Exhibit D

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MEMORANDUM

March 24, 2020

To: Mr. Doug Shafer
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Sent via email (DIlsley@shafervineyards.com)

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Job No. 707-NPA01

From: Geza Demeter, Christopher Wick, and Richard C. Slade
Richard C. Slade & Associates LLC (RCS)

Re: Results of Napa County Tier 1 Water Availability Analysis
New Vineyard Development
Shafer Vineyards-Blodgett Property
Vicinity Oak Knoll Crossroad and Silverado Trail
Napa County, California

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Introduction

This Memorandum presents the key findings and conclusions, along with our preliminary recommendations, regarding the Water Availability Analysis (WAA) prepared by RCS for the proposed new vineyard development at the Shafer Vineyards-Blodgett property (subject property) in Napa County (County), California. RCS prepared this document to conform to County Tier 1 requirements, as described in the County WAA Guidelines (WAA, 2015). The subject property is comprised by four (4) non-contiguous parcels having a combined acreage of 215.44 acres, and is located east of the Silverado Trail and north of the Oak Knoll Crossroad, in Napa, California.

Figure 1, "Location Map," shows the approximate parcel boundaries of the subject property (as obtained from freely available County GIS data), superimposed on a topographic base map of the area. Also shown on Figure 1 are the locations of the existing onsite water wells. These wells include: the Old La Mesa Well; the Ridgeback Well; the La Mesa Well; the Russler Well; the Residence Well; and the School Bus Well. In addition, the locations of nearby, offsite wells owned by other, are shown on Figure 1. Figure 2, "Aerial Photo Map," shows the same property boundaries and well locations that are illustrated on Figure 1, but the base map for Figure 2 is an

aerial photograph of the area; this aerial photograph was obtained via the ArcGIS Pro software package.

As reported by the project engineer, PPI Engineering, Inc. (PPI) of Napa, California, the 215.44-acre subject property is currently developed with a total of 77.20 acres of existing vineyards. A residence previously existed on the subject property; however, this structure was reportedly destroyed in the Atlas Fire in 2017. A new residence is in the process of being constructed. Water demands for the existing onsite vineyards and previously existing residence have historically been met via groundwater pumped by the existing onsite wells. The Old La Mesa well is currently not active due to reported issues with its existing pump and is no longer used to meet irrigation demands of the onsite vineyards.

RCS understands the proposed project is to develop an additional 20.88 acres of new vineyards distributed across the four non-contiguous parcels as shown below. In the future, the water demands for the existing and the proposed new vineyards are to be met using groundwater pumped from the existing onsite irrigation wells, with the exception of the Residence Well. Domestic water demands for a future residence (currently under construction) will be met by pumping groundwater from the Residence Well.

The following is a list of each parcel (showing its respective Assessor's Parcel Number [APN]) and its corresponding acreage, along with the wells used for irrigation purposes on each parcel, and the respective acreage of existing and proposed new vineyards:

Parcel APN	Parcel Area (acres)	Well Used for Irrigation Purposes	Existing Vineyards (acres)	Proposed Vineyards (acres)
039-051-019	77.51	Russler Well	18.50	10.20
039-051-021	36.10	School Bus Well	22.00	0.80
039-051-023	40.90	Ridgeback Well	18.60	5.26
039-051-033	60.93	La Mesa Well Old La Mesa Well (formerly)	18.10	4.62

In the text of this document, the four non-contiguous parcels are discussed and evaluated as a single "subject property" to maintain consistency with the approach used by PPI for the erosion control plan (ECP) for the project. For clarity, Table 1, "Parcel-Specific Data Summary", shows parcel-specific details for each section of this WAA for each of the four discrete parcels that comprise the subject property. Table 1 is referenced repeatedly in the text below where parcel specific data are relevant.

The basic 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 within 500 ft of any of the irrigation wells (the project wells), County requirements for a "Tier 2" WAA analysis (i.e., a Well Interference Evaluation) have been "presumptively met" per the WAA Guidelines.

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Site Conditions

From our review of data provided by the vineyard manager, and from our field reconnaissance visit to the subject property on August 6, 2019, the following key items are to be noted and/or were observed (refer to Figures 1 and 2):

a. The Shafer Vineyards-Blodgett property is comprised of four (4) parcels having the following APNs of: 039-051-019, 039-051-021, 039-051-023, and 039-051-033. The total assessed area of the subject property is 215.44 acres. Individual parcel sizes are shown on Table 1.

b. Topographically, the subject property is located mainly in the hillsides on the eastern side of Napa Valley, just north of the intersection of Silverado Trail and Oak Knoll Avenue. As illustrated by the topographic contours on Figure 1, the subject property is comprised mainly by south-trending and west-trending ridgelines that are separated by intervening ephemeral drainages. Moderate slopes occur in the southern portion of the property, and moderate to steep slopes are present in the northern portion of the subject property.

