
TECHNICAL MEMORANDUM - DRAFT

To:	PVWMA	Date:	May 8, 2016
From:	Martin Feeney, PG, CHg with support from: Casey Meusel (PVWMA) Brian Lockwood, PG, CHg (PVWMA)		
Subject:	Groundwater Monitoring Network Review, Modifications, and Recommended Improvements		

INTRODUCTION

This Technical Memorandum (TM) presents a review of the Pajaro Valley Water Management Agency's (Agency) groundwater monitoring network. The purpose is to inventory, classify, and evaluate the existing groundwater monitoring network as to its adequacy to develop data to understand and effectively manage the groundwater resources of the Pajaro Valley Groundwater Basin (PVGB). Specifically, the network is evaluated on the ability to capture basin responses to groundwater condition changes associated with factors such as climate, pumping, and groundwater management activities. Additionally, the network and associated data collection program are compared to the recently published draft requirements for groundwater monitoring as part of the Sustainable Groundwater Management Act (SGMA). Based on the review, recommendations to improve the network's overall effectiveness and comply with the requirements of SGMA are presented herein. Lastly, an evaluation of the costs of the current monitoring program and recommendations of potential cost savings is presented.

As the review process began, some obvious shortcomings to the network were identified. Most prominent was the network's lack of spatial coverage within the city limits of Watsonville. Due to the obvious need and because funding was available at the time, the Agency constructed two multi-completion monitoring wells known as the PV20 series in the Agency parking lot located in downtown Watsonville prior to the release of this TM. Additionally, some minor corrections and updates to network data files were made as conflicts, errors, and omissions were identified and are summarized later in this TM.

BACKGROUND

Pajaro Valley Groundwater Basin

The hydrogeology of the PVGB has been evaluated by many investigators. Most notable, is the work by the California State Water Resources Board in 1953 (Bulletin 5), by Ludroff and Scaladini (1987), by Dupre (1975), and by the USGS (Muir, Hanson). The PVGB consists of a thick sequence of sedimentary deposits filling a structural basin west of the San Andreas Fault. These sedimentary materials have traditionally been assigned based on their lithology and hydraulic responses into four major aquifer units. The shallowest deposits consist of the alluvial deposits flanking the river on the valley floor. Underlying the alluvium (Qal) and flanking the valley floor, are the Quaternary-aged Aromas Sands Formation (Qa) – an aeolian-fluvial sequence of sand and gravels. Past analyses of data from water well logs revealed an extensive regional fine-grained unit within this sequence subdividing the Aromas Sands into an upper (Qaup) and lower (Qalo) aquifer. Underlying the Aromas Sands Formation is the Tertiary-aged Purisima

Formation (Tp) which extends to significant depth below ground surface. Although not confirmed in many locations, it is inferred that the Purisima Formation overlies granitic basement.

Most groundwater in the PVGB is extracted from wells completed in either the alluvial deposits or the Aromas Sands Formation, or some combination thereof. Although the Purisima Formation provides a significant portion of the supply to the Central and Soquel Creek Water Districts to the north, its use in the PVGB is limited.

Groundwater development began in the Pajaro Valley at the beginning of the 1900s with limited demand. Demand increased throughout the century as more water intensive crops were cultivated. Groundwater levels declined as demand exceeded natural recharge and this eventually led to water level elevations falling below sea level allowing seawater to intrude into the aquifer system. Seawater intrusion (SWI) was first documented in the PVGB in 1953 (State Water Resources Board, 1953). Currently SWI has been detected as far inland as Highway 1 in the valley floor area and as far as Elkhorn Slough in the Springfield Terrace and past San Andreas Road in the San Andreas Terrace. To date, SWI has only been identified in the Aromas Sands and the Alluvial Aquifers, although there is evidence of saline connate water in the deeper portions of the Purisima Formation (Hanson, 2003). Long term overdraft in the PVGB based on simulated hydrologic model results indicate an average imbalance of 12,100 acre-feet per year for the period of 1964-2009 (Hanson et al, 2014). For a more detailed summary of current conditions please refer to the 2014 Basin Management Plan Update (BMP).

GROUNDWATER MONITORING NETWORK

Purpose of Groundwater Monitoring Network

The purpose of the groundwater monitoring network is to collect data to accurately assess groundwater conditions and enable the Agency and community stakeholders to be adequately informed when making management decisions. The water quality data garnered from the network assists in tracking trends in groundwater both spatially and temporally, the progression of SWI, and the impacts of water management projects. Water level data obtained through the monitoring network track changes in groundwater storage, impacts of water management projects, and is also used in the development and refinement of the Pajaro Valley Hydrologic Model (PVHM). In addition to the functions listed above, the data collected through the network serves to establish a catalog of groundwater conditions for use in future investigations that have yet to be conceived.

Description of Groundwater Monitoring Network

The Agency's groundwater monitoring network currently consists of 255 individual wells with some individual historical records extending back as far as the 1940s. The majority of the wells in the network were inherited from existing groundwater monitoring networks established by the state of California, the County of Monterey, and the County of Santa Cruz. The network is predominantly composed of privately owned wells with a minority made up of municipal supply and dedicated monitoring wells. Almost all of the wells in the network provide water level data and a majority are capable of producing water quality samples for laboratory analysis. Most of the wells in the network were constructed for supply purposes and the intention of obtaining the maximum yield and therefore are commonly perforated in more than one aquifer unit.

While the Agency performs the majority of monitoring activities of the network, a small subset of wells in the network are monitored by other entities that share data with the Agency. These partnering entities

include Soquel Creek Water District (SCWD), Central Water District (CWD), City of Watsonville (CoW), and Monterey County Water Resources Agency (MCWRA) and are briefly described below.

- SCWD - Purveys municipal water supply to the area north of the Agency's boundary. They collect and share water level data and production data from their production wells and dedicated monitoring wells.
- CWD - Purveys municipal water to an area north of the Agency's boundary (but east of SCWD's service area). They collect and share water level data and production data from their production wells and a handful of monitoring wells.
- CoW - Purveys municipal water to Watsonville area residents inside the Agency's boundary. They provide water level, water quality, and production data from their production wells and monitoring wells.
- MCWRA - Manages the surface and groundwater resources of Monterey County outside of the Agency's southern boundary. They provide water level data for a series of monitoring wells located along the Agency's southern boundary.

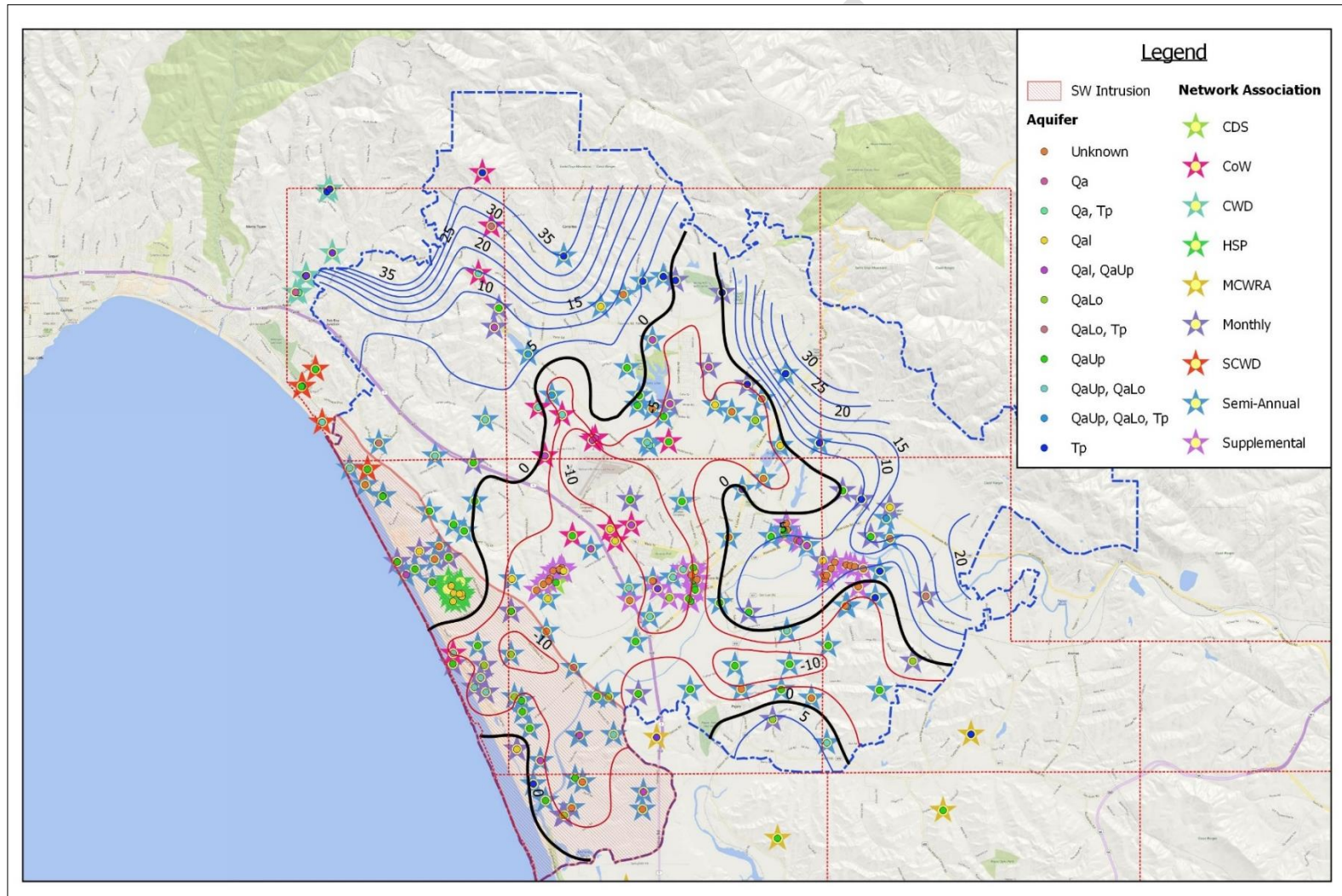
The large portion of the monitoring network that is monitored directly by the Agency is broken down into subnetworks based on the frequency of data collection (monthly, semi-annually) or a specific project (supplemental, Harkins Slough Project). These subnetworks are described below.

- Monthly - The Monthly subnetwork consists of 48 wells distributed across the PVGB. Water levels are measured on a monthly basis with water quality samples collected semi-annually. All of the Agency's dedicated monitoring wells known as the "PV" series are part of this subnetwork and are sampled for water quality on a quarterly frequency.
- Semi-Annual - The Semi-Annual subnetwork consists of 94 wells distributed across the PVGB. Water levels are measured and water quality samples are collected twice per year in April and September with the intent to capture the annual groundwater highs and lows respectively. Agency staff endeavor to collect both a water level measurement and a water quality sample for each well but due to access and operational issues this is not always feasible.
- Supplemental - The Supplemental subnetwork is composed of 37 wells and was created in 2004 for the purpose of monitoring groundwater conditions at three locations that were potential sites for supplemental supply wells to the Coastal Distribution System (CDS). These locations are Beach Road near the Water Resources Center, Lewis Road near the intersection of Hayes Road, and San Juan Road about three miles east of the community of Pajaro. Surrounding each potential site, a number of existing wells were selected to be monitored for water level and water quality. While the Beach Road location was the only site where a supplemental well was constructed, monitoring has continued at all three sites. Of the 37 wells, 10 are proximate to the Beach Road location, 14 are proximate to the Lewis Road location, and 13 are proximate to the San Juan Road location. At present, Agency staff collect water level and water quality data from these wells every April and September coinciding with the Semi-Annual subnetwork.
- Harkin Slough Project - The Harkin Slough Project (HSP) diverts water from Harkins Slough and impounds it in a spreading basin located on the adjacent San Andreas Terrace. The water infiltrates into the underlying groundwater system and is later recovered using a series of production wells for use as a supplemental water supply for the CDS. As part of the HSP, the Agency has installed 13 recovery wells and 16 monitoring wells to operate and observe project performance. The water quality monitoring frequency of the HSP subnetwork has varied in the

past from as often as biweekly to quarterly depending on the operational status of the project and available staff time. The water levels of the wells are monitored continuously with dedicated data loggers. Water quality samples are collected from twenty-four of these wells.

The location of the 255 monitoring sites and the entity that performs the monitoring are shown on the following page Figure 1 - Well Location Map. A complete list of all the wells in the groundwater monitoring network including details on the aquifer of completion, the assigned PVHM layer, the construction details, type of data collected, length of record, subnetwork association, and many other considerations are listed in Appendix B.

Figure 1 – Network Well Locations and Monitoring Entities



Water Level Monitoring

Groundwater water level data can be collected from 233 of the monitoring network wells. The frequency of water level measurements varies between the sub-networks as described above but all wells are visited at least twice per year. 85 of the wells are equipped with pressure transducers to collect water level data continuously at intervals as often as fifteen minutes. Water level data collected by the Agency and partnering entities is housed and maintained in Microsoft Access databases for use in analyses and archiving.

