9	1.0	3.0	1.9
1q	1	200 - 400	81	69	Nut Trees	DDW	PUBLIC SUPPLY	2002	2014	20	2.2	0.6	3.0	2.4
1q	2	100 - 200	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	83	3.5	0.4	3.3	1.6
1q	3	100 - 200	2	92	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	88	3.3	0.3	6.3	1.7
1q	4	200 - 400	22	59	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	79	3.5	0.4	4.5	1.9
1q	5	100 - 200	64	59	Nut Trees	DDW	PUBLIC SUPPLY	2002	2012	9	2.4	1.1	N/A	0.0
1q	6	100 - 200	12	88	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2014	51	1.5	0.2	3.6	2.2
1q	7	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1998	2014	26	1.9	0.6	3.6	1.5
1q	8	200 - 400	0	94	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2013	36	3.3	0.8	3.3	1.5
1q	9	200 - 400	81	69	Nut Trees	DDW	PUBLIC SUPPLY	1992	2014	14	12.3	1.6	12.3	4.4
1q	10	100 - 200	94	56	Nut Trees	TID	OTHER	1999	2008	5	4.7	1.8	4.7	1.8
1r	1	100 - 200	100	52	Nut Trees	DWR	UNKNOWN	1977	1977	1	N/A	0.0	N/A	0.0
1s	1	100 - 200	97	39	Grasses	DWR	UNKNOWN	1964	1964	1	N/A	0.0	N/A	0.0
1s	2	100 - 200	100	8	Nut Trees	DWR	UNKNOWN	1963	1963	1	N/A	N/A	N/A	0.0
1s	3	100 - 200	33	9	Non Agricultural	DDW	PUBLIC SUPPLY	1997	2015	22	2.3	0.8	3.3	1.1
1s	4	100 - 200	81	19	Nut Trees	DDW	PUBLIC SUPPLY	2002	2012	11	2.0	0.9	3.1	2.3
1s	5	100 - 200	94	3	Nut Trees	DWR	UNKNOWN	1964	1984	3	18.7	9.0	18.7	6.7
1s	6	200 - 400	36	9	Non Agricultural	DDW	PUBLIC SUPPLY	1990	2012	20	2.9	1.1	3.6	1.2
1s	7	100 - 200	95	3	Nut Trees	DWR	UNKNOWN	1984	1984	1	N/A	0.0	N/A	0.0
1s	8	100 - 200	94	17	Nut Trees	DWR	UNKNOWN	1976	1976	1	N/A	0.0	N/A	0.0
1s	9	200 - 400	75	19	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
1s	10	100 - 200	59	45	Nut Trees	DDW	PUBLIC SUPPLY	2006	2014	9	1.9	0.9	6.3	3.0

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Monitoring Subarea	Well Rank Within Subarea	Estimated Total Well Depth (feet)	Percent Agricultural Land in Vicinity (within 1 mile)	Percent Same Land Use as 1995 in Vicinity (within 1 mile)	Dominant Land Use Category in Vicinity (within 1 mile)	Monitoring Entity[1] (acronyms defined on last page of table)	Well Type	First Year Sampled	Last Year Sampled	Number of Historical Water Quality Tests	Maximum Interval Between NO3 Tests (years)	Average Interval Between NO3 Tests (years)	Maximum Interval Between TDS Tests (years)	Average Interval Between TDS Tests (years)
2a	1	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	316	2.4	0.1	6.0	1.8
2a	2	200 - 400	64	41	Non Agricultural	DDW	PUBLIC SUPPLY	2003	2015	15	2.2	0.8	3.0	1.8
2a	3	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	54	2.1	0.6	3.1	2.4
2a	4	200 - 400	33	61	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2015	49	1.0	0.3	6.0	3.0
2a	5	200 - 400	0	97	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2003	43	2.1	0.4	3.1	2.4
2a	6	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	89	2.3	0.3	9.0	2.7
2a	7	200 - 400	25	83	Non Agricultural	DDW	PUBLIC SUPPLY	2006	2014	13	1.0	0.6	3.1	2.0
2a	8	200 - 400	2	97	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	38	3.4	0.8	6.1	3.0
2a	9	200 - 400	5	92	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	21	4.7	1.3	5.3	2.6
2a	10	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2007	45	2.8	0.5	8.9	3.8
2b	1	200 - 400	78	25	Nut Trees	DDW	PUBLIC SUPPLY	2004	2014	13	1.4	0.8	3.0	1.5
2b	2	100 - 200	94	17	Grains/Cotton	DWR	UNKNOWN	1944	1984	11	23.0	5.4	17.9	3.6
2b	3	100 - 200	88	50	Nut Trees	DWR	UNKNOWN	1934	1985	10	24.0	5.6	21.3	5.1
2b	4	100 - 200	100	66	Nut Trees	GAMA	PUBLIC SUPPLY	1948	1966	7	N/A	N/A	11.0	2.6
2b	5	100 - 200	95	44	Nut Trees	GAMA	PUBLIC SUPPLY	1944	1966	7	N/A	N/A	10.9	3.1
2b	6	100 - 200	81	47	Nut Trees	USGS	UNKNOWN	1947	1966	3	N/A	N/A	18.9	6.3
2b	7	100 - 200	80	2	Grasses	GAMA	PUBLIC SUPPLY	1955	1980	17	13.0	3.8	13.0	1.5
2b	8	100 - 200	92	16	Nut Trees	USGS	UNKNOWN	1960	1980	6	13.0	3.8	13.0	3.3
2b	9	100 - 200	98	52	Nut Trees	DWR	UNKNOWN	1957	1966	4	N/A	N/A	4.1	2.3
2b	10	100 - 200	94	17	Grains/Cotton	USGS	UNKNOWN	1966	1966	1	N/A	N/A	N/A	0.0
2c	1	100 - 200	84	56	Nut Trees	DDW	PUBLIC SUPPLY	2002	2015	50	1.7	0.3	3.0	1.5
2c	2	100 - 200	91	62	Nut Trees	DWR	UNKNOWN	1934	1985	14	16.1	3.5	14.5	3.6
2c	3	100 - 200	94	20	Double Crops	GAMA	PUBLIC SUPPLY	1934	1979	20	16.1	3.1	14.5	2.3
2c	4	200 - 400	95	2	Grains/Cotton	DDW	PUBLIC SUPPLY	2003	2014	14	1.0	0.8	3.1	1.5
2c	5	100 - 200	94	86	Nut Trees	GAMA	PUBLIC SUPPLY	1954	1966	6	N/A	0.0	10.1	2.0
2c	6	100 - 200	92	20	Nut Trees	DDW	PUBLIC SUPPLY	2004	2014	20	1.0	0.5	3.3	1.5
2c	7	100 - 200	94	47	Nut Trees	GAMA	PUBLIC SUPPLY	1948	1966	5	N/A	N/A	12.3	3.6
2c	8	100 - 200	94	34	Grains/Cotton	GAMA	PUBLIC SUPPLY	1934	1966	7	N/A	N/A	21.3	4.6
2c	9	200 - 400	95	2	Grains/Cotton	DDW	PUBLIC SUPPLY	2002	2014	23	1.1	0.5	3.5	2.3
2c	10	100 - 200	100	58	Nut Trees	GAMA	PUBLIC SUPPLY	1952	1966	7	2.5	1.0	5.2	2.0
2d	1	100 - 200	98	3	Double Crops	GAMA	PUBLIC SUPPLY	1943	1969	24	N/A	N/A	9.0	1.1
2d	2	200 - 400	78	56	Nut Trees	USGS	UNKNOWN	1956	1966	9	3.9	1.3	2.0	1.1
2d	3	100 - 200	81	22	Grains/Cotton	DWR	UNKNOWN	1957	1969	11	N/A	N/A	3.0	1.1
2d	4	100 - 200	55	28	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2014	14	2.6	0.9	3.2	2.0
2d	5	100 - 200	95	22	Double Crops	GAMA	PUBLIC SUPPLY	1943	1951	12	N/A	N/A	2.0	0.7
2d	6	100 - 200	89	56	Nut Trees	TID	OTHER	2003	2008	2	5.3	2.5	5.3	2.5
2d	7	100 - 200	94	34	Double Crops	TID	OTHER	2007	2009	2	1.8	1.0	1.8	1.0
2d	8	100 - 200	84	6	Nut Trees	TID	OTHER	2009	2009	1	N/A	0.0	N/A	0.0
2d	9	100 - 200	67	59	Non Agricultural	GAMA	PUBLIC SUPPLY	1956	1966	11	3.9	1.3	2.0	0.9
2d	10	100 - 200	78	19	Double Crops	DDW	PUBLIC SUPPLY	2003	2014	22	1.1	0.5	4.5	2.0

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2e	1	200 - 400	67	48	Nut Trees	DDW	PUBLIC SUPPLY	2004	2015	107	0.3	0.1	3.0	1.8
2e	2	100 - 200	83	56	Nut Trees	DDW	PUBLIC SUPPLY	2005	2014	35	1.0	0.3	3.2	2.0
2e	3	100 - 200	80	33	Nut Trees	USGS	UNKNOWN	1994	2001	4	7.0	3.5	7.0	1.8
2e	4	100 - 200	75	27	Nut Trees	USGS	UNKNOWN	1987	1987	1	N/A	0.0	N/A	0.0
2e	5	100 - 200	72	44	Nut Trees	DDW	PUBLIC SUPPLY	2005	2007	10	0.6	0.2	N/A	0.0
2e	6	100 - 200	27	22	Non Agricultural	DDW	PUBLIC SUPPLY	2004	2014	14	1.1	0.7	3.1	2.3
2e	7	100 - 200	64	39	Nut Trees	DDW	PUBLIC SUPPLY	1992	1992	1	N/A	0.0	N/A	0.0
2e	8	100 - 200	56	44	Nut Trees	DWR	UNKNOWN	1949	1949	1	N/A	N/A	N/A	0.0
2e	9	100 - 200	56	58	Nut Trees	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
2e	10	100 - 200	33	45	Non Agricultural	TID	OTHER	2002	2009	2	6.7	3.5	6.7	3.5
2f	1	100 - 200	81	72	Nut Trees	TID	OTHER	2009	2009	1	N/A	0.0	N/A	0.0
2f	2	100 - 200	92	78	Nut Trees	GAMA	PUBLIC SUPPLY	2003	2003	2	N/A	0.0	N/A	0.0
2f	3	100 - 200	84	45	Nut Trees	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	0.0	N/A	0.0
2f	4	100 - 200	97	95	Nut Trees	DWR	UNKNOWN	1965	1965	1	N/A	0.0	N/A	0.0
2f	5	100 - 200	80	42	Nut Trees	USGS	UNKNOWN	1965	1965	1	N/A	0.0	N/A	0.0
2f	6	200 - 400	73	59	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
2f	7	100 - 200	97	19	Double Crops	DWR	UNKNOWN	1988	1988	1	N/A	0.0	N/A	0.0
2f	8	100 - 200	69	52	Nut Trees	GAMA	PUBLIC SUPPLY	2002	2002	1	N/A	N/A	N/A	0.0
2f	9	100 - 200	84	55	Nut Trees	TID	OTHER	2000	2009	4	6.6	2.3	6.6	2.3
2f	10	100 - 200	73	59	Nut Trees	DWR	UNKNOWN	1958	1966	7	3.8	1.3	2.7	1.1
2g	1	100 - 200	80	55	Nut Trees	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
2g	2	100 - 200	69	47	Nut Trees	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
2g	3	100 - 200	45	47	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
2g	4	100 - 200	66	20	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
2g	5	100 - 200	80	81	Nut Trees	GAMA	PUBLIC SUPPLY	2012	2013	3	0.2	0.3	N/A	0.0
2g	6	200 - 400	72	73	Nut Trees	DDW	PUBLIC SUPPLY	2008	2014	3	5.3	2.0	N/A	0.0
2g	7	100 - 200	69	64	Nut Trees	DDW	PUBLIC SUPPLY	2004	2015	47	1.9	0.2	2.0	1.1
2g	8	100 - 200	91	27	Grains/Cotton	USGS	UNKNOWN	1983	1985	6	N/A	N/A	1.0	0.3
2g	9	100 - 200	92	72	Nut Trees	GAMA	PUBLIC SUPPLY	1957	1965	6	5.0	1.6	5.0	1.3
2g	10	200 - 400	89	78	Nut Trees	USGS	UNKNOWN	1987	1987	1	N/A	0.0	N/A	0.0
2h	1	100 - 200	53	31	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
2h	2	100 - 200	94	36	Double Crops	USGS	UNKNOWN	1994	2012	17	7.2	1.8	7.2	1.1
2h	3	100 - 200	83	39	Grains/Cotton	USGS	UNKNOWN	1992	1993	4	1.0	0.5	1.0	0.3
2h	4	100 - 200	69	48	Nut Trees	GAMA	PUBLIC SUPPLY	1957	1966	10	4.0	1.3	2.0	0.9
2h	5	100 - 200	62	45	Non Agricultural	USGS	UNKNOWN	1957	1966	9	4.0	1.3	2.0	1.0
2h	6	100 - 200	78	38	Grasses	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	0.0	N/A	0.0
2h	7	100 - 200	88	34	Nut Trees	DWR	UNKNOWN	1975	1975	1	N/A	0.0	N/A	0.0
2h	8	100 - 200	66	44	Non Agricultural	DWR	UNKNOWN	1957	1966	9	4.0	1.3	2.0	1.0
2h	9	100 - 200	88	19	Double Crops	USGS	UNKNOWN	1994	1994	2	N/A	N/A	N/A	0.0
2h	10	100 - 200	20	70	Non Agricultural	GAMA	PUBLIC SUPPLY	1990	2002	27	3.1	0.4	3.2	1.5