c. No surface water runoff was observed by the RCS geologist in any onsite drainage on the subject property at the time of the site visit. Based on the topographic contours, any surface water runoff would occur on an ephemeral basis and would drain to the south in the southern half of the property, and to the west in the northern half of the site (see Figure 1). The nearest perennial drainage to the subject property is the Napa River, which lies offsite to the west of the Silverado Trail (see Figure 2).

d. The subject property is currently developed with 77.20 acres of existing vineyards that are dispersed throughout the four parcels; see Table 1 for vineyard acreages on individual parcels. A residence formerly existed on the subject property, but was reportedly destroyed in the 2017 Atlas Fire. At the time of the August 2019 RCS site visit, a new residence was under construction on APN 039-051-033.

e. Offsite areas surrounding the subject property are developed with both residences and vineyards. Areas to the north of the subject property appear to be relatively undeveloped.

f. As shown on Figures 1 and 2, the existing onsite wells are located on various portions of the subject property. As reported by the vineyard manager, existing vineyard areas are irrigated by the following wells:

Parcel APN	Well Used
039-051-019	Russler Well
039-051-021	School Bus Well
039-051-023	Ridgeback Well
039-051-033	La Mesa Well

Hence, each well is used to irrigate vineyards on the parcel in which the respective well is located. The Old La Mesa Well is located approximately 20 ft from the existing

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La Mesa Well, but is currently not active due to issues with its permanent pump. The Residence Well, which will supply domestic demands to the future onsite residence, is located on APN 039-051-033.

g. During the site visit, an RCS geologist 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 nearby but offsite wells owned by others.

   RCS geologists contacted the County Planning, Building, and Environmental Service (PBES) Department, in an attempt to acquire "Well Completion Reports" (also known as "driller's logs") that might exist for wells located on those neighboring but offsite properties. In addition, RCS geologists also used the California Department of Water Resources (DWR) online Well Completion Report website to download driller's logs for wells within the immediate vicinity of the subject property. As a result of those inquiries, several driller's logs were obtained for wells historically drilled 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 offsite wells are known to or appear to lie within a 500-foot radius of any of the onsite wells.

Key Construction and Testing Data for Existing Onsite Wells

DWR Well Completion Reports are available for the following onsite wells: the Old La Mesa Well (Log No. 474531); the Ridgeback Well (Log No. 814558); the La Mesa Well (Log No. 1073632); the Russler Well (Log No. e0234971), and; the Residence Well (Log No. WCR2019-003564). Copies of these driller's logs are appended to this Memorandum. A driller's log for the School Bus Well is not available. Table 2, "Summary of Well Construction and Pumping Data," provides a tabulation of key well construction data, groundwater airlifting data, and pumping data that are available for the wells located on the subject property.

Well Construction Data

Key data listed on the available driller's log for and/or identified during our site visit are as follows:

Old La Mesa Well:

a. This well was drilled and constructed in April 1996 by Pulliam Well Drilling of Napa, California, using the direct air rotary drilling method.

b. The pilot hole (the borehole drilled before the well casing was placed downwell) was reported to have been drilled to a total depth of 640 feet below ground surface (bgs).

c. The borehole was cased with polyvinyl chloride (PVC) well casing having a nominal diameter of 6 inches; the total casing depth is reported to be 635 ft bgs.

d. Casing perforations for the well are factory-cut slots, with a slot opening width of 0.032 inches (32-slot). These perforations were placed continuously between 120 and 635 ft bgs.

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

f. The Old La Mesa Well was reportedly constructed with a sanitary seal consisting of cement from ground surface to 25 ft bgs.

Ridgeback Well:

a. The air rotary drilling method was used by Pulliam Well Drilling to construct this well in May 1999.
b. The pilot hole was drilled to 710 bgs.
c. The borehole was cased with 8-inch diameter PVC well casing to 697 ft bgs.
d. Casing perforations are factory-cut slots having a slot opening width of 0.032 inches (32-slot); perforations were placed continuously between 267 and 697 ft bgs.
e. The gravel pack material is reported to be “pea gravel”.
f. The Ridgeback Well was reportedly constructed with a sanitary seal consisting of cement from ground surface to 24 ft bgs.

La Mesa Well:

a. This well was drilled and constructed in June 2008 by Pulliam Well Exploration using the air rotary drilling method.
b. The reported pilot hole depth was 740 bgs.
c. PVC well casing having a nominal diameter of 8 inches was installed to a depth of 740 ft bgs.
d. Casing perforations for the well are factory-cut slots, having a slot opening width of 0.032 inches (32-slot); and were placed between 180 and 740 ft bgs.
e. The gravel pack material is reported to be “pea gravel”.
f. The sanitary seal is of cement and was emplaced from ground surface to 23 ft bgs.