Groundwater Quality Monitoring

Groundwater quality data can be collected from 185 of the monitoring network wells. The collected data is utilized for purposes of characterizing the groundwater quality in the PVGB. Attempts to collect water quality samples are made at the frequencies noted above and samples are submitted to Monterey Bay Analytical Services (MBAS) for analysis. The analytical data collected by the Agency and partnering entities is housed and maintained in a Microsoft Access database for use in analyses and archiving.

Of the approximate 55,000 acre-feet of water extracted annually within the Agency boundary, roughly 850% is utilized for agricultural irrigation purposes. As such, an important focus of water quality monitoring is on the suitability of the groundwater supply for agronomic purposes. The agricultural suitability analysis performed by MBAS incorporates chloride analysis which is used to detect and map seawater intrusion based on a threshold of 100 mg/L of chloride. Water samples collected as part of scheduled monitoring are at minimum analyzed for the constituents listed in Table 1 - Water Quality Constituents - PVWMA Groundwater Monitoring Network.

Table 1
PVWMA Groundwater Monitoring Network
Water Quality Constituents

Alkalinity (as CaCO ₃)	Nitrate as NO ₃ -N
Bicarbonate (as HCO ₃ -)	Nitrite as NO ₂ -N
Boron	Nitrate+Nitrite as N
Bromide	o-Phosphate-P
Calcium	pH
Carbonate (as CaCO ₃)	Potassium
Chloride	SAR
Fluoride	SAR (adjusted)
Hardness (as CaCO ₃)	Sodium
Langlier Index	Specific Conductance
Magnesium	Sulfate
Nitrate as NO ₃	Total Dissolved Solids

Current Use of Collected Data

The collected water level data is utilized by the Agency to assess changes in groundwater storage that are occurring as a result of natural conditions, pumping stresses, and management activities. Other key uses include its utilization to prepare hydrographs of individual wells for purposes of focused investigations, its use in calibration of the PVHM, and its use to create water level contour maps.

Water quality data is utilized by Agency staff to monitor general water quality conditions and changes in these conditions throughout the PVGB both spatially and temporally. With water quality data, staff are able assess the movement of SWI and prepare maps illustrating its progression. Additionally, collected data is used to characterize water quality impacts that may result from overlying land uses. It is important to note that at present the Agency does not include the collection and tabulation of industrial contamination.

MONITORING NETWORK REVIEW

Evaluation of Monitoring Program

The existing groundwater monitoring network described above was evaluated to assess the effectiveness of the current efforts and expenditures relative to the Agency's mission. This includes evaluation of both the areal and vertical spatial distribution of monitoring points to capture water level and water quality data used to characterize the PVGB. Additionally, the effectiveness of the network to capture and evaluate key indicators of potential water quality degrading processes were evaluated.

Review of Database – The Agency has a comprehensive database that includes detailed information on network monitoring wells. This information includes the location, depth, use, perforated interval, and data collection history for each well when known. Each well has also been assigned to an aquifer unit or units based off of the PVHM stratigraphy. The following recommendations were advanced and implemented to the database during the review process.

- Assignment of proper Agency to various wells – many of the wells in the database had missing fields as to ownership or responsibility. These omissions were corrected.
- Removal of Redundant Wells – there were multiple instances of redundant wells – a single well that had several different names, these conflicts were identified and removed.
- Clarification of Multi Completion Wells – Several wells in the network are nested or cluster wells, however, these wells were in the database as a single well. The database was updated to treat each separate completion as a separate well, even if the casings were in the same borehole.
- General corrections to perforated intervals, depths, aquifer assignments, and ownership were also made.

Network Evaluation by Aquifer

In the following section, the network is evaluated by aquifer unit. The base map utilized in the following figures present groundwater level contours from 2012 and the area where SWI has been detected (defined by chloride ions greater than 100 mg/L last updated in 2011). These elements are compositions created from data from all aquifers.

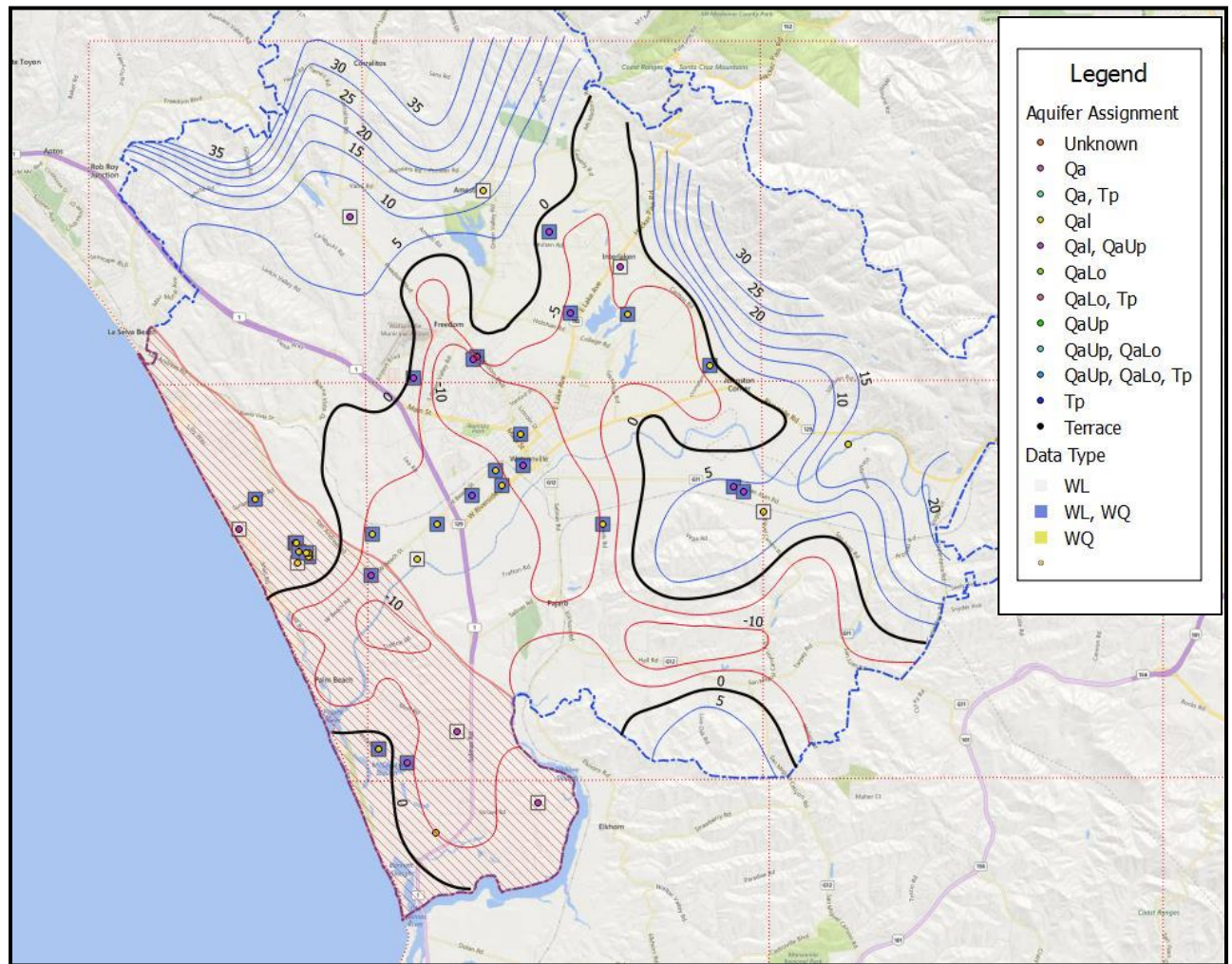
Figure 2- Network Wells Perforated in Alluvial Deposits or Upper Aromas

Figure 2 presents network wells perforated in the Alluvial aquifer or in both the Alluvial and Upper Aromas aquifers. Of the 40 wells, 24 are perforated in only the Alluvial and 16 are perforated in both aquifers. Water level data only is collected from 10 wells while both water level and water quality data are collected from 28 wells. Of this subset of wells, 15 wells are located within the 2011 SWI area.

The spatial distribution of these wells mirrors the distribution of the Alluvial Deposits in the center portion of the valley flanking the Pajaro River. Several wells are assigned to the Alluvial Deposits in Springfield Terrace area; however, this assignment seems unlikely. The distribution within the SWI area is limited however, many wells in the SWI area are no longer active due to poor water quality and establishing new monitoring locations is difficult. This data gap could be filled with dedicated wells designed for induction logging to survey the entire length of saturated sediment for changes in water quality. In the coastal portion of the basin, there are some wells that are relatively closely spaced, and may be redundant. A detailed review of the perforated intervals of these wells could eliminate redundancies from the network.

Figure 3 – Network Wells Perforated in Upper and Lower Aromas

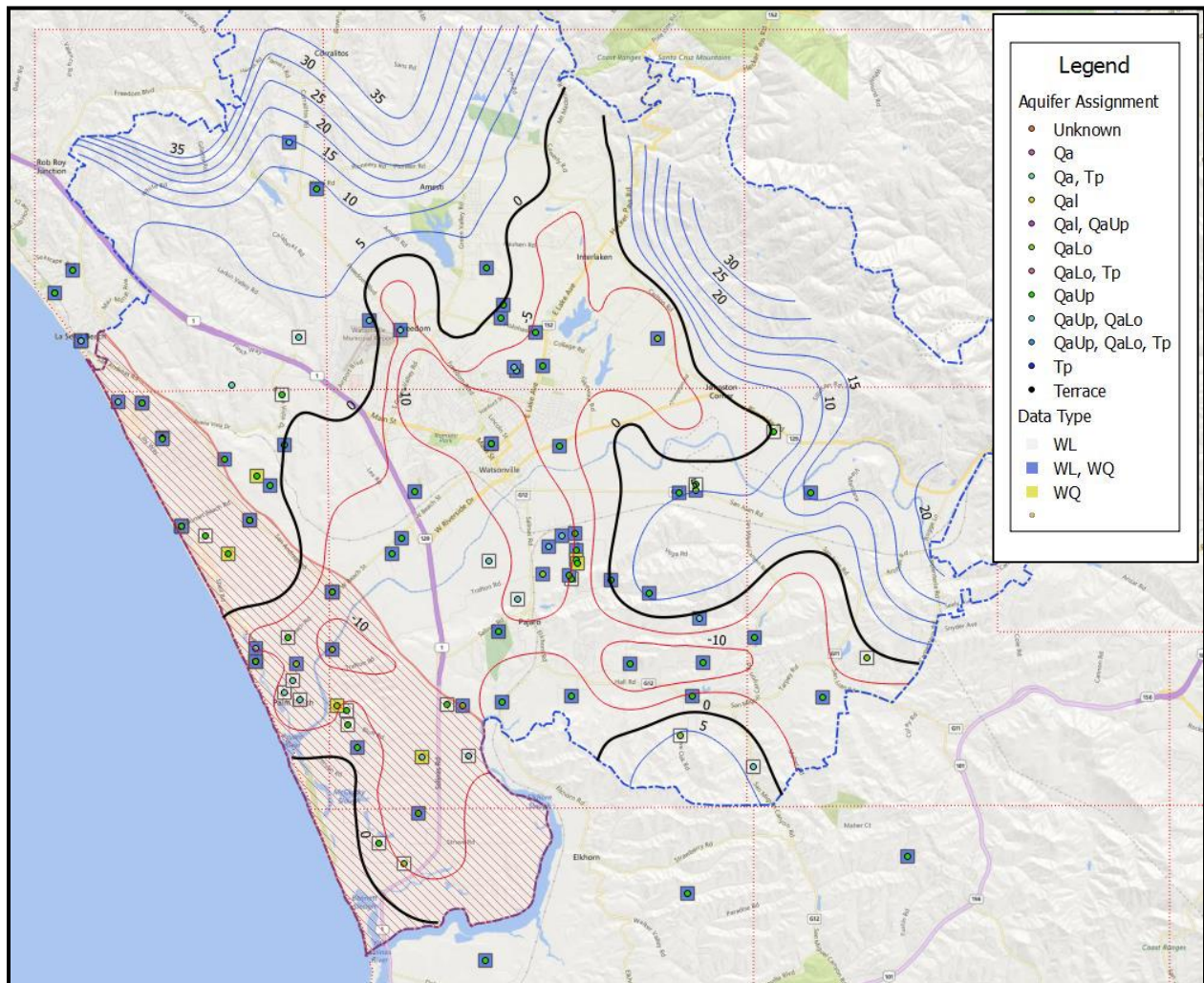


Figure 3 presents the location of the wells perforated solely in either the Upper or Lower Aromas units or a combination thereof. Of the 101 network wells, 71 can capture both water quality and water level data, 24 can measure water level only, and 6 are restricted to water quality data are collection only. There are 34 wells located within the 2011 SWI area – 16 in the Upper Aromas, 7 in the Lower Aromas, and 9 that perforate both units.

The overall areal spatial distribution is good, both throughout the PVGB and also in the SWI area. There is adequate vertical distribution although it could be improved. Again, the installation of induction logging wells could be useful in detailing SWI. In the center portion of the basin there is a high density of wells that may have redundancies.

