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CONSULTING GROUNDWATER GEOLOGISTS

REVISED MEMORANDUM

February 23, 2023

To: Mr. Cuong Pham
Red Boat LLC
Sent via email (phamcuongt@gmail.com)

Cc: Ms. Annalee Sanborn & Mr. Jim Bushey
PPI Engineering, Inc. (PPI)
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Job No. 747-NPA01

From: Geza Demeter, Anthony Hicke, Edward Linden, and Richard C. Slade
Richard C. Slade & Associates LLC (RCS)

Re: Results of Revised Napa County Tier 1 Water Availability Analysis
Red Boat Vineyard Development Project
1373 Soda Canyon Road
Napa, California

Introduction

This Revised Memorandum presents the key findings and conclusions, along with preliminary recommendations, regarding the Water Availability Analysis (WAA) prepared by RCS for the proposed new vineyard development at the Red Boat Vineyards property in Napa County (County), California. This document was prepared by RCS to provide conformance with Napa County Tier 1 requirements, as described in the Napa County WAA Guidelines (Napa County, 2015). Note that this document is a revised version of a previous WAA submittal that was reviewed by Napa County. Comments were received from the County's Consultant, Luhdorff & Scalmanini Consulting Engineers (LSCE) in a letter dated October 17, 2022 (LSCE, 2022). This revised document was edited to respond to each of the issues raised in that letter (with the exception of the Tier 3 analysis), and therefore the information in this document supersedes the prior version. A "Tier 3" WAA has been prepared for the project under separate cover and was separately reviewed by the County.

The Red Boat Vineyards property (referred to herein as "subject property") is comprised by 18.3 acres and is located at 1373 Soda Canyon Road, north of the City of Napa in Napa County. Figure 1, "Location Map", shows the boundaries of the subject property superimposed on a USGS topographic map. Property boundaries shown on Figure 1 were adapted from the County Assessor's parcel data, which are freely available on the County GIS website. Also shown on Figure 1 are the locations of two existing onsite water wells, the Lower Well and the Upper Well, an inactive onsite well, and the locations of known nearby but offsite wells owned by others.

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Please note that the known offsite well locations shown on the figures herein are not meant to be an all-inclusive map showing all nearby offsite wells owned by others. Those known wells have been identified either by our field visit or via our driller's log research. Hence, other offsite wells may exist. Figure 2, "Aerial Photograph Map", shows the same property boundaries and well locations that are illustrated on Figure 1, but the basemap for Figure 2 is an aerial photograph of the area, which was obtained using the ArcGIS Pro software package.

As reported by the project engineer, PPI Engineering, Inc. (PPI) of Napa, California, the 18.3-acre subject property is currently developed with a residence, associated landscaping, and a pool; no vineyards currently exist on the property. Water demands for the existing onsite developments have historically been and continue to be met by pumping groundwater from the existing Lower Well.

RCS understands the proposed project is to develop approximately 7.0 acres of new vineyards. For this project, the future water demands for the new vineyards are proposed to be met using groundwater pumped from the existing Upper Well.

As part of the permit submittal for the proposed new winery project, a WAA is required by the County. The purpose of this Memorandum is to comply with the County's WAA guidelines for a "Tier 1" WAA (i.e., a Groundwater Recharge Estimate); those guidelines were promulgated by the County in May 2015. Because there are no known offsite wells located with 500 feet (ft) of the Upper Well (the project well), County requirements for a "Tier 2" WAA analysis (i.e., a Well Interference Evaluation) have been "presumptively met" per the WAA Guidelines. A "Tier 3" WAA has been prepared for the project under separate cover.

Site Conditions

From RCS data review work and field reconnaissance visit to the subject property on May 6, 2021, the following key items were noted and/or observed (refer to Figures 1 and 2):

a. The subject property is comprised of a single parcel having a County Assessor's Parcel Number (APN) of 039-380-037. The total assessed area of the subject property, per the assessor's records, is 18.3 acres.

b. The subject property is situated within the foothills on the eastern side of Napa Valley, and approximately 6 miles north of the City of Napa. Based on the topographic contours illustrated in Figure 1, ground surface at the subject property is located on ridge that slopes moderately to the south-southwest.

c. Soda Creek is located immediately to the east of the subject property. Soda Creek, which drains towards the Napa River to the south, was observed to be flowing at the time of the RCS site visit.

d. Developments on the subject property currently consist of one residence with associated landscaping and a pool. There are currently no vineyards planted on the property as of the date of this report.

e. Offsite areas surrounding the subject property consist primarily of residences and vineyards. Naturally vegetated and/or wooded hillsides (i.e., undeveloped areas) were also observed farther offsite to the northeast.

f. As shown on Figures 1 and 2, the existing active water wells and the inactive well are located in the northern portion of the property near the existing residence. Reportedly, the Lower Well currently supplies all water needed for domestic supply to the primary residence, the pool, and for irrigation supply to the existing landscaping of the residence. Currently, the Upper Well is not in use by the property owner, but is an active, functional well. It should be noted that the current property owner only recently took possession of the property, so the historic use of the onsite wells is unknown. An inactive, non-functional well was also observed at the property, located very near the Upper Well. No other onsite wells were observed by the RCS geologist during the site visit.

g. During the site visit, an RCS groundwater geologist also traveled along onsite roads and offsite public roads in the area surrounding the subject property in attempt to identify the possible locations and/or existence of known, nearby, but offsite wells owned by others.

   RCS geologists also reviewed the County Planning, Building, and Environmental Service (PBES) electronic document retrieval website (Napa County, 2021) in an attempt to acquire "Well Completion Reports" (also known as "driller's logs") that might exist for the onsite wells, including the wells located on those neighboring, but offsite properties. In addition, RCS groundwater geologists also used the California Department of Water Resources (DWR) online Well Completion Report website (CA DWR, 2021b) to download driller's logs for wells within the immediate vicinity of the subject property. As a result of those inquiries, a few driller's logs were obtained for wells historically constructed in the area.

   Figures 1 and 2 show the approximate locations of known, reported, and/or inferred nearby offsite wells surrounding the subject property, as determined from the field reconnaissance and well log research. None of these mapped, known offsite wells appear to lie to within 500 ft of the two existing active onsite wells. The nearest offsite well to the Upper Well is 800 ft to the northeast, and the nearest offsite well to the lower well is 810 ft to the southwest.

Key Construction and Testing Data for Existing Onsite Wells

A DWR Well Completion Report (also known as a "driller's log") was downloaded from the PBES website for the existing Lower Well and it is represented by Log No. 823010, a copy of which is appended to this Memorandum. However, a driller's log could not be located for the Upper Well from the various online sources reviewed by RCS. Limited information was available for the Upper Well from the County permit that was obtained by the drilling contractor prior to the construction of the well. Table 1, "Summary of Well Construction and Pumping Data", provides key well construction data, groundwater airlifting data, and pumping data that are available for the two onsite wells.

Well Construction Data – Lower Well

Key data listed on the available driller's log for the Lower Well and/or identified during the site visit include:

a. This well was drilled and constructed in April 1994 by Pulliam Well Drilling (PWD) of Napa, California, using the direct air rotary method.

b. The pilot hole (the borehole drilled before the well casing was placed downwell) was reported to have been drilled to a depth of about 205 ft below ground surface (bgs).

c. The borehole was cased with polyvinyl chloride (PVC) well casing having an inner diameter (ID) of 5 inches; the total casing depth of the Lower Well is reported to be 205 ft bgs. During the May 2021 site visit, a 6-inch diameter steel casing was observed at the wellhead of the Lower Well.

d. Casing perforations for the Lower Well are reportedly factory-cut slots having a slot opening width of 0.094 inches (94-slot). Perforations in this well were placed continuously between the depths of 40 ft to 205 ft bgs.

e. The gravel pack material listed on the driller's log is reported to be "pea gravel."

f. The Lower Well is reportedly constructed with a concrete sanitary seal from ground surface to 25 ft bgs.

Summary of Initial "Test" Data for the Lower Well

The driller's log for the Lower Well provided the original post-construction static water level (SWL), and the original airlift test rate (as shown on Table 1), as follows:

- The initial SWL, following completion of well construction was reported to be 15 ft bgs on April 19, 1994.
- The reported maximum airlift flow rate during initial post-construction airlifting operation in the Lower Well was estimated by the driller to be 30 gallons per minute (gpm). As a rule of thumb, RCS groundwater geologists estimate that normal operational pumping rates for a new well equipped with a permanent pump are typically on the order of only about one-half or less of the airlifting rate reported on a driller's log.
- A "water level drawdown" value was not (and could not) be provided on the driller's log, because water level drawdown cannot be measured during airlifting operations; thus, the original post-construction specific capacity[1] value for the Lower Well cannot be calculated from the data on the available driller's log.

Pumping Test Data by Others for the Lower Well

On February 1, 2021, a 2-hour constant rate pumping test of the Lower Well was performed by Ray's Well Testing Service, Inc. (RWTS) of Sebastopol, California. Testing of the well was performed using the permanent pump that existed at the time of testing; the permanent pump was reported by RWTS to be a 1.5-horsepower pump that had been previously installed to a depth of approximately 130 ft below the wellhead reference point (brp). The 2-hour pumping test was performed at a final flow rate of 26 gpm. Key data available from the constant rate pumping test by RWTS include:

- A SWL of 78.7 ft brp was recorded by the pumper before the test began.

[1] Specific capacity, in gallons per minute per foot of water level drawdown (gpm/ft ddn), represents the ratio of the pumping rate in a well (in gpm) divided by the amount of water level drawdown (in ft ddn) created in the well while pumping at that rate.

- Based on the reported pumping rates by the pumper, the well was initially pumped at a rate of 28 gpm, but the pumping rate declined to a final pumping rate of 26 gpm at the end of the 2-hour period.
- A maximum pumping water level (PWL) of 92 ft brp was reported by the pumper at the end of the continuous 2-hour pumping period; this represents a maximum water level drawdown of 13.3 ft at the end of the test.
- Based on the final pumping rate of 26 gpm, the short-term specific capacity of the Lower Well is calculated to have been 2 gpm/ft ddn at the time of testing.

Groundwater Sampling Results for the Lower Well

Groundwater samples were collected for laboratory testing by the RWTS pumper near the end of the pumping test for the Lower Well on February 1, 2021. The sample containers were delivered to RWTS for analysis of general mineral and inorganic (metal) constituents, and also to Alpha Analytical Laboratories, Inc. (AAL) of Ukiah, California for analysis of arsenic and BAC-T. The results of these laboratory analyses of the groundwater samples are listed on Table 2, "Summary of Groundwater Quality Analysis"; a copy of the laboratory report is appended to this Memorandum. The following provides a summary of these results:

- General Mineral Analyses: Each of the listed constituents was detected at a concentration below its respective current State Water Resources Control Board (SWRCB), Department of Drinking Water (DDW) and the United States Environmental Protection Agency (EPA) respective Primary and/or Secondary Maximum Contaminant Levels (MCLs) or SWRCB Notification Level (NL), as applicable, for water to be used for domestic-supply purposes.
- Inorganic (Trace Element) Constituents: Each of the tested trace elements (inorganic chemicals) was detected at a concentration that is below its respective MCL or NL.
- Total coliform and fecal coliform (E.coli), were both absent in the samples.

Pumping Test Data by Others for the Upper Well

On February 8, 2021, RWTS returned to the subject property and performed a 2-hour constant rate pumping test on the Upper Well, using the installed permanent pump that existed at the time of testing. The permanent pump was reported by RWTS to be a 2-horsepower pump that had been installed to a depth of at least 160 ft brp, but according to the notes on the pumper's form, the measurement device couldn't descend any deeper into the well. The 2-hour pumping test was performed at a final flow rate of 30.9 gpm. Key data available from the constant rate pumping test by RWTS include:

- A SWL of 87.5 ft brp was recorded by the pumper before the test began.
- Based on the reported pumping rates by the pumper, the well was initially pumped at a rate of 34.5 gpm, but the pumping rate declined to a final pumping rate of 30.9 gpm.
- A maximum PWL of 94 ft brp was reported by the pumper at the end of the continuous 2-hour pumping period; this represents a maximum water level drawdown of 6.5 ft at the end of the test.

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- Based on the final pumping rate of 30.9 gpm, the short-term specific capacity of the Upper Well is calculated to have been 4.8 gpm/ft ddn at the time of testing.