Russler Well:

a. This well was constructed in September 2014 by Pulliam Well Exploration using the air rotary drilling method.
b. The pilot hole was drilled to a depth of 790 bgs.
c. PVC well casing having a nominal diameter of 6 inches was set to a depth of 784 ft bgs.
d. Casing perforations for the well are factory-cut slots, with a slot opening width of 0.032 inches (32-slot). These perforations were placed every other 20 ft, beginning at a depth of 264 ft bgs.
e. The gravel pack material is “#6 well pack”.
f. The sanitary seal is cement and it was installed from ground surface to 24 ft bgs.

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Residence Well:

a. In February 2019, Pulliam Well Exploration drilled this well using the air rotary drilling method.

b. The pilot hole was drilled to a total depth of 695 bgs.

c. The well is cased with PVC, having a nominal diameter of 6 inches; the total casing depth is 695 ft bgs.

d. Factory-cut slots, with a slot opening width of 0.032 inches (32-slot), were placed between 315 and 695 ft bgs.

e. The gravel pack is "size 10 bird's eye gravel well pack".

f. The cement sanitary seal was emplaced from ground surface to 23 ft bgs.

School Bus Well:

a. The casing exposed at the surface is steel, having a nominal diameter of 8 inches. No other well construction data are available for this well.

Summary of Initial "Test" Data for Onsite Wells

The driller's logs for the six onsite wells provided the depth to the original post-construction static water level (SWL), and the original airlift flow rate in each well (as shown on Table 2), as follows:

Old La Mesa Well:

- The initial SWL, following completion of well construction, was at 80 ft bgs in April 1996.
- The reported maximum airlift flow rate[1] during initial post-construction airlifting operation in the well was estimated by the driller to be 130 gallons per minute (gpm) during 3 hours of intermittent airlifting.

Ridgeback Well:

- Following well construction in May 1999, the initial SWL was reported to be 220 ft bgs.
- The reported maximum airlift flow rate during initial post-construction airlifting operation in the well was estimated by the driller to be 110 gpm during 4 hours of intermittent airlifting.

La Mesa Well:

- In June 2008, just following well construction, the original SWL was at 100 ft bgs.
- The reported maximum airlift flow rate during initial post-construction airlifting was estimated by the driller to be 85 gpm during 4 hours of intermittent airlifting.

[1] As a rule of thumb, RCS 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.

Russler Well:

- The original SWL, in September 2014 immediately following well construction, was at 190 ft bgs.
- A maximum airlift flow rate during initial post-construction airlifting operation in the well was driller-estimated to be 60 gpm during 4 hours of intermittent airlifting.

Residence Well:

- Following well construction in February 2019, the initial SWL was at a depth of 290 ft bgs.
- The reported maximum airlift flow rate during initial post-construction airlifting operation in the well was estimated by the driller to be 50 gpm during 4 hours of intermittent airlifting.

Initial post-construction "test" data for the School Bus Well are not available because its driller's log was not available for this project.

"Water level drawdown" values during airlifting were not listed on the driller's logs for the onsite wells, because water level drawdown cannot be measured during airlifting operations; thus, the original post-construction specific capacity[2] value for each of the wells cannot be calculated from the data on the driller's log.

Pumping Test Data by Others

On November 20, 2007, a 3-hour variable rate pumping test of the Old La Mesa Well was performed by Imboden Pump (IP) of Napa, California. Water levels during the test were manually measured and recorded by an IP pumper using a water level tape sounder device. A copy of this IP pumping report is appended to this Memorandum. Key data available for this short-term pumping test include:

- A SWL of 112 ft below the wellhead reference point (brp) was recorded by the pumper before the pumping test began.
- Based on the reported pumping rates, the well was initially pumped at a rate of 120 gpm, but the pump was adjusted by lowering the rate throughout the remainder of the test to help reduce turbid water conditions, and to help create a relatively stable pumping water level (PWL). A final pumping rate of 93 gpm was reported by the pumper at the end of this 3-hour test. In essence, this test can be considered to be a constant drawdown test and not a constant rate test.
- A maximum PWL of 370 ft brp was created in the well at the end of the 3-hour pumping period; this represents a maximum water level drawdown of 258 ft.
- As shown in the pumping test report prepared by IP, in the last 70 minutes of the pumping test, PWLs did not decline but rather were reported to be stable at a depth of 370 ft brp.

[2] 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 final pumping rate of 93 gpm, the specific capacity value of the Old La Mesa Well was calculated to have been 0.36 gpm/ ft ddn at the time of this IP test in November 2007.
- Most of the reported PWLs observed during this test were below the 120-foot depth to the top of the uppermost perforations in this well. Hence, cascading water conditions did occur and will continue to occur in this well while it is being pumped in the future.