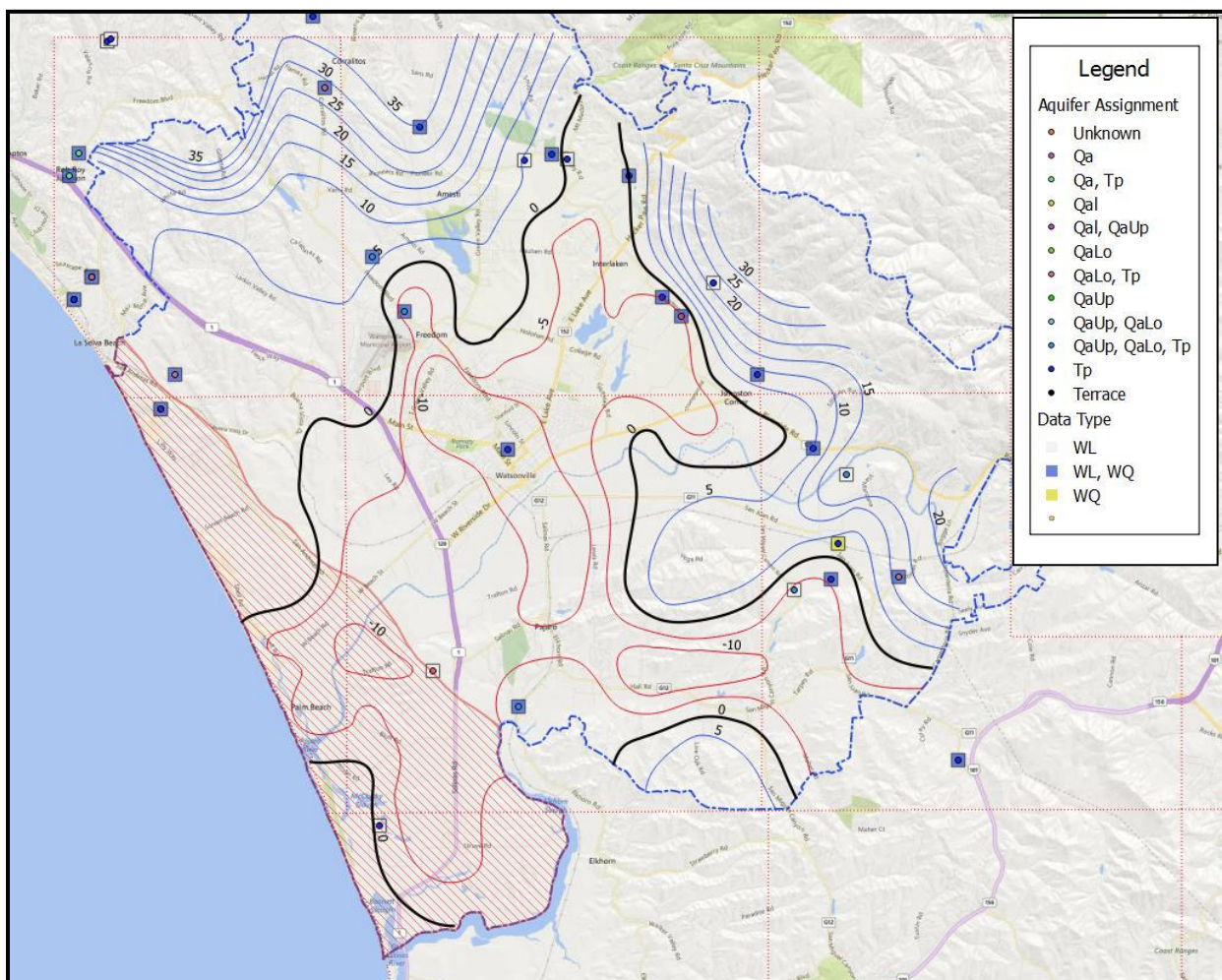
Figure 4 - Network Wells Perforated in Purisima

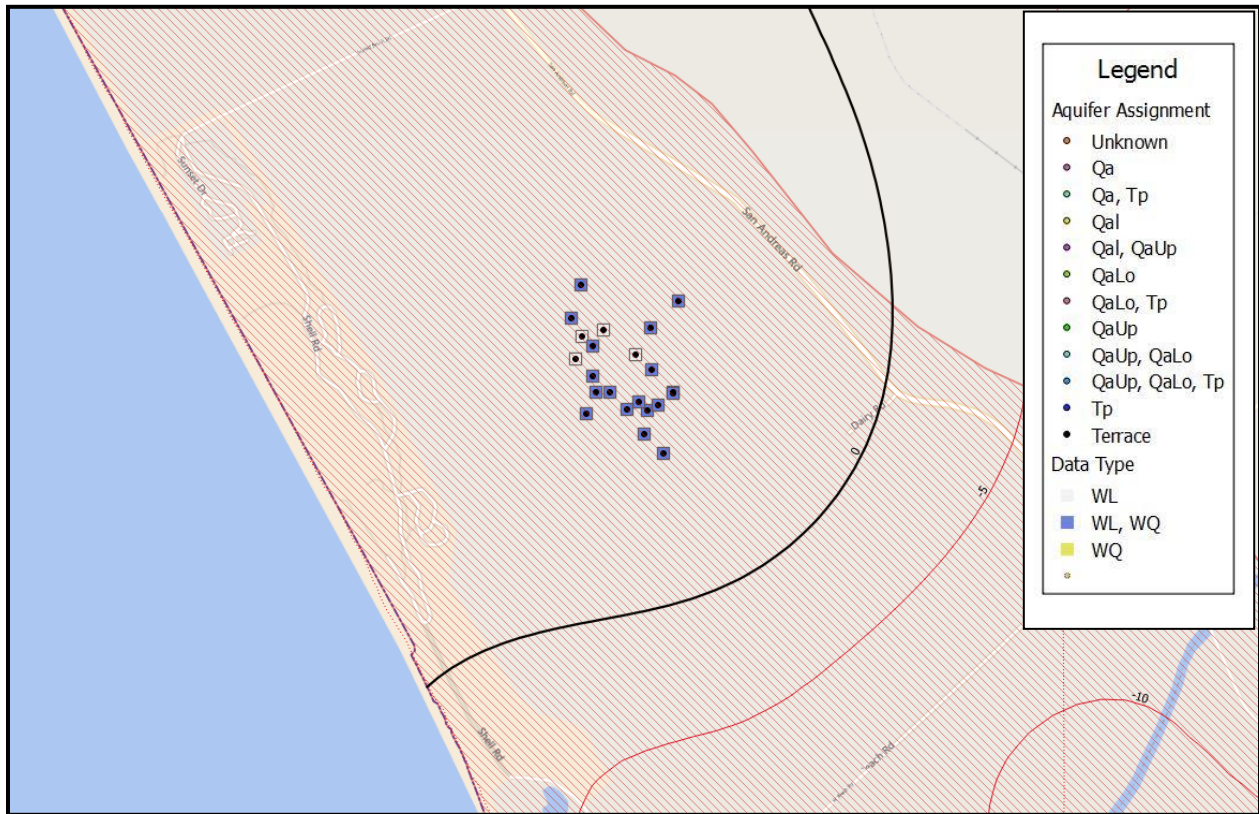
Figure 4 presents network wells that are perforated in entirety or in part in the Purisima Formation. Of the 36 wells, 25 are perforated solely in the Purisima Formation, 5 are perforated in both the Upper and Lower Aromas and the Purisima Formation, 6 are perforated in the Lower Aromas and the Purisima, and 2 are perforated in the Alluvial Deposits and the Purisima Formation. Water level and water quality data can be collected from 26 wells, 9 are measured only for water level, and 1 is strictly monitored for water quality.

Spatially the wells are predominately located in the foothill areas where the Purisima is shallow or comes to the surface. There are several wells however, that extend through the more shallow units in the SWI zone to the underlying Purisima.

Evaluation of Selected Project Specific Subnetworks

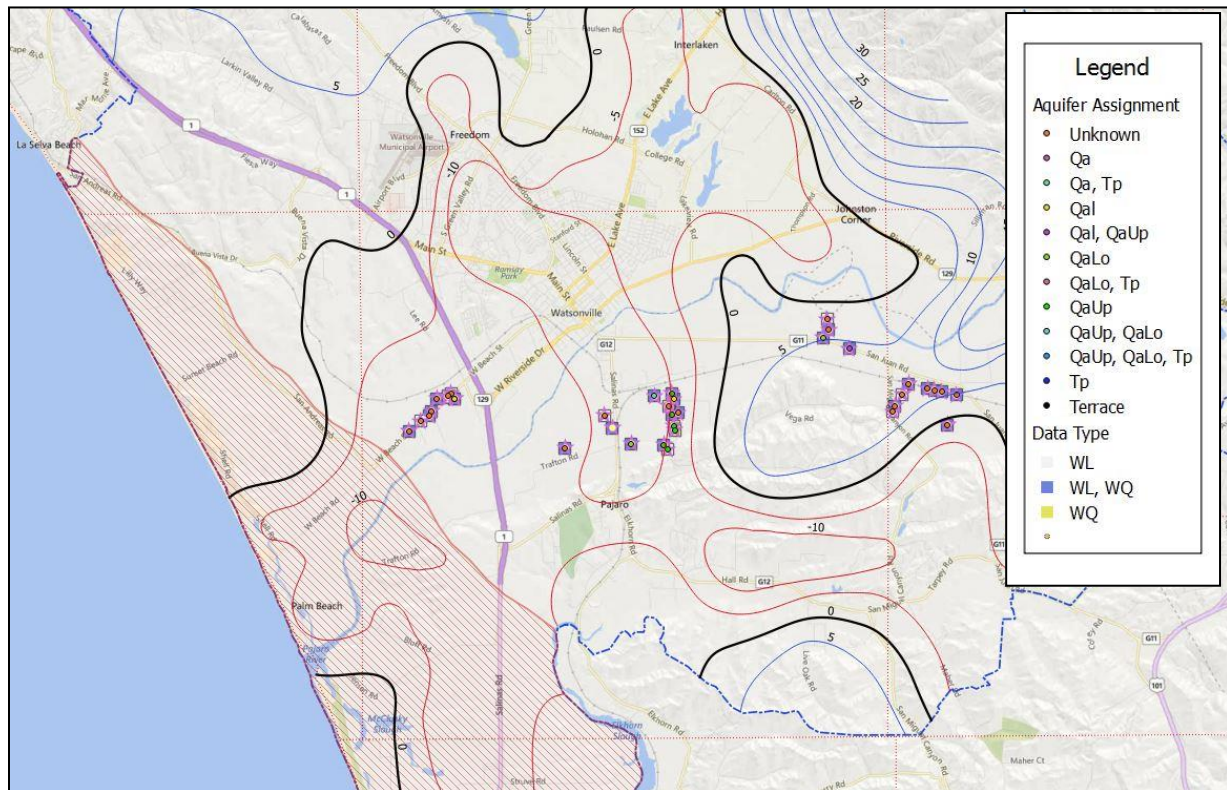
In addition to reviewing the monitoring network in regards to aquifer specific data, this review also assesses the Harkins Slough Project and the Supplemental subnetworks.

Figure 5 -Network Wells Associated with Harkin Slough Project (Terrace Aquifer)



Of the 255 wells that are part of the monitoring network, 29 wells are associated with the HSP. During the exploration and operation activities of the HSP, it is evident that there is a localized isolated aquifer system in the terrace deposits that underlie the project. The base of these terrace deposits are located approximately at sea level. Water levels in 22 monitoring and production wells associated with the project display water level elevations around 40-50 feet above sea level whereas water levels in the regional aquifer system are at elevations near or below sea level. The 2011 SWI boundary indicates the regional aquifer is intruded with seawater but because the HSP is located above an isolated aquifer system, it comes as no surprise that HSP wells do not indicate any intrusion of seawater. For this reason, the HSP subnetwork wells with the exception of HSPDMW1, should be assigned the aquifer designation of "Terrace."

Of the 22 wells, 18 are used for both water quality sampling and water level data collection and 4 are used only for water level data collection. As discussed above, these wells are perforated in an aquifer system that has its base at an elevation above sea level. As such, the wells are not relevant to the detection of SWI although they could have some utility in understanding nutrient loading.

Figure 6 - Network Wells Assigned to Supplemental Well Network

The Supplemental subnetwork was established with the intent to monitor the impacts associated with the installation and operation of inland wells that would send blend water to the CDS. There are 37 wells in the subnetwork clustered in the Lewis Road, San Juan Road, and Beach Road areas. The wells were selected predominately on proximity to the proposed Supplemental Well sites. The completion depth and perforation locations are not known for 23 of the wells. Of the 15 other wells, 2 are perforated in the Lower Aromas, 6 in the Upper Aromas, 1 in both the Upper and Lower Aromas, and 1 in the Alluvial Deposits and the Upper Aromas. 25 of these wells are sampled for water quality and measured for water level, and 8 are strictly measured for water level.

None of the wells along the Beach Road area have known construction details. Perforation intervals are known for 9 of the 14 subnetwork wells near Lewis Road and only 1 of the 12 wells in the San Juan Road area. The wells with known construction details in this subnetwork are relatively redundant to monitoring wells in the greater network.