Groundwater Sampling Results for the Upper Well

Groundwater samples were collected for laboratory testing by the RWTS pumper near the end of the pumping test for the Upper Well on February 8, 2021. The sample containers were delivered to RWTS for analysis of general mineral and inorganic (metal) constituents, and also to AAL for analysis of arsenic and BAC-T. The results of these laboratory analyses of the groundwater samples are listed on Table 2 for this well; a copy of the laboratory report is appended to this Memorandum. The following provides a summary of these results:

- General Mineral Analyses: Each of the listed constituents was detected at a concentration below its current SWRCB, DDW, and the EPA respective Primary and/or Secondary MCLs or SWRCB NLs as applicable, for water to be used for domestic-supply purposes.
- Inorganic (Trace Element) Constituents: Each of the listed trace elements (inorganic chemicals) was detected at a concentration that is below its respective MCL or NL.
- Total coliform and fecal coliform (E.coli), were both absent in the samples.

Well Data from Site Visit

As discussed above, a site visit to the subject property was performed by an RCS groundwater geologist on May 6, 2021. The following information for the onsite wells were collected from that site visit:

- The Lower Well was observed to be equipped with a permanent pump, but the well was not being actively pumped at the time of the site visit. A SWL of 77.2 ft brp was measured by the RCS geologist while the pump was shut off. This SWL is roughly 1.5 ft shallower than the 78.7-foot SWL depth reported by RWTS in February 2021, and 62.2 ft deeper than the 15-foot SWL depth reported on the driller's log for the Lower Well, immediately after it had been constructed in April 1994.
- The Upper Well was observed to be equipped with a permanent pump, but the well was not being actively pumped at the time of the site visit. A SWL of 86.7 ft brp was measured by the RCS geologist during the site visit on May 6, 2021. This SWL is roughly 0.8 ft shallower than the 87.5-foot SWL depth reported by RWTS in February 2021.
- No totalizer flow dial devices (to measure flow rates and flow volumes) were observed near the wellhead of either of the two onsite wells.
- A well with an 8-in. outer diameter steel casing was observed to the east of the Upper Well. This inactive well was observed to be equipped with a permanent pump, but was not pumping at the time of the site visit, again, because the well is not used (inactive). An attempt was made by the RCS groundwater geologist to measure the SWL inside the well, but a blockage was encountered at about 5 ft below the top of the well head entry port. No other data are available for this well.

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Local Geologic Conditions

Figure 3, "Geologic Map", illustrates the types, lateral extents, and boundaries between the various earth materials mapped at ground surface in the region by others. Specifically, Figure 3 has been adapted from the results of regional geologic field mapping of the Eastern Sonoma and Western Napa Counties, as published by the USGS in 2007. As shown on Figure 3, the key earth materials mapped at ground surface in the area, from geologically youngest to oldest, include the following:

a. Alluvial-type deposits. These deposits consist of undifferentiated and/or undivided alluvium (map symbols Qha, Qa, and Qoa on Figure 3). These deposits are generally unconsolidated, and consist of layers and lenses of sand, gravel, silt, and clay. These geologic materials do not occur on the subject property, but instead are generally exposed at ground surface further to the west and southwest along the main floor of Napa Valley.

   Sonoma Volcanics. The Sonoma Volcanics are comprised by a highly variable sequence of chemically and lithologically diverse volcanic rocks. These rock types include: rhyolite flows (map symbol Tsr); andesitic to basaltic lava flows (map symbol Tsa); pumiceous ash-flow tuff (map symbol Tst); and volcanic sand and gravel (map symbol Tss). As shown on Figure 3, andesitic to basaltic lava flows are the primary volcanic rock material exposed at ground surface on the subject property; a small exposure of rhyolite flows occurs at ground surface in the northern portion of the subject property.

RCS interpretation of the driller's descriptions of the drill cuttings listed on the available driller's log for the Lower Well, reveals that typical rocks of the Sonoma Volcanics were likely encountered when drilling the pilot borehole for this well. Typical driller-terminology for the drill cuttings on this log included: "hard black rock;" "black ash;" and "hard black rock with red ash." Therefore, based on the generalized terminology used by the driller for this well, the Sonoma Volcanics are interpreted by RCS to extend to depths of at least 205 ft bgs at the location of this Lower well.

Local Hydrogeologic Conditions

The earth materials described above can generally be separated into two basic categories, based on their relative ability to store and transmit groundwater to wells. These two basic categories include:

Potentially Water-Bearing Materials

The principal water-bearing materials beneath the subject property and its environs are represented by the hard, fractured volcanic flow rocks and flow breccias of the Sonoma Volcanics. The occurrence and movement of groundwater in these rocks tend to be controlled primarily by the secondary porosity within the rock mass, that is, by the fractures and joints that have been created in these harder volcanic flow-type rocks over time by various volcanic and tectonic processes. Specifically, these fractures and joints have been created as a result of the cooling of these originally molten flow rocks and flow breccias deposits following their deposition, and also from mountain building or tectonic processes (faulting and folding) that have occurred over time in the region after the rocks were erupted and hardened. Some groundwater can also occur in zones of deep weathering between the periods of volcanic events that yielded the various flow

rocks, and also with the pore spaces created by the grain-to-grain interaction in the volcanic tuff and ash, if those rock types exist beneath the harder, flow-type rocks.

The amount of groundwater available at a particular drill site for a well constructed into the Sonoma Volcanics beneath the subject property would depend on such factors as:

- the number, frequency, size, and degree of openness of the fractures/joints in the subsurface
- the degree of interconnection of the various fracture/joint systems in the subsurface
- the extent to which the open fractures may have been possibly in-filled over time by chemicals precipitates/deposits and/or weathering products (clay, etc.)
- the amount of recharge from local rainfall that becomes available for deep percolation to the fracture systems
- to a lesser extent, the size of the pore-spaces formed by the grain-to-grain interactions of volcanic ash particles, if those rock types existed beneath the subject property.

As stated above, the principal rock type expected in the subsurface beneath a portion of the property is a combination of hard, volcanic flow rock, and ash flow tuff that may be fractured to varying degrees. Descriptions of drill cuttings by the well driller that are recorded on the available driller's log for the Lower Well are consistent with the typical descriptions of the various rocks known in the Sonoma Volcanics. From long-term experience by RCS with the fractured flow rocks within the Sonoma Volcanics, based on numerous other water well construction projects in Napa County, pumping capacities in individual wells have ranged widely, from rates as low as 5 to 10 gpm, to rates greater than 200 gpm.

Potentially Nonwater-Bearing Rocks

This category includes the geologically older and fine-grained sedimentary rocks of the Great Valley Sequence; these materials do not occur at ground surface on the property. Instead, these potentially nonwater-bearing rocks underlie the volcanic rocks that exist beneath the subject property at unknown depths greater than at least 205 ft bgs, depending on location.

In essence, these diverse sedimentary rocks are well-cemented and well-lithified and have an overall low permeability. Occasionally, localized conditions can allow for small quantities of groundwater to exist in these rocks wherever they may be sufficiently fractured and/or are relatively more coarse-grained. However, even in areas with potentially favorable conditions, well yields are often only a few gpm in these rocks, and the water quality can be marginal to poor in terms of total dissolved solids concentrations, and other dissolved constituents.

Geologic Structure

A fault trace[2], as mapped by others, has been interpreted by others to exist in the vicinity of the subject property as shown by the dark-colored, lines and/or dashed lines on Figure 3 (USGS, 2007). Specifically, this north-south trending fault trace, which is part of the Soda Creek fault system, is shown to be mapped to the east of the property. Faults can serve to increase the number and frequency of fracturing in the local earth materials, including the underlying Sonoma

[2] Note that it is neither the purpose nor within our Scope of Hydrogeologic Services for this project to assess the potential seismicity or activity of any faults that may occur in the region.

Volcanics. If such fractures were to occur, they would tend to increase the amount of open area in the rock fractures which, in turn, could increase the ability of the local earth materials to store groundwater. Faults can also act as barriers to groundwater flow. The possible nature of the offsite fault shown on Figure 3 is unknown.

Project Water Demands

For the purposes of this WAA, the Upper Well is considered to be the "project well", as it will be the onsite well that is proposed to be used to meet the new water demands of the proposed vineyard development project. All existing onsite water demands currently supplied by groundwater will continue to use groundwater pumped from the Lower Well.

Existing and proposed (future) onsite water demands for the property have been estimated by RCS[3], as discussed below. Table 3, "Groundwater Use Estimates", is intended to categorize the specific water demands of the project and other onsite uses. Those estimated annual groundwater demands for the project are discussed below.

Existing Water Demands

Water demands for the existing onsite residence, pool, and landscaping are currently met by pumping groundwater from the Lower Well. Because there are no historic flowmeter totalizer data for the Lower Well, the actual historic onsite water production from this well is unknown in terms of instantaneous flow rates and the total volume pumped each season. Therefore, the existing annual onsite water demands have been estimated using standard use assumption provided in the WAA Guidelines Documents (Napa County, 2015):

a. Existing residential demand = 0.85 acre-feet per year (AF/yr)
    - This includes 0.75 AF/yr for the residence and 0.10 AF/yr for the pool
b. Existing landscape irrigation demand = 0.6 AF/yr
    - This estimate assumes a landscaped area of approximately 0.16 acres (7,000 square feet, ft^2); this area was estimated from aerial photographs of the property. The WAA Guidance document states water use for landscape irrigation is 0.10 AF/yr for every 1,000 ft^2 of non-xeriscape landscaping above the first 1,000 ft^2. Therefore, the water use calculation is as follows:

      $= [(7{,}000\ ft^2 - 1{,}000\ ft^2) \div 1{,}000\ ft^2] \times 0.1\ AF/yr = 0.6\ AF/yr.$
c. Total estimated existing water demand = a + b = 1.5 AF/yr

Hence, the estimated total existing annual water demand is 1.5 AF/yr, and this annual volume is currently met by pumping groundwater from the Lower Well.

[3] These water demand estimates were based on those values presented for specified land uses provided in Appendix B of the County's WAA Guidance Document (Napa County, 2015).

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Proposed Water Demands

Groundwater demands for the proposed new vineyards will be met by pumping groundwater from the designated project well (Upper Well), whereas groundwater demands for the residence, pool, and landscape irrigation will continue to be met by pumping groundwater from the Lower Well. Water demand estimates for the proposed project have been estimated as follows:

a. Residential groundwater demand, including pool = 0.85 AF/yr (same as existing)

b. Existing landscape irrigation demand = 0.6 AF/yr (same as existing)

c. Vineyard irrigation groundwater demand = 3.5 AF/yr (from the project well)

   - Based on the total proposed vineyard acreage of 7.0 acres and an estimated unit water use of approximately 0.5 AF per acre vine per year (AF/ac/yr).
   - The vineyard irrigation demand will reportedly not vary depending on wet year or dry year conditions. Mr. Johnnie White Jr., vineyard manager for the proposed vineyard development, informed RCS via email that dry year irrigation will not require additional water because drought tolerant rootstocks have been selected for the project (White J.Jr., 2022).

d. Total proposed future groundwater demand for the Red Boat Vineyards property:

   = a + b + c = 5.0 AF/yr

Proposed Pumping Rates

To determine an appropriate pumping rate necessary from the project well (the Upper Well) to meet the future proposed vineyard irrigation groundwater demands of 3.5 AF/yr ("c", above), it was estimated that groundwater from the project well will be pumped during a 20-week irrigation season each year to meet the demand; this does not include the residence, pool, or landscaping demands, which will continue to be met using the Lower Well. Based on these assumptions, the project well would need to pump at a rate of about 12 gpm to meet the groundwater demands for the proposed project. This pumping rate assumes that the project well would be pumped on a 50% operational basis (12 hours/day, 7 days/week) during the entire 20-week irrigation season each year.

Based on the constant rate pumping test performed on the project well by RWTS in February 2021 (at an average rate of 30.9 gpm), it appears that the project well is likely capable of meeting the instantaneous groundwater pumping rate demands (12 gpm) required during the 20-week vineyard irrigation season each year. The pumping rate of the Upper Well during that recent pumping test (30.9 gpm) is more than two times greater than the pumping rate required from this well to meet the total groundwater demand for the proposed vineyards (12 gpm).

Rainfall

In their review letter, LSCE (2022) provided a recommended rainfall value to use for the WAA analyses. LSCE review of the 10-year PRISM average data set (Napa County, 2022b) determined that the ten-water year average rainfall during water years 2012 to 2021 for the subject parcel was 23.53 inches per year (in/yr; LSCE, 2022), or 1.96 feet per year (ft/yr).