On December 29, 2016, a 2-hour variable rate pumping test of the Old La Mesa Well was performed by Ray's Well Testing Service (RWTS) of Sebastopol, California. Water levels during the test were measured manually and recorded by a RWTS pumper using a water level tape sounder device; a copy of the pumper's report is appended to this Memorandum. Key data available for this short-term RWTS test include:

- A pre-test SWL at a depth of 117 ft brp.
- Based on the pumping rates reported by the pumper, the well was initially pumped at a rate of 95 gpm, but this rate was incrementally lowered to a final pumping rate of 80 gpm at the end of the 2-hour pumping test; this can be considered to be a constant drawdown test.
- A maximum PWL of 235.5ft brp was recorded at the end of the 2-hour pumping period; this represents a maximum water level drawdown of 118.5 ft.
- As shown in the appended RWTS report, in the last one hour of the pumping test, PWLs did not decline but were reported to be stable at a depth of 235.5 ft brp.
- Based on the reported final pumping rate of 80 gpm, the specific capacity value of the Old La Mesa Well was calculated to be 0.68 gpm/ ft ddn during this RWTS test in December 2016.
- As with the previous pumping test that occurred in November 2007, most of the reported PWLs observed during testing were below the 120-foot depth to the top of its uppermost perforations (i.e., cascading water conditions were occurring).

To our knowledge, no other constant drawdown or constant rate pumping tests have ever been performed in the Ridgeback Well, the La Mesa Well, the Russler Well, the Residence Well, or the School Bus Well.

Well Data from Site Visit

As discussed above, a site visit to the subject property was performed by an RCS geologist on August 6, 2019. The following information for the six wells was collected during that site visit:

- The Old La Mesa Well was reported to be inactive due to issues with the pump. As a result, a SWL measurement could not be taken by RCS. In addition, this well is not equipped with a totalizer flow dial device (to measure flow rates and flow volumes).
- The Ridgeback Well was observed to be equipped with a permanent pump, and the well was not being pumped at the time of the visit. A SWL of 331 ft brp was measured by the RCS geologist. The reference point (RP) for this measurement is approximately 1.83 ft above ground surface (ags). This SWL is about 109 ft deeper than the 220-foot SWL depth reported on the driller's log, which was collected immediately after the

well had been constructed in May 1999. This well is equipped with a totalizer flowmeter device and a reading of 31,502,997 gallons was recorded during the site visit.

- The La Mesa Well is equipped with a permanent pump, and the well was being pumped at the time of the visit; a PWL of 131.7 ft brp was measured. This RP is approximately 0.75 ft ags. This well was observed to be not equipped with a totalizer flowmeter during the site visit.
- The Russler Well is equipped with a permanent pump, but the well was not being pumped at the time of the visit; a SWL of 290.7 ft brp was measured by the RCS geologist. This RP is approximately 1.71 ft ags. This recent SWL is roughly 100 ft deeper than the 190-foot SWL depth reported on the driller's log, immediately after the well had been constructed in September 2014. The existing totalizer flowmeter device had a reading of 4,964,762 gallons during the site visit.
- The Residence Well was not equipped with a permanent pump at the time of the visit. A SWL of 236.8 ft brp was measured by the RCS geologist; this RP is approximately 1.17 ft ags. This current SWL is approximately 53 ft shallower than the 290-foot SWL depth reported on the driller's log, immediately after the well had been constructed in February 2019. This well was observed to be not equipped with a totalizer flowmeter device. Reportedly, this well will be used to meet the future domestic demands of the new residence that is currently under construction.
- The School Bus Well was observed to be equipped with a permanent pump; the well was not being pumped at the time of the visit. A SWL reading was not taken because an access port into the well casing was not accessible at the time of the visit. The totalizer flowmeter device showed a reading of 6,388,551 gallons during the site visit.

Local Geologic Conditions

Figure 3, "Geologic Map", illustrates the types, lateral extents, and ground surface boundaries between the various earth materials as mapped by others at ground surface in the region. Specifically, Figure 3 has been adapted from the results of regional geologic field mapping of the Napa (2004) and Yountville (2005) 7.5' Quadrangles, as published by the California Geological Survey (CGS). As shown on Figure 3, the key earth materials mapped at ground surface in the area include the following:

a. Artificial fill: This consists of small areas used to artificially change the grade or elevation on a property (map symbol, af); it can be engineered or non-engineered material. This material is not shown to exist on the subject property.

b. Alluvial-type deposits: These deposits are Quaternary in geologic age and consist of the following: alluvial fan and/or undivided alluvium; terrace, stream, or basin materials; landslide and older fluvial and lacustrine deposits (map symbols Qhc, Qhty, Qha, and Qoa on Figure 3). These deposits are generally unconsolidated, and consist of layers and lenses of gravel, sand, silt, and clay. These materials exist only within a small portion of the southern part of the subject properties, specifically within the boundaries of parcels 039-051-021 and 039-051-023 (see Figure 3).

c. Sonoma Volcanics. The Sonoma Volcanics are comprised by a highly variable sequence of chemically and lithologically diverse volcanic rocks. These rock types include: andesite flows of Atlas Peak (map symbol Tsvaa); dacite flows and domes (map symbol Tsvdg); and andesite flows and flow breccias of Stags Leap (map symbol Tsvasl). As shown on Figure 3, dacite flows and domes are exposed at ground surface across the majority of the property, whereas the andesite flows and flow breccias are exposed near the northern and southern edges of the subject property.