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2i	1	100 - 200	94	5	Grasses	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
2i	2	100 - 200	83	17	Nut Trees	MID	UNKNOWN	2008	2008	1	N/A	0.0	N/A	0.0
2i	3	200 - 400	92	66	Nut Trees	USGS	UNKNOWN	1994	2001	4	7.1	3.5	7.1	1.8
2i	4	100 - 200	89	31	Vegetables	USGS	UNKNOWN	1995	2002	4	7.0	3.5	7.0	1.8
2i	5	> 400	89	2	Nut Trees	USGS	UNKNOWN	1983	1985	6	N/A	N/A	1.0	0.3
2i	6	200 - 400	92	2	Nut Trees	USGS	UNKNOWN	1985	1985	2	N/A	N/A	N/A	0.0
2i	7	100 - 200	72	31	Nut Trees	GAMA	PUBLIC SUPPLY	1957	1966	11	3.0	1.1	1.2	0.8
2i	8	100 - 200	83	33	Grasses	GAMA	PUBLIC SUPPLY	1957	1966	9	4.8	1.5	2.8	1.0
2i	9	100 - 200	83	17	Nut Trees	USGS	UNKNOWN	1957	1966	10	3.0	1.1	1.2	0.9
2i	10	100 - 200	83	17	Nut Trees	DWR	UNKNOWN	1957	1975	11	9.0	2.0	9.0	1.6
2j	1	100 - 200	100	100	Rice	DWR	UNKNOWN	1954	1954	1	N/A	N/A	N/A	0.0
2j	2	100 - 200	95	78	Grasses	DWR	UNKNOWN	1971	1979	2	8.4	4.0	8.4	4.0
2j	3	100 - 200	94	56	Grains/Cotton	DWR	UNKNOWN	1962	1965	3	2.1	1.0	2.1	1.0
2j	4	100 - 200	94	20	Grains/Cotton	USGS	UNKNOWN	1967	1967	2	N/A	N/A	0.1	0.0
2j	5	200 - 400	94	30	Grains/Cotton	USGS	UNKNOWN	1985	1985	2	N/A	N/A	N/A	0.0
2j	6	100 - 200	98	44	Grains/Cotton	DWR	UNKNOWN	1961	1961	1	N/A	N/A	N/A	0.0
2j	7	100 - 200	97	6	Grains/Cotton	DWR	UNKNOWN	1954	1965	2	N/A	0.0	11.2	5.5
2j	8	100 - 200	88	38	Grains/Cotton	GAMA	PUBLIC SUPPLY	1961	1961	1	N/A	N/A	N/A	0.0
2j	9	100 - 200	94	41	Grasses	DWR	UNKNOWN	1967	1967	2	N/A	N/A	0.1	0.0
2j	10	100 - 200	52	52	Non Agricultural	DWR	UNKNOWN	1979	1979	1	N/A	0.0	N/A	0.0
2k	1	100 - 200	89	27	Nut Trees	DDW	PUBLIC SUPPLY	2005	2014	14	1.0	0.6	3.6	2.3
2k	2	100 - 200	89	41	Non Agricultural	Dairy	IRRIGATION	2007	2008	2	1.0	0.5	N/A	N/A
2k	3	> 400	89	27	Nut Trees	DDW	PUBLIC SUPPLY	2002	2010	9	2.1	0.9	N/A	N/A
2l	1	200 - 400	3	91	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	59	3.2	0.5	3.3	1.6
2l	2	100 - 200	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2010	83	2.7	0.3	3.5	1.5
2l	3	100 - 200	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2007	68	3.3	0.3	3.3	1.9
2l	4	200 - 400	72	44	Nut Trees	DDW	PUBLIC SUPPLY	2002	2014	14	1.0	0.9	3.0	2.0
2l	5	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1984	2014	24	4.5	1.3	9.2	3.1
2l	6	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1988	2014	37	2.8	0.7	3.3	1.5
2l	7	100 - 200	9	91	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2013	34	2.4	0.8	3.0	2.2
2l	8	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	20	6.5	1.4	8.5	2.0
2l	9	100 - 200	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	293	6.3	0.1	7.3	2.6
2l	10	100 - 200	8	92	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	423	4.5	0.1	7.3	2.8
2m	1	100 - 200	92	36	Nut Trees	DDW	PUBLIC SUPPLY	2005	2014	49	0.4	0.2	3.0	2.3
2m	2	200 - 400	94	28	Grasses	DDW	PUBLIC SUPPLY	2003	2007	14	1.3	0.3	3.1	1.5
2m	3	100 - 200	89	19	Grasses	DDW	PUBLIC SUPPLY	2004	2010	20	1.0	0.3	3.0	1.5
2m	4	100 - 200	78	16	Grasses	DDW	PUBLIC SUPPLY	2003	2014	24	2.3	0.5	3.0	1.3
2m	5	100 - 200	94	94	Nut Trees	TID	OTHER	1999	2007	3	4.7	2.7	4.7	2.7
2m	6	100 - 200	98	80	Nut Trees	DWR	UNKNOWN	1980	1980	1	N/A	0.0	N/A	0.0
2m	7	100 - 200	88	41	Nut Trees	GAMA	PUBLIC SUPPLY	2006	2010	4	4.0	2.0	4.0	1.0
2m	8	100 - 200	98	52	Nut Trees	TID	OTHER	2007	2007	1	N/A	0.0	N/A	0.0
2m	9	100 - 200	98	62	Nut Trees	GAMA	PUBLIC SUPPLY	1995	1995	2	N/A	0.0	N/A	0.0
2m	10	100 - 200	100	30	Non Agricultural	TID	OTHER	2007	2009	2	2.0	1.0	2.0	1.0

TABLE 7
Top Ranked Monitoring Network Candidate Wells by Subarea

Monitoring Subarea	Well Rank Within Subarea	Estimated Total Well Depth (feet)	Percent Agricultural Land in Vicinity (within 1 mile)	Percent Same Land Use as 1995 in Vicinity (within 1 mile)	Dominant Land Use Category in Vicinity (within 1 mile)	Monitoring Entity[1] (acronyms defined on last page of table)	Well Type	First Year Sampled	Last Year Sampled	Number of Historical Water Quality Tests	Maximum Interval Between NO3 Tests (years)	Average Interval Between NO3 Tests (years)	Maximum Interval Between TDS Tests (years)	Average Interval Between TDS Tests (years)
2n	1	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1988	2012	65	5.8	0.4	6.5	3.0
2n	2	> 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	51	6.0	0.6	6.0	2.7
2n	3	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	58	3.1	0.5	3.1	2.6
2n	4	100 - 200	73	27	Grasses	DDW	PUBLIC SUPPLY	2007	2015	26	1.2	0.3	3.0	1.5
2n	5	200 - 400	0	94	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	43	4.9	0.7	6.0	2.7
2n	6	100 - 200	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2013	43	5.9	0.6	5.9	3.4
2n	7	> 400	3	59	Non Agricultural	DDW	PUBLIC SUPPLY	1996	2015	74	1.1	0.3	3.1	2.1
2n	8	200 - 400	22	75	Non Agricultural	DDW	PUBLIC SUPPLY	1996	2014	36	1.6	0.5	3.1	2.5
2n	9	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	25	3.7	1.2	3.8	2.4
2n	10	> 400	3	97	Non Agricultural	DDW	PUBLIC SUPPLY	1996	2015	82	1.2	0.2	3.0	2.1