If supplemental subnetwork wells are to continue being monitored, an effort should be made to find the associated well logs and learn the construction details. If at least the depth of the well is obtained, a tentative aquifer assignment could be made. If a well log had been filed with the State of California, it is likely the Agency would have gotten a copy as part of their many data requests. In absence of a log from the State, it may be possible to obtain a well log from the owner or the local drilling contractors.

Cost Evaluation and Network Optimization

The current monitoring program annually includes:

- Approximately 1000 individual water level measurements collected at roughly 200 locations
- Approximately 190 individual water quality samples collected from roughly 90 locations on average

Based on discussions with Agency field staff, it takes an estimated average of 10 minutes of staff time per site to perform monitoring activities. Water level measurements and water quality sample collection at an individual site usually are collected on separate visits. The time required is not sensitive to whether only a water level measurement is made or a water quality sample collected, or both. After collection, water quality samples need to be delivered to the analytical laboratory. Both water quality and water level data are then input into the appropriate databases.

The Agency estimates that annual cost for groundwater data collection is approximately \$40,000. Of this approximately \$16,000 are incurred as laboratory costs. The remaining expenditure can be roughly split between time involved with water level data collection and archiving and water quality sampling and data archiving. Given these estimates the average per unit cost for water level data collection is approximately \$12 per measurement. The average per unit costs for groundwater quality sampling and analysis is approximately \$150 per sample.

ADEQUACY OF EXISTING NETWORK TO MEET REQUIREMENTS OF SGMA

The requirements outlined below are those presented in the current draft requirements (2/2016). The requirement is presented in normal text; an assessment of how the current network exceeds, meets or falls short of the requirement is presented in italics.

- (a) The best management practices for monitoring developed by each Agency shall include the following minimum standards:
- (1) Groundwater Elevations. The monitoring network shall be capable of demonstrating groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features that includes the following:
 - (A) A sufficient density of monitoring wells capable of collecting representative measurements through depth discrete perforated intervals to adequately characterize the potentiometric surface for each of the principal aquifer.
 - (B) Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.

The Agency monitoring network as currently developed and maintained has sufficient areal density, temporal frequency, and vertical discretization to collect the data necessary to characterize the aquifer system as required. The network is able to measure the achievement of basin objectives and detect incidence of minimum thresholds. Although there is sparse evidence that the differences in potentiometric surfaces between the principal aquifer system is significant, if future data suggest that it is, some additional effort to improvement the Agency's ability to contour each aquifer unit would be appropriate. To be fully compliant the Agency should periodically consult with county agencies or GeoTraker regarding potential industrial contamination events in the basin and the status of their clean-up efforts.

- (2) Groundwater Storage. The monitoring network shall be capable of providing sufficient data to enable a reasonably accurate and detailed assessment of the change in annual groundwater storage.

The existing network is adequate to prepare annual contour maps of the aquifer system and calculate the changes in storage. Although significant differences in aquifer water levels have not been demonstrated to date, the Agency should evaluate whether each principal aquifer unit needs to be contoured.

- (3) Seawater Intrusion. The network shall be capable of monitoring chloride concentrations, or other constituents approved by the Department, and be sufficiently dense to calculate the current and projected rate of seawater intrusion for each principal aquifer.

The primary travel path of intruding seawater has not been well defined. Given the highly stratified nature of the Aromas Sands, it is doubtful that any given discretely perforated monitoring well will be perforated in the correct location to accurately detect advancing seawater. The Agency should consider utilizing either surface or downhole geophysics as an alternative method of monitoring SWI. Potential geophysical methods could take the form of either reoccupying the same location on periodic basis and taking geophysical soundings or installation of wells that fully

penetrate all aquifers and can be used for induction logging to detect changes in groundwater resistivity indicative of SWI.

- (4) Water Quality. The monitoring network shall be capable of collecting sufficient spatial and temporal data from each principal aquifer to determine groundwater quality trends for established constituents of concern.
- (5) Land subsidence. The monitoring network shall be capable of identifying the rate and spatial distribution of land subsidence, which may be measured by extensometers, GPS surveying, remote sensing technology, or other method approved by the Department.

Subsidence is not a major concern in basins connected to the ocean. Depleted groundwater storage, at least in part, is replaced by seawater which maintains pore fluid pressure.

- (6) Interconnected surface waters. The monitoring network shall be capable of monitoring surface and groundwater conditions where interconnected surface water exists. Monitoring of interconnected surface water systems shall be sufficient to characterize the spatial and temporal exchanges between surface water and groundwater, as necessary and appropriate, to adequately calibrate and apply the tools and methods selected to identify interconnected surface water systems. The interconnected surface water monitoring network shall be able to characterize the following:
 - (1) Flow conditions including, but not limited to, surface water discharge, surface water head, and baseflow contribution.
 - (2) Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.
 - (3) Monitor the conditions to adequately characterize temporal changes in conditions with varying stream discharges and regional groundwater pumping conditions.
 - (4) Any other factor that is necessary to identify potential significant and unreasonable adverse impact on beneficial uses of the surface water.

Surface water, except where significant for groundwater recharge, is not a major component of the monitoring program.

CONCLUSIONS

The Agency has an areally-extensive groundwater data collection network. This network allows monitoring of water level and water quality data across the basin and within the four primary aquifer units. The network has been developed over decades and the accumulated data represents an invaluable resource for understanding and managing the water resources of the basin. The review of the network finds it to be robust and well implemented but with room to improve. The following conclusions and recommendations are provided with some items having already been addressed concurrent with this evaluation.

- There are four primary aquifer units in the PVGB for which extraction data are collected and subtotaled. The current network enables collection of water level data from some wells perforated in singular aquifer units. However, the densities of these monitoring points are insufficient to prepare aquifer-specific groundwater level maps. As a result, the Agency prepares composite groundwater level maps. Initially this appears to be a deficiency in the network but at locations where water level data are available for all four aquifer units, the data shows only minor differences in water surface elevations. As such, efforts to establish more aquifer-specific monitoring locations may not provide meaningful data.
- There are redundancies in the monitoring network. There are locations where wells are spaced very close together where the same type of data are being collected from wells that are assigned to the same aquifer unit. However, eliminating this redundancy will require a detailed analysis of the data accumulated to date to evaluate the value of any given dataset and to parse out those network locations that are truly redundant. Given the unit cost of data collection, the cost of the effort to reduce this redundancy may not be cost-effective.
- The construction details (depth or perforated interval) of 42 of the wells in the network are unknown. If you remove the 28 monitoring wells associated with HSP from the total network, there are about 227 wells monitoring the basin. Therefore, about 18% of wells are of unknown depth and completion. Half of the network wells with unknown construction/completion are monitored semi-annually for both water level and water quality. Many have 15 to 20 year historical records. The other half are Supplemental subnetwork wells and are sampled for both water level and water quality with a few exceptions. Historical records for these wells date back to 2004.
- The current network generally meets the standards of SGMA. As the program advances, some modifications of the program will likely be necessary.
- All of the 22 wells in the HSP subnetwork are currently assigned to the Alluvial Aquifer. However, with one exception; they are completed in a hydraulically-isolated unit overlying the Aromas Aquifer. Characterizing them as “Alluvial” is confusing and aggregates the data from the HSP wells with data from wells in a separate hydrogeologic unit.

RECOMMENDATIONS

Based on the review of the existing monitoring network, the following recommendations are advanced. Some of the recommendations have already been implemented and are only included here for completeness.

- It is assumed that the constructions details of the wells are unknown because driller logs are not available. The Agency should obtain permission from property owners to seek well construction information from local pump/drilling contractors. Many times the drillers' log doesn't get filed or is misplaced by DWR. Drilling contractors may have retained copies of otherwise lost logs. Additionally, most pump contractors sound the total depth of a well before they install equipment – these installation logs can at least infer a total depth and perforation locations could assumed from the depth information. Many of the network wells lacking construction details have years of data which is valuable in-and-itself. Given the time and labor invested in obtaining the data, a small amount of work to make this data more useful and defensible would be a good investment.
- Reduce the number of wells in the Supplemental subnetwork in the central portion of basin. The producing intervals are not precisely known and significant redundancy likely exists (check whether data are complementary). Currently, water samples are collected and analyzed twice a year from 23 wells for which the construction is unknown. Based on the evaluation of per-sample costs, the continued sampling of these wells costs approximately \$7,000 per year. The Supplemental subnetwork wells were added when the previous BMP (2000) was proposing supplemental supply wells for the CDS at three locations. The purpose of the subnetwork wells was to quantify water level or water quality impacts that might accrue from the operation of the supplemental supply wells. Ultimately, the Agency only built supplemental supply wells at one location and there are no plans to build additional wells.
- Adopt a new aquifer unit designation for the HSP subnetwork wells that are perforated in the aquifer system above the Alluvial Aquifer (i.e. Terrace Deposits). These wells are located in an area where regional water levels are at or below sea level and in an area intruded by seawater. This reassignment will separate these wells and the data they provide from the rest of the wells assigned to the Alluvial Aquifer as defined in the PVHM.
- Incorporate automated calculation of SWI indicators within the water quality database. Currently, water quality data within the SWI area is utilized to define chloride levels and then prepare maps of the intruded area. With minor changes to the database additional indicators of initial stages of seawater intrusion could be passively calculated. This will allow early detection and characterization of saline degradation of the groundwater system. A discussion of easily implemented changes to the database allowing passive calculation of key SWI indicators and background thereof is presented in the APPENDIX A. Several constituents may need to be added to the water quality analytical program to utilize these methods or possibly a different analytical program could be adopted in the coastal area.
- Existing data suggests that aquifer-specific water level contouring may not be particularly meaningful and likely not worth effort. In contrast, the complexity of the aquifer system makes delineation of the area impacted by SWI difficult. Currently the published maps delineate an area where at least at some depth of groundwater is impacted by SWI. However, at many locations within this delineated area there are many wells that are not impacted. This is an artifact of presenting data from a 3-dimensional problem on a 2-dimensional map. An effort could be made to evaluate whether within the network there are subsets of wells that can be used to better

understand the depth/aquifer-specific nature of SWI. Alternatively, a useful tool would be the installation of “Sentinel Wells” that would allow periodic induction logging of the entire saturated thickness of sediments (at least to top of the Purisima) to detect changes in pore-fluid resistivity.

- Although there are redundancies and wells of unknown construction in the network, many of these wells have long periods of record which are valuable in-and-of-itself. The Agency however should not add any more redundant wells or wells with unknown construction to the network. The elimination of redundant wells or wells lacking construction details should be the result of careful review. It is hard to predict the future value of data from any given location.
- The cost of the monitoring program may be slightly reduced by eliminating redundant wells or wells that are of an unknown construction. Data from the wells of unknown construction, while possibly having a value in looking at historical trends if there is a long period of record, cannot be used for rigorous basin analysis. The cost of the laboratory analysis could be lessened by reducing the frequency of laboratory analysis for some of the wells or by substituting field measurements of key indicators such as electrical conductivity and nitrates. This would be most applicable to wells inland of the area where SWI is considered possible. If changes in key indicators are noted, additional samples for laboratory analysis could then be collected.
- There is an areal gap in the groundwater monitoring network within the city limits of Watsonville. The Agency should install multi-aquifer monitoring well within the city to fill this gap. (***Agency installed multi-aquifer monitoring well at their office in 2015***)
- Because the dominant use of groundwater in the basin is agriculture, a key focus of water quality monitoring is understandably on agricultural suitability and the analytical program reflects this. However, there also are municipal and domestic users in the basin. The analytical program for water quality would benefit to be expanded to include constituents of concern relevant to these users. These constituents might include: Iron, Manganese, Arsenic, and Chromium (both total and VI).
- To comply with SGMA requirements it will be important to maintain an inventory of industrial groundwater pollution sources. This might be achieved by integrating data from the State’s GeoTracker database into the monitoring program. Additionally, the tracking of shallow industrial contamination could be integrated into other Agency efforts such as the Salt and Nutrient Management Plan.

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APPENDIX A – SEAWATER INTRUSION DETECTION – POSSIBLE MODIFICATIONS TO WQ DATABASE

Simple calculations could be made passively within database when the data are entered. A list and brief description of easily calculated seawater intrusion indicators is presented below.

Water quality changes associated with advancing seawater intrusion (SWI)

- Increasing chloride ion concentrations
- Calcium enrichment - Ratios of Ca to Mg – 0.3 in seawater
- Percentage of SO₄ to all ions – 8% in seawater, greater in fresher waters
- Ca to HCO₃+SO₄ (mg/l) - greater than 1 can be indicative of SWI
- Ratio of Chloride to Bromide (mg/l) – Seawater~297, Pajaro GW ~
- Jones Ratio - Ratios of Sodium to Chloride – molar¹ ratios less than 0.86 possible SWI
- Simpson Ratio (Todd 1959) – Ratio of Cl/HCO₃ + CO₃ (mg/l)=> good quality(< 0.5), slightly contaminated (0.5-1.3), moderately contaminated (1.3-2.8), injuriously contaminated (2.8-6.6), highly contaminated (6.6 – 15.5)
- Base Exchange Index (BEX) – $BEX = Na + K + Mg - 1.0716 Cl$ (all units in meg/l²); positive value indicates freshening, negative value indicates salinization.