d. Great Valley Sequence. The geologically older (Cretaceous-aged) Great Valley Sequence rocks (not shown on Figure 3) are not exposed on the subject property but are known to occur at ground surface further to the northeast and southwest of the property. These rocks consist mainly of well-consolidated to cemented rocks, including thickly-bedded mudstone, siltstone, and shale, with minor amounts of thinly-bedded sandstone. These rocks are also known to underlie all younger geologic materials (including the Sonoma Volcanics) that occur in the region, and are considered to be the bedrock of the area.

Review of the driller's descriptions listed on the available driller's log for the Old La Mesa Well, the Ridgeback Well, the La Mesa Well, the Russler Well, and the Residence Well reveals that drilling of these five onsite wells encountered only typical rocks of the Sonoma Volcanics at the well site. Typical driller-terminology for the drill cuttings on these logs included: "black basalt," "black & red ash," "hard purple and gray rock," and "black white ash." Therefore, based on the available subsurface geologic data, the Sonoma Volcanics are interpreted by RCS to extend to depths of at least 695 ft bgs beneath the property.

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 domes 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, flow breccias, and domes 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.

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 with ground surface and also with one another 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.

As stated above, the principal rock type expected in the subsurface beneath the property is a combination of hard, volcanic flow rock, and domes that may be fractured to varying degrees, with interbedded ash deposits to a lesser degree. Descriptions of drill cuttings by the well driller that are recorded on the available driller's log for the onsite wells are consistent with the typical descriptions of the various rocks known in the Sonoma Volcanics. From our long-term experience with the fractured flow rocks within the Sonoma Volcanics, based on numerous other water well construction projects in the County, pumping capacities in individual wells constructed into the Sonoma Volcanics have ranged widely, from rates as low as 5 to 10 gpm (if abundant soft and fine-grained ash-flow tuff is present), to rates as high as 200 gpm, or more (if particularly abundant, hard, and well-fractured flow rocks are present).

Potentially Nonwater-Bearing Rocks

This category includes the geologically older, well-consolidated and/or lithified, and fine-grained sedimentary rocks of the Great Valley Sequence; as stated above, these materials do not occur at ground surface on the property. Instead, these potentially non-water-bearing rocks would underlie the volcanic rocks that exist beneath the subject property at depths greater than ±790 ft bgs, depending on the location, as interpreted by RCS from the driller's descriptions listed on the driller's logs available for the onsite wells.

In essence, these diverse rocks are well-cemented and well-lithified, and have an overall low permeability; these rocks represent the local bedrock. 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

Several faults[3], as mapped by others, have been interpreted to exist on and east of the subject property as shown by the dashed black lines labeled as unnamed faults on Figure 3 (CGS 2004 and 2005). The possible impacts of these faults on groundwater availability

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

in the region are unknown due to an absence of requisite data. Faults can serve to increase the number and frequency of fractures in the Sonoma Volcanics rocks. 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; it is unknown if these mapped faults impact groundwater flow, because water level data necessary to make such a determination are not available.

Northeast Napa Study Area (NENSA)

The subject property is partially located within an area of Napa County that was recently identified by others as the Northeast Napa Study Area (NENSA). This study area has been identified as an area of concern by the County with respect to groundwater use and development. Figure 1 shows the northern boundary of the NENSA study area, shaded in purple, which traverses across the southern portion of the subject property. Through prior discussions with the County, and review of publicly available documents, it is the understanding of RCS that the County does not expect that any new groundwater restrictions will be placed by the County on projects within the NENSA in the near future. Any conditions of approval for projects located in the NENSA are expected to be related to monitoring of groundwater levels and extraction volumes; specific conditions are unknown at this time.

Project Water Demands

For the purposes of this WAA, the Ridgeback Well, the La Mesa Well, the Russler Well and the School Bus Well are considered to be the "project wells," as they represent the onsite wells that will be used to meet water demands of the proposed new vineyard development project. The Old La Mesa Well is currently and will continue to be inactive, and the Residence Well will reportedly be used to only meet the future water demands of the onsite residence on APN 039-051-033.

Existing and proposed (future) onsite water demands for the property have been estimated by the Shafer Vineyards-Blodgett vineyard manager, as discussed below. Table 3, "Groundwater Use Estimates," is intended to categorize the specific water demands of the proposed project and of the other onsite uses. As shown on Table 3, the estimated annual groundwater demands for the project are discussed below.

<u>Existing Water Demands</u>

Existing water demands for the existing vineyard have been provided by the Shafer Vineyard-Blodgett vineyard manager (Mr. David Ilsley), as follows:

a. Existing residential demand[4] = 0.75 AF/yr
    - Based on the primary onsite residence that was destroyed by fire in 2017 on the subject property.

b. Existing vineyard irrigation demand = 23.16 AF/yr for 77.20 ac of existing vineyards (see Table 1 for parcel-specific calculation)

[4] 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).