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3a	1	100 - 200	92	84	Grasses	GAMA	PUBLIC SUPPLY	2009	2009	1	N/A	N/A	N/A	0.0
3a	2	100 - 200	92	56	Grasses	GAMA	PUBLIC SUPPLY	2009	2009	4	N/A	N/A	N/A	0.0
3a	3	100 - 200	91	77	Grasses	GAMA	PUBLIC SUPPLY	2007	2007	5	N/A	N/A	N/A	0.0
3a	4	200 - 400	95	72	Nut Trees	DDW	PUBLIC SUPPLY	2004	2014	8	7.2	1.3	N/A	0.0
3a	5	100 - 200	97	61	Nut Trees	DWR	UNKNOWN	1947	1975	4	N/A	0.0	9.8	7.0
3a	6	100 - 200	73	47	Grasses	GAMA	PUBLIC SUPPLY	2009	2009	5	N/A	N/A	N/A	0.0
3a	7	100 - 200	100	80	Nut Trees	GAMA	PUBLIC SUPPLY	1953	1966	5	N/A	N/A	10.0	2.6
3a	8	100 - 200	86	86	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	N/A	N/A	0.0
3a	9	100 - 200	61	73	Grasses	GAMA	PUBLIC SUPPLY	2009	2009	6	N/A	N/A	N/A	0.0
3a	10	100 - 200	97	78	Nut Trees	USGS	UNKNOWN	2001	2001	2	N/A	0.0	N/A	0.0
3b	1	> 400	25	73	Non Agricultural	DDW	PUBLIC SUPPLY	1993	2014	22	3.8	1.0	3.8	2.7
3b	2	100 - 200	55	38	Non Agricultural	DDW	PUBLIC SUPPLY	2003	2015	14	2.0	0.9	3.1	2.3
3b	3	200 - 400	6	83	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	23	3.2	1.2	3.7	2.7
3b	4	200 - 400	0	95	Non Agricultural	DDW	PUBLIC SUPPLY	1993	2015	30	2.5	0.7	7.6	2.9
3b	5	> 400	0	89	Non Agricultural	DDW	PUBLIC SUPPLY	1990	2014	22	3.7	1.1	5.7	2.9
3b	6	> 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1990	2014	24	3.3	1.0	3.7	2.1
3b	7	200 - 400	59	41	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2015	14	1.1	0.9	3.0	2.4
3b	8	200 - 400	5	75	Non Agricultural	DDW	PUBLIC SUPPLY	1990	2014	27	2.3	0.9	4.5	2.3
3b	9	> 400	11	73	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2015	37	1.1	0.4	3.0	2.4
3b	10	200 - 400	0	95	Non Agricultural	DDW	PUBLIC SUPPLY	1984	2014	28	4.6	1.1	6.8	3.3
3c	1	100 - 200	89	36	Vegetables	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
3c	2	100 - 200	92	17	Grains/Cotton	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
3c	3	100 - 200	88	45	Nut Trees	USGS	UNKNOWN	1987	1987	1	N/A	0.0	N/A	0.0
3c	4	100 - 200	94	45	Grapes	USGS	UNKNOWN	1965	1965	1	N/A	0.0	N/A	0.0
3c	5	100 - 200	92	17	Grains/Cotton	DWR	UNKNOWN	1958	1988	9	22.8	4.3	22.8	3.3
3c	6	100 - 200	94	6	Vegetables	DWR	UNKNOWN	1980	1980	1	N/A	0.0	N/A	0.0
3c	7	100 - 200	97	12	Double Crops	DWR	UNKNOWN	1959	1959	1	N/A	N/A	N/A	0.0
3c	8	100 - 200	77	70	Grapes	USGS	UNKNOWN	2004	2004	4	0.5	0.0	0.5	0.0
3c	9	100 - 200	70	17	Non Agricultural	GAMA	PUBLIC SUPPLY	1958	1965	10	4.0	1.2	2.0	0.7
3c	10	100 - 200	53	62	Non Agricultural	DWR	UNKNOWN	1978	1978	1	N/A	0.0	N/A	0.0
3d	1	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	50	3.2	0.6	7.9	3.0
3d	2	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	50	1.9	0.6	8.9	2.9
3d	3	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	43	4.4	0.7	6.3	2.6
3d	4	100 - 200	2	98	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2007	185	3.9	0.1	6.4	3.0
3d	5	200 - 400	2	98	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2005	52	2.9	0.4	9.1	2.0
3d	6	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	30	2.5	1.0	5.8	2.5
3d	7	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	31	3.2	1.0	13.7	3.2
3d	8	200 - 400	0	77	Non Agricultural	DDW	PUBLIC SUPPLY	1987	2015	107	9.9	0.3	16.8	3.0
3d	9	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	35	3.0	0.9	11.8	3.6
3d	10	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2002	37	1.4	0.5	9.0	3.8

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3e	1	100 - 200	23	62	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	28	6.0	1.0	6.0	3.0
3e	2	200 - 400	39	44	Non Agricultural	DDW	PUBLIC SUPPLY	1989	2014	22	8.0	1.1	8.0	3.6
3e	3	200 - 400	25	62	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	37	6.4	0.8	6.4	3.6
3e	4	200 - 400	23	69	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2005	20	6.1	1.0	6.1	3.8
3e	5	100 - 200	67	61	Nut Trees	USGS	UNKNOWN	2001	2001	2	N/A	N/A	N/A	0.0
3e	6	100 - 200	70	41	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3e	7	100 - 200	69	33	Nut Trees	GAMA	PUBLIC SUPPLY	2001	2013	4	8.4	3.0	N/A	0.0
3e	8	100 - 200	72	42	Nut Trees	DWR	UNKNOWN	1958	1963	5	2.1	1.3	2.0	1.0
3e	9	100 - 200	88	36	Nut Trees	DWR	UNKNOWN	1976	1976	1	N/A	0.0	N/A	0.0
3e	10	100 - 200	61	27	Nut Trees	GAMA	PUBLIC SUPPLY	2010	2010	2	N/A	0.0	N/A	0.0
3f	1	> 400	64	28	Non Agricultural	DDW	PUBLIC SUPPLY	2000	2015	44	1.0	0.3	3.1	2.0
3f	2	200 - 400	9	83	Non Agricultural	DDW	PUBLIC SUPPLY	1992	2015	65	1.1	0.4	3.7	2.1
3f	3	200 - 400	0	97	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	74	6.2	0.4	6.2	2.8
3f	4	200 - 400	8	91	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	46	5.5	0.6	6.2	3.3
3f	5	> 400	8	92	Non Agricultural	DDW	PUBLIC SUPPLY	1984	2014	30	3.0	1.0	6.2	2.7
3f	6	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	52	5.6	0.6	5.6	3.0
3f	7	200 - 400	2	98	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	35	3.1	0.8	3.2	2.5
3f	8	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2015	87	3.0	0.3	3.1	2.5
3f	9	200 - 400	0	100	Non Agricultural	DDW	PUBLIC SUPPLY	1986	2014	44	3.0	0.6	3.2	2.7
3f	10	> 400	66	50	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2014	12	2.0	1.0	3.0	2.0
3g	1	100 - 200	91	70	Nut Trees	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
3g	2	100 - 200	77	56	Nut Trees	MID	UNKNOWN	2005	2007	2	1.8	1.0	1.8	1.0
3g	3	100 - 200	78	80	Nut Trees	MID	UNKNOWN	2005	2005	1	N/A	0.0	N/A	0.0
3g	4	100 - 200	67	42	Nut Trees	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
3g	5	200 - 400	73	62	Nut Trees	DDW	PUBLIC SUPPLY	2003	2014	14	2.0	0.8	N/A	0.0
3g	6	100 - 200	95	16	Double Crops	DDW	PUBLIC SUPPLY	2007	2015	15	1.0	0.5	3.0	1.8
3g	7	100 - 200	50	36	Non Agricultural	USGS	UNKNOWN	1986	2002	20	7.2	2.2	7.2	0.8
3g	8	100 - 200	77	75	Nut Trees	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	N/A	N/A	0.0
3g	9	100 - 200	88	41	Grasses	USGS	UNKNOWN	1957	1960	3	1.7	1.0	1.7	1.0
3g	10	100 - 200	45	53	Non Agricultural	USGS	UNKNOWN	1991	1992	4	1.1	0.5	1.1	0.3
3h	1	100 - 200	42	36	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
3h	2	> 400	77	42	Grasses	USGS	UNKNOWN	1960	1960	1	N/A	N/A	N/A	0.0
3h	3	100 - 200	56	31	Non Agricultural	GAMA	PUBLIC SUPPLY	1958	1966	9	4.9	1.6	1.9	0.9
3h	4	100 - 200	66	50	Non Agricultural	USGS	UNKNOWN	1992	1992	2	N/A	0.0	N/A	0.0
3h	5	100 - 200	50	62	Non Agricultural	GAMA	PUBLIC SUPPLY	1960	1960	1	N/A	N/A	N/A	0.0
3h	6	100 - 200	61	23	Non Agricultural	DWR	UNKNOWN	1958	1966	8	4.9	1.6	1.9	1.0
3h	7	100 - 200	8	92	Non Agricultural	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	N/A	N/A	0.0
3h	8	> 400	61	11	Non Agricultural	USGS	UNKNOWN	1987	1987	1	N/A	0.0	N/A	0.0
3h	9	100 - 200	61	23	Non Agricultural	USGS	UNKNOWN	1958	1966	8	4.9	1.6	1.9	1.0
3h	10	100 - 200	73	19	Non Agricultural	Dairy	IRRIGATION	2008	2008	1	N/A	0.0	N/A	N/A

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3i	1	100 - 200	66	45	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
3i	2	100 - 200	75	12	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
3i	3	100 - 200	97	53	Vegetables	DWR	UNKNOWN	1988	1988	1	N/A	0.0	N/A	0.0
3i	4	200 - 400	86	25	Grasses	USGS	UNKNOWN	1983	1983	2	N/A	N/A	N/A	0.0
3i	5	100 - 200	98	52	Nut Trees	DWR	UNKNOWN	1977	1977	1	N/A	0.0	N/A	0.0
3i	6	200 - 400	64	30	Grains/Cotton	USGS	UNKNOWN	1957	1966	8	4.8	1.5	2.8	1.1
3i	7	100 - 200	64	30	Grains/Cotton	DWR	UNKNOWN	1957	1966	8	4.8	1.5	2.8	1.1
3i	8	200 - 400	62	28	Grasses	USGS	UNKNOWN	1984	1984	2	N/A	N/A	N/A	0.0
3i	9	100 - 200	72	17	Nut Trees	DWR	UNKNOWN	1988	1988	1	N/A	0.0	N/A	0.0
3i	10	100 - 200	36	3	Non Agricultural	DWR	UNKNOWN	1977	1977	1	N/A	0.0	N/A	0.0
3j	1	100 - 200	95	25	Grains/Cotton	USGS	UNKNOWN	1983	1985	6	N/A	N/A	1.0	0.3
3j	2	> 400	84	88	Grains/Cotton	USGS	UNKNOWN	1961	1962	2	N/A	0.0	1.1	0.5
3j	3	100 - 200	84	47	Grasses	USGS	UNKNOWN	1962	1966	3	3.9	2.0	3.2	1.3
3j	4	200 - 400	86	33	Double Crops	USGS	UNKNOWN	1987	1987	1	N/A	0.0	N/A	0.0
3j	5	100 - 200	83	95	Grains/Cotton	DWR	UNKNOWN	1961	1962	2	N/A	0.0	1.1	0.5
3j	6	100 - 200	84	47	Grasses	DWR	UNKNOWN	1961	1966	4	3.9	2.0	3.2	1.3
3j	7	100 - 200	56	58	Non Agricultural	DWR	UNKNOWN	1946	1948	2	N/A	N/A	2.1	1.0
3j	8	> 400	34	66	Non Agricultural	USGS	UNKNOWN	1983	1985	6	N/A	N/A	1.0	0.3
3j	9	100 - 200	83	17	Grasses	DWR	UNKNOWN	1948	1948	1	N/A	0.0	N/A	0.0
3j	10	100 - 200	38	62	Non Agricultural	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	0.0	N/A	0.0
3k	1	> 400	95	50	Nut Trees	DDW	PUBLIC SUPPLY	2003	2014	15	3.0	0.7	3.5	2.0
3k	2	100 - 200	100	0	Nut Trees	DDW	PUBLIC SUPPLY	2012	2014	3	1.9	0.7	N/A	0.0
3k	3	100 - 200	98	69	Nut Trees	DWR	UNKNOWN	1964	1984	4	14.2	6.3	14.2	5.0
3k	4	100 - 200	98	69	Nut Trees	USGS	UNKNOWN	1965	1979	2	14.2	7.0	14.2	7.0
3k	5	100 - 200	100	50	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3k	6	100 - 200	98	61	Nut Trees	GAMA	PUBLIC SUPPLY	1965	1979	4	14.2	7.0	14.2	3.5
3k	7	200 - 400	91	39	Nut Trees	USGS	UNKNOWN	1995	2002	4	7.0	3.5	7.0	1.8
3k	8	100 - 200	72	28	Nut Trees	DDW	PUBLIC SUPPLY	2006	2015	68	1.1	0.1	2.4	1.8
3k	9	100 - 200	100	36	Grasses	DWR	UNKNOWN	1964	1984	3	19.2	9.5	19.2	6.7
3k	10	100 - 200	98	36	Grasses	GAMA	PUBLIC SUPPLY	2008	2008	1	N/A	0.0	N/A	0.0
3l	1	> 400	100	88	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3l	2	100 - 200	100	100	Nut Trees	GAMA	PUBLIC SUPPLY	1966	1966	1	N/A	0.0	N/A	0.0
3l	3	100 - 200	100	38	Nut Trees	DWR	UNKNOWN	1957	1964	7	2.0	1.2	2.0	1.0
3l	4	100 - 200	97	36	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3l	5	100 - 200	98	0	Grains/Cotton	DWR	UNKNOWN	1955	1985	10	20.1	3.8	20.1	3.0
3l	6	100 - 200	77	25	Nut Trees	DDW	PUBLIC SUPPLY	2002	2014	12	3.1	1.0	11.5	6.0
3l	7	100 - 200	100	100	Nut Trees	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3l	8	100 - 200	97	81	Nut Trees	GAMA	PUBLIC SUPPLY	1966	1966	1	N/A	0.0	N/A	0.0
3l	9	100 - 200	97	78	Nut Trees	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3l	10	200 - 400	98	55	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0