None of these indicators in and of themselves are conclusive but given the ease of calculation, the tracking of all these indicators in aggregate may allow early detection – i.e. if multiple indicators are suggesting intrusion. It would be possible to configure a report in the water quality database that would summarize and graph these various indicators.

¹ Molar weight = weight of constituent in solution divided by atomic weight of constituent. For example. 45 mg/L Ca = 0.045 g/L divided by 40.08 g/mole = 0.0011 mol/L

² meg/l = milliequivalents=concentration in mg/l divided by valance

APPENDIX B – MONITORING WELL INVENTORY

DRAFT

PVWMA Mnt Network

Site Name, C.10	Inside_DWZ, C.5	Well_Type, C.15	Assoc_Netw, C.12	Well_Comp, C.10	DWR_Well_N, C.15	Casing_Dia, C.4	Yield_GPM, C.5	Perf_Inter, C.30	Top_of_Per, C.5	Bot_of_Per, C.5	Completed_N, 19.11	Ref_Point_N, 13.11	Well_Bot_EN, 13.11	Elev_Masu, C.5	Date_Const, D	Date_Destr, D	Production, C.11	Screened_1, C.25	Data_Provi, C.14	Count_WQ_S, N5.0	Start_WQ_D, D	Last_WQ_Da, D	Count_WL_M, N5.0	Start_WL_D, D	Last_WL_Da, D		
264	No	Metered Well	Semi-Annual	<Null>	<Null>																						
269	Yes	Metered Well	Semi-Annual	00063903	12S01E-25	12			500	650	650	14,0612	-635.939	No	05/23/76	#####	Active	Alluvial	WL_WQ	73	08/10/61	04/18/14	225	11/80/68	12/20/13		
278	No	Metered Well	Semi-Annual	<Null>	<Null>				360	400	440-500	122	-423	Yes			Active	Aromas	WL_WQ	38	08/22/95	10/02/14	56	12/14/79	10/02/13		
281	No	Metered Well	Semi-Annual	<Null>	<Null>				360	500	545	122	-423	Yes			Active	Purisima	WL_WQ	14	08/25/95	09/16/14	24	08/15/92	04/11/13		
291	No	Metered Well	Semi-Annual	00097243	12S02E-9	6			136	156	163	30.0369	-132.964	No	01/24/75		Active	Aromas	WL_WQ	35	07/30/62	09/30/14	54	11/23/60	04/15/13		
293	Yes	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	15.481	0	No		Active	Aromas	WL_WQ	13	05/02/05	10/01/14	13	07/08/05	09/27/13		
294	Yes	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	14.7062	0	No		Active		WL_WQ	2	05/03/02	05/02/12	12	07/08/05	09/24/13		
313	No	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			0	39.25	0	No		Active		WL_WQ	13	04/11/96	10/02/14	5	12/19/95	05/14/09		
314	Yes	Metered Well	Semi-Annual	<Null>	<Null>				255-275?	255?	275?	0	106.7	0	Yes		Active	Aromas	WL	13	08/15/95	05/17/05	137	11/22/57	09/23/13		
315	No	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			200	119.5	-80.5	Yes		Idle	Alluvial, Aromas	WL	24	06/17/62	08/18/96	83	03/17/65	09/23/13		
322	No	Metered Well	Semi-Annual	00004629	12S01E-12D	12	800		260	328	332	222.499	-109.501	No	06/10/54		Active	Aromas	WL	90	08/03/61	09/15/14	73	08/17/78	05/07/09		
327	Yes	Metered Well	Monthly	<Null>	<Null>				<Null>			600	9.6	-590.4	Yes		Active	Aromas	WL_WQ	89	10/15/92	09/27/13	219	08/15/78	01/21/14		
351	No	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			0	132	0	Yes		Active		WL_WQ	27	04/12/96	09/16/14	22	12/27/95	09/19/13		
360	Yes	Monitoring Well	Monthly	<Null>	13S02E-06R01				50-120	120	120	25.4	-94.6	Yes		03/01/11	Destroyed	Alluvial	Destroyed	14	07/26/61	05/09/97	235	08/21/47	01/14/11		
362	Yes	Metered Well	Semi-Annual	00022762	12S02E-31	16	936		200	300	305	58.7367	-246.263	No	07/30/77		Active	Aromas	WL_WQ	36	04/10/96	09/27/13	36	11/06/89	09/23/13		
365	Yes	Domestic Well	Semi-Annual	<Null>	<Null>				140-180	180?	180	68	-112	Yes			Active	Aromas	WL	24	04/10/96	04/10/96	119	03/24/47	09/23/13		
369	No	Metered Well	Semi-Annual	00579293	11S01E-16	12	1235		300	600	600	134.846	-465.154	No	04/30/94		Active	Aromas, Purisima	WL_WQ	1	08/19/95	08/19/95	32	09/02/94	09/19/13		
384	Yes	Metered Well	Semi-Annual	00071834	12S02E-2/C	12			288	432	456	166	-290	Yes	05/04/62		Idle	Aromas, Purisima	WL	4	05/08/97	05/24/05	17	11/28/95	09/23/13		
387	Yes	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	18.1573	0	No		Active		WL_WQ	7	04/12/02	09/16/14	17	07/08/05	09/24/13		
389	Yes	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	17.3845	0	No		Idle		WL	5	04/19/02	09/21/06	20	07/08/05	09/24/13		
436	Yes	Metered Well	Semi-Annual	00089273	12S01E-24	12			338-390	338	390	400	9.83543	-390.165	No	02/24/75		Idle	Aromas	WL	11	04/18/96	04/22/02	21	11/28/95	09/18/13	
439	No	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			316	131.42	-184.58	No		Active	Aromas	WL_WQ	18	04/10/96	04/18/13	20	07/28/93	09/23/13		
441	No	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	56.6908	0	No		Idle		WL	0			16	07/13/05	09/24/13		
442	No	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	61.9794	0	No		Active		WL_WQ	5	07/17/07	04/15/14	15	07/13/05	09/24/13		
443	No	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	63.9323	0	No		Active		WL_WQ	0			15	07/13/05	09/24/13		
444	No	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	64.6132	0	No		Active		WL_WQ	3	04/24/06	04/15/14	13	07/13/05	09/24/13		
445	No	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	65.0021	0	No		Active		WL_WQ	1	04/23/13	04/23/13	15	07/13/05	09/24/13		
449	No	Monitoring Well	Semi-Annual	00237374?	12S03E-08C01				181-260	260	260	58	-202	Yes	05/11/84		Idle	Aromas, Purisima	WL	8	08/21/96	08/21/96	67	07/21/47	09/20/13		
469	No	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			90	32.31	-124.8	Yes	03/01/39	Active	Alluvial	WL_WQ	81	08/05/61	09/15/14	73	08/15/78	09/18/13		
477	Yes	Metered Well	Semi-Annual	<Null>	12S02E-18D1				90-125	125	135	10.2	-124.8	Yes	03/01/39		Active	Alluvial	WL_WQ	60	06/09/71	04/17/14	71	01/05/70	09/18/13		
480	Yes	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	15.0184	0	No		Active		WL_WQ	9	04/11/02	10/01/13	16	07/08/05	09/24/13		
483	No	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			0	47.9529	0	No		Active		WL_WQ	21	05/27/99	04/11/14	19	04/12/96	09/20/13		
485	No	Metered Well	Monthly	00117396	12S03E-6	14			95-135	190-230	280-360	95	360	422	75.5009	-346.499	No	05/21/69	Active	Aromas	WL_WQ	43	05/06/93	10/07/14	172	03/05/47	01/21/14
489	No	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			174	67.5	-106.5	Yes		Active	Alluvial, Aromas	WL_WQ	25	08/12/82	09/16/14	59	11/22/78	04/11/13		
501	No	Metered Well	Monthly	00247160	11S02E-23	5	27		360-420	360	420	262.7	-157.3	Yes	07/28/82		Active	Purisima	WL_WQ	12	04/29/08	10/13/14	90	01/25/96	01/21/14		
503	No	Monitoring Well	Monthly	<Null>	11S01E-24G01				105-135	105	135	148	186.5	38.5	Yes		Active	Alluvial, Aromas	WL	28	08/10/81	07/26/96	292	03/20/47	01/21/14		
526	No	Metered Well	Semi-Annual	<Null>	<Null>				300-510	300	510	550	76	-474	Yes		Active	Aromas	WL_WQ	30	08/25/95	04/08/14	22	04/17/94	04/12/13		
538	Yes	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			0	14.1182	0	No		Active		WL_WQ	28	08/22/95	04/19/13	69	12/15/67	09/23/13		
580	No	Metered Well	Supplemental	00100857	11S01E-24	8			128-168	128	168	176	30.5506	-145.449	No	01/20/67		Active	Alluvial	WL_WQ	7	06/26/02	10/01/14	14	07/08/05	09/24/13	
2119	No	Monitoring Well	Semi-Annual	<Null>	<Null>	10			317-377	317	377	377	186.5	-190.5	Yes	05/01/67		Idle	Purisima	WL	0			14	05/13/05	09/19/13	
541	No	Metered Well	Semi-Annual	<Null>	<Null>				520	179.549	340.451	No					Active	Aromas	WL_WQ	10	04/09/96	10/18/05	16	01/25/96	09/23/13		
531	No	Monitoring Well	Semi-Annual	<Null>	12S02E-18K03				137-155	137	155	155	20	-135	Yes		Idle	Alluvial	WL	23	06/09/71	08/10/83	74	01/05/70	10/23/13		
544	Yes	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	17.5223	0	No		Active		WL	0			17	07/08/05	09/24/13		
627	No	Metered Well	Supplemental	<Null>	<Null>				<Null>			0	65.4233	0	No		Active		WL_WQ	7	05/02/05	10/07/14	14	07/13/05	09/24/13		
636	No	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			160	102.5	-57.5	Yes		Active	Alluvial	WL_WQ	28	08/14/98	09/29/14	15	10/11/04	09/26/13		
647	No	Metered Well	Semi-Annual	<Null>	<Null>				400-500	400	500	535	108	-427	Yes		Idle	Purisima	WL	4	04/12/96	04/07/10	21	12/19/95	09/19/13		
651	No	Metered Well	Semi-Annual	00306422	11S01E-35	12	1100		360-500	360	500	500	196.496	-303.504	No	11/20/88		Active	Aromas	No Access	13	08/14/96	09/14/10	5	12/06/95	05/07/09	
657	No	Metered Well	Semi-Annual	<Null>	<Null>				370-430	370	430	440	174.6	-265.4	Yes		Active	Aromas	WL_WQ	19	04/10/96	10/10/14	14	12/19/95	09/20/13		
659	Yes	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			366	165.017	-200.983	No		Active	Aromas	WL	14	02/15/90	05/19/05	0				
683	Yes	Metered Well	Semi-Annual	00081242	13S02E-05C2	10			168-384	168	384	408	61.1	-346.9	Yes	04/08/74		Active	Aromas	WL_WQ	32	04/09/96	05/08/14	40	12/17/80	09/27/13	
701	Yes	Metered Well	Semi-Annual	00498071	<Null>	12	1000		170-250	170	250	270	108.619	-160.381	No	04/10/95		Active	Alluvial	WL_WQ	33	05/08/98	10/13/14	5	09/20/11	09/26/13	
703	No	Metered Well	Semi-Annual	00201457	11S01E-27/34	12	800		270-370	270	370	370	149.277	-220.723	No	07/03/87		Active	Aromas, Purisima	WL_WQ	17	04/15/96	04/07/14	21	02/08/96	09/18/13	
707	No	Metered Well	Supplemental	<Null>	<Null>				<Null>			600	23.7969	-576.203	No		Active	Aromas	WL_WQ	4	08/17/08	04/16/13	11	04/25/06	09/24/13		
730	No	Metered Well	Semi-Annual	<Null>	<Null>				190-270	190	270	274	61.5	-212.5	Yes		Active	Aromas	WL_WQ	18	08/13/99	10/01/13	40	12/24/80	09/20/13		
731	No	Metered Well	Semi-Annual	<Null>	<Null>				<Null>			0	156.793	0	No		Active		WL_WQ	15	04/25/97	09/15/14	15	10/14/04	09/18/13		
HSPRW6	Yes	Recovery Well	HSP	00742195	12S01E-13	10	16		100-140	100	140	160	139.3	-20.7	Yes	03/27/01	#####	Idle	Alluvial	WL	3	02/06/03	1				