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Estimate of Groundwater Recharge

Napa County recently promulgated new guidelines for WAA preparation with respect to groundwater recharge calculations in response to the Governor's Executive Order N-7-22 (Napa County, 2022a) and the ongoing drought in the State. As part of those guidelines, the County has mandated that groundwater recharge calculations for parcels outside of the Napa Valley Subbasin of the Napa-Sonoma Valley Groundwater Basin (as defined by the California Department of Water Resources [CA DWR] Bulletin 118 [CA DWR, 2021a]) must be calculated on a parcel-specific basis (Napa County, 2023), and that those calculations must consider "average rainfall" to be the average water year rainfall that has occurred during the last 10 water years[4] (Napa County, 2022b). Review of the Napa Valley subbasin boundaries (CA DWR, 2003; see bold brown boundary on Figure 4A, "Watershed Geology") in relation to the subject parcel reveals that the entire subject parcel lies outside of the Napa Valley subbasin. Therefore, groundwater recharge on the subject property (and allowable usage) must be calculated on a parcel-specific basis. As stated above in the prior section "Rainfall", in their review letter, LSCE (2022) provided a recommended site-specific rainfall value to be used for this calculation.

Groundwater recharge on a long-term average annual basis at the subject property can be estimated as a percentage of average rainfall that falls on the property and becomes available to deep percolate into the aquifers over the long-term. The actual percentage of rainfall that deep percolates can be variable and is a function of numerous local and regional conditions, including the slope of the land surface; soil types; ground cover; evapotranspiration; and the frequency, intensity, and duration of rainfall, among other possible factors. Therefore, we must look to various analyses of deep percolation into the Sonoma Volcanics relied upon by other consultants and government agencies. For the purposes of this project, and to help satisfy the County requirements, a site-specific groundwater recharge estimate was developed for the subject property.

Updated Napa County Hydrogeologic Conceptual Model (LSCE & MBK, 2013)

Estimates of groundwater recharge as a percentage of rainfall were presented for several watersheds in Napa County in the report titled "Updated Napa County Hydrogeologic Conceptual Model" (LSCE & MBK, 2013). Watershed boundaries within Napa County are shown on Figures 8-3 and 8-4 in that report. Figure 4A was prepared for this project using those same watershed boundaries provided by MBK Engineers (MBK), for which watershed water balance data are available in LSCE & MBK (2013). As shown on Figure 4A, the subject property is located just outside the boundaries of the watershed referred to by LSCE & MBK as the "Napa River Watershed near Napa." Table 8-9 of LSCE & MBK (2013) shows that an estimated 17% of the average annual rainfall that occurs within this watershed deep percolates as groundwater recharge (i.e., the recharge rate).

Prior to the publication of LSCE & MBK (2013), recharge estimates regularly used by RCS and others for the Sonoma Volcanics throughout Napa County in different watersheds have historically ranged from 7% to perhaps 14%. A more site-specific estimate of the deep percolation rate of rainfall at the subject property can be made using data from LSCE & MBK (2013) in conjunction with the county-provided 10-year average PRISM rainfall dataset (Napa County, 2022b) and the

[4] Here, a water year is defined as beginning on October 1 and ending on September 30 of the following year. As an example, water year 2012 would begin on October 19, 2020, and end on September 30, 2021.

boundary of the Napa Valley subbasin of the Napa-Sonoma Valley Groundwater Basin (adapted from CA DWR, 2003). Figure 4 shows the watershed boundaries of LSCE & MBK (2013), superimposed on a geologic map of the region (USGS, 2007); Figure 4B shows a reproduction of the explanation of geologic units and symbols for that USGS map. The bold brown line shown on Figure 4A represents the approximate outline of the Napa Valley subbasin (CA DWR, 2003), which roughly delineates the boundary between alluvial deposits on the Napa Valley floor (shown as tan to light yellow areas) and the hill and mountain areas that generally surround these alluvial deposits. The subject property is shown on Figure 4A lying just east-southeast of the boundary of the Napa River Watershed Near Napa, and in the same Sonoma Volcanics rocks that comprise a large portion of the western side of the watershed.

As discussed above, LSCE & MBK (2013) estimated that 17% of the average annual rain that falls within the "Napa River Watershed near Napa" undergoes deep percolation and recharges the groundwater in the local aquifers. However, this "recharge rate" estimate is a watershed-wide water balance-based average that does not differentiate between hydrogeologically distinct areas of the watershed. It is more likely that the actual percentage of rainfall that undergoes deep percolation into the valley floor alluvial deposits (within the brown boundary on Figure 4A) of the "Napa River Watershed near Napa" is significantly higher than the percentage of rainfall that undergoes deep percolation into the geologic materials that are exposed throughout the hillside and mountain areas of the watershed.

A more hydrogeologically plausible estimate of the groundwater recharge rate in the hill and mountain areas can be calculated by assuming that this rate is higher within the Napa Valley subbasin portion of the watershed (primarily valley floor alluvial deposits), relative to the groundwater recharge rate in the hill and mountain areas of the watershed that are outside of the subbasin (and are generally underlain by different geologic materials that are more consolidated and generally less permeable). This is as opposed to using a constant groundwater recharge rate throughout the entire watershed, as presented by LSCE & MBK (2013). The key value that is required to calculate this estimate is the average volume of rain that falls in each of these distinct portions of the watershed (valley floor areas versus hill and mountain areas). To accomplish this, the following values (also presented on Table 4, "Calculation of Theoretical Rainfall Recharge Percentage - Napa River Near Napa Watershed") were calculated with a GIS:

- 45.58 square miles (sqmi) - The area[5] of the Napa Valley subbasin (CA DWR, 2003) within the "Napa River Watershed near Napa" (LSCE & MBK, 2013), or the "valley floor portion".

- 172.89 sqmi - The area[6] of the portion of the "Napa River Watershed near Napa" (LSCE & MBK, 2013) that is not within the Napa Valley subbasin (CA DWR, 2003), or the "hill and mountain portion".

- The average annual rainfall value for the valley floor portion was derived by calculating the area-weighted average of the portions of the County-provided PRISM rainfall dataset (Napa County, 2022b) cells that are within both the watershed and the subbasin.

[5] Calculated in the "NAD 1983 StatePlane California II FIPS 0402 (US Feet)" projected coordinate system.

- The average annual rainfall value for the hill and mountain portion was derived by calculating the area-weighted average of the portions of the County-provided PRISM rainfall dataset (Napa County, 2022b) cells that are within the watershed[6], but are outside of the subbasin.

The results of these calculations are shown on Table 4. With these values, and as shown on Table 4, assuming the average rainfall as calculated using the County-provided PRISM data set, three scenarios are presented in which the deep percolation percentage on the floor of the Napa Valley is adjusted to values higher than 17% that are more hydrogeologically plausible than a 17% deep percolation percentage. The results of the three scenarios listed on Table 4 are as follows:

- Scenario 1 assumes a valley floor (alluvium) deep percolation percentage of 20%, with a resultant deep percolation percentage for the volcanic rocks in the adjoining hill and mountain areas of the watershed of 16%.
- Assuming the deep percolation of rainfall in the alluvium is 25% for Scenario 2, the percentage of rainfall that is calculated to deep percolate in the adjoining hill and mountain areas of the watershed is 15%.
- A deep percolation percentage in the alluvium for Scenario 3 of 30% yields a deep percolation percentage for the volcanic rocks in the adjoining hill and mountain areas of 14%.

Based on the analyses presented in Table 4, a value of 14% is an appropriate and conservative estimate for the groundwater recharge rate for areas within and proximal to the "Napa River Watershed Near Napa", but outside of the alluvial deposits of the Napa Valley subbasin (e.g., the subject property). With a deep percolation rate of 14%, the County-provided average rainfall value of 1.96 ft/yr, and the 18.3-acre assessed area of the subject property, the average annual groundwater recharge at the subject property is estimated to be 5.02 AF/yr (18.3 acres x 1.96 ft x 14%), which is greater than the total estimated average annual groundwater demand for the proposed project of 5.0 AF/yr.

Prolonged Drought Analysis

A "prolonged drought analysis" is no longer required for WAA preparation due to the required use of the 10-year annual rainfall average or the unit groundwater use of 0.3 AFY/ac (Napa County, 2022c).

Estimate of Groundwater in Storage

To help evaluate possible impacts to the local volcanic rock aquifer systems that might occur as a result of pumping for the proposed project, the volume of groundwater extracted for the project can be compared to an estimate of the current volume of groundwater in storage strictly beneath the subject property. To estimate the amount of groundwater currently in storage beneath the subject property, the following parameters are needed:

a) Approximate surface area of subject property = 18.3 acres

b) Depth to base of perforations in the Lower Well = 205 ft bgs; a driller's log for the Upper well could not be located, therefore, only data from the Lower Well can be used to

[6] The County-provided PRISM rainfall dataset (Napa County, 2022b) contains many small gaps along the inner edge of the boundary of Napa County; these areas of missing data could not be included in the area-weighted average calculations, but are adequately small (0.18% of total watershed area) that they are unlikely to have a significant impact on the analyses presented herein.

estimate the thickness of currently saturated rocks within the Sonoma Volcanics that might exist beneath the property. It is possible that the rocks of the Sonoma Volcanics extend to a much greater depth than that for the Lower Well, and thus, the saturated zone beneath the property could extend deeper than is estimated using these data.

c) To present a conservative calculation of groundwater in storage, we will also assume that the current saturated thickness of the aquifer(s) beneath the subject property is about 126 ft vertical feet. This value is calculated using the Lower Well data by subtracting the RWTS-measured SWL of about 79 ft bgs in this well (on February 1, 2021) from the reported depth to bottom of the perforations in the well at 205 ft bgs. Based on the water level data presented herein, the February 2021 SWL is the deepest available SWL measured for this well, and, thus, is used herein to provide a more conservative calculation of the minimum volume of groundwater currently in storage beneath the property.

d) Approximate average specific yield of the Sonoma Volcanics = 2%. The specific yield is essentially the ratio of the volume of water that drains from the saturated portion of the geologic materials (due to gravity) to the total volume of rocks. Specific yield of the Sonoma Volcanics can vary greatly depending on a number of factors, including the degree and interconnection of the pore spaces and/or fracture zones within the rocks. A conservative estimate by Kunkel and Upson for the specific yield of the Sonoma Volcanics ranges from 3% to 5% (USGS, 1960). For other nearby properties for which RCS has performed similar analyses, an even more conservative estimate for specific yield of 2% has been used. Hence, to present a conservative analysis, we will assume a specific yield of 2% for the Sonoma Volcanics rocks that underlie the subject property, but the actual value, in reality, could be higher.

e) Thus, a quite conservative estimate of the groundwater currently in storage (S), beneath the subject property (as of February 2021) is calculated as:

   S = property area (subpart a, above) times saturated thickness (subpart c, above) times average specific yield (subpart d, above) = (18.3 acres)(126 ft)(2%) = 46.1 AF

In contrast, the proposed average annual groundwater use for the property is estimated to be 5.0 AF/yr. Hence, the estimated groundwater demand for the entire property represents only about 11% of the groundwater conservatively estimated to currently be in storage in the volcanic rocks beneath the subject property based on water level data for February 2021 and the known depth to the bottom of the perforations in the Lower well. Furthermore, this percentage does not include annual groundwater recharge that will occur from rainfall into the onsite aquifers. Based on the foregoing, the estimated groundwater demands of the proposed project and the entire subject property are not expected to cause a net deficit in the volume of groundwater within the aquifers beneath the property so as to impact nearby wells to a point that they would not support permitted land uses.

Northeast Napa Management Area (NENMA)

Figure 4A shows the location of the “Northeast Napa Management Area” (NENMA). This area has been identified by others as an area of concern within the County with respect to groundwater use and development. The boundary shown on Figure 4A was adapted from Figure 2-8 of the “Napa County Groundwater Sustainability Agency Annual Report - Water Year 2020” (LSCE, 2021). Note that the subject property is located outside of the management area boundary (see

Figure 4A). Because the property is located outside of the NENMA boundary, no additional analyses are required as part of the subject WAA.