- This demand includes irrigation water used for the existing 77.20 acres of vineyards, assuming 0.30 AF of groundwater per acre of vines (AF/ac), based on the following calculation:
  - Estimated existing long-term irrigation demand as reported by the vineyard manager:

    = 75 gallons/vine/year (yr) x 1,245 vines/acre

    = 93,375 gallons/acre/year

    = approximately 0.30 AF/ac/yr

c. Total estimated existing water demand = a + b = 23.91 AF/yr.

Proposed Groundwater Demands

Subject property water demands in the future (including both the existing use and the increased use for the additional vineyards) are proposed to be met by pumping groundwater from the Ridgeback Well, the La Mesa Well, the Russler Well, the Residence Well, and the School Bus Well. The total proposed onsite groundwater demands for the property will be as follows:

a. Residential groundwater demand = 0.75 AF/yr (same as existing)

b. Existing vineyard irrigation demand = 23.16 AF/yr

c. Proposed vineyard demand = 6.27 AF/yr
   - This demand includes irrigation water that will be used for the proposed 20.90 acres of vineyards, assuming a unit use of 0.30 AF/ac.

d. Total proposed annual groundwater demand = a + b + c = 30.18 AF/yr

See Table 1 for parcel-specific future groundwater use demands for the project.

Proposed Pumping Rates

To determine an appropriate estimated combined pumping rate necessary from the four project irrigation-supply wells, it was conservatively assumed that the irrigation water demands for the vineyards (23.16 AF/yr for the existing vineyards plus 6.27 AF/yr for proposed vineyards = 29.43 AF/yr) will be required during a 20-week (140-day) irrigation season each year.

Based on these assumptions, the four onsite project irrigation-supply wells would need to pump at a total combined rate of about 95 gpm to meet the estimated demand. This pumping rate assumes that these wells would be pumped at a 50% operational basis, that is, 12 hours/day, 7 days/week during the assumed 20-week vineyard irrigation season each year. Table 1 lists the specific pumping rates required from each of the four project irrigation wells to meet the total future onsite irrigation demands.

Airlift rates for the onsite irrigation-supply wells, as reported by others, have a combined total of 255 gpm (note that airlift rates for the School Bus Well are not available and are not included in this calculation for combined airlift rate). As previously mentioned, RCS geologists typically estimate that normal operational pumping rates for a 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. Therefore, the theoretical combined operational pumping rate of the onsite irrigation-supply wells would be approximately 127 gpm, not including the School Bus Well. Refer to Table 1 for a

breakdown of the approximate pumping rate available from each well per their corresponding parcel. Although there are no actual operational pumping data for these active project wells, the 127 gpm combined theoretical pumping rate for the three project wells (using driller-estimated airlift rates) is greater than the 95 gpm needed to the proposed project groundwater demands. Further, as shown on Table 1, the theoretical pumping rate for each well is greater than the estimated required pumping rate for the same well.

Rainfall

Long-term rainfall data are essential for estimating the average annual recharge that may occur to the groundwater beneath the subject property. Average annual rainfall totals that occur specifically at the subject property are not directly known, because an onsite rain gage does not exist. Rainfall data exist for the nearby "Milliken Reservoir" rain gage, which is located roughly 4 miles east of the subject property. Data for this rain gage are available from the Napa One Rain website, which is maintained by Napa County. Data from the Napa One Rain website for this gage are available beginning in water year (WY) 2000-01 (October 2000 - September 2001) through WY 2018-19. Note that several months of rainfall data are missing between March 28, 2013 and August 28, 2013 for this rain gauge. The average annual rainfall for WY 2000-01 through WY 2018-19 at this gage is calculated to be 23.20 inches (1.93 ft). This rain gage is located at a slightly higher elevation than the subject property, and therefore, the average annual rainfall at the subject property could be considered to be slightly lower than that experienced at this known gage location. RCS does not consider these data to be representative of the long-term annual average rainfall in the area surrounding the subject property because the period of record for this gage is relatively short (19 years).

Another rain gage with a relatively short rainfall record was found to be approximately 4 miles northwest of the subject property. Data for this "Napa River at Yountville Cross Road" rain gage were available from the Nape OneRain website; the rainfall record was listed to be WY 2000-01 through WY 2018-19. Based on these data, an average water year rainfall for WY 2000-01 through WY 2018-19 was calculated to be 30.50 inches (2.54 ft). This rain gage is located at a lower elevation than the subject property, and therefore, the average water year rainfall at the subject property would tend to be somewhat higher than that experienced at this known gage location. However, because the period of record for this gage is relatively short (19 years), RCS does not consider these data to be representative of the long-term annual average rainfall in the area surrounding the subject property.