PVWMA Main Network

Site Name, C.10	Inside_DWZ.C.5	Well_Type.C.15	Assoc_New.C.12	Well_Comp_C.10	DWR_Well_N.C.15	Casing_Dia.C.4	Yield_GPM.C.5	Perf_Inter.C.30	Top_of_Per.C.5	Bot_of_Per.C.5	Completed_N.19.11	Ref_Point_N.13.11	Well_Bot_E.N.13.11	Elev_Measu.C.5	Date_Const.D	Date_Destr.D	Production.C.11	Screened_1.C.25	Data_Provl.C.14	Count_WQ_S.N.5.0	Start_WQ_D.D	Last_WQ_Da.D	Count_WL_M.N.5.0	Start_WL_D.D	Last_WL_Da.D
PV1D	No	Nested MW	Monthly	00258248	12S01E-10R001N2		250-270	250	270	270	71.8	-198.2	Yes	02/24/88		Idle	Aromas	WL, WQ	49	10/24/88	07/02/14	235	01/12/89	01/30/14	
PV1M	No	Nested MW	Monthly	00258248	12S01E-10R002N2		132 4-171.5, 193 6-230	132	230	230	71.67	-158.33	Yes	02/24/88		Idle	Aromas	WL, WQ	54	10/24/88	07/02/14	235	01/12/89	01/30/14	
2552	No	Domestic Well	Monthly	<Null>	12S02E-14C01		180-220	180	220	220	160	-80	Yes			Active	Aromas	WL, WQ	26	08/17/78	04/21/14	190	12/01/80	01/21/14	
2561	No	Metered Well	Semi-Annual	<Null>	<Null>		<Null>			170	8	-162	Yes			Active	Aromas	WL, WQ	9	08/21/95	04/21/14	15	04/21/95	09/26/13	
3000	No	Domestic Well	Semi-Annual	<Null>	<Null>		<Null>			0	55.3	0	Yes			Active	Aromas	WL, WQ	38	08/21/95	09/30/14	62	02/11/99	09/26/13	
65001	Yes	Domestic Well	Semi-Annual	00062895	12S02E-32	10	253-289, 315-603	253	603	603	89.3	-533.7	Yes	10/01/64		Idle	Aromas	WL	3	08/16/57	10/10/89	94	11/21/57	09/23/13	
75150	Yes	Monitoring Well	HSP	<Null>	<Null>		170-250	170	250	295	131.89	-153.11	Yes			Idle	Alluvial	WL	2	08/18/95	08/18/95	68	04/09/95	05/10/06	
76011	No	Domestic Well	Monthly	00360792	12S02E-15	5	24 160-200	160	200	200	79.6	-120.4	Yes	04/26/91		Active	Aromas	WL	10	08/17/78	04/05/94	230	12/07/60	01/21/14	
76547	No	Domestic Well	Monthly	<Null>	<Null>	10	125-160	125	160	172	58	-114	Yes	10/01/64		Active	Alluvial	WL	1	05/27/89	05/27/89	123	02/19/99	01/21/14	
99005	No	Domestic Well	Semi-Annual	<Null>	<Null>	10	164-224	164	224	232	154.7	-77.3	Yes	09/09/59		Idle	Alluvial, Aromas	WL	87	08/06/81	07/25/11	94	08/14/78	09/18/13	
99066	No	Domestic Well	Semi-Annual	<Null>	<Null>	6	270-330	270	330	330	60	-270	Yes	10/01/64		Idle	Aromas, Purisima	WL	2	04/11/86	05/26/05	18	02/02/96	09/20/13	
99141	No	Domestic Well	Semi-Annual	<Null>	<Null>	10	290-340	290	340	350	134	-216	Yes			Active	Aromas	WL, WQ	19	08/19/95	09/15/14	27	06/05/94	09/18/13	
AB1	Yes	Monitoring Well	HSP	<Null>	<Null>		155-195	155	195	460	126.07	-333.93	Yes			Idle	Alluvial	WL	0			7	04/05/12	11/05/13	
BW1	Yes	CDS Source	CDS	00499438	12S02E	16	210-300, 350-410	210	410	410	16.2341	-394.766	No	06/25/99		Active	Aromas	WL, WQ	21	06/03/04	10/02/14	0			
BW2	Yes	CDS Source	CDS	00804362	12S02E-16	16	2000 250-500	250	500	510	18.3405	-491.659	No	11/12/03		Active	Aromas	WL, WQ	29	11/12/03	09/10/14	0			
DolanD	No	Monitoring Well	Monthly	00490993	13S02E-15R02	2	530-580	530	580	600	89	-511	Yes	12/04/94		Idle	Aromas	WL, WQ	4	01/26/96	08/01/02	142	11/01/95	01/21/14	
DolanS	No	Monitoring Well	Monthly	00490990	13S02E-15R03	2	150-200	150	200	205	89	-116	Yes	12/02/94		Idle	Aromas	WL, WQ	3	01/26/96	08/01/02	142	11/01/95	01/21/14	
HSPDMW1	Yes	Monitoring Well	HSP	E048135	12S01E-13	3	200-220	200	220	240	125.51	-114.49	Yes	01/25/07		Idle	Alluvial	WL, WQ	34	01/26/07	06/18/14	33	01/04/11	11/04/13	
HSPMMW1	Yes	Monitoring Well	HSP	E0119970	12S01E-13	3	155-185	155	185	195	125.06	-69.94	Yes	11/10/10		Idle	Alluvial	WL, WQ	32	11/08/10	06/18/14	33	01/04/11	11/04/13	
HSPMMW2	Yes	Monitoring Well	HSP	E0119969	12S01E-13	3	162-172	162	172	177	133.91	-43.09	Yes	11/10/10		Idle	Alluvial	WL, WQ	32	11/10/10	06/19/14	33	01/04/11	11/04/13	
HSPMMW3	Yes	Monitoring Well	HSP	E0119968	12S01E-13	3	153-163	153	163	183	123.91	-59.59	Yes	11/10/10		Idle	Alluvial	WL, WQ	32	11/10/10	06/19/14	33	01/04/11	11/05/13	
HSPMW1	Yes	Monitoring Well	HSP	00742524	12S01E-13	4	45-85	45	85	135	130.04	45.04	Yes	01/16/01	#####	Active	Alluvial	WL, WQ	27	10/29/83	07/17/13	34	01/04/11	11/05/13	
HSPMW2	Yes	Monitoring Well	HSP	00742525	12S01E-13	4	65-126	65	126	126	140.37	14.37	Yes	01/17/01	#####	Active	Alluvial	WL, WQ	40	08/02/04	06/18/14	33	01/04/11	11/04/13	
HSPMW3	Yes	Monitoring Well	HSP	00742526	12S01E-13	4	55-115	55	115	115	129.91	14.91	Yes	01/18/01	#####	Active	Alluvial	WL, WQ	39	07/06/04	06/18/14	33	01/04/11	11/04/13	
HSPMW4	Yes	Monitoring Well	HSP	00742527	12S01E-13	4	91-151	91	151	151	164.76	13.76	Yes	01/16/01	#####	Active	Alluvial	WL, WQ	39	07/06/04	06/19/14	33	01/04/11	11/04/13	
HSPMW5	Yes	Monitoring Well	HSP	00742528	12S01E-13	4	53-113	53	113	113	147.19	34.19	Yes	01/15/01	#####	Active	Alluvial	WL, WQ	39	07/06/04	06/18/14	33	01/04/11	11/04/13	
HSPMW6	Yes	Monitoring Well	HSP	00742529	12S01E-13	4	97-157	97	157	157	172.32	15.32	Yes	01/23/01	#####	Active	Alluvial	WL, WQ	36	07/06/04	06/18/14	33	01/04/11	11/04/13	
HSPMW7	Yes	Monitoring Well	HSP	00742530	12S01E-13	4	51-111	51	111	111	125.92	14.92	Yes	01/26/01	#####	Active	Alluvial	WL, WQ	37	10/28/03	06/18/14	33	01/04/11	11/04/13	
HSPMW8	Yes	Monitoring Well	HSP	00742531	12S01E-13	4	63-123	63	123	123	137.81	14.81	Yes	01/22/01	#####	Active	Alluvial	WL, WQ	38	07/06/04	06/19/14	33	01/04/11	11/05/13	
HSPMW9	Yes	Monitoring Well	HSP	00742532	12S01E-13	4	63-123	63	123	123	137.27	14.27	Yes	01/19/01	#####	Active	Alluvial	WL, WQ	37	08/02/04	06/19/14	33	01/04/11	11/05/13	
HSPRW1	Yes	Recovery Well	HSP	00742201	12S01E-13	10	72 100-140	100	140	160	140.42	-19.58	Yes	04/11/01	#####	Active	Alluvial	WL, WQ	76	02/06/03	09/10/14	5	10/03/11	01/03/13	
HSPRW10	Yes	Recovery Well	HSP	00742200	12S01E-13	10	80 90-130	90	130	150	127.62	-22.38	Yes	04/16/01	#####	Active	Alluvial	WL, WQ	84	02/06/03	09/10/14	4	10/03/11	01/03/13	
HSPRW11	Yes	Monitoring Well	HSP	E0163206	12S01E-13	8	22 60-120	60	120	130	126.978	-1.022	No	07/18/12	#####	Active	Alluvial	WL, WQ	1	07/25/12	07/25/12	7	10/16/12	11/07/13	
HSPRW12	Yes	Monitoring Well	HSP	E0163203	12S01E-13	8	95 60-140	60	140	150	139.317	-10.6834	No	07/13/12	#####	Active	Alluvial	WL, WQ	7	07/16/12	09/10/14	8	10/16/12	11/04/13	
HSPRW13	Yes	Monitoring Well	HSP	E0166194	12S01E-13	8	12 60-120	60	120	130	127.762	-2.23754	No	07/10/12	#####	Active	Alluvial	WL, WQ	1	07/25/12	07/25/12	8	10/16/12	11/04/13	
HSPRW2	Yes	Recovery Well	HSP	00742199	12S01E-13	10	40 110-150	110	150	170	146.55	-23.45	Yes	03/10/01	#####	Active	Alluvial	WL, WQ	91	02/06/03	09/10/14	5	10/03/11	01/03/13	
1	Yes	Metered Well	Monthly	<Null>	12S01E-25C1		400-604	400	604	604	7.96786	-596.032	No	07/31/89		Idle	Aromas	WL	6	05/02/02	06/20/05	286	01/05/70	01/21/14	
2	Yes	Metered Well	Monthly	<Null>	12S01E-25A3		400-604	400	604	604	7.45	-596.55	Yes	01/01/47		Idle	Aromas	WL	76	08/16/82	09/02/10	244	01/05/70	01/21/14	
3	Yes	Metered Well	Monthly	<Null>	12S01E-25B1		495-575	495	575	580	9.01817	-570.982	No	06/01/38		Active	Aromas	WL	31	08/04/82	06/16/14	207	01/05/70	01/21/14	
7	Yes	Metered Well	Supplemental	<Null>	<Null>		<Null>				0.148206	0	No			Active	Aromas	WL, WQ	3	05/03/02	04/25/06	18	07/08/05	09/24/13	
9	No	Metered Well	Supplemental	00022750	12S02E-10	16	1500 85-158	85	158	163	49.2078	-113.792	No	05/07/77		Active	Aromas	WL, WQ	27	09/17/04	09/30/14	22	07/08/04	04/16/13	
16	No	Metered Well	Semi-Annual	<Null>	<Null>		239-432	239	432	456	21.0426	-434.957	No	05/04/62		Active	Aromas	WL	10	08/16/95	05/13/97	88	08/16/70	09/23/13	
19	No	Metered Well	Monthly	<Null>	11S01E-24A02		125-205	125	205	220	201.2	-18.8	Yes			Active	Aromas	WL, WQ	15	08/19/95	10/01/12	142	08/13/94	01/21/14	
23	Yes	Metered Well	Supplemental	<Null>	<Null>		<Null>			0	16.0688	0	No			Active	Aromas	WL	6	04/11/02	05/02/12	19	07/08/05	04/16/13	
24	Yes	Metered Well	Supplemental	<Null>	<Null>		<Null>			0	16.3575	0	No			Active	Aromas	WQ	1	05/21/03	05/21/03	12	07/08/05	09/18/08	
28	No	Metered Well	Semi-Annual	00498090	<Null>	15.5	2500 360-540	360	540	560	23.1454	-536.855	No	06/07/95		Idle	Aromas	WL	12	08/16/95	06/02/03	66	11/20/70	09/23/13	
35	No	Metered Well	Semi-Annual	<Null>	<Null>		<Null>			0	76.1907	0	No			Active	Aromas	WL, WQ	26	08/14/81	09/29/14	63	11/20/72	10/01/13	
36	No	Metered Well	Semi-Annual	00113680	11S02E-27	10	160-230	160	230	250	72.4706	-177.529	No	07/24/68		Active	Aromas	WL, WQ	29	08/16/82	10/01/12	93	07/25/47	09/19/13	
40	No	Metered Well	Semi-Annual	00316589	12S02E-17	12	1580 140-180, 200-240	140	240	250	35.5098	-214.49	No	10/05/89		Active	Aromas	WL, WQ	3	05/25/89	04/11/14	20	12/19/95	09/20/13	
54	No	Metered Well	Monthly	00339525	11S02E	16	1200 340-400, 420-500	340	500	520	72.8134	-447.187	No	01/18/90		Active	Purisima	WL, WQ	19	08/13/80	10/13/14	105	04/12/94	01/21/14	
60	No	Metered Well	Semi-Annual	00082921	12S03E-20	16	600 100-170	100	170	180	46.7794	-133.221	No	04/09/81		Active	Aromas	WL, WQ	15	10/17/03	04/19/13	15	07/08/05	09/24/13	
65	Yes	Metered Well	Semi-Annual	00490442	12S01E-25	12	800 520-600	520	600	600	82.5793	-517.421	No	06/07/92		Active	Aromas	WQ	2	09/23/09	09/21/11	0			
68	No	Metered Well	Semi-Annual	<Null>	<Null>		<Null>			0	53.7528	0	No			Active	Purisima	WL, WQ</							