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3m	1	> 400	86	75	Grains/Cotton	USGS	UNKNOWN	1985	1985	1	N/A	0.0	N/A	0.0
3m	2	> 400	97	34	Grasses	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3m	3	100 - 200	94	52	Grains/Cotton	DWR	UNKNOWN	1946	1949	4	N/A	0.0	1.4	0.8
3m	4	100 - 200	97	73	Grains/Cotton	DWR	UNKNOWN	1965	1965	1	N/A	0.0	N/A	0.0
3m	5	100 - 200	89	78	Grains/Cotton	DWR	UNKNOWN	1964	1965	2	N/A	0.0	0.7	0.5
3m	6	100 - 200	64	31	Nut Trees	DWR	UNKNOWN	1947	1984	2	N/A	0.0	37.0	18.5
3m	7	100 - 200	98	9	Nut Trees	DWR	UNKNOWN	1961	1965	4	0.9	0.5	2.1	1.0
3m	8	> 400	100	6	Grains/Cotton	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3m	9	200 - 400	70	42	Grasses	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3m	10	100 - 200	92	36	Grains/Cotton	DWR	UNKNOWN	1964	1964	1	N/A	N/A	N/A	0.0
3n	1	100 - 200	100	52	Nut Trees	DWR	UNKNOWN	1957	1985	9	20.1	4.0	20.1	3.1
3n	2	100 - 200	100	100	Nut Trees	DWR	UNKNOWN	1964	1964	1	N/A	N/A	N/A	0.0
3n	3	200 - 400	97	61	Nut Trees	USGS	UNKNOWN	1965	1965	2	N/A	0.0	N/A	0.0
3n	4	200 - 400	100	41	Grasses	USGS	UNKNOWN	1965	1965	1	N/A	N/A	N/A	0.0
3n	5	100 - 200	100	88	Nut Trees	DWR	UNKNOWN	1964	1964	1	N/A	0.0	N/A	0.0
3n	6	100 - 200	81	72	Nut Trees	GAMA	PUBLIC SUPPLY	2008	2008	1	N/A	0.0	N/A	0.0
3n	7	100 - 200	95	50	Grapes	DWR	UNKNOWN	1957	1965	8	3.9	1.6	2.0	1.0
3n	8	200 - 400	91	48	Grapes	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3n	9	100 - 200	91	86	Nut Trees	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3n	10	100 - 200	92	0	Grapes	USGS	UNKNOWN	1965	1966	4	0.6	0.5	0.6	0.3
3o	1	100 - 200	98	84	Grapes	GAMA	PUBLIC SUPPLY	2013	2013	1	N/A	N/A	N/A	0.0
3o	2	> 400	94	67	Grapes	DDW	PUBLIC SUPPLY	2008	2014	9	1.9	0.7	N/A	0.0
3o	3	100 - 200	95	81	Grapes	GAMA	PUBLIC SUPPLY	2013	2013	1	N/A	0.0	N/A	0.0
3o	4	100 - 200	91	84	Grapes	GAMA	PUBLIC SUPPLY	2013	2013	1	N/A	N/A	N/A	0.0
3o	5	200 - 400	66	20	Non Agricultural	DDW	PUBLIC SUPPLY	2006	2014	14	1.0	0.6	3.2	1.5
3o	6	100 - 200	97	89	Grapes	DWR	UNKNOWN	1957	1985	6	21.8	5.6	21.8	4.7
3o	7	100 - 200	95	81	Grapes	DDW	PUBLIC SUPPLY	2002	2014	11	3.1	1.1	N/A	0.0
3o	8	100 - 200	95	72	Grapes	DDW	PUBLIC SUPPLY	2003	2014	12	1.8	0.9	3.3	2.0
3o	9	200 - 400	98	70	Grapes	USGS	UNKNOWN	1993	2001	4	N/A	0.0	8.1	2.0
3o	10	100 - 200	88	81	Grapes	DDW	PUBLIC SUPPLY	2001	2011	19	1.9	0.5	3.2	1.4
3p	1	200 - 400	100	91	Grapes	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3p	2	100 - 200	100	62	Grapes	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3p	3	100 - 200	100	91	Grapes	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3p	4	100 - 200	98	83	Grapes	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3p	5	200 - 400	83	38	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3p	6	100 - 200	97	61	Nut Trees	DWR	UNKNOWN	1976	1976	1	N/A	0.0	N/A	0.0
3p	7	200 - 400	91	44	Nut Trees	USGS	UNKNOWN	1962	1962	1	N/A	0.0	N/A	0.0
3p	8	100 - 200	100	78	Nut Trees	GAMA	PUBLIC SUPPLY	1962	1962	2	N/A	0.0	N/A	0.0
3p	9	100 - 200	86	75	Nut Trees	DWR	UNKNOWN	1953	1953	1	N/A	0.0	N/A	0.0
3p	10	100 - 200	91	44	Grapes	USGS	UNKNOWN	1965	1965	1	N/A	0.0	N/A	0.0

TABLE 7
Top Ranked Monitoring Network Candidate Wells by Subarea

Monitoring Subarea	Well Rank Within Subarea	Estimated Total Well Depth (feet)	Percent Agricultural Land in Vicinity (within 1 mile)	Percent Same Land Use as 1995 in Vicinity (within 1 mile)	Dominant Land Use Category in Vicinity (within 1 mile)	Monitoring Entity[1] (acronyms defined on last page of table)	Well Type	First Year Sampled	Last Year Sampled	Number of Historical Water Quality Tests	Maximum Interval Between NO3 Tests (years)	Average Interval Between NO3 Tests (years)	Maximum Interval Between TDS Tests (years)	Average Interval Between TDS Tests (years)
3q	1	100 - 200	88	64	Nut Trees	GAMA	PUBLIC SUPPLY	2012	2012	1	N/A	0.0	N/A	0.0
3q	2	200 - 400	52	80	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	18	12.7	1.6	12.7	4.0
3q	3	> 400	12	88	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2009	30	5.2	0.8	5.2	2.1
3q	4	> 400	12	86	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	34	5.2	0.9	5.2	2.5
3q	5	200 - 400	19	80	Non Agricultural	DDW	PUBLIC SUPPLY	1997	2014	29	1.2	0.6	4.3	2.1
3q	6	> 400	16	84	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2006	23	5.2	0.9	5.2	2.6
3q	7	> 400	9	91	Non Agricultural	DDW	PUBLIC SUPPLY	1997	2014	27	1.5	0.6	6.0	2.5
3q	8	100 - 200	89	33	Nut Trees	GAMA	PUBLIC SUPPLY	2008	2008	1	N/A	0.0	N/A	0.0
3q	9	100 - 200	86	61	Grapes	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3q	10	100 - 200	88	64	Nut Trees	GAMA	PUBLIC SUPPLY	2012	2012	2	0.1	0.0	N/A	0.0
3r	1	100 - 200	100	80	Grasses	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3r	2	100 - 200	100	73	Grasses	GAMA	PUBLIC SUPPLY	1966	1966	2	N/A	0.0	N/A	0.0
3r	3	100 - 200	86	59	Vegetables	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3r	4	100 - 200	98	23	Double Crops	USGS	UNKNOWN	1983	1983	2	N/A	N/A	N/A	0.0
3r	5	100 - 200	88	30	Grasses	DWR	UNKNOWN	1980	1980	1	N/A	0.0	N/A	0.0
3r	6	> 400	77	30	Non Agricultural	USGS	UNKNOWN	1985	1985	1	N/A	0.0	N/A	0.0
3r	7	100 - 200	100	3	Grains/Cotton	GAMA	PUBLIC SUPPLY	2002	2002	2	N/A	0.0	N/A	0.0
3r	8	100 - 200	94	23	Double Crops	DWR	UNKNOWN	1987	1987	1	N/A	0.0	N/A	0.0
3r	9	100 - 200	98	19	Double Crops	GAMA	PUBLIC SUPPLY	1979	1979	2	N/A	0.0	N/A	0.0
3r	10	100 - 200	80	25	Double Crops	DWR	UNKNOWN	1979	1979	1	N/A	0.0	N/A	0.0
3s	1	100 - 200	100	11	Nut Trees	GAMA	PUBLIC SUPPLY	2007	2008	13	N/A	N/A	1.0	0.1
3s	2	100 - 200	98	64	Nut Trees	USGS	UNKNOWN	2001	2001	2	N/A	0.0	N/A	0.0
3s	3	100 - 200	77	19	Double Crops	GAMA	PUBLIC SUPPLY	2007	2008	15	N/A	N/A	1.0	0.1
3s	4	100 - 200	95	25	Grains/Cotton	GAMA	PUBLIC SUPPLY	1946	1963	18	2.1	1.3	6.9	0.9
3s	5	100 - 200	86	9	Double Crops	GAMA	PUBLIC SUPPLY	2009	2009	5	N/A	N/A	N/A	0.0
3s	6	200 - 400	92	53	Nut Trees	USGS	UNKNOWN	1944	1963	10	2.1	1.3	7.0	1.9
3s	7	100 - 200	94	27	Nut Trees	DWR	UNKNOWN	1946	1963	13	2.1	1.0	6.9	1.3
3s	8	100 - 200	84	36	Nut Trees	GAMA	PUBLIC SUPPLY	2008	2008	9	N/A	N/A	N/A	0.0
3s	9	100 - 200	95	8	Double Crops	GAMA	PUBLIC SUPPLY	1950	1969	20	N/A	0.0	6.9	1.0
3s	10	100 - 200	91	36	Nut Trees	DWR	UNKNOWN	1955	1979	3	13.1	6.5	13.1	8.0
3t	1	100 - 200	100	0	Grains/Cotton	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
3t	2	100 - 200	58	31	Non Agricultural	MID	UNKNOWN	2007	2007	1	N/A	0.0	N/A	0.0
3t	3	100 - 200	89	91	Nut Trees	GAMA	PUBLIC SUPPLY	1957	1966	12	3.9	1.3	1.1	0.8
3t	4	200 - 400	39	53	Non Agricultural	DDW	PUBLIC SUPPLY	2003	2014	14	1.2	0.8	3.1	1.8
3t	5	200 - 400	89	52	Nut Trees	USGS	UNKNOWN	1983	1985	6	N/A	N/A	1.0	0.3
3t	6	100 - 200	88	47	Nut Trees	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	N/A	N/A	0.0
3t	7	100 - 200	88	44	Nut Trees	GAMA	PUBLIC SUPPLY	1958	1965	6	5.0	1.8	5.0	1.2
3t	8	100 - 200	75	19	Nut Trees	USGS	UNKNOWN	1960	1970	11	1.1	1.0	1.1	0.9
3t	9	100 - 200	89	66	Nut Trees	DWR	UNKNOWN	1957	1966	9	3.9	1.3	2.1	1.0
3t	10	100 - 200	92	3	Nut Trees	USGS	UNKNOWN	1958	1965	4	5.0	1.8	5.0	1.8