The nearest rain gage to the subject property with a relatively long data record is the gage located at the Napa State Hospital, located in the City of Napa. The data for this gage is available from the Western Regional Climate Center (WRCC) website (WRCC 2020). For that rain gage, the period of record is listed as the year 1893 through December 2019. Note that several months and/or years of rainfall data are missing between 1894 and 1901, and between 1915 and 1916 for this rain gauge. For the available period of record, the average annual rainfall at this Napa State Hospital gage is 23.50 inches (1.96 ft), as reported on the WRCC website. This rainfall gage, however, is located at a lower elevation than the subject property, and therefore, the average annual rainfall at the subject property would tend to be somewhat higher than that experienced at this known gage location. Also, this rain gage is located roughly 7 miles south-southeast of the subject property, thus making it less likely that its rainfall data are representative of the long-term average rainfall at the subject property.

To help corroborate the average annual rainfall data derived from the Napa One Rain and/or WRCC gages, RCS reviewed the precipitation data published by the PRISM Climate Group at Oregon State University. This data set, which is freely available from the PRISM website, contains "spatially gridded average annual precipitation at 800m [800-meter] grid cell resolution." The date range for this dataset includes the climatological period between 1981 and 2010. These gridded data provide an average annual rainfall distributed across the subject property. Using this data set, RCS determined that the average rainfall for the subject property for the stated date range may be approximately 28.20 inches (2.35 ft).

An additional rainfall data source, an isohyetal map (a map showing contours of equal average annual rainfall) was prepared by the County for all of Napa County, and is freely available for download from the online Napa County GIS database (a copy of this map is not provided herein). As described in the metadata for the file (also available via the County GIS database), the isohyets are based on the 60-year data period of 1900 to 1960. As stated in the metadata for the file, the contour interval for the map is reported to be "variable due to the degree of variation of annual precipitation with horizontal distance", and therefore the resolution of the data for individual properties is difficult to discern. The subject property is situated within the boundaries of the 27.50-inch average annual rainfall contour on this County map. Based on the RCS interpretation of the actual isohyetal contour map, the long-term average annual rainfall at the subject property could be on the order of 27.50 inches (2.29 ft).

Table 4, "Comparison of Rainfall Data Sources", provides a comparison of the data collected from the different rainfall gages discussed above. Based on those rainfall data sources, RCS will consider the long-term average annual rainfall at the subject property to be 28.20 inches (2.35 ft), as derived from the PRISM data set. The use of 28.20 inches per year is based on the data source with a relatively long period of record (29 years), and is more site-specific, when compared to the other rainfall data sources listed in Table 4 that: exist at different elevations; and/or are located at a significant distance from the subject property; and/or have a shorter period of available data.

Estimate of Groundwater Recharge

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 subject property and becomes available to deep percolate into the aquifer system(s) beneath the site over the long-term. The actual percentage of rain that deep percolates can be variable based on numerous conditions, such as: the slope of the land; the soil type that exists at the property; the evapotranspiration that occurs on the property; the intensity and duration of the rainfall; etc. Therefore, RCS has considered various analyses of deep percolation into the rocks of the Sonoma Volcanics, as relied upon by other consultants and by certain government agencies for projects in the Napa Valley.

Recharge volumes estimated in this Memorandum are based on the long-term average annual rainfall value determined for the subject property using the available data presented above. Note that a calculation of average annual rainfall for any long-term period always includes periods of below-average rainfall and above-average rainfall that occurred during the period over which the average was calculated. Therefore, the following calculations based on average rainfall values also include consideration of drought year conditions.

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

Estimates of groundwater recharge as a percentage of rainfall are presented for a number of, but not all, watersheds in the County in the report titled "Updated Napa County Hydrogeologic Conceptual Model" (LSCE&MBK, 2013) that was prepared for the County. Watershed boundaries within the County are shown on Figures 8-3 and 8-4 in that report. At the request of RCS, those watershed boundaries were provided to RCS by MBK Engineers (MBK). Figure 4, "Watershed Boundaries," was prepared for this project using those watershed boundaries for which data are available. As shown on Figure 4, the subject property is located partially within the watershed referred to by MBK as "Napa River Watershed near Napa." As shown on Table 8-9 on page 97 of the referenced report (LSCE&MBK, 2013), 17% of the average annual rainfall that occurs within this watershed was estimated to be able to deep percolate as groundwater recharge. Note that, as shown on Table 8-9 of LSCE & MBK (2013), calculations for the "Napa River Watershed near Napa" include a number of other smaller "up-river" watersheds that are tributary to the Napa River Watershed near Napa.