Key Conclusions and Recommendations

1. The existing property is currently developed with a residence, landscaping, and a pool. There are no existing vineyards on the subject property.
2. Current groundwater demands for the existing property are estimated to be approximately 1.5 AF/yr. This demand includes 0.85 AF/yr for the existing residence (and pool) and 0.6 AF/yr for landscape irrigation.
3. The proposed project consists of developing 7.0 acres of new vines, which will require 3.5 AF/yr of groundwater for irrigation purposes annually.
4. The future average annual groundwater demand for the proposed project (including the existing residence, pool, landscaping, and 7.0 acres of new vines) is estimated to be approximately 5.0 AF/yr.
5. The groundwater demand for the proposed new vineyards will be met by pumping groundwater from the Upper Well. The existing onsite water demands (the residence, pool, and landscaping) will continue to be supplied by the Lower Well.
6. To meet the estimated peak pumping rate for the project each year, the Upper Well would need to pump at an operational basis of 12 hours per day, every day, and at a rate of about 12 gpm to meet the irrigation demands during the assumed 20-week irrigation season each year.
7. Based on the results of the constant rate pumping test of the Upper Well in February 2021 (it was pumped at a reported final rate of 30.9 gpm for a period of 2 continuous hours), this well appears to be capable of pumping at rates well above the rates required to meet the future groundwater demands needed for the proposed onsite vineyards.
8. Groundwater recharge at the subject property on an average annual basis is estimated to be 5.02 AF/yr; this value is based on the 10-water year average annual rainfall at the property (1.96 ft/yr) determined by LSCE, and conservative estimates of deep percolation of that rainfall into the aquifer materials underlying the subject property.
9. As stated by the vineyard manager, groundwater use for vineyard irrigation will not vary between dry and wet years because drought-tolerant rootstocks have reportedly been selected for the proposed vineyard development.
10. In the future, RCS recommends monitoring on a regular basis of static and pumping water levels, and also of the instantaneous flow rates and cumulative pumped volumes from both onsite wells, via the use of a water level pressure transducer and the proper installation of a dual-reading flow meter near the wellhead (that records both flow rate and totalizing values, respectively). RCS also recommends that new water level transducers be purchased and installed in the Upper and Lower wells to permit the automatic, frequent, and accurate recording of water levels in these wells. By continuing to observe the trends in groundwater levels and future well production rates/volumes over time by qualified professionals, potential declines in water levels and/or well production in the onsite wells can be addressed in a timely manner.

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Table 1
Summary of Well Construction and Testing Data
Red Boat Vineyard Development Project

WELL CONSTRUCTION DETAILS

Reported Well Designation	DWR Well Log No.	Date Drilled	Method of Drilling	Pilot Hole Depth (ft bgs)	Casing Depth (ft bgs)	Casing Type	Casing Diameter (in)	Borehole Diameter (in)	Sanitary Seal Depth (ft bgs)	Perforation Intervals (ft bgs)	Type and Size (in) of Perforations	Gravel Pack Interval (ft) and Size	Current Status of Well
Lower Well	462625	April 1994	Air Rotary	205	205	PVC with Steel Upper	6	8	25	40-205	0.094 Machine-Slotted	25-205 Pea Gravel	Active
Upper Well	ND	1999	ND	ND	ND	PVC	6	10.6	23	ND	ND	ND	Active

POST-CONSTRUCTION YIELD DATA

Reported Well Designation	DWR Well Log No.	Date & Type of Yield Data	Duration of "Test" (hrs)	Estimated Flow Rate (gpm)	Static Water Level (ft)	Pumping Water Level (ft)	Estimated Specific Capacity (gpm/ft ddn)
Lower Well	462625	4/19/1994 Airlift	4	30	15.00	ND	ND
		2/1/2021 Pump	2	26	78.7	92	2.0
Upper Well	ND	2/8/2021 Pump	2	30.9	87.5	94	4.8

Notes: ND = No data available
ft bgs = feet below ground surface
in = inches
hrs = hours
gpm = gallons per minute
gpm/ft ddn = gallons per minute per foot of water level drawdown
Driller's log for Upper Well could not be located; limited info gathered from Napa County permit.

Table 2
Summary of Groundwater Quality Analysis
Red Boat Vineyard Development Project

Constituent Analyzed	Units	Maximum Contaminant Level	Lower Well	Upper Well
		Date of Samples:	**2/1/2021**	**2/8/2021**
General Physical Constituents				
Specific Conductance	µmhos/cm	900; 1,600; 2,200[(1)]	182	167
pH	units	6.5 to 8.5	6.93	6.4
General Mineral Constituents				
Total Hardness	gpg	None	4	4
Silica (as SiO_2)	mg/L	None	99	100
Nitrate (as NO_3)		45	6.5	5.5
Detected Inorganic Constituents (Trace Elements)				
Arsenic	µg/L	10	4.1	7
Iron	mg/L	0.3	0.06	ND
Manganese		0.05	0.02	ND

Notes:

(1) The three listed numbers represent the recommended, upper and short-term State Maximum Contaminant Levels for the constituent.

µmhos/cm = micromhos per centimeter; mg/L = milligrams per liter; µg/L = micrograms per liter; gpg = grains per gallon

ND = constituent not detected or below reporting detection limit

Table 3
Groundwater Use Estimates
Red Boat Vineyard Development Project

Groundwater Use	Estimated Groundwater Use (acre-feet/year)[1]	
	Existing	Future
Residential Groundwater Use		
Existing Primary Residence	0.75	0.75
Existing Pool	0.10	0.10
Total Residential Groundwater Use	**0.85**	**0.85**
Irrigation Groundwater Use		
Landscaping - ≤1,000 square feet	0.6	0.6
Vineyard - Existing 0 acres	0.0	--
Vineyard - Proposed 7.0 acres	---	3.5
Total Irrigation Groundwater Use	**0.6**	**4.1**
Total Combined Groundwater Use (Residential + Irrigation)	**1.5**	**5.0**

Notes:

[1]This residential water demand estimate is based on values presented for specified land uses provided in Appendix B of the County's WAA Guidance Document (WAA 2015).

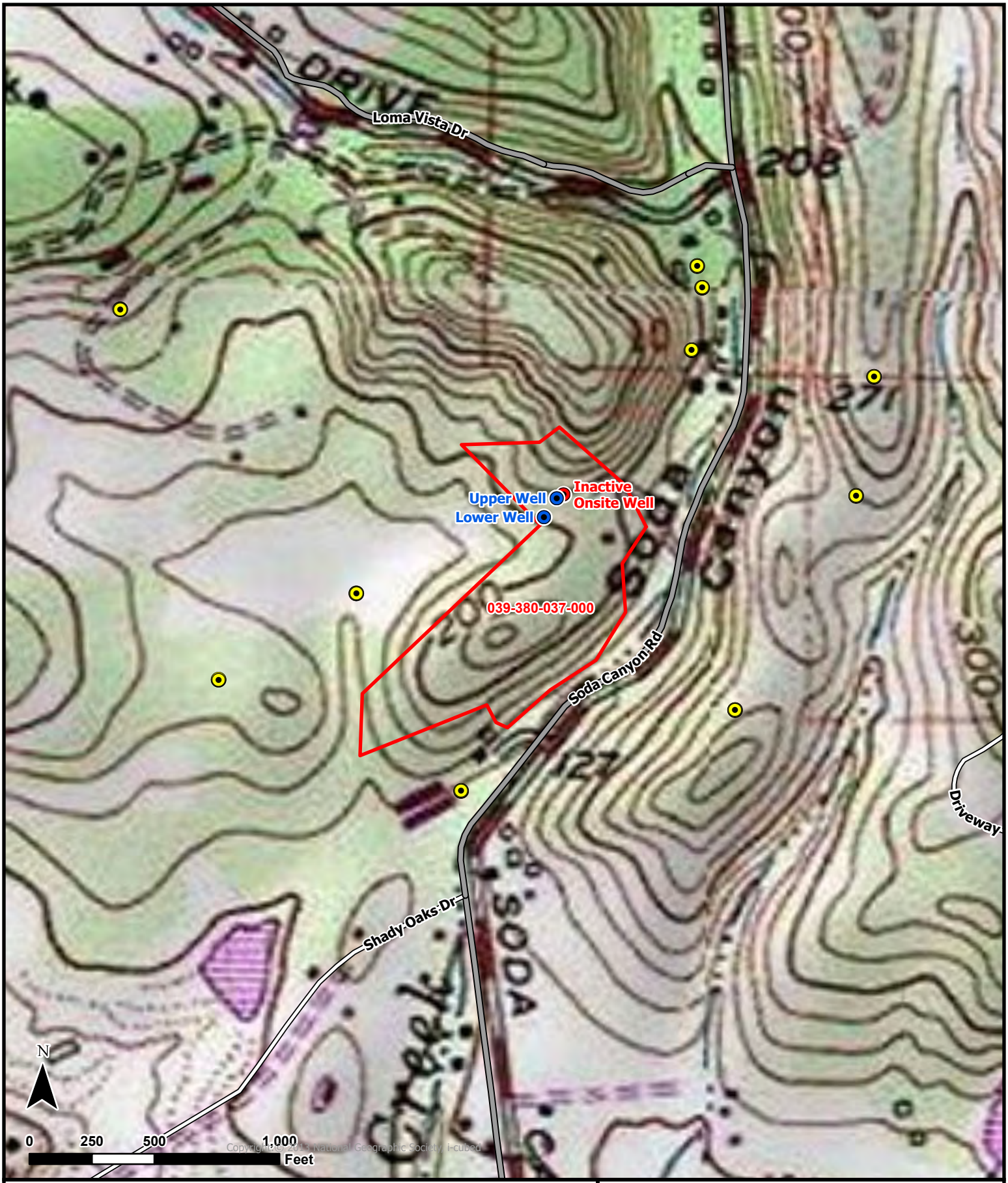
1 acre-foot = 325,851 gallons

Table 4
Calculation of Theoretical Rainfall Recharge Percentage - Napa River Near Napa Watershed

Portion of "Napa River Watershed Near Napa"	Area*		PRISM Rainfall+ (inches)	Rainfall Volume (AFY)	Scenario 1 Deep Percolation		Scenario 2 Deep Percolation		Scenario 3 Deep Percolation	
	(mi^2)	(acres)			Percentage (%)	Volume (AF)	Percentage (%)	Volume (AF)	Percentage (%)	Volume (AF)
Valley Floor Portion	45.58	29,171	29.42	71,518	20%	14,304	25%	17,880	30%	21,455
Hill and Mountain Portion	172.89	110,650	31.83	293,498	16%	47,735	15%	44,159	14%	40,583
Entire Watershed	218.47	139,821	31.32	364,932	17%	62,038	17%	62,038	17%	62,038

+PRISM 10-Year Average Rainfall (2012-2021) provided by Napa County (2022b)

*Calculated in the "NAD 1983 StatePlane California II FIPS 0402 (US Feet)" projected coordinate system



LEGEND

- Subject Property (Showing County APN)
- Onsite Well Location (approx.)
- Inactive Onsite Well Location (approx.)
- Known Offsite Well Location (approx.)

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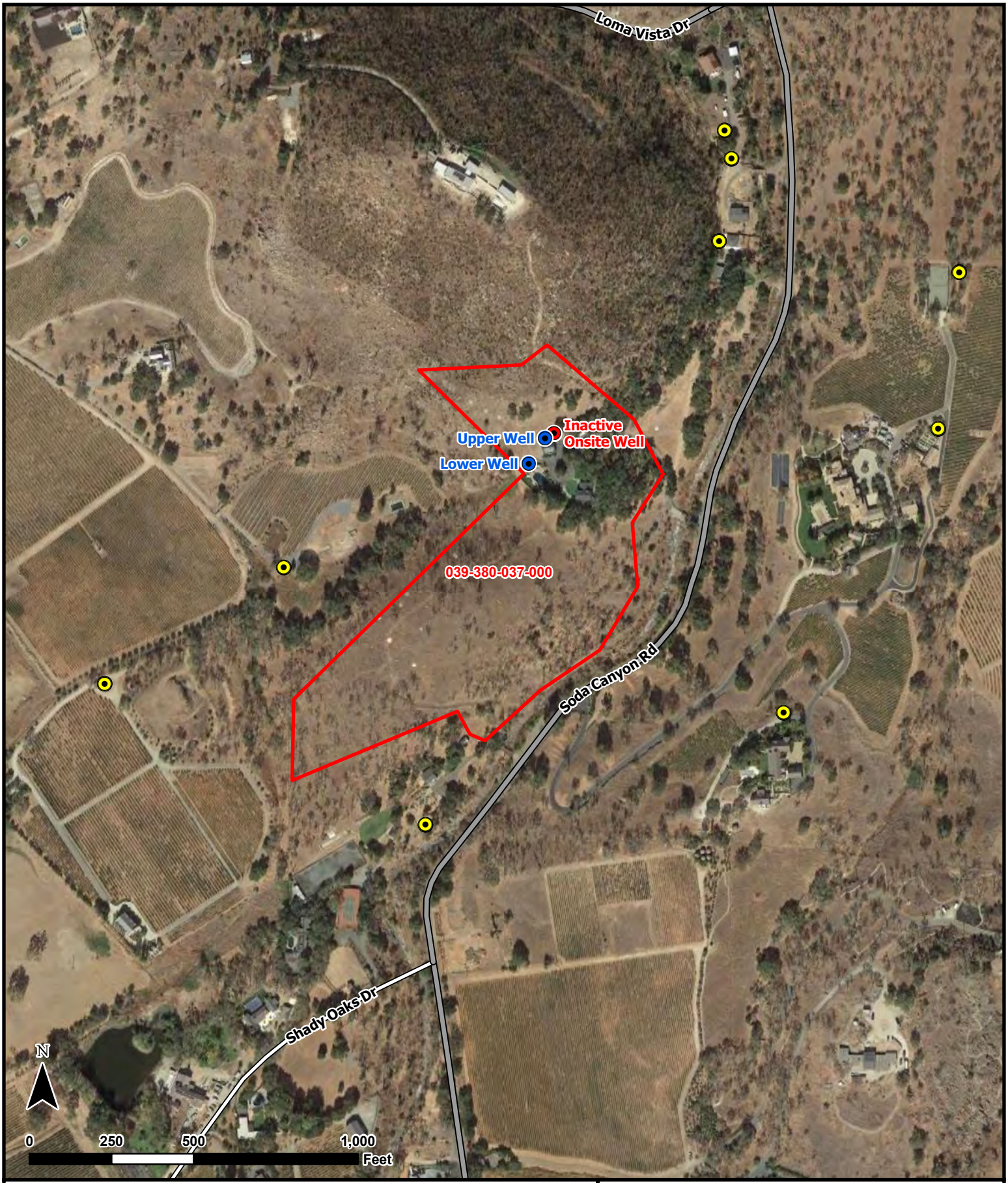
FIGURE 1
LOCATION MAP