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Monitoring Subarea	Well Rank Within Subarea	Estimated Total Well Depth (feet)	Percent Agricultural Land in Vicinity (within 1 mile)	Percent Same Land Use as 1995 in Vicinity (within 1 mile)	Dominant Land Use Category in Vicinity (within 1 mile)	Monitoring Entity[1] (acronyms defined on last page of table)	Well Type	First Year Sampled	Last Year Sampled	Number of Historical Water Quality Tests	Maximum Interval Between NO3 Tests (years)	Average Interval Between NO3 Tests (years)	Maximum Interval Between TDS Tests (years)	Average Interval Between TDS Tests (years)
3u	1	100 - 200	100	48	Grasses	USGS	UNKNOWN	1983	1984	4	N/A	N/A	0.9	0.3
3u	2	100 - 200	84	69	Grasses	GAMA	PUBLIC SUPPLY	2009	2009	6	N/A	N/A	N/A	0.0
3u	3	100 - 200	98	11	Nut Trees	USGS	UNKNOWN	1983	1985	6	N/A	N/A	1.0	0.3
3u	4	100 - 200	91	20	Grains/Cotton	USGS	UNKNOWN	1983	1985	6	N/A	N/A	1.0	0.3
3u	5	100 - 200	75	20	Double Crops	GAMA	PUBLIC SUPPLY	1991	2008	21	N/A	0.0	14.8	0.8
3u	6	100 - 200	92	0	Double Crops	GAMA	PUBLIC SUPPLY	2007	2007	5	N/A	N/A	N/A	0.0
3u	7	100 - 200	84	12	Double Crops	GAMA	PUBLIC SUPPLY	2008	2008	5	N/A	N/A	N/A	0.0
3u	8	100 - 200	39	66	Non Agricultural	GAMA	PUBLIC SUPPLY	2009	2009	6	N/A	N/A	N/A	0.0
3u	9	100 - 200	94	31	Grasses	DWR	UNKNOWN	1946	1948	3	N/A	0.0	2.1	0.7
3u	10	100 - 200	77	19	Double Crops	GAMA	PUBLIC SUPPLY	2006	2008	18	N/A	N/A	0.3	0.1
3v	1	200 - 400	6	88	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2015	34	2.6	0.9	7.3	2.9
3v	2	100 - 200	97	61	Nut Trees	DWR	UNKNOWN	1949	1957	9	N/A	0.0	2.9	0.9
3v	3	100 - 200	3	98	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2014	28	3.4	1.0	8.9	3.2
3v	4	100 - 200	67	31	Nut Trees	GAMA	PUBLIC SUPPLY	2012	2013	3	N/A	N/A	0.3	0.3
3v	5	100 - 200	95	50	Grasses	GAMA	PUBLIC SUPPLY	1948	1966	3	N/A	N/A	18.2	6.0
3v	6	100 - 200	59	69	Non Agricultural	GAMA	PUBLIC SUPPLY	1950	1966	7	N/A	N/A	10.1	2.3
3v	7	100 - 200	17	11	Non Agricultural	DDW	PUBLIC SUPPLY	1994	2015	24	2.0	0.9	3.0	2.2
3v	8	200 - 400	92	3	Grains/Cotton	USGS	UNKNOWN	1949	1966	3	N/A	N/A	17.0	5.7
3v	9	100 - 200	91	27	Grains/Cotton	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	0.0	N/A	0.0
3v	10	200 - 400	67	42	Nut Trees	USGS	UNKNOWN	1966	1966	1	N/A	N/A	N/A	0.0
3w	1	100 - 200	91	73	Nut Trees	USGS	UNKNOWN	1987	1987	1	N/A	0.0	N/A	0.0
3w	2	100 - 200	88	81	Grasses	DWR	UNKNOWN	1976	1976	1	N/A	0.0	N/A	0.0
3w	3	100 - 200	89	2	Grains/Cotton	GAMA	PUBLIC SUPPLY	1957	1965	3	6.0	2.7	6.0	2.7
3w	4	100 - 200	98	0	Grains/Cotton	DWR	UNKNOWN	1980	1980	1	N/A	0.0	N/A	0.0
3w	5	100 - 200	62	39	Non Agricultural	USGS	UNKNOWN	1957	1965	3	6.0	2.7	6.0	2.7
3w	6	100 - 200	6	83	Non Agricultural	USGS	UNKNOWN	1983	1985	6	N/A	N/A	1.0	0.3
3w	7	100 - 200	62	39	Non Agricultural	DWR	UNKNOWN	1957	1965	3	6.0	2.7	6.0	2.7
3w	8	100 - 200	70	9	Non Agricultural	DWR	UNKNOWN	1980	1980	1	N/A	0.0	N/A	0.0
3w	9	100 - 200	75	47	Grasses	DWR	UNKNOWN	1971	1971	1	N/A	0.0	N/A	0.0
3w	10	100 - 200	81	34	Grasses	Dairy	IRRIGATION	2007	2007	1	N/A	0.0	N/A	N/A
3x	1	> 400	100	59	Grasses	USGS	UNKNOWN	1983	1983	2	N/A	N/A	N/A	0.0
3x	2	100 - 200	98	72	Nut Trees	DWR	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3x	3	100 - 200	100	58	Grasses	DWR	UNKNOWN	1961	1961	1	N/A	N/A	N/A	0.0
3x	4	100 - 200	81	42	Grains/Cotton	GAMA	PUBLIC SUPPLY	2008	2008	1	N/A	0.0	N/A	0.0
3x	5	100 - 200	92	39	Nut Trees	DWR	PUBLIC SUPPLY	1946	1949	5	1.0	0.5	1.3	0.6
3x	6	100 - 200	91	62	Nut Trees	DWR	UNKNOWN	1965	1979	3	13.9	4.7	13.9	4.7
3x	7	100 - 200	77	84	Nut Trees	GAMA	PUBLIC SUPPLY	2008	2008	1	N/A	0.0	N/A	0.0
3x	8	200 - 400	89	20	Nut Trees	USGS	UNKNOWN	1987	1987	2	N/A	0.0	N/A	0.0
3x	9	100 - 200	78	89	Nut Trees	USGS	UNKNOWN	1957	1964	3	4.9	2.5	4.9	2.3
3x	10	100 - 200	100	22	Nut Trees	DWR	UNKNOWN	1964	1965	2	N/A	N/A	0.7	0.5

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Monitoring Subarea	Well Rank Within Subarea	Estimated Total Well Depth (feet)	Percent Agricultural Land in Vicinity (within 1 mile)	Percent Same Land Use as 1995 in Vicinity (within 1 mile)	Dominant Land Use Category in Vicinity (within 1 mile)	Monitoring Entity[1] (acronyms defined on last page of table)	Well Type	First Year Sampled	Last Year Sampled	Number of Historical Water Quality Tests	Maximum Interval Between NO3 Tests (years)	Average Interval Between NO3 Tests (years)	Maximum Interval Between TDS Tests (years)	Average Interval Between TDS Tests (years)
3y	1	200 - 400	73	59	Grasses	DDW	PUBLIC SUPPLY	2002	2015	36	1.5	0.4	N/A	0.0
3y	2	> 400	50	50	Non Agricultural	DDW	PUBLIC SUPPLY	1985	2006	8	6.7	2.6	6.7	4.2
3y	3	100 - 200	94	59	Nut Trees	GAMA	PUBLIC SUPPLY	1994	2012	5	17.8	3.6	N/A	0.0
3y	4	100 - 200	97	52	Grasses	DWR	UNKNOWN	1966	1984	2	17.9	9.0	17.9	9.0
3y	5	> 400	100	50	Non Agricultural	USGS	UNKNOWN	1979	1979	1	N/A	0.0	N/A	0.0
3y	6	> 400	94	53	Grasses	USGS	UNKNOWN	1965	1965	1	N/A	0.0	N/A	0.0
3y	7	200 - 400	98	9	Grasses	USGS	UNKNOWN	1995	2002	4	7.0	3.5	7.0	1.8
3y	8	200 - 400	97	17	Vegetables	USGS	UNKNOWN	1966	1966	1	N/A	0.0	N/A	0.0
3y	9	200 - 400	100	16	Nut Trees	USGS	UNKNOWN	1979	1979	1	N/A	0.0	N/A	0.0
3y	10	100 - 200	94	53	Grasses	DWR	UNKNOWN	1947	1965	2	17.6	9.0	17.6	9.0
3z	1	100 - 200	83	0	Double Crops	USGS	UNKNOWN	1983	1990	12	N/A	N/A	3.0	0.6
3z	2	100 - 200	22	94	Non Agricultural	DDW	PUBLIC SUPPLY	1995	2014	25	1.7	0.8	3.2	2.7
3z	3	200 - 400	52	38	Non Agricultural	DDW	PUBLIC SUPPLY	2002	2014	16	1.2	0.8	3.2	2.4
3z	4	> 400	20	83	Non Agricultural	DDW	PUBLIC SUPPLY	1992	2014	8	12.5	2.8	13.5	3.5
3z	5	100 - 200	45	31	Non Agricultural	USGS	UNKNOWN	1983	1990	8	N/A	N/A	3.0	0.9
3z	6	200 - 400	59	3	Non Agricultural	USGS	UNKNOWN	1992	1993	4	1.0	0.5	1.0	0.3
3z	7	100 - 200	67	12	Non Agricultural	DDW	PUBLIC SUPPLY	1986	1994	6	3.0	1.5	3.0	1.3
3z	8	100 - 200	0	100	Non Agricultural	GAMA	PUBLIC SUPPLY	1952	1970	22	8.0	1.5	1.1	0.5
3z	9	100 - 200	9	95	Non Agricultural	DDW	PUBLIC SUPPLY	2008	2014	9	1.3	0.7	3.1	2.0
3z	10	100 - 200	61	3	Non Agricultural	GAMA	PUBLIC SUPPLY	1957	1966	9	4.0	1.3	3.0	1.0
3aa	1	100 - 200	94	55	Grasses	DWR	UNKNOWN	1977	1977	1	N/A	0.0	N/A	0.0
3aa	2	> 400	78	3	Vegetables	USGS	UNKNOWN	1987	1987	1	N/A	0.0	N/A	0.0
3aa	3	> 400	92	0	Grasses	USGS	UNKNOWN	1984	1984	2	N/A	N/A	N/A	0.0
3aa	4	100 - 200	80	25	Grasses	DWR	UNKNOWN	1980	1980	1	N/A	0.0	N/A	0.0
3aa	5	100 - 200	75	17	Double Crops	DWR	UNKNOWN	1979	1979	1	N/A	0.0	N/A	0.0
3aa	6	100 - 200	89	19	Grasses	DWR	UNKNOWN	1971	1971	1	N/A	0.0	N/A	0.0
3aa	7	100 - 200	70	22	Double Crops	DWR	UNKNOWN	1980	1980	1	N/A	0.0	N/A	0.0
3aa	8	100 - 200	25	75	Non Agricultural	DWR	UNKNOWN	1980	1980	1	N/A	0.0	N/A	0.0
3aa	9	100 - 200	0	100	Non Agricultural	GAMA	PUBLIC SUPPLY	1961	1966	3	4.5	2.5	4.5	1.7
3aa	10	100 - 200	16	83	Non Agricultural	DWR	UNKNOWN	1980	1980	1	N/A	0.0	N/A	0.0
3ab	1	200 - 400	78	75	Grasses	DDW	PUBLIC SUPPLY	2003	2005	8	0.8	0.3	N/A	0.0
3ab	2	200 - 400	58	67	Non Agricultural	DDW	PUBLIC SUPPLY	2001	2014	16	2.0	0.8	3.0	2.2
3ab	3	100 - 200	94	72	Rice	GAMA	PUBLIC SUPPLY	2006	2006	1	N/A	0.0	N/A	0.0
3ab	4	100 - 200	80	41	Grains/Cotton	DDW	PUBLIC SUPPLY	2002	2013	7	7.1	1.6	11.8	5.5
3ab	5	200 - 400	91	56	Grasses	DDW	PUBLIC SUPPLY	2003	2012	14	2.1	0.6	3.1	2.0
3ab	6	100 - 200	66	17	Grains/Cotton	DDW	PUBLIC SUPPLY	2002	2008	24	0.9	0.3	N/A	0.0
3ab	7	200 - 400	42	66	Non Agricultural	DDW	PUBLIC SUPPLY	2003	2014	12	2.0	0.9	3.0	2.3
3ab	8	100 - 200	27	84	Non Agricultural	DDW	PUBLIC SUPPLY	2003	2012	2	9.0	4.5	9.0	4.5
3ab	9	100 - 200	91	42	Grasses	GAMA	PUBLIC SUPPLY	1959	1966	3	N/A	N/A	7.0	2.3
3ab	10	100 - 200	81	48	Grasses	DWR	UNKNOWN	1956	1988	3	21.9	10.7	21.9	11.0