PVWMA Mntn Network

Site Name C.10	Inside DWZ C.5	Well Type C.15	Assoc. New C.12	Well Comp C.10	DWR Well N.C.15	Casing Dia C.4	Yield GPM C.5	Perf Inter C.30	Top of Per C.5	Bot of Per C.5	Completed N.19.11	Reg Point N.13.11	Well Bot E.N.13.11	Elev Measu C.5	Date Const.D	Date Dest.D	Production C.11	Screened 1.C.25	Data Provi C.14	Count_WQ_S.N.5.0	Start_WQ_D.D	Last_WQ_Da.D	Count_WL_M.N.5.0	Start_WL_D.D	Last_WL_Da.D
127	No	Metered Well	Semi-Annual	00046952	12S01E-3	8	400	180-200, 210-230, 240-260	180	260	260	144.313	-115.687	No	09/12/76		Active	Aromas	WL, WQ	152	08/06/81	04/18/13	134	08/15/78	05/07/09
131	No	Metered Well	Semi-Annual	00300794	12S02E-25	10	45	345-355, 365-405	345	405	405	74.544	-330.456	No	07/23/68		Active	Aromas	WL, WQ	13	08/21/95	10/02/14	23	04/17/94	09/26/13
135	No	Metered Well	Semi-Annual	00496724	12S02E-22	10	400	380-520	380	520	520	208	-312	Yes	07/06/94		Active	Aromas	WL, WQ	31	08/21/95	10/02/14	9	04/17/94	09/26/13
137	No	Metered Well	Semi-Annual	<Null>	<Null>			<Null>			0	13.5158	0	No			Active	Aromas	WL, WQ	9	08/29/97	10/02/14	20	11/27/95	09/20/13
139	Yes	Metered Well	Semi-Annual	00061210	12S02E-32	12		200-602	200	602	602	177.015	-424.985	No	08/23/73		Active	Aromas	WQ	26	08/14/95	10/02/14	8	08/14/94	10/06/04
154	No	Metered Well	Semi-Annual	00176626	12S03E-17	16		400-475, 550-570, 620-650	400	550	670	64.0237	-585.976	No	06/26/89		Active	Purisima	WL, WQ	29	06/22/95	04/11/14	18	04/25/94	09/20/13
156	No	Metered Well	Semi-Annual	00156209	11S02E-28	14		150-180, 220-260	150	260	260	90.6551	-189.345	No	05/10/84		Active	Aromas	WL, WQ	16	04/28/97	10/07/14	38	12/01/47	09/19/13
159	No	Metered Well	Semi-Annual	<Null>	<Null>			<Null>			180	99.7	-80.3	Yes			Active	Aromas	WL, WQ	56	08/12/81	10/07/14	60	01/07/70	09/19/13
160	No	Metered Well	Supplemental	00096722	<Null>	8	700	200-260	200	260	260	30.1984	-229.802	No			Idle	Aromas	WL	3	07/01/02	05/01/03	6	04/12/11	09/24/13
161	No	Metered Well	Supplemental	00096722	<Null>	8	700	200-260	200	260	260	28.8956	-231.104	No			Active	Aromas	WL, WQ	1	06/26/02	06/26/02	14	07/08/05	09/24/13
170	No	Metered Well	Semi-Annual	<Null>	<Null>			<Null>			0	112.836	0	No			Active	Aromas	WQ	88	08/06/81	04/17/14	74	01/07/70	04/24/97
174	No	Metered Well	Semi-Annual	<Null>	<Null>			<Null>			265	114.5	-150.5	Yes			Active	Aromas	WL, WQ	22	08/15/83	04/23/08	80	01/05/70	09/19/13
183	No	Metered Well	Supplemental	00074504	12S03E-18	12	1000	120-160, 210-220, 350-370	120	370	380	55.1955	-324.6	No	05/31/78		Active	Alluvial, Aromas	WL, WQ	3	09/18/10	05/07/14	15	07/13/05	09/24/13
186	No	Metered Well	Semi-Annual	<Null>	<Null>			<Null>			0	38.7049	0	No			Active	Aromas	WL, WQ	8	08/30/03	09/20/13	63	11/23/60	09/26/13
190	No	Metered Well	Supplemental	00119500	12S02E	13	400	140-190	140	190	195	30.5126	-164.487	No	12/18/74		Active	Aromas	WQ	1	08/18/09	09/18/09	0		
191	No	Metered Well	Supplemental	00119500	12S02E	13	400	140-190	140	190	195	31.1123	-163.888	No	12/18/74		Active	Aromas	WQ	1	05/21/12	05/21/12	0		
207	No	Metered Well	Supplemental	<Null>	<Null>			<Null>			0	32.1623	0	No			Active	Aromas	WL, WQ	3	06/26/02	09/25/13	13	07/08/05	04/16/13
208	No	Metered Well	Semi-Annual	00339524	12S02E-14	16		320-420	320	420	440	26.6861	-413.314	No	01/09/90		Active	Aromas	WQ	25	04/11/96	10/01/14	47	04/13/95	09/27/13
209	No	Metered Well	Semi-Annual	<Null>	<Null>			125-175	125	175	180	53	-127	Yes			Active	Alluvial, Aromas	WL, WQ	45	07/21/75	04/12/13	45	07/22/47	09/20/13
214	No	Metered Well	Supplemental	<Null>	<Null>			<Null>			0	63.2715	0	No			Active	Aromas	WL, WQ	7	04/02/07	04/15/14	11	07/13/05	09/24/13
222	No	Metered Well	Semi-Annual	<Null>	<Null>			140-191	140	191	191	128.8	-62.2	Yes			Active	Aromas, Purisima	WL, WQ	52	08/10/81	04/08/14	76	01/07/70	09/19/13
226	No	Metered Well	Semi-Annual	00019109	12S01E-11	12		126-168	126	168	172	136.796	-33.2039	No	02/26/71		Idle	Aromas	WL	15	10/01/96	04/25/12	10	09/24/96	09/18/13
227	No	Metered Well	Semi-Annual	00232035	12S03E-29	13	490	260-280, 300-360	260	360	360	181	-199	Yes	06/10/82		Active	Aromas	WL	6	04/29/04	05/22/08	11	09/13/06	04/30/12
238	No	Metered Well	Monthly	<Null>	<Null>			165-7.226	165	7.226	-97.2774	0		No			Idle	Aromas	WL	6	10/14/05	03/16/09	92	06/29/00	01/21/14
240	No	Metered Well	Semi-Annual	00403036	12S01E-11	16	2000	330-450	330	450	470	262.873	-207.127	No	02/26/90		Active	Aromas	WL, WQ	78	05/19/75	10/07/14	27	04/16/90	09/18/13
249	No	Metered Well	Supplemental	<Null>	<Null>			<Null>			0	21.4151	0	No			Active	Aromas	WL, WQ	22	08/22/95	04/09/14	78	02/20/47	09/24/13
252	No	Metered Well	Semi-Annual	<Null>	<Null>			300-473, 498-597	300	597	637	68	-569	Yes			Active	Purisima	WQ	19	08/25/95	10/07/14	12	04/17/94	05/13/08
HSPRW3	Yes	Recovery Well	HSP	00742198	12S01E-13	10	50	130-160	130	160	180	152.22	-27.78	Yes	03/16/01	#####	Active	Alluvial	WL, WQ	80	02/06/03	09/10/14	5	10/03/11	01/03/13
HSPRW4	Yes	Recovery Well	HSP	00742197	12S01E-13	10	40	122-162	122	162	181	16.3	-18.17	Yes	03/16/01	#####	Active	Alluvial	WL, WQ	72	02/06/03	10/10/13	5	10/03/11	01/03/13
HSPRW5	Yes	Recovery Well	HSP	00742196	12S01E-13	10	20	120-160	120	160	180	158.51	-21.49	Yes	03/23/01	#####	Idle	Alluvial	WL	6	02/06/03	02/04/09	0	#####	#####
PV8D	No	Nested MW	Monthly	00259813	12S01E-11R001N2			570-590	570	590	590	118.2	-471.8	Yes	02/27/88		Idle	Aromas	WL	20	10/14/88	02/03/10	219	01/12/89	01/21/14
PV8M	No	Nested MW	Monthly	00259813	12S01E-11R002N2			413-432, 463.7-532.2	413	532	532	118	-414	Yes	02/27/88		Idle	Aromas	Obstructed	21	10/14/88	02/03/10	202	01/12/89	07/26/12
PV8S	No	Nested MW	Monthly	00259813	12S01E-11R003N2			136.1-145.2, 188.2-198.4	136	198	200	118.1	-81.9	Yes	02/27/88		Idle	Aromas	WL, WQ	36	10/14/88	06/30/14	219	01/12/89	01/21/14
T441	No	Monitoring Well	Monthly	<Null>	<Null>			7135-1407, 7240-2607			280	135.3	-144.7	Yes			Idle	Alluvial, Aromas	WL	1	07/18/06	07/18/06	158	12/19/95	01/21/14
T116	No	Monitoring Well	Semi-Annual	<Null>	12S03E-19M01			100-161	100	161	161	125	-36	Yes			Active	Aromas	WL, WQ	36	07/30/62	10/01/14	81	12/01/60	09/20/13
T17	No	Monitoring Well	Semi-Annual	<Null>	<Null>			92-148	92	148	148	149.8	1.8	Yes			Active	Aromas	WL	31	04/11/96	09/17/08	58	12/07/60	09/20/13
T2	No	Domestic Well	Monthly	<Null>	<Null>			279-308	279	308	312	131	-181	Yes			Active	Purisima	WL	36	08/10/61	04/29/08	222	01/29/70	01/21/14
T20	Yes	Monitoring Well	Semi-Annual	<Null>	<Null>			<Null>			0	20.4	0	Yes	03/01/11	Destroyed	Destroyed	Destroyed	18	06/17/57	06/17/59	141	07/15/47	09/15/10	
T21	Yes	Monitoring Well	Semi-Annual	<Null>	<Null>			880-1020	880	1020	0	18	0	Yes			Idle	Purisima	WL	1	05/03/01	05/03/01	16	05/24/05	09/23/13
T3	No	Metered Well	Semi-Annual	<Null>	<Null>			120-220	120	220	220	104	-116	Yes			Active	Aromas	WL, WQ	15	09/08/99	10/10/14	9	09/01/06	09/30/13
T401	No	Monitoring Well	Semi-Annual	<Null>	<Null>			60-100	60	100	100	29.5	-70.5	Yes			Idle	Aromas	WL	12	08/14/96	09/01/06	19	12/04/95	09/18/13
T7	Yes	Monitoring Well	Semi-Annual	<Null>	<Null>			100-342	100	342	338	175.7	-162.3	Yes			Active	Alluvial, Aromas	WL	0			16	05/16/05	09/23/13
99066A	No	Domestic Well	Semi-Annual	<Null>	<Null>			<Null>			0	60	0	Yes			Active	Aromas	WQ	8	04/29/11	10/01/14	0		
PV15A	No	Monitoring Well	Monthly	<Null>	<Null>	2		130-170, 190-230	130	230	235	71.8	-164.2	Yes			Idle	Aromas	WL	0			34	02/22/11	01/21/14
AVMD Ameer	No	Monitoring Well	Monthly	00319905	<Null>			320-340	320	340	400	208	-192	No	11/20/89		Idle	Aromas	WL	0			26	08/15/11	01/21/14
778	Yes	Metered Well	Semi-Annual	<Null>	<Null>			164-219	164	219	219	27	-192	Yes			Active	Alluvial, Aromas	WL, WQ	24	08/17/98	09/15/10	16	05/24/05	09/23/13
782	No	Metered Well	Monthly	<Null>	<Null>			100-210	100	210	210	60	-150	Yes			Active	Alluvial, Aromas	WL, WQ	4	11/27/07	06/16/14	102	02/28/01	01/21/14
799	Yes	Metered Well	Semi-Annual	<Null>	<Null>			<Null>			0	38.9972	0	No			Active	Aromas	WL, WQ	8	05/23/03	04/19/13	9	09/24/09	09/23/13
866	No	Metered Well	Semi-Annual	00824125	12S01E-2/3	10		220-300	220	300	320	147.397	-172.603	No	07/05/98		Active	Aromas	WL, WQ	2	06/04/04	09/20/11	12	04/16/08	09/18/13
880	No	Metered Well	Supplemental	<Null>	<Null>			<Null>			0	57.8022	0	No			Active	Aromas	WL, WQ	12	05/02/05	09/30/14	1	09/21/12	09/21/12
887	No	Metered Well	Supplemental	<Null>	<Null>			<Null>			0	29.1431	0	No			Active	Aromas	WQ	3	06/03/04	05/21/12	9	07/08/05	05/14/09
893	No	Metered Well	Supplemental	00742045	12S02E-10	10	650	400-560	400	560	560	28.1521	-531.848	No	02/24/01		Active	Aromas	WL, WQ	2	05/12/11	10/09/14	15	07/08/05	09/24/13
899	No	Metered Well	Supplemental	<Null>	<Null>			<Null>			400	29.7989	-370.201	No			Active	Aromas	WL, WQ	4	09/27/11	10/09/14	11	07/08/05	09/24/13
947	No	Metered Well	Supplemental	<Null>	<Null>			<Null>			0	52.0016	0	No			Active	Aromas	WL, WQ	2</					