RCS Job No. 747-NPA01

November 2021



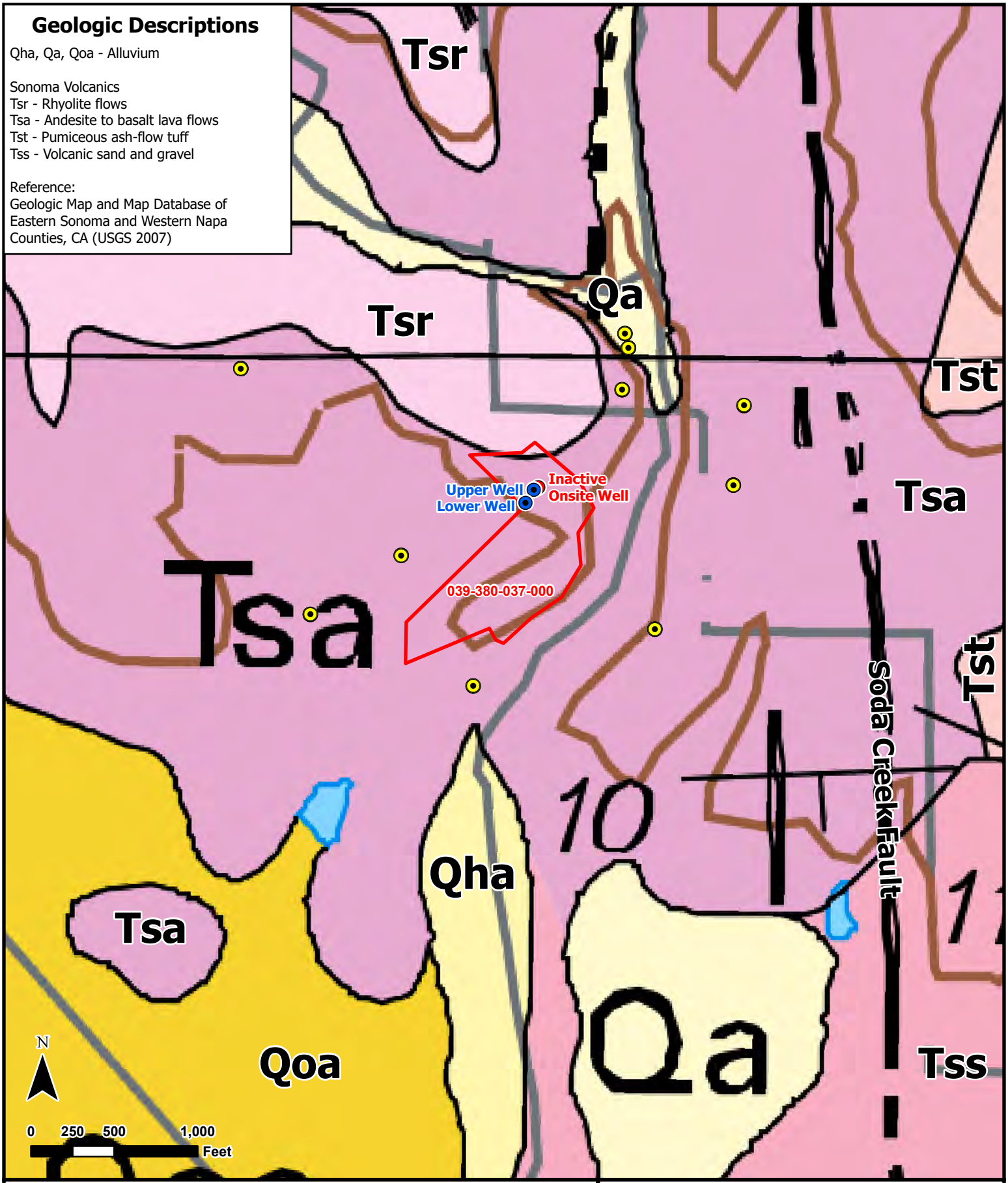
LEGEND

- Subject Property (Showing County APN)
- Onsite Well Location (approx.)
- Inactive Onsite Well Location (approx.)
- Known Offsite Well Location (approx.)

RCS

FIGURE 2
AERIAL PHOTOGRAPH MAP

RCS Job No. 747-NPA01 November 2021



LEGEND

- Subject Property (Showing County APN)
- Onsite Well Location (approx.)
- Inactive Onsite Well Location (approx.)
- Known Offsite Well Location (approx.)
- Fault - dashed where inferred

RCS

FIGURE 3
GEOLOGIC MAP

RCS Job No. 747-NPA01 November 2021

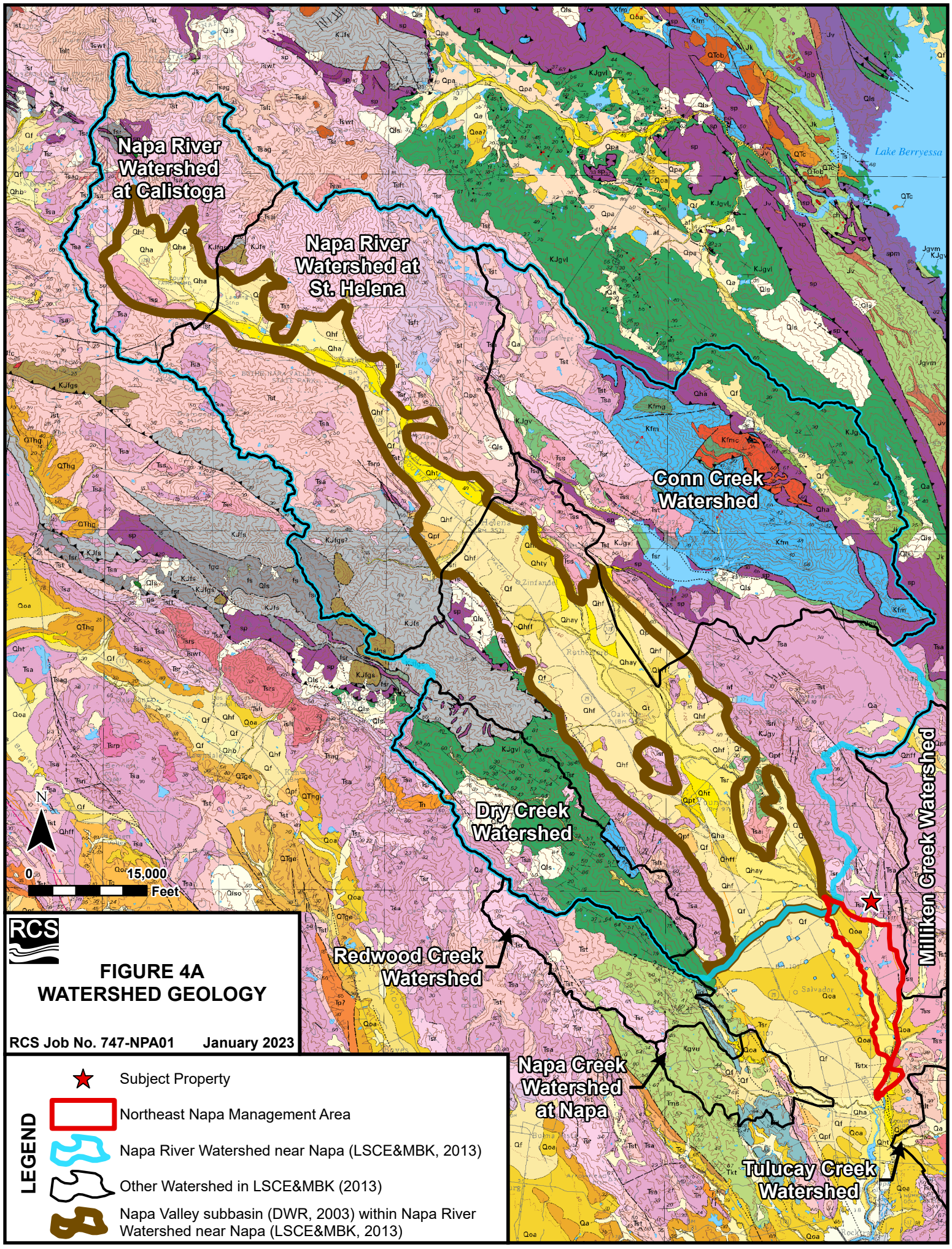


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FIGURE 4A
WATERSHED GEOLOGY

RCS Job No. 747-NPA01 January 2023

LEGEND

- Subject Property
- Northeast Napa Management Area
- Napa River Watershed near Napa (LSCE&MBK, 2013)
- Other Watershed in LSCE&MBK (2013)
- Napa Valley subbasin (DWR, 2003) within Napa River Watershed near Napa (LSCE&MBK, 2013)

LIST OF MAP UNITS

[Some unit exposures on the map are too small to distinguish the color for unit identification. These units are labeled where possible, and unlabeled units are attributed in the database.]

SURFICIAL DEPOSITS

- af — Artificial fill (Historic)
- afbm — Artificial fill over Bay mud (Historic)
- alf — Artificial levee fill (Historic)
- Qhc — Stream channel deposits (late Holocene)
- Qhay — Younger alluvium (late Holocene)
- Qhty — Terrace deposits (late Holocene)
- Qha — Alluvium (Holocene)
- Qht — Terrace deposits (Holocene)
- Qhf — Alluvial fan deposits (Holocene)
- Qhff — Fine-grained alluvial fan deposits (Holocene)
- Qhl — Natural levee deposits (Holocene)
- Qhb — Basin deposits (Holocene)
- Qhbm — Bay mud (Holocene)
- Qa — Alluvium (Holocene and late Pleistocene)
- Qt — Terrace deposits (Holocene and late Pleistocene)
- Qf — Alluvial fan deposits (Holocene and late Pleistocene)
- Qls — Landslide deposits (Holocene and late Pleistocene)
- Qlsa — Andesitic composition
- Qlsr — Rhyolitic composition
- Qpa — Alluvium (late Pleistocene)
- Qpt — Terrace deposit (late Pleistocene)
- Qpf — Alluvial fan deposits (late Pleistocene)
- Qoa — Alluvium (late and early Pleistocene)
- Qlso — Landslide deposits (late and early Pleistocene)

Clear Lake Volcanics

- Qr — Rhyolite (Pleistocene)
- QTob — Olivine basalt (Pleistocene and Pliocene)
- QTt — Tuff (Pleistocene and(or) Pliocene)
- Tr — Rhyolite (Pliocene)

- QTc — Cache Formation (Pleistocene and(or) Pliocene)
- QTge — Glen Ellen Formation (early Pleistocene? and Pliocene)
- QThg — Huichica and Glen Ellen Formations, undivided (early Pleistocene? and Pliocene)

Sonoma Volcanics

- Tsv — Sonoma Volcanics, undivided (Pliocene and late Miocene)
- Tsr — Rhyolite flows
- Tsri — Rhyolite plugs
- Tsrs — Soda rhyolite flows
- Tsrp — Perlitic rhyolite
- Tsrb — Rhyolite breccia
- Tsa — Andesite to basalt lava flows
- Tsal — Andesite to dacite plugs
- Tsb — Basalt flows
- Tsfd — Basalt or andesite lava flows and sediments
- Tst — Pumiceous ash-flow tuff
- Tswt — Welded ash-flow tuff
- Tstx — Tuff(?)
- Tsag — Agglomerate
- Tslt — Tuff breccia
- Tsft — Tuff
- Tss — Volcanic sand and gravel
- Tssd — Diatomite

- Twg — Wilson Grove Formation (late Pliocene to late Miocene)
- Tc — Sand and gravel of Cotati (Pliocene and late Miocene)
- Tp — Petaluma Formation (early Pliocene and late Miocene)
- Tdr — Donnell Ranch Volcanics (late Miocene)
- Th — Neroly Sandstone (late Miocene)
- Tci — Cierbo Sandstone (late Miocene)
- Tbm — Burdell Mountain volcanics (late and middle? Miocene)
- Tms — Unnamed sandstone (middle Miocene)
- Tkt — Kirker Tuff (early Miocene and(or) Oligocene)
- Td — Unnamed sandstone (Eocene and Paleocene)
- Ts — Unnamed sandstone (Eocene? or Paleocene?)