[1] Dairy = CVRWQCB WDR Dairy Data; DDW = SWRCB, Division of Drinking Water; DWR = California Department of Water Resources; GAMA = SWRCB Geotracker GAMA; MID = Modesto Irrigation District; TID = Turlock Irrigation District; USGS = U.S. Geological Survey

TABLE 8
Reporting Elements

Reporting Element	Description of Reporting Method	Reporting Frequency
GQTMP monitoring data submittal	Upload data to Geotracker database	Annual
Report Content		
Design of trend monitoring program	Map(s) of monitoring subareas	Annual/Five years
	Map(s) of sampled wells	Annual/Five years
Tabulation of results	Summary statistics	Annual/Five years
	Complete analytical results	Annual/Five years
	Analytical reports	Annual/Five years
Visual presentation and interpretation of results	Map(s) of patterns within aquifer system (e.g., color gradient symbols)	Annual/Five years
Graphic presentation of time series data	Graphs of time series data illustrating temporal changes	Annual/Five years
Groundwater levels	Map(s) of groundwater elevations (e.g., contours) within select areas as applicable to regional monitoring network	Annual/Five years
Update regional groundwater quality characterization (using all readily available groundwater quality data)	Map(s) and tabulation of groundwater quality data relevant to irrigated agriculture	Five years
	Map(s) and tabulation of DPR groundwater pesticide monitoring data	Five years
Comparison of regional groundwater quality trends (using all readily available groundwater quality data)		
Temporal trends analyses	Non-parametric statistical analyses of trends (e.g., Mann-Kendall test)	Five years
	Parametric statistical analysis of trends (e.g., linear regression)	Five years
Presentation of spatial patterns in trends (i.e., maps showing trends)	Statistical summary of conditions and trends relative to monitoring subareas	Five years
	Analyses of groundwater quality trends by depth zone	Five years
	Analyses of groundwater quality trends by location and locational characteristics (e.g., land use composition)	Five years
Report Discussion		
Rationale for trend monitoring program design	Discussion of basis for monitoring subarea delineation and trend monitoring well selection	Annual/Five years
Synthesis of findings	Discussion of findings relating to groundwater quality trends and patterns	Annual/Five years
	Evaluation of relationships between groundwater quality trends and land use	Annual/Five years
Evaluation of uncertainty and data gaps	Evaluation of representation of GQTMP monitoring network in relation to trends and patterns observed across Coalition region	Annual/Five years
Assess need to future GQTMP refinements	Provide recommendations regarding monitoring network	Annual/Five years
Coordination with education and outreach efforts	Evaluation of GQTMP design in relation to Coalition education and outreach efforts	Annual/Five years

FIGURES

Figure 1
Roadmap for GQTM Program Implementation

Waste Discharge Requirements December 7, 2012

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Notice of Applicability Start January 11, 2013

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Groundwater Quality Assessment Report January 13, 2014

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Groundwater Quality Assessment Report Approval December 23, 2014

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Groundwater Quality Trend Monitoring Workplan Due June 4, 2015

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Groundwater Quality Trend Monitoring Workplan Phase I – Monitoring Design Approach

- Objectives
- Approach
- Groundwater Quality Trend Monitoring Network Design
- Implementation
- Analysis
- Reporting
- Phase II
- Future Design Considerations

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Workplan Phase I Submittal June 4, 2015

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Initial Comments from Regional Board on Workplan Phase 1 August 4, 2015

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Address Regional Board Comments as Applicable (October – December 2015; May Address in Phase II)

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Groundwater Quality Trend Monitoring Workplan Phase II – Determination of Specific Wells for GQTM

- Outreach by Coalition
  - Coalition Members
  - Community Water Supply Entities
  - Other
- Implementation
  - Vetting of Candidate Monitoring Wells Identified in Phase I
  - Criteria for Well Selection
    - Construction
    - Coordination with Other Entities and/or Land Owners
      - Coordination Agreements
    - Accessibility
    - Location / Relation to Irrigated Land
    - Site Visit / Inspection
    - Other (See Phase I for Candidate Well Ranking)
  - Select Other Candidate Wells for Vetting as Needed
  - Complete Network Design
    - Monitoring Schedule (Target Spring 2016 to Begin/Coordinate with Other Entities)
    - Reporting

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Workplan Phase II Submit December 4, 2015

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Initiate Monitoring Spring 2016

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Status Report on Monitoring Program May 1, 2016

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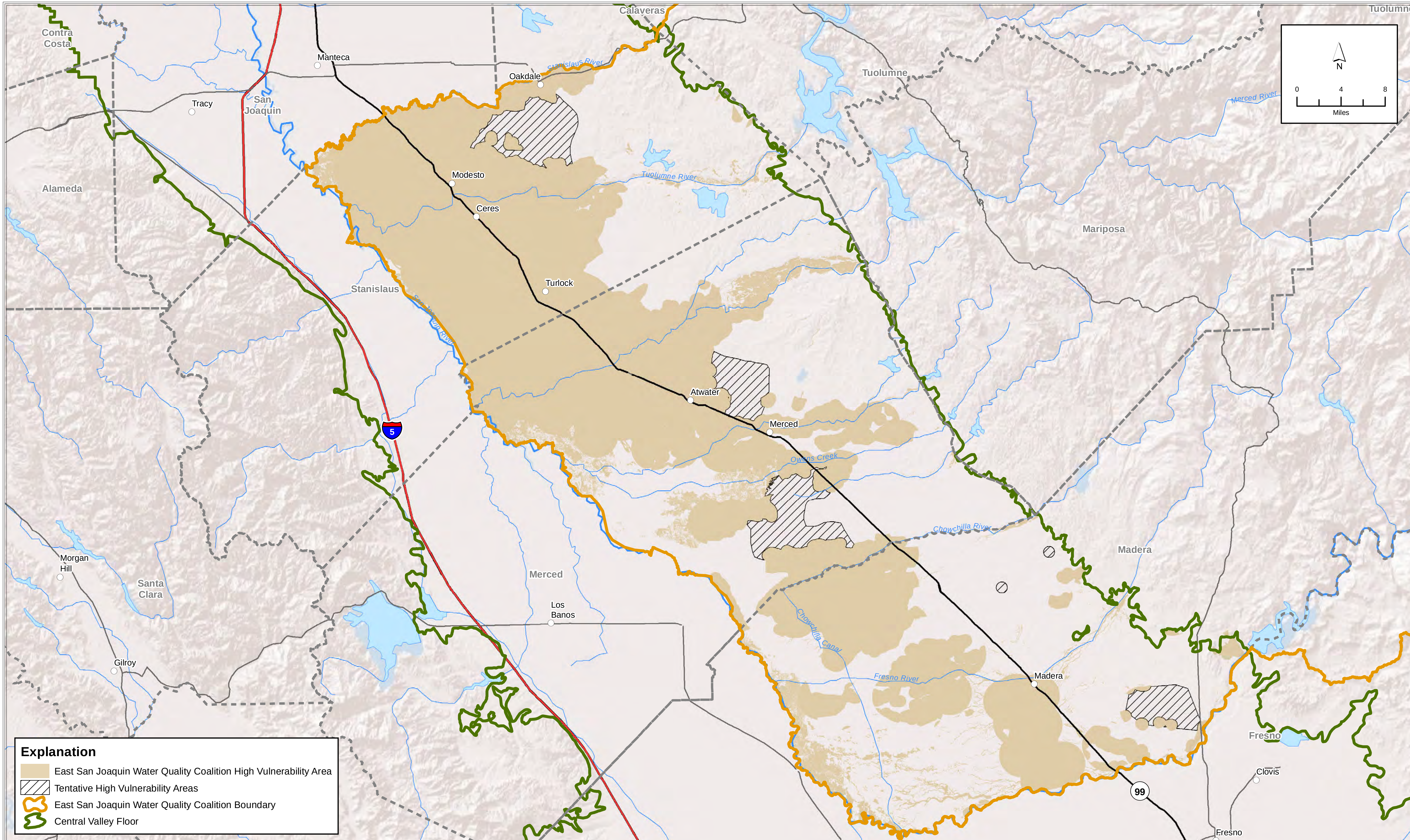
First Full Annual Groundwater Quality Trend Monitoring Report May 1, 2017



Path: X:\2015 Job Files\15-019 ESJWQC\GIS_ESJWQC_Monitoring\Figures\Figure 1 High Vulnerability Area for ESJ.mxd

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Figure 2
High Vulnerability Area for the East San Joaquin Water Quality Coalition