PVWMA Mntr Network

	Site Name C.10	Inside DWZ C.5	Well Type C.15	Assoc. Name C.12	Well Comp. C.10	DWR Well N.C.15	Casing Dia C.4	Yield GPM C.5	Perf Inter C.30	Top of Per C.5	Bot of Per C.5	Completed N.19.11	Ref Point N.13.11	Well Bot E.N.13.11	Elev. Measu C.5	Date Const. D	Date Destr. D	Production C.11	Screened 1 C.25	Data Provi C.14	Count WQ S.N.5.0	Start WQ D.D	Last WQ Ds.D	Count WL M.N.5.0	Start WL D.D	Last WL Ds.D
PV3D	No	Nested MW	Monthly	00258250	12S01E-23R002N2			384-404, 464-486, 567-606	384	606	606	6.9	-599.1	Yes	02/27/88		Idle	Aromas	WL WQ	49	11/02/88	07/02/14	241	01/12/89	01/30/14	
PV3M	No	Nested MW	Monthly	00258250	12S01E-23R002N2			250-270	250	270	270	7	-263	Yes	02/27/88		Idle	Aromas	WL	10	10/23/88	10/21/93	194	01/12/89	01/21/14	
PV3S	No	Nested MW	Monthly	00258250	12S01E-23R004N2			140-150, 160-170	140	170	170	6.9	-163.1	Yes	02/27/88		Idle	Aromas	WL WQ	50	10/24/88	07/02/14	242	01/12/89	01/30/14	
PV4MD	Yes	Nested MW	Monthly	00258509	12S02E-31E001N2			130-160	130	160	160	23.36	-136.64	Yes	02/27/88		Idle	Alluvial	WL WQ	33	08/30/88	06/30/14	197	01/12/89	01/21/14	
PV4S	Yes	Nested MW	Monthly	00258509	12S02E-31E002N2			80-110	80	110	110	23.4	-86.6	Yes	02/27/88		Idle	Alluvial	WL WQ	35	08/30/88	06/30/14	193	01/12/89	01/21/14	
PV6D	Yes	Nested MW	Monthly	00258511	12S01E-11R004N2			730-750	730	750	750	9.44	-740.56	Yes	03/04/88		Idle	Aromas	WL WQ	36	09/20/88	06/30/14	216	01/12/89	01/21/14	
PV6MD	Yes	Nested MW	Monthly	00258511	12S02E-18N002N2			526-556, 607.6-663.2	526	663	650	9.37	-640.63	Yes	03/04/88		Idle	Aromas	WL WQ	35	09/20/88	06/30/14	221	01/12/89	01/21/14	
PV6S	Yes	Nested MW	Monthly	00258511	12S02E-18M004N2			110-120, 160-180	110	180	180	9.48	-170.52	Yes	03/04/88		Idle	Alluvial, Aromas	WL WQ	35	09/20/88	06/30/14	223	01/12/89	01/21/14	
PV6SM	Yes	Nested MW	Monthly	00258511	12S02E-18N003N2			260-280	260	280	280	9.48	-270.52	Yes	03/04/88		Idle	Aromas	WL WQ	35	09/20/88	06/30/14	221	01/12/89	01/21/14	
SC A2A	No	Monitoring Well	SCWD	00178926	11S01E-29H	2		460-480	460	480	450	131.03	-358.37	Yes	01/01/86	02/01/12	Idle	Purisima	Destroyed	0			0			
SC A2B	No	Monitoring Well	SCWD	00178926	11S01E-29H	2		420-440	420	440	450	130.95	-359.06	Yes	01/01/86	02/01/12	Idle	Purisima	Destroyed	0			0			
SC A2C	No	Monitoring Well	SCWD	00178926	11S01E-29H	2		140-180	140	180	450	130.97	-359.03	Yes	01/01/86	02/01/12	Idle	Aromas	Destroyed	0			0			
SC A3A	No	Monitoring Well	SCWD	00178926	11S01E-33E	2		230-310	230	310	320	103.09	-216.91	Yes	01/01/86		Idle	Aromas	WL WQ	0			0			
SC A3B	No	Monitoring Well	SCWD	00178926	11S01E-33E	2		230-250, 260-270	230	270	320	103.09	-216.91	Yes	01/01/86		Idle	Aromas	WL WQ	0			0			
SC A3C	No	Monitoring Well	SCWD	00178926	11S01E-33E	2		125-145	125	145	320	103.09	-216.91	Yes	01/01/86		Idle	Aromas	WL WQ	0			0			
SC A4A	No	Monitoring Well	SCWD	00178924	12S01E-3C	2		520-540	520	540	550	185.89	-364.11	Yes	01/01/86		Idle	Purisima	WL WQ	0			0			
SC A4B	No	Monitoring Well	SCWD	00178924	12S01E-3C	2		480-500	480	500	550	185.89	-364.11	Yes	01/01/86		Idle	Purisima	WL WQ	0			0			
SC A4C	No	Monitoring Well	SCWD	00178924	12S01E-3C	2		280-310, 390-410	290	410	550	185.89	-364.11	Yes	01/01/86		Idle	Aromas	WL WQ	0			0			
SC A4D	No	Monitoring Well	SCWD	00178924	12S01E-3C	2		220-240	220	240	550	185.89	-364.11	Yes	01/01/86		Idle	Aromas	WL WQ	0			0			
SC A5A	No	Monitoring Well	SCWD	00178931	11S01E-28D	2		660-670	660	670	680	175.3	-504.7	Yes	01/01/86		Idle	Purisima	WL WQ	0			0			
SC A5B	No	Monitoring Well	SCWD	00178931	11S01E-28D	2		580-600	580	600	680	175.3	-504.7	Yes	01/01/86		Idle	Purisima	WL WQ	0			0			
SC A5C	No	Monitoring Well	SCWD	00178931	11S01E-28D	2		310-330, 370-390, 410-430	310	430	680	175.3	-504.7	Yes	01/01/86		Idle	Aromas, Purisima	WL WQ	0			0			
SC A5D	No	Monitoring Well	SCWD	00178931	11S01E-28D	2		210-230	210	230	680	175.3	-504.7	Yes	01/01/86		Idle	Aromas	WL WQ	0			0			
WW08	No	Supply Well	CoW		11S01E-13G02M14	700		306-380	306	380	395	268.8	-126.2	Yes	01/01/53		Active	Aromas	WL WQ	0			0			
WW10	No	Supply Well	CoW		12S02E-09C02M16	1100		103-147	103	147	177	29.4	-147.6	Yes	01/01/61		Active	Alluvial, Aromas	WL WQ	0			0			
WW11	No	Supply Well	CoW		11S01E-01G01M14	280		192-342	192	342	350	331.4	-18.6	Yes	01/01/61		Active	Purisima	WL WQ	0			0			
WW19	No	Supply Well	CoW		11S01W-12K1	16	835	412-560	412	560	610	273	-337	Yes	01/01/89		Active	Aromas, Purisima	WL WQ	0			0			
CWD 4	No	Supply Well	CWD		11S01E-17R	18		144-344	144	344	350	150	-200	Yes	01/01/61		Active	Aromas, Purisima	WL WQ	0			0			
CWD 12	No	Supply Well	CWD		11S01E-16E	18		231-280, 300-360, 480-530	231	530	550	172	-378	Yes	01/01/05		Active	Aromas, Purisima	WL WQ	0			0			
CWD MW A	No	Monitoring Well	CWD			2		126-146	126	146	166	171	5	Yes			Idle		WL	0			0			
CWD MW B	No	Monitoring Well	CWD			2		226-246	226	246	266	171	-95	Yes			Idle		WL	0			0			
CWD MW C	No	Monitoring Well	CWD			2		326-346, 476-496	326	496	506	171	-335	Yes			Idle		WL	0			0			
CWD 10	No	Supply Well	CWD		11S01E-17R			160-180, 220-240, 255-265	160	265	295	156	-139	Yes	06/10/78		Active	Aromas	WL WQ	0			0			
CWD Black	No	Supply Well	CWD		11S01E-9G	10		370-380, 430-450, 460-470, 500	370	510	515	390	-125	Yes	09/28/77		Idle		WL	0			0			
CWD 3	No	Supply Well	CWD		11S01E-4A	12		190-300	172	292	300	290	-10	Yes	12/05/60		Idle	Purisima	WL	0			0			
CWD 5	No	Supply Well	CWD		11S01E-4A	12		195-210, 222-262	195	262	266	318	52	Yes	01/20/67		Idle	Purisima	WL	0			0			
16D01	No	Monitoring Well	MCWRA	00082877	13S02E-16D01	12		124-220	124	220	220	27	-193	Yes	06/22/63		Active	Aromas	WL WQ	0			0			
04L01	No	Monitoring Well	MCWRA	00025548	13S03E-04L01	8		212-252	212	252	260	492	232	Yes	05/17/56		Active	Aromas	WL WQ	0			0			
12D01	No	Monitoring Well	MCWRA	00058527	13S02E-12D01	12		216-396	216	396	396	190.3	-205.7	Yes	08/24/59		Active	Aromas	WL WQ	0			0			
33H01	No	Monitoring Well	MCWRA		12S02E-33H01			<Null>			0	35	0	Yes		12/01/10	Idle		Destroyed	0			0			
33H01	No	Monitoring Well	MCWRA	00071605	12S03E-33H01	10		335-445	335	445	445	145	-300	Yes	06/02/62		Active	Purisima	WL WQ	0			0			
WW18	No	Supply Well	CoW		11S02E-31B02M16	1700		417-547	417	547	555	159.3	-395.7	Yes	01/01/87		Active	Aromas	WL WQ	0			0			
WW17	No	Supply Well	CoW		12S02E-05K01M16	1650		435-535	435	535	545	137.9	-407.1	Yes	01/01/84		Active	Aromas	WL WQ	0			0			
WW14	No	Supply Well	CoW		11S02E-31R02M14	1800		198-218, 266-296, 326-446	198	446	500	116.1	-383.9	Yes	01/01/72		Active	Alluvial, Aromas	WL WQ	0			0			
WW05	No	Supply Well	CoW		11S02E-32K03M14	870		157-200	157	200	237	110.6	-126.4	Yes	01/01/47		Active	Alluvial, Aromas	WL WQ	0			0			
WW01	No	Supply Well	CoW		11S02E-32K02M14	1000		178-218	178	218	240	119.1	-120.9	Yes	01/01/27		Active	Alluvial, Aromas	WL WQ	0			0			
WW02	No	Supply Well	CoW	00915994	11S02E-34001M16	1750		213-413	213	413	423	63.4	-359.6	Yes	02/06/04		Active	Aromas	WL WQ	0			0			
WW15	No	Supply Well	CoW		12S02E-09M03M16	1400		85-150	85	150	165	27.7	-137.3	Yes	01/01/75		Active	Alluvial	WL WQ	0			0			
WW03	No	Supply Well	CoW	00941969	12S02E-08E01N16	850		190-230	190	230	240	32.4	-207.6	Yes	01/01/07		Active	Aromas	WL WQ	0			0			
WW07	No	Supply Well	CoW		12S02E-08H02M14	800		157-200	157	200	237	110.6	-126.4	Yes	01/01/53		Active	Alluvial	WL WQ	0			0			
WW13	Yes	Supply Well	CoW		12S01E-23J04M14	575		350-380	350	380	767	10	-757	Yes	01/01/67		Active	Aromas	WL WQ	0			0			
SC A2RA	No	Monitoring Well	SCWD	E0147062		2		460-480	460	480	490	128.28	-361.72	Yes	02/27/12		Idle	Purisima	WL WQ	0			0			
545	No	Metered Well	Semi-Annual					122-158	122	158	168	18.8	-149.2	Yes			Active	Alluvial, Aromas	WL WQ	43	10/12/76	09/15/14	120	02/24/47	10/01/13	
549	No	Metered Well	Semi-Annual								0	46.9304	0	No			Active		WL WQ	34	08/12/81	05/15/12	56	01/05/70	09/20/13	
558	Yes	Metered Well	Supplemental					133-153	133	153	159	18.277	-140.723	No	05/01/47		Active	Alluvial	WL WQ	1	04/19/13	04/19/13	17	07/08/05	09/24/13	
312	No	Metered Well	Semi-Annual	00031424	12S02E-25	12		210-290	210	290	300	34	-266	No	03/06/78		Active	Aromas	WL WQ	0			0			
567	No	Metered Well	Supplemental								0	24.2237	0	No			Active		WL WQ	1	07/01/02	07/01/02	13	07/08/05	09/24/13	
SC A2RB	No	Monitoring Well	SCWD	E0147063		2		420-440	420	440	450	128.2	-321.8	Yes	03/02/12		Idle	Purisima	WL WQ	0			0			
SC A2RC																										