GREAT VALLEY COMPLEX

Great Valley sequence

- KJgv — Sandstone, shale, and conglomerate (Late Cretaceous to Late Jurassic)
- Kgvu — Sandstone, shale, and conglomerate (Late Cretaceous)
- Kv — Venado Formation (Late Cretaceous)
- KJgvl — Sandstone and shale (Early Cretaceous and Late Jurassic)
- KJsp — Sedimentary serpentinite member
- Jk — Knoxville Formation (Late Jurassic)
- Jsp — Sedimentary serpentinite member
- Jgvm — Mélange

Coast Range ophiolite

- Jv — Basaltic pillow lava and breccia (Jurassic)
- Jmi — Mafic intrusive complex (Jurassic)
- Jgb — Gabbro (Jurassic)
- sp — Serpentinite (Jurassic)
- sc — Silica-carbonate rock
- spm — Serpentinite-matrix mélange

FRANCISCAN COMPLEX

- fsr — Mélange, including blocks, mapped locally, of:
- sp — Serpentinite
- fs — Graywacke
- ch — Chert
- fgc — Greenstone and chert
- gs — Greenstone
- m — High-grade metamorphic rocks
- Kfss — Sandstone (Late Cretaceous, Turonian?)
- Kfm — Metagraywacke (Late and Early Cretaceous)
- Kfmc — Metachert (Late and Early Cretaceous)
- Kfmg — Metagreenstone (Late and Early Cretaceous)
- KJfs — Graywacke and melange (Early Cretaceous and Late Jurassic)
- KJfc — Chert (Cretaceous to Jurassic)
- KJfgc — Greenstone and chert (Cretaceous to Jurassic)
- KJfgs — Greenstone (Cretaceous to Jurassic)

MAP SYMBOLS

- **Contact**—Depositional or intrusive contact, dashed where approximately located, dotted where concealed
- **Fault**—Dashed where approximately located, small dashes where inferred, dotted where concealed, queried where location is uncertain, orange denotes Quaternary-active fault, magenta denotes Holocene active-fault
- **Reverse or thrust fault**—Dashed where approximately located,small dashes where inferred, dotted where concealed, queried where location is uncertain; sawteeth on upper plate
- **Anticline**—Dashed where approximately located, dotted where concealed
- **Syncline**—Dashed where approximately located, dotted where concealed
- 35 — Strike and dip of bedding
- 48 — Strike and dip of bedding, top indicator observed
- 20 — Strike and dip of bedding, approximate
- 83 — Overturned bedding
- 79 — Overturned bedding, top indicator observed
- 45 — Crumpled bedding
- 25 — Air photo attitude
- Vertical bedding
- Horizontal bedding
- 35 — Strike and dip of foliation
- 73 — Strike and dip of foliation and bedding
- Vertical foliation
- Strike and dip of joint

Reproduced from "Geologic Map and Map Database of Eastern Sonoma and Western Napa Counties, California (USGS, 2007)

RCS

FIGURE 4B
EXPLANATION OF GEOLOGIC MAP UNITS AND SYMBOLS

RCS Job No. 747-NPA01 **January 2023**

REVISED MEMORANDUM

APPENDIX

CALIFORNIA DEPARTMENT OF WATER RESOURCES
(DWR)
WELL COMPLETION REPORT (DRILLER'S LOG)

ORIGINAL
File with DWR

Page ____ of ____

Owner's Well No. ________

Date Work Began 4-19-94, Ended 4-21-94

Local Permit Agency Napa

Permit No. 35100 Permit Date 4-19-94

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 462625

DWR USE ONLY — DO NOT FILL IN 10/18

06N04W

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ____ HORIZONTAL ____ ANGLE ____ (SPECIFY)

DEPTH TO FIRST WATER — (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.		DESCRIPTION Describe material, grain size, color, etc.
85	140	hard black rock
140	160	black ash
160	205	hard black rock with redash

TOTAL DEPTH OF BORING 205 (Feet)

TOTAL DEPTH OF COMPLETED WELL 205 (Feet)

[redacted]

WELL LOCATION

Address Same

City Napa

County Napa

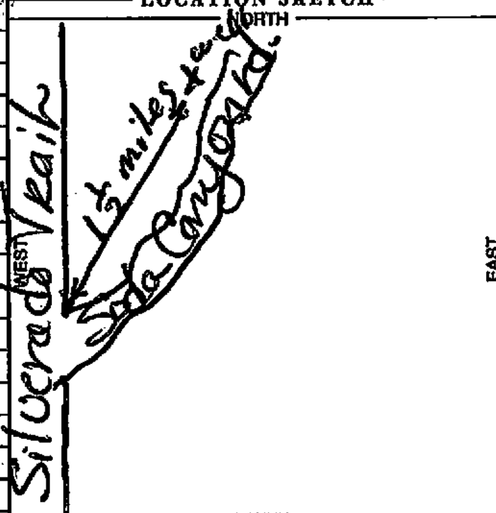
APN Book ____ Page ____ Parcel 39-380-13

Township ____ Range ____ Section ____

Latitude ____ NORTH DEG. MIN. SEC. Longitude ____ WEST DEG. MIN. SEC.

LOCATION SKETCH

NORTH



WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

____ NEW WELL

MODIFICATION/REPAIR

✓ Deepen

____ Other (Specify)

____ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

____ MONITORING

WATER SUPPLY

✓ Domestic

____ Public

____ Irrigation

____ Industrial

____ "TEST WELL"

____ CATHODIC PROTECTION

____ OTHER (Specify)

DRILLING METHOD Air FLUID —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 15 (Ft.) & DATE MEASURED 4-19-94

ESTIMATED YIELD* 30 (GPM) & TEST TYPE air lift

TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 160 (Ft.)

* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE: BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
~~0~~	~~25~~	~~7⅞~~								
0	40	7⅞	✓				Plastic	5	200	
40	205	7⅞		✓			"	5	"	3/32

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	25	✓			
25	205				Pea gravel

ATTACHMENTS (✓)

____ Geologic Log

____ Well Construction Diagram

____ Geophysical Log(s)

____ Soil/Water Chemical Analyses

____ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Pulliam Well Drilling 369
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

3377 Piedmont Napa Ca. 94558
ADDRESS CITY STATE ZIP

Signed Tom Pulliam 4-25-92 94538
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

DATE 7/27/99
FEE $119.00
RECEIPT NO. 10088
BY PJ

A.P.# 39-380-013
RECORD # 96-1182

NAPA COUNTY
DEPT. OF ENVIRONMENTAL MANAGEMENT
APPLICATION & PERMIT TO CONSTRUCT A WATER WELL

NAME Clyde Anderson (Owner) ADDRESS 1373 Soda Canyon rd - Napa (Job Location)

NAME Pulliam Drilling (Well Driller) PHONE # 2249396 ADDRESS

TYPE OF WORK
New Class I PERMIT ✓ Test Hole Date Called In
New Class II PERMIT U.S.G.S. Map Received
Well Reconstruction Well Deepening Horizontal Well
Well Destruction High Hazard Low Hazard Hand Dug

PROPOSED USE
DOMESTIC IRRIGATION ✓ INDUSTRIAL MUNICIPAL
TEST WELL HOT WATER (D.O.G. Clearance) OTHER

Sewage Disposal System (existing or proposed) Public Individual ✓ Private
Distance from well to any part of nearest sewage disposal system 200 feet.
Septic System Location Determined By: owner
Plot plan of well location received Yes County road setback 32 ft. from centerline.

WORKER'S COMPENSATION COVERAGE: (Check one of the following)

✓ A certificate of current Worker's Compensation Insurance coverage is presently on file with this office.

___ A certificate of current Worker's Compensation Insurance is being filed with this application.

___ I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Worker's Compensation laws in California.

****

TERMS OF PERMIT

1) Call at least 24 hours in advance to schedule an inspection.
2) Prior to receiving a Final Clearance on the well, a copy of the Department of Water Resources "Water Well Drillers Report" (DWR-188) must be returned to our Department.

Old Wells to be Destroyed:
Other Remarks:

Bill Pulliam
Signature of Applicant

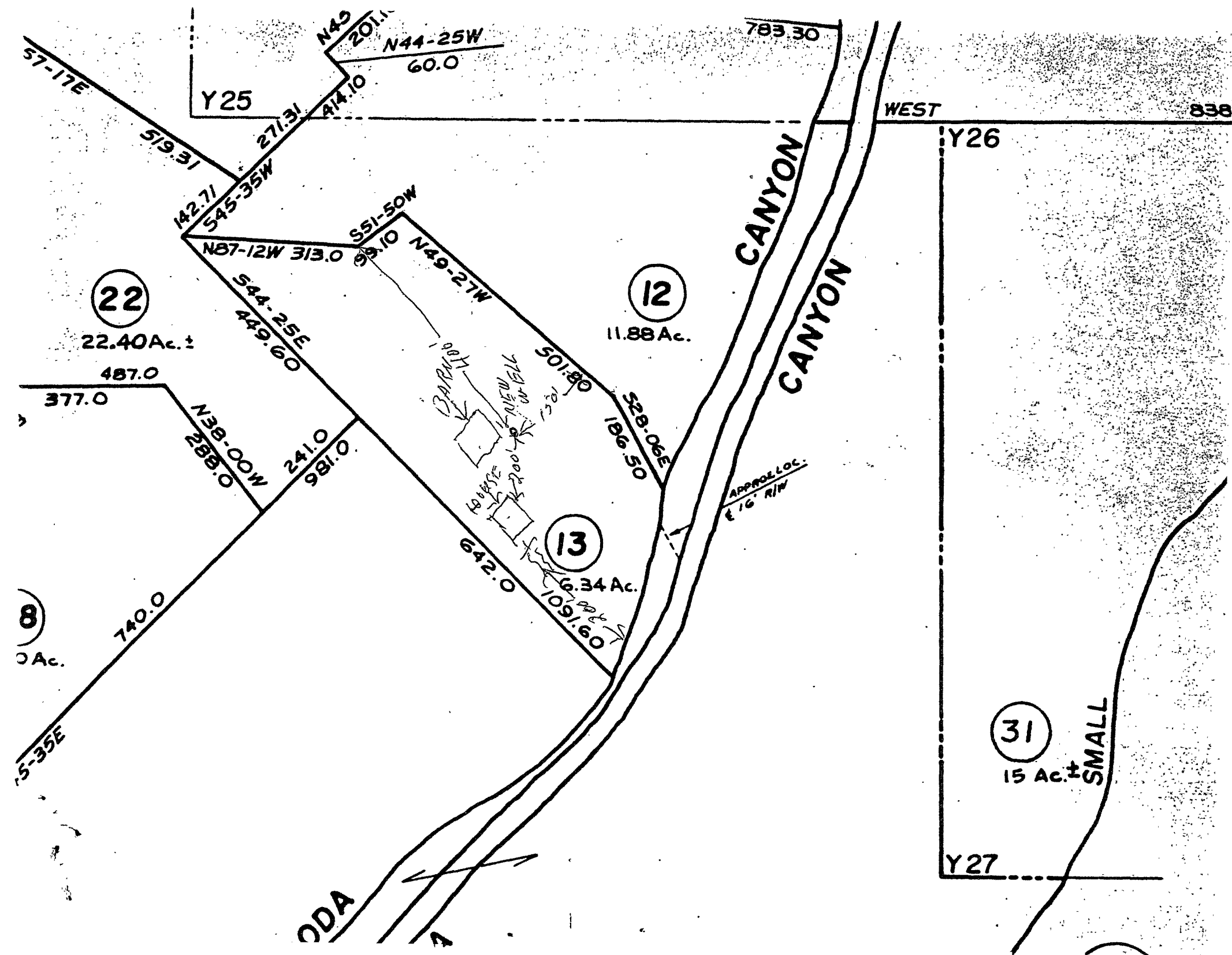
7-27-99
Date

****

FOR OFFICE USE ONLY

	Date	By	Remarks
City Clearance			
Pub. Works Clearance			
Pre-Inspection			
Class II Approval			
Permit Issued	7/27/99	QM	
Const. Insp.	~~8/12/4/99~~	QM	23' seal, 5" casing, 10 5/8" borehole
Well Log Rec.			
Final Insp.			