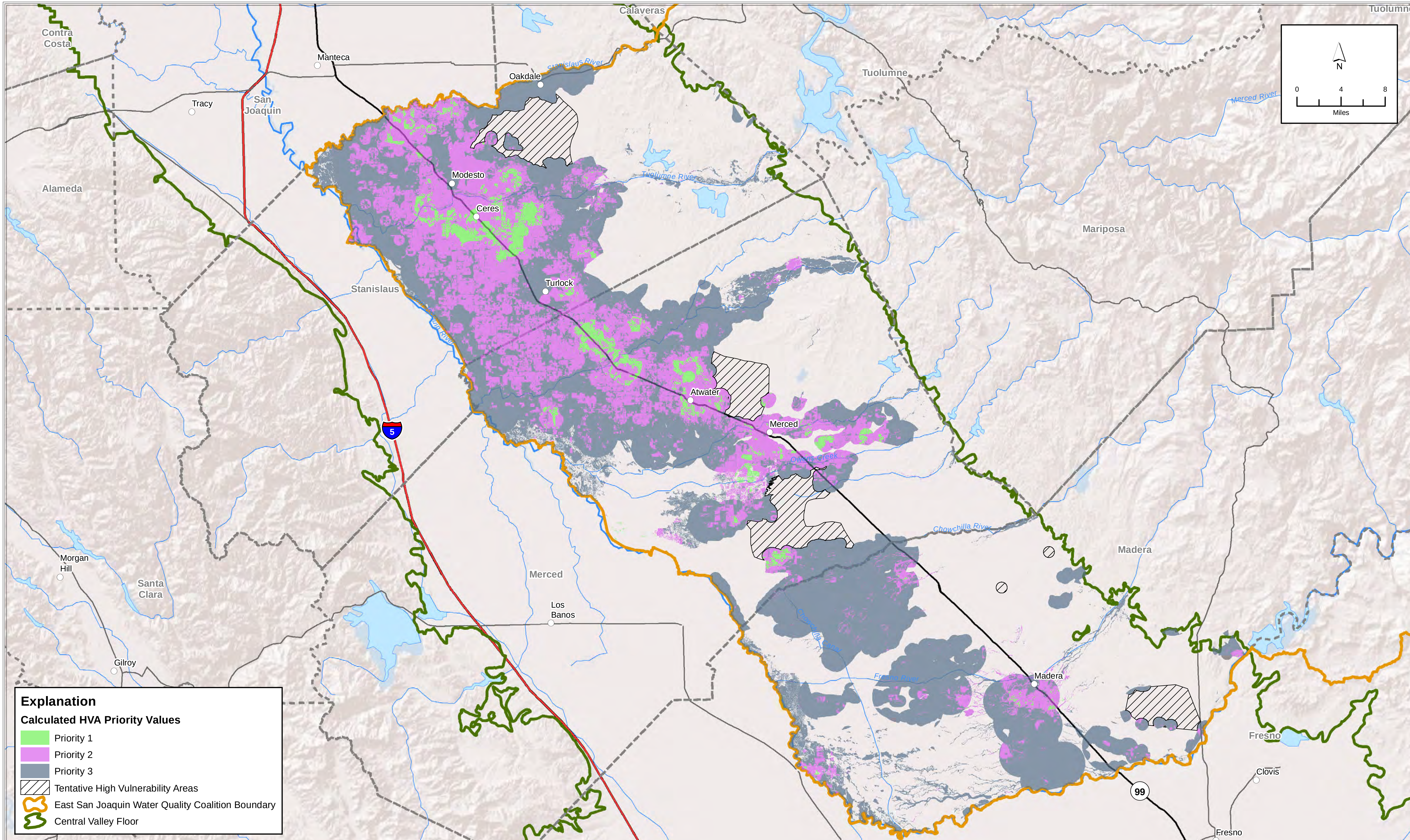

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Figure 3
Calculated High Vulnerability Priority Areas

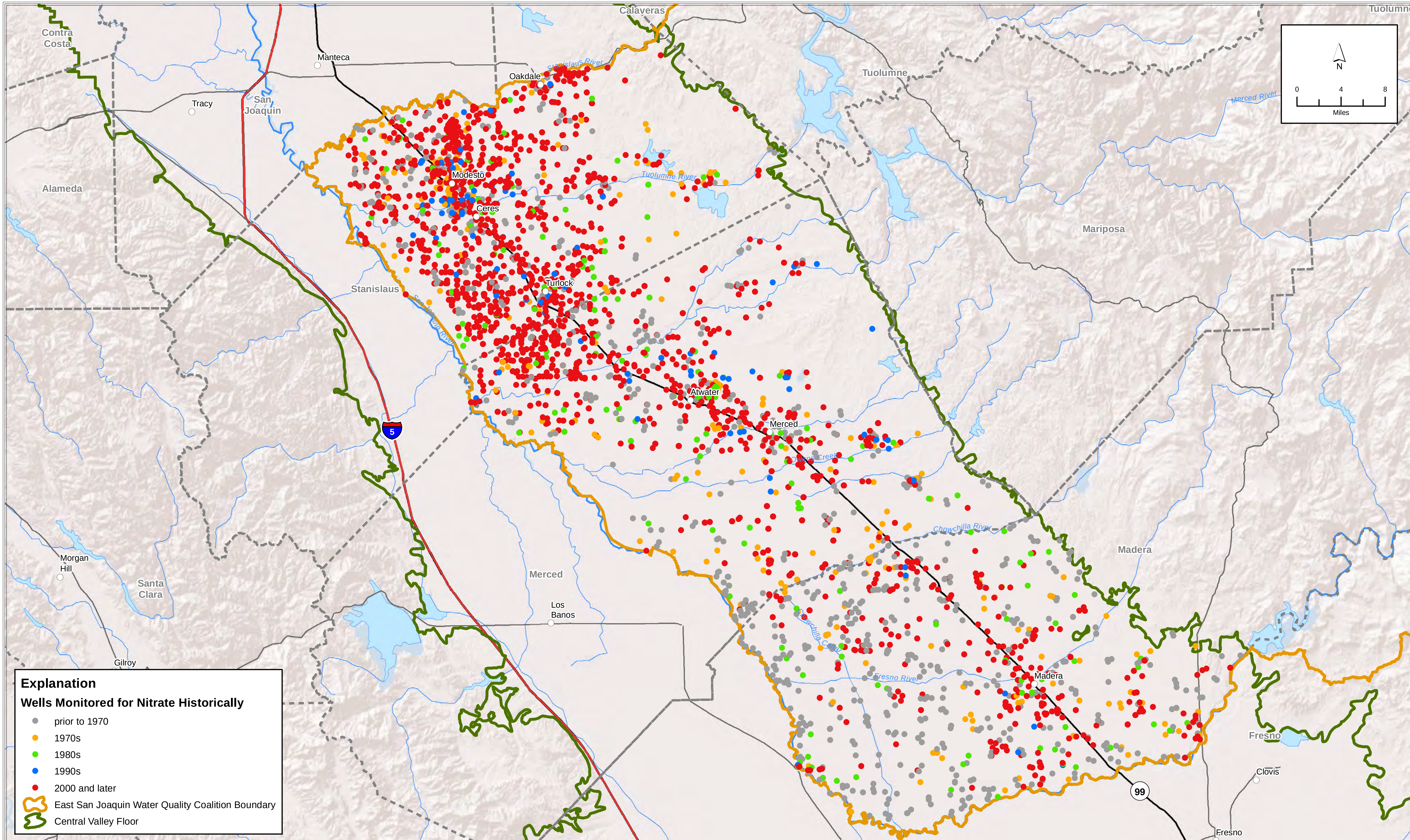

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Figure 4
Wells with Historical Nitrate Concentration Data Used to Characterize Groundwater Quality in the GAR

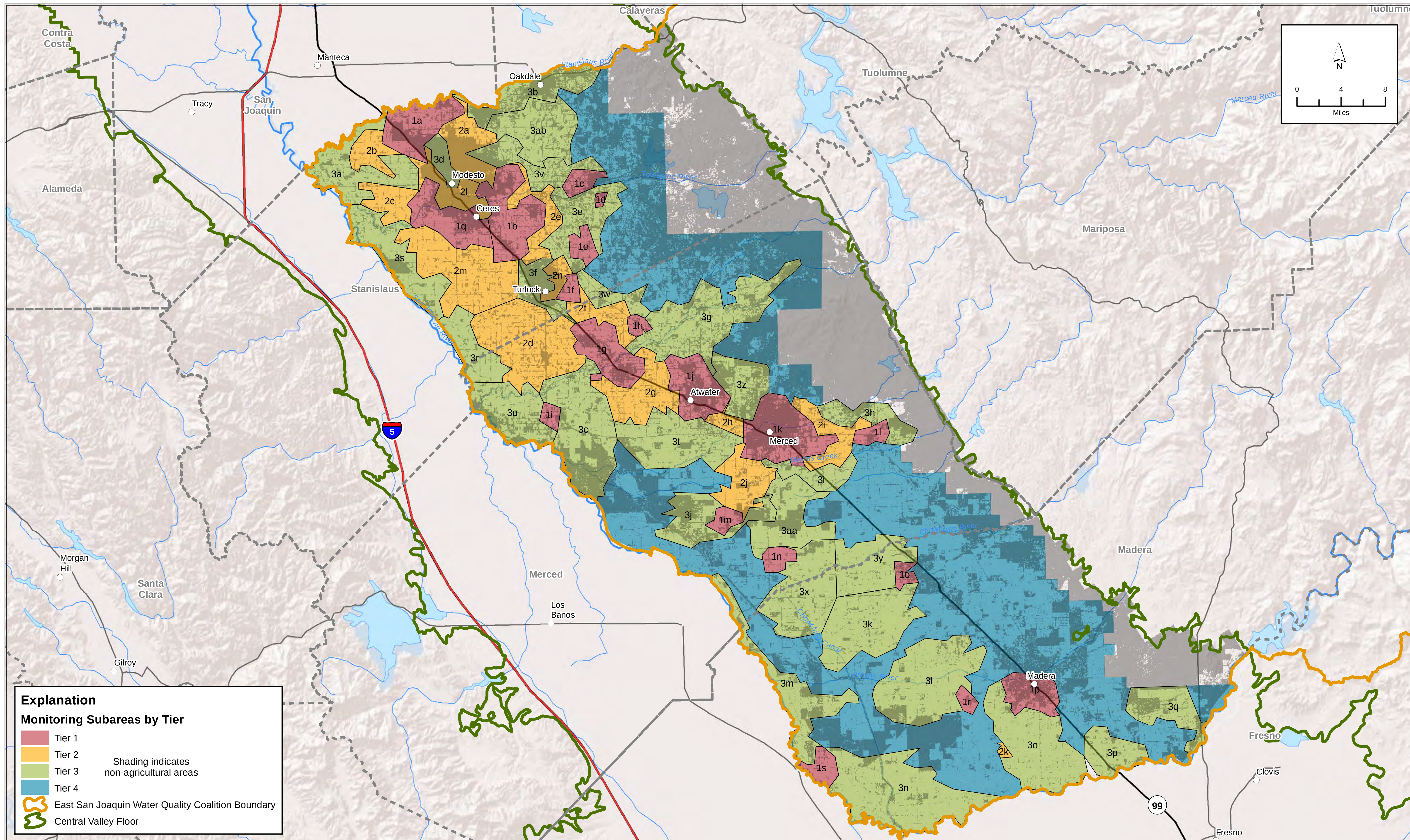

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Figure 5
Groundwater Quality Trend Monitoring Subareas