White-Office Yellow-Owner Pink-Contractor
EHM Form Letter#6 / 12-14-88


N44-25W
60.0
783.30
Y25
WEST
838
Y26
414.10
271.31
519.31
S45-35W
142.71
S51-50W
N87-12W 313.0
99.10
N49-27W
501.80
S28-06E
186.50
S44-25E
449.60
642.0
1091.60
22
22.40Ac.±
487.0
377.0
N38-00W
288.0
241.0
981.0
740.0
12
11.88Ac.
13
6.34Ac.
CANYON
CANYON
APPROX LOC.
± 16' R/W
31
15 Ac.±
SMALL
Y27
8
Ac.

REVISED MEMORANDUM

APPENDIX

FEBRUARY 1, 2021 AND FEBRUARY 8, 2021 PUMPING TESTS
OF THE LOWER AND UPPER WELLS, REXPECTIVELY
BY
RAY'S WELL TESTING SERVICE, INC.

Ray's Well Testing Service Inc.
4853 Vine Hill Rd, Sebastopol Ca 95472
Phone 707 823 3191 **Fax** 707 317 0057 **Lic#** 903708

CUSTOMER INFORMATION

REPORT #: 12450-1 - By: Matt Owens	DATE OF TEST: 2/8/21
CUSTOMER NAME: Cuong Pham	CONTACT:
AGENT NAME: Carla Griffin - Coldwell Banker	CONTACT: 707 738 8183
PROPERTY ADDRESS: 1373 Soda Canyon Rd, Napa CA 94558	SENT TO: cgriffin@cbnapavalley.com

WELL DATA

LOCATION OF WELL:	Upper Well - North side of detached garage
TYPE OF WELL:	Drilled
DEPTH OF COMPLETED WELL:	Unknown - Please refer to well log
DIAMETER OF WELL CASING:	6" PVC
SANITARY WELL SEAL (PLATE SEAL AT OPENING OF WELL CASING):	Yes
ANNULAR SEAL (IN-GROUND SEAL OF BOREHOLE):	Unknown - Please Refer to well log
PUMP HP AND TYPE:	2 HP 230V Submersible, 1.25" tee, #10-4 cable
DEPTH OF PUMP SUCTION:	Probe stopped at 160 Feet in casing

WATER PRODUCTION RESULTS

WATER LEVEL AT START (STATIC LEVEL):	87.5 Feet	FLOW RATE AT START:	34.5 GPM
FINAL PUMPING LEVEL:	94 Feet	FINAL FLOW RATE:	**30.9 GPM**
WATER LEVEL DRAWDOWN:	6.5 Feet	TOTAL LENGTH OF TEST:	2 Hours

CONSTANT PUMPING LEVEL INFORMATION

STABILIZED PUMPING LEVEL:	94 Feet	STABILIZED FLOW RATE (YIELD):	**30.9 GPM**
DURATION OF CONSTANT PUMPING LEVEL:	1 Hour	TOTAL YIELD:	1,854 gallons

WATER SYSTEM INSPECTION

WELL PUMP	Functional	TECHNICAL INFO: 20 GPM @ 100 PSI @ 90', 10.7 amps, control box dated 2011
ELECTRICAL	Functional	TECHNICAL INFO: 20 amp fuse disconnect at well head
PRESSURE TANK	Functional	TECHNICAL INFO: 2- 85 gallon AT-266 tanks, 2011 date codes, 26/30 PSI air charges
STORAGE TANK	None	TECHNICAL INFO:
BOOSTER PUMP	None	TECHNICAL INFO:

WATER QUALITY TESTING

THE FOLLOWING SAMPLES ARE BEING ANALYZED. PLEASE REFER TO FOLLOW-UP REPORT FOR RESULTS.		
Basic Residential Package	DATED: 2/8/21	TURNAROUND: Standard
	DATED:	TURNAROUND:
	DATED:	TURNAROUND:
	DATED:	TURNAROUND:

SEE NEXT PAGE FOR FURTHER INFORMATION...

DATE: 2/8/21

ADDRESS: 1373 Soda Canyon Rd, Napa CA 94558

COMMENTS:
1. The recharge rate at the end of the test was 30.9 gallons per minute. This test may not represent the long term or seasonal yield.
2. The water was visibly clear, sediment and odor free for the duration of the test.
3. The well pump pressurizes two 85 gallon AT-266 pressure tanks. The operating pressure range is set 50 to 75 PSI. This system
is interconnected to the lower well. These systems pressurize water for domestic and irrigation use. Due to the operating pressure
settings, the upper well is the primary well. If the system pressure should drop to 40 PSI, the lower well will activate.
4. There is a 2" Amiad Brushaway filter installed on the main line leaving the pump house adjacent to the lower well.
5. There is an old well approximately 20 feet from the upper well. The well is not in service and was not tested or inspected.
6. The main shut off valve at the well head was found closed and left closed on the day of the inspection.
RECOMMENDATIONS:
1. The check valve at the well head was not seating properly on the day of the inspection. Recommend replacement.
2. The pressure gauge has failed. Recommend replacement.
3. The fuses in the disconnect are undersized. Recommend installation of properly sized fuses.
4. Water tests results for upper well and possible follow up recommendations pending.

Thank you for allowing us to do your well inspection!

APPROVED BY: NICK BRASESCO

Water levels and well depth are measured as feet below top of well casing unless otherwise noted.

All wells and springs are subject to seasonal and yearly changes in regards to water yield, production and quality. Wells may be influenced by creeks or other water sources and are likely to yield less water during dry months of the year; typically August, September, & October. We make no predictions of future water production or water quality.

Well Head

Fuse Disconnect

Pressure Tanks

Main Shut Off Valve

Amiad Brushaway Sediment Filter

Old Well

Ray's Well Testing Service Inc.
4853 Vine Hill Rd, Sebastopol Ca 95472
Phone 707 823 3191 **Fax** 707 317 0057 **Lic#** 903708

CUSTOMER INFORMATION

REPORT #: 12450-2 - By: Matt Owens	DATE OF TEST: 2/1/21
CUSTOMER NAME: Cuong Pham	CONTACT:
AGENT NAME: Carla Griffin - Coldwell Banker	CONTACT: 707 738 8183
PROPERTY ADDRESS: 1373 Soda Canyon Rd, Napa CA 94558	SENT TO: cgriffin@cbnapavalley.com

WELL DATA

LOCATION OF WELL:	Lower Well - Outside pump house near pool
TYPE OF WELL:	Drilled
DEPTH OF COMPLETED WELL:	Probe stopped at 140 Feet in casing
DIAMETER OF WELL CASING:	6" I.D. Steel
SANITARY WELL SEAL (PLATE SEAL AT OPENING OF WELL CASING):	Yes
ANNULAR SEAL (IN-GROUND SEAL OF BOREHOLE):	Unknown - Please Refer to well log
PUMP HP AND TYPE:	1.5 HP 230V Submersible, 1.25" Sch. 80 pipe, #10-4 cable
DEPTH OF PUMP SUCTION:	130 Feet - As indicated by installer records

WATER PRODUCTION RESULTS

WATER LEVEL AT START (STATIC LEVEL):	78.7 Feet	FLOW RATE AT START:	28 GPM
FINAL PUMPING LEVEL:	92 Feet	FINAL FLOW RATE:	**26 GPM**
WATER LEVEL DRAWDOWN:	13.3 Feet	TOTAL LENGTH OF TEST:	2 Hours

CONSTANT PUMPING LEVEL INFORMATION

STABILIZED PUMPING LEVEL:	92 Feet	STABILIZED FLOW RATE (YIELD):	**26 GPM**
DURATION OF CONSTANT PUMPING LEVEL:	1 Hour	TOTAL YIELD:	1,560 gallons

WATER SYSTEM INSPECTION

WELL PUMP	Functional	TECHNICAL INFO: 22.6 GPM @ 60 PSI @ 80', 18GS15 installed November 2011
ELECTRICAL	Functional	TECHNICAL INFO: 30 amp breaker in pump house sub panel
PRESSURE TANK	Functional	TECHNICAL INFO: 85 gallon AT-266, dated 2011, 26 PSI air charge
STORAGE TANK	None	TECHNICAL INFO:
BOOSTER PUMP	None	TECHNICAL INFO:

WATER QUALITY TESTING

THE FOLLOWING SAMPLES ARE BEING ANALYZED. PLEASE REFER TO FOLLOW-UP REPORT FOR RESULTS.		
Basic Residential Package	DATED: 2/1/21	TURNAROUND: Standard
	DATED:	TURNAROUND:
	DATED:	TURNAROUND:
	DATED:	TURNAROUND:

SEE NEXT PAGE FOR FURTHER INFORMATION...

DATE: 2/1/21

ADDRESS: 1373 Soda Canyon Rd, Napa CA 94558

COMMENTS:
1. The recharge rate at the end of the test was 26 gallons per minute. This test may not represent the long term or seasonal yield.
2. The water was visibly clear, sediment and odor free for the duration of the test.
3. The well pump pressurizes the 85 gallon AT-266 pressure tank. The operating pressure range is set 40 to 60 PSI. This system
is interconnected to the upper well located on the north side of the garage. These systems pressurize water for domestic and irrigation.
4. There is a 2" Amiad Brushaway filter installed on the the main line leaving the pump house.
5. There is an old well located approximately 20 Feet from the upper well. The old well is not in service and was not tested or inspected.
RECOMMENDATIONS:
1. The water tests indicate arsenic detection, although the level is within the MCL drinking standard. An optional drinking water system
should be considered.
2. Water test results for upper well pending.

Thank you for allowing us to do your well inspection!

APPROVED BY: NICK BRASESCO

Water levels and well depth are measured as feet below top of well casing unless otherwise noted.

All wells and springs are subject to seasonal and yearly changes in regards to water yield, production and quality. Wells may be influenced by creeks or other water sources and are likely to yield less water during dry months of the year; typically August, September, & October. We make no predictions of future water production or water quality.

Well Head

Electrical Sub Panel

Pressure Tank

Amiad Brushaway Filter

Irrigation Shut Off Valve

House Shut Off Valve

Pool Fill Shut Off Valve

Old Well

REVISED MEMORANDUM

APPENDIX

ANALYTICAL LABORATORY REPORTS
FOR
LOWER AND UPPER WELLS, RESPECTIVELY

Alpha Analytical Laboratories, Inc. email: clientservices@alpha-labs.com
Corporate: 208 Mason Street | Ukiah, CA 95482 | T: 707-468-0401 | F: 707-468-5267 | ELAP# 1551

24 February 2021

Ray's Well Testing Service
Attn: Ray's Well Testing Service
4853 Vine Hill Rd.
Sebastopol, CA 95472

RE: Water Quality
1373 Soda Canyon Rd.