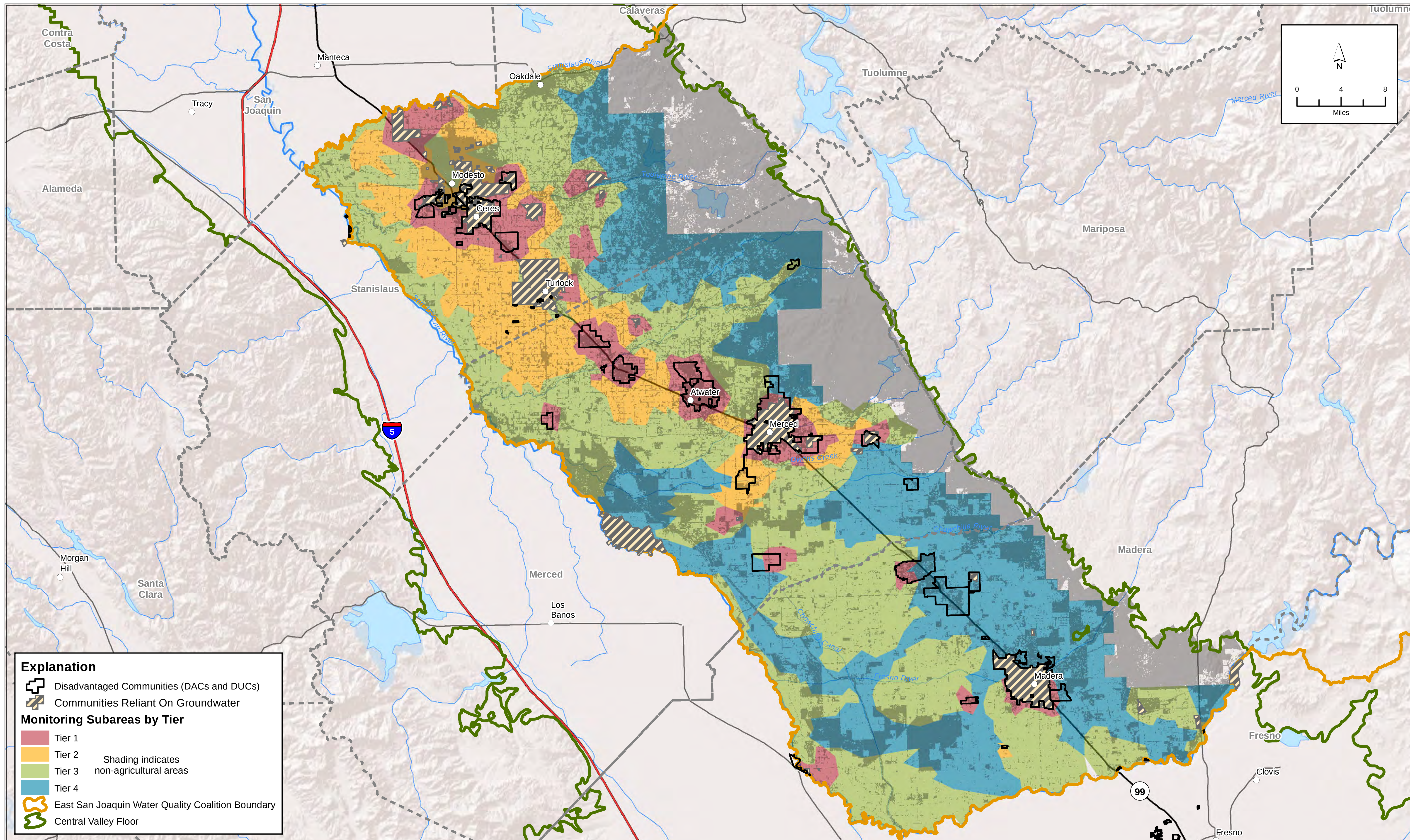

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Figure 6
Groundwater Quality Trend Monitoring Subareas Relative to Communities Reliant on Groundwater

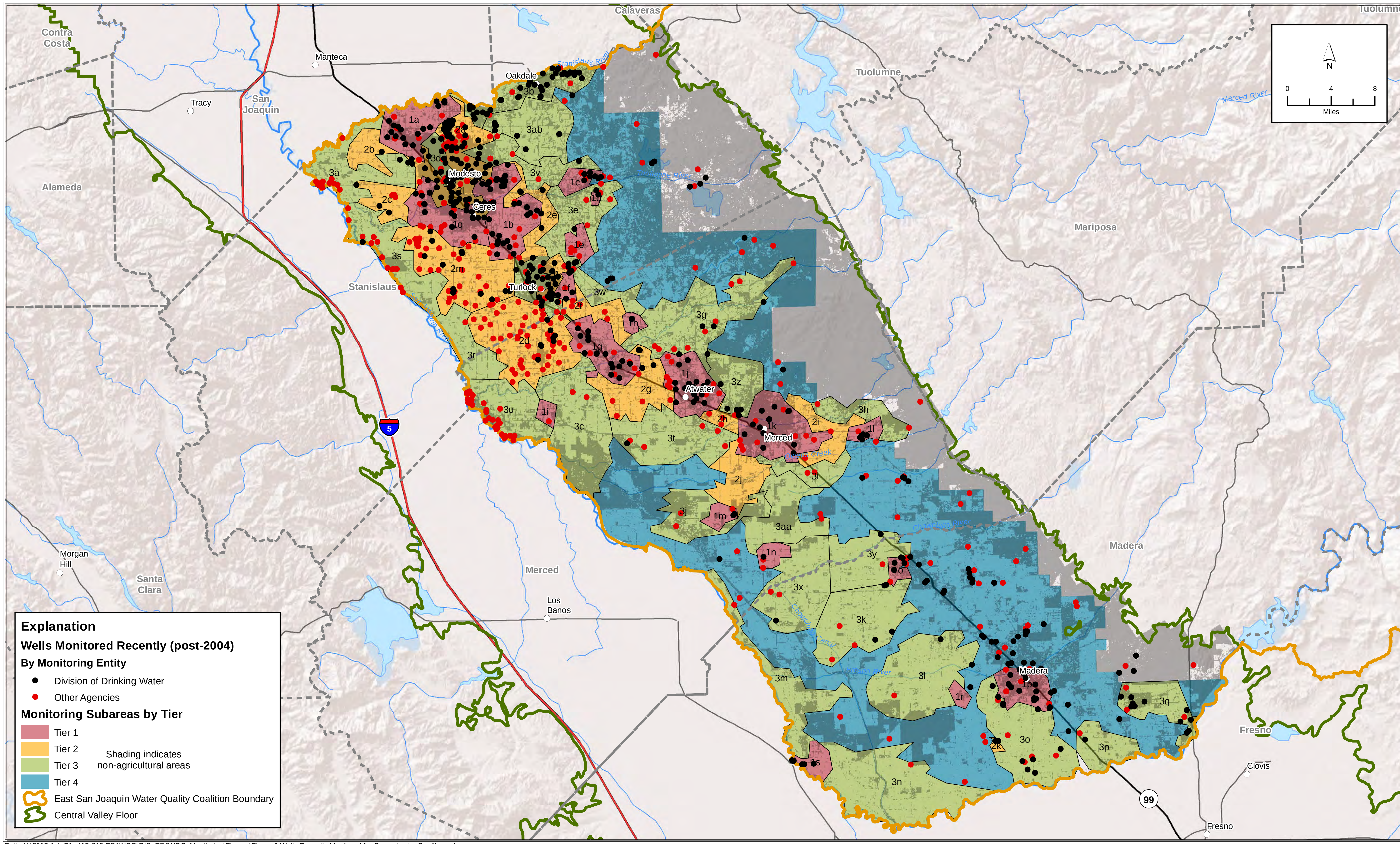

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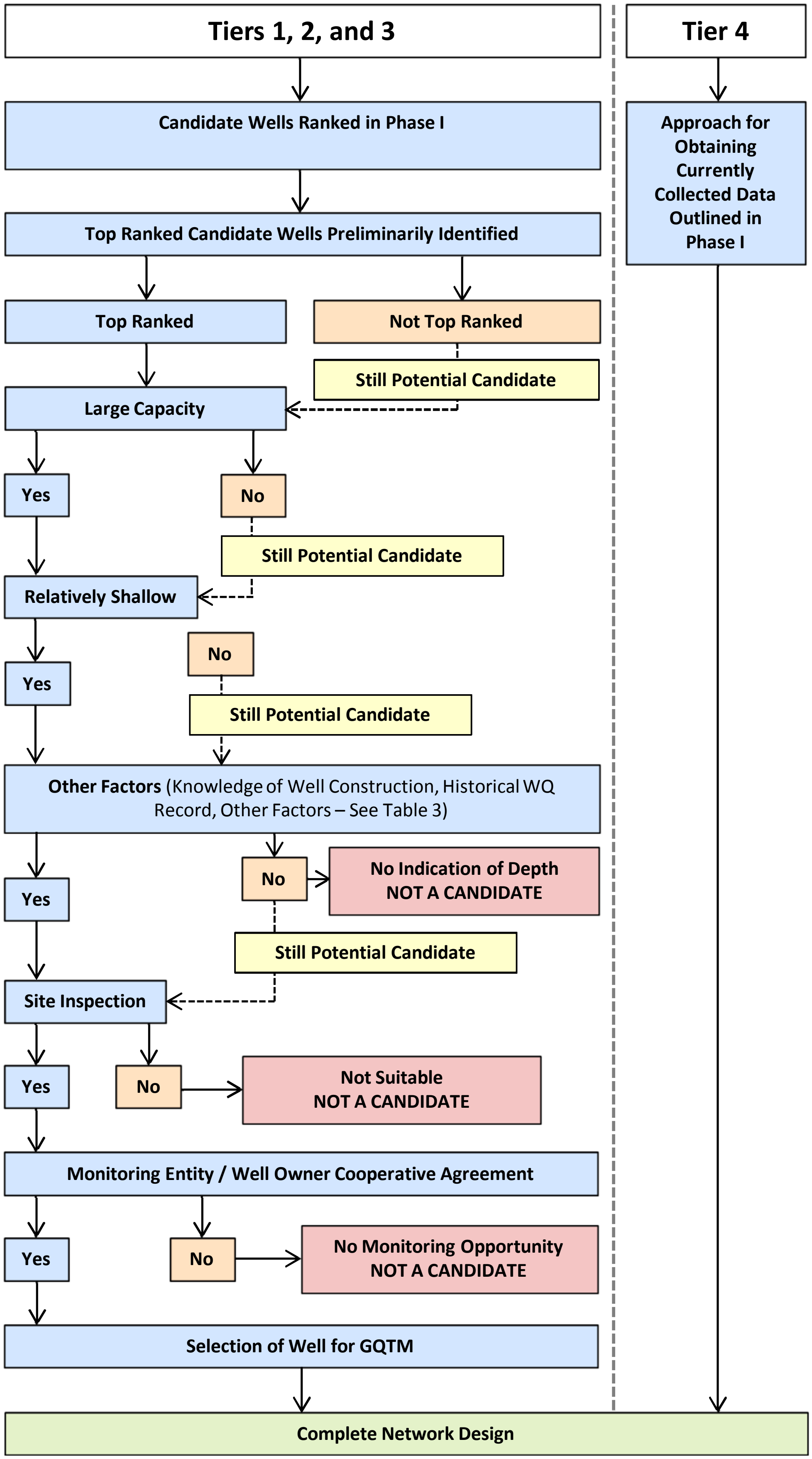
Figure 7
Wells Recently Monitored for Groundwater Quality

Figure 8
Decision Tree for Selection of GQTM Network Wells



Note: Outlined process generally represented; unique factors / circumstances may exist

Figure 9
Timeline for Trend Monitoring Elements