Work Order: 21B1678

Enclosed are the results of analyses for samples received by the laboratory on 02/09/21 13:00. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeanette Poplin

Jeanette L. Poplin For Stephen F. McWeeney
Lab Manager

Alpha Analytical Laboratories, Inc. email: clientservices@alpha-labs.com
Corporate: 208 Mason Street | Ukiah, CA 95482 | T: 707-468-0401 | F: 707-468-5267 | ELAP# 1551

Bay Area: 262 Rickenbacker Circle | Livermore, CA 94551 | T: 925-828-6226 | F: 925-828-6309 | ELAP# 2728
Central Valley: 9090 Union Park Way Suite 113 | Elk Grove, CA 95624 | T: 916-686-5190 | F: 916-686-5192 | ELAP# 2922
North Bay: 110 Liberty Street | Petaluma, CA 94952 | T: 707-769-3128 | F: 707-769-8093 | ELAP# 2303
San Diego: 2722 Loker Avenue West Suite A | Carlsbad, CA 92010 | T: 760-930-2555 | F: 760-930-2510 | ELAP# 3055

Ray's Well Testing Service	Project:	Water Quality	
4853 Vine Hill Rd.	Project #:	1373 Soda Canyon Rd.	Reported:
Sebastopol CA, 95472	Project Mgr:	Ray's Well Testing Service	02/24/21 13:28

Analytical Report for Samples

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Raw Well	21B1678-01	Water	02/08/21 14:00	02/09/21 13:00

Alpha Analytical Laboratories, Inc. email: clientservices@alpha-labs.com
Corporate: 208 Mason Street | Ukiah, CA 95482 | T: 707-468-0401 | F: 707-468-5267 | ELAP# 1551

Sample Name:	Raw Well	Report Date:	02/24/21 13:28
Laboratory ID:	21B1678-01	Sample Date:	02/08/21 14:00
Notes:		Sample Received:	02/09/21 13:00

Parameter	Result	MCL	Reporting Limit	Units	Test Method	ELAP #	Notes
Total Coliforms	<1.0	1	1.0	MPN/100mL	SM9223B	2303	
E. Coli	<1.0	1	1.0	MPN/100mL	SM9223B	2303	

Inorganic Chemicals

Parameter	Result	MCL	Reporting Limit	Units	Test Method	ELAP #	Notes
Arsenic	7.0	10	2.0	ug/L	EPA 200.8	1551	

Alpha Analytical Laboratories, Inc. email: clientservices@alpha-labs.com
Corporate: 208 Mason Street | Ukiah, CA 95482 | T: 707-468-0401 | F: 707-468-5267 | ELAP# 1551

Notes and Definitions

MCL	Maximum Contaminant Level, the highest level of a contaminant that is allowed in drinking water regulated by the state of California. If no MCL is listed, the MCL has not been established.
ND	Analyte NOT DETECTED at or above the reporting limit
*	Tiered Maximum Contaminant and/or Action Levels: Sulfate and Chloride 250-500-600 mg/L, Specific Conductance 900-1600-2200 umho/cm, TDS 500-1000-1500 mg/L.

Phone: (707) 823-3191 **Fax:** (707) 317-0057 **Email:** rayswelltesting@gmail.com
Address: 4853 Vine Hill Rd, Sebastopol Ca 95472 CA Lic. #: 903708

Report of Mineral Analysis

DATE: 2/2/21

CUSTOMER NAME: Cuong Pham

PROPERTY ADDRESS: 1373 Soda Canyon Rd

PARAMETER	RESULT		RECOMMENDED RANGES
	Raw - Well		
PH	6.40		< 7 Increasingly acidic - may be corrosive 6.8 to 8.5 - Recommended Range >7 Increasingly basic
TOTAL HARDNESS	4 gpg		< 1 gpg Soft 1 to 3.5 gpg Slightly Hard 3.5 to 7 gpg Moderately Hard 7 to 10.5 gpg Hard > 10.5 gpg Very Hard
TOTAL IRON	ND		0.3 mg/l - SMCL
TOTAL MANGANESE	ND		0.05 mg/l - SMCL
CONDUCTIVITY	167 us/cm		900 us/cm - Recommended Upper Limit 1600 us/cm - SMCL
NITRATES	5.5 mg/l		45 mg/l - MCL (tested as N03)
SILICA	100 mg/l		*There is no EPA recommended Limit
VISUAL APPEARANCE	Clear		

*Silica is increasingly reported as a nuisance at levels above 50 mg/l. 30 mg/l to 70 mg/l is common for the region.

Abbreviations: gpg = grains per gallon
mg/l = milligrams per liter
us/cm = microseimens/centimeter
< = less than
> = greater than

MCL = Primary maximum contaminant level as set by the EPA
SMCL = Secondary maximum contaminant level as set by the EPA
NT = not tested
ND = not detected

IMPORTANT INFORMATION ON THE LIMITATIONS OF THIS REPORT:
The purpose of this report is to provide information regarding the general mineralogical character of a water supply. Unless specifically noted, this report does not include analysis for bacteria or any other health related contaminants. This analysis alone is therefore not suitable for determining the safety of a drinking water supply. This report is intended for the sole and exclusive use of our client named above. Our liability for error or omissions is expressly limited to the amount paid for the analysis.

Phone: (707) 823-3191 **Fax:** (707) 317-0057 **Email:** rayswelltesting@gmail.com **Address:** 4031 Shadowhill Dr, Santa Rosa Ca 95404 **CA Lic. #:** 903708

Informational Handout Subject: Silica in Well Water

Silica – (silicon dioxide) is a compound of silicon and oxygen (Si02), a hard, glassy mineral substance which occurs in a variety of forms such as sand, quartz, sandstone, and granite.

In most cases, Silica in well water is naturally occurring and is generally considered more of a nuisance than a drinking water hazard. The state does not have a drinking water standard for Silica.

High Silica is a common occurrence in deep wells in volcanic areas of Sonoma & Napa Counties with levels ranging from 70 mg/l to 100 mg/l. Levels detected above 50 mg/l are considered a potential nuisance due to bonding with varying surfaces after water evaporates. 30 mg/l to 70 mg/l is a common range for the regions of Sonoma and Napa Counties.

Complaints with Silica include residue build up or deposits on surfaces such as glass, marble, porcelain, etc. (i.e. shower doors, sinks, vehicle surfaces).

Most homeowners deal with high Silica levels by not allowing water to air dry on glass surfaces such as shower doors or glassware (i.e. squeegee shower doors and hand dry glassware) .

The other option is to treat the whole house with reverse osmosis, which requires a storage tank and booster pump system. Installation of such a system can be costly and produces a significant amount of wastewater. Please contact us for installer references.

*This informational handout is for general guidance only and is based on common findings in the well industry. Individual cases may differ.

Alpha Analytical Laboratories, Inc. email: clientservices@alpha-labs.com
Corporate: 208 Mason Street | Ukiah, CA 95482 | T: 707-468-0401 | F: 707-468-5267 | ELAP# 1551

16 February 2021

Ray's Well Testing Service
Attn: Ray's Well Testing Service
4853 Vine Hill Rd.
Sebastopol, CA 95472

RE: Water Quality
1373 Soda Canyon Rd - Lower Well

Work Order: 21B0347

Enclosed are the results of analyses for samples received by the laboratory on 02/02/21 13:50. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeanette Poplin

Jeanette L. Poplin For Stephen F. McWeeney
Lab Manager

Alpha Analytical Laboratories, Inc. email: clientservices@alpha-labs.com
Corporate: 208 Mason Street | Ukiah, CA 95482 | T: 707-468-0401 | F: 707-468-5267 | ELAP# 1551

Bay Area: 262 Rickenbacker Circle | Livermore, CA 94551 | T: 925-828-6226 | F: 925-828-6309 | ELAP# 2728
Central Valley: 9090 Union Park Way Suite 113 | Elk Grove, CA 95624 | T: 916-686-5190 | F: 916-686-5192 | ELAP# 2922
North Bay: 110 Liberty Street | Petaluma, CA 94952 | T: 707-769-3128 | F: 707-769-8093 | ELAP# 2303
San Diego: 2722 Loker Avenue West Suite A | Carlsbad, CA 92010 | T: 760-930-2555 | F: 760-930-2510 | ELAP# 3055

Ray's Well Testing Service	Project:	Water Quality	
4853 Vine Hill Rd.	Project #:	1373 Soda Canyon Rd - Lower Well	Reported:
Sebastopol CA, 95472	Project Mgr:	Ray's Well Testing Service	02/16/21 15:47

Analytical Report for Samples

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Raw Well	21B0347-01	Water	02/01/21 14:00	02/02/21 13:50

Alpha Analytical Laboratories, Inc. email: clientservices@alpha-labs.com
Corporate: 208 Mason Street | Ukiah, CA 95482 | T: 707-468-0401 | F: 707-468-5267 | ELAP# 1551

Sample Name:	Raw Well	Report Date:	02/16/21 15:47
Laboratory ID:	21B0347-01	Sample Date:	02/01/21 14:00
Notes:		Sample Received:	02/02/21 13:50

Parameter	Result	MCL	Reporting Limit	Units	Test Method	ELAP #	Notes
Total Coliforms	<1.0	1	1.0	MPN/100mL	SM9223B	2303	
E. Coli	<1.0	1	1.0	MPN/100mL	SM9223B	2303	

Inorganic Chemicals

Parameter	Result	MCL	Reporting Limit	Units	Test Method	ELAP #	Notes
Arsenic	4.1	10	2.0	ug/L	EPA 200.8	1551	

Alpha Analytical Laboratories, Inc. email: clientservices@alpha-labs.com
Corporate: 208 Mason Street | Ukiah, CA 95482 | T: 707-468-0401 | F: 707-468-5267 | ELAP# 1551

Notes and Definitions

MCL	Maximum Contaminant Level, the highest level of a contaminant that is allowed in drinking water regulated by the state of California. If no MCL is listed, the MCL has not been established.
ND	Analyte NOT DETECTED at or above the reporting limit
*	Tiered Maximum Contaminant and/or Action Levels: Sulfate and Chloride 250-500-600 mg/L, Specific Conductance 900-1600-2200 umho/cm, TDS 500-1000-1500 mg/L.

Phone: (707) 823-3191 **Fax:** (707) 317-0057 **Email:** rayswelltesting@gmail.com
Address: 4853 Vine Hill Rd, Sebastopol Ca 95472 CA Lic. #: 903708

Report of Mineral Analysis

DATE: 2/11/21

CUSTOMER NAME: Cuong Pham

PROPERTY ADDRESS: 1373 Soda Canyon Rd - Lower Well

PARAMETER	RESULT		RECOMMENDED RANGES
	Raw - Well		
PH	6.93		< 7 Increasingly acidic - may be corrosive 6.8 to 8.5 - Recommended Range >7 Increasingly basic
TOTAL HARDNESS	4 gpg		< 1 gpg Soft 1 to 3.5 gpg Slightly Hard 3.5 to 7 gpg Moderately Hard 7 to 10.5 gpg Hard > 10.5 gpg Very Hard
TOTAL IRON	0.06 mg/l		0.3 mg/l - SMCL
TOTAL MANGANESE	0.02 mg/l		0.05 mg/l - SMCL
CONDUCTIVITY	182 us/cm		900 us/cm - Recommended Upper Limit 1600 us/cm - SMCL
NITRATES	6.5 mg/l		45 mg/l - MCL (tested as N03)
SILICA	99 mg/l		*There is no EPA recommended Limit
VISUAL APPEARANCE	Clear		

*Silica is increasingly reported as a nuisance at levels above 50 mg/l. 30 mg/l to 70 mg/l is common for the region.

Abbreviations: gpg = grains per gallon
mg/l = milligrams per liter
us/cm = microseimens/centimeter
< = less than
> = greater than

MCL = Primary maximum contaminant level as set by the EPA
SMCL = Secondary maximum contaminant level as set by the EPA
NT = not tested
ND = not detected

IMPORTANT INFORMATION ON THE LIMITATIONS OF THIS REPORT:
The purpose of this report is to provide information regarding the general mineralogical character of a water supply. Unless specifically noted, this report does not include analysis for bacteria or any other health related contaminants. This analysis alone is therefore not suitable for determining the safety of a drinking water supply. This report is intended for the sole and exclusive use of our client named above. Our liability for error or omissions is expressly limited to the amount paid for the analysis.

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Informational Handout Subject: Silica in Well Water

Silica – (silicon dioxide) is a compound of silicon and oxygen (Si02), a hard, glassy mineral substance which occurs in a variety of forms such as sand, quartz, sandstone, and granite.

In most cases, Silica in well water is naturally occurring and is generally considered more of a nuisance than a drinking water hazard. The state does not have a drinking water standard for Silica.

High Silica is a common occurrence in deep wells in volcanic areas of Sonoma & Napa Counties with levels ranging from 70 mg/l to 100 mg/l. Levels detected above 50 mg/l are considered a potential nuisance due to bonding with varying surfaces after water evaporates. 30 mg/l to 70 mg/l is a common range for the regions of Sonoma and Napa Counties.

Complaints with Silica include residue build up or deposits on surfaces such as glass, marble, porcelain, etc. (i.e. shower doors, sinks, vehicle surfaces).

Most homeowners deal with high Silica levels by not allowing water to air dry on glass surfaces such as shower doors or glassware (i.e. squeegee shower doors and hand dry glassware) .

The other option is to treat the whole house with reverse osmosis, which requires a storage tank and booster pump system. Installation of such a system can be costly and produces a significant amount of wastewater. Please contact us for installer references.

*This informational handout is for general guidance only and is based on common findings in the well industry. Individual cases may differ.