As stated above, the total surface area of the subject property is 215.44 acres. Assuming 28.20 inches (2.35 ft) of rainfall falls on the subject property on a long-term average annual basis, then the average volume of rainfall that would fall each year directly on the property over the long term would be approximately 506.28 AF (215.44 acres x 2.35 ft). Assuming 17% of the average annual rainfall would be able to deep percolate to the groundwater beneath the subject property, then the average annual groundwater recharge at the subject property would be approximately 86.07 AF/yr (506.28 AF x 0.17). This estimated average annual recharge volume (i.e., 86.07 AF/yr) is nearly three times greater than the estimated total onsite future (proposed) groundwater demand of 30.18 AF/yr (see Table 3).

In addition, a very small portion of the subject property (approximately 1.42 acres) appears to have slopes greater than 30 degrees; such steep slopes will tend to reduce the deep percolation of rainfall. Table 1 shows parcel specific details regarding slopes exceeding 30 degrees. Thus, for this analysis, RCS will assume for those portions of the property with slopes greater than 30 degrees, infiltration is reduced to 0%. Assuming a deep percolation of rainfall volume of 17% and using the "reduced" available surface area (214.02 acres, see Table 1) of the subject property, then the average annual groundwater recharge at the subject property (i.e., those portions with slopes less than 30 degrees) is estimated to be 85.50 AF/yr (214.02 ac x 2.35 ft of rainfall x 17% deep percolation). This recharge estimate is also noted to be nearly three times greater than the estimated average annual groundwater demand for the subject property in the future (30.18 AF/yr). Table 1 shows parcel specific demand estimates and calculated recharge estimates.

Estimate of Groundwater in Storage

To help evaluate potential water level impacts to the groundwater in 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 the "reduced" subject property = 214.02 acres

b) Depth to base of perforations in the Residence Well = 695 ft bgs; this well was selected for analysis instead of using the other project wells because its perforations end at a somewhat shallower depth than those in the other three project wells. Based on this depth in the Residence Well, and on the data listed on the driller's logs for this well and the other onsite wells, rocks of the Sonoma Volcanics clearly extend to a greater depth than the 695-foot total depth of the Residence Well. Thus, it is highly likely that the saturated zone beneath the property could extend deeper than is estimated using the perforation depths for only the Residence Well.

c) To present a conservative calculation of groundwater in storage, RCS also assumes that the current saturated thickness of the aquifer(s) beneath the subject property is about 405 ft vertical feet. This value is calculated using the Residence Well data by subtracting the post-construction SWL of about 290 ft bgs in this well (on February 20, 2019) from the reported depth to bottom of its perforations at 695 ft bgs. Based on the water level data presented herein, the February 2019 SWL is the deepest recorded SWL measured for this well, and thus is used herein to help 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 fracture zones within the rocks. A conservative estimate provided by Kunkel and Upson for the specific yield of the Sonoma Volcanics shows a range 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 greater.

e) Thus, a conservative estimate of the groundwater currently in storage (S), beneath the subject property (as of February 2019) is calculated as:

S = "reduced" property area (subpart a, above) times saturated thickness (subpart c, above) times average specific yield (subpart d, above)
= (214.02 acres)(405 ft)(2%)
= 1,733 AF

In contrast, the proposed average annual groundwater use for the property is estimated to be 30.18 AF/yr. Hence, the estimated groundwater demand for the entire property represents only about 2% 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 2019. 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 adversely impact wells on nearby but offsite properties to a point that they would not support their permitted land uses. Parcel-specific estimates of groundwater in storage are shown on Table 1.

Possible Effects of "Prolonged Drought"

California has experienced a number of periods of extended drought throughout its history. Here, drought is defined as a meteorological drought, that is, a period in which the total annual precipitation is less than the long-term average annual precipitation (DWR 2015). For similar projects in the County, Napa County PBES has asked RCS to consider what the effects on groundwater availability at a particular property might be if a period of "prolonged drought" were to occur in the region, assuming the project were to operate in the future as described herein. Recharge volumes estimated in this document are based on the long-term average rainfall value determined for the subject property using available data. Recall that a calculation of average annual rainfall for any long-term period always includes periods of below-average rainfall and above-average rainfall that occurred during the period over which the average was calculated. Therefore, it is our opinion that the preceding calculations do inherently include consideration of drought year conditions.

However, to help understand what potential conditions might exist in the local volcanic rocks beneath the property during a "prolonged drought period", a "prolonged drought" must be defined. As discussed by DWR, "there is no universal definition of when a drought begins or ends, nor is there a state statutory process for defining or declaring drought" (DWR 2015). California's most significant historical statewide droughts were defined by DWR as occurring during the following periods (DWR 2015):

- WY 1928-29 through WY1933-34 – six years
- WY 1975-76 through WY 1976-77 – two years
- WY 1986-87 through WY 1991-92 – six years
- WY 2006-07 through WY 2008-09 – three years
- Recent drought – WY 2011-12 through WY 2015-16[5] – five years

Table 5, "Drought Period Rainfall as Percentage of Average," shows the average amount of rainfall that occurred during each drought period for which rainfall data exist at the three rain gages discussed above and shown on Table 5; that drought period rainfall amount is also expressed on Table 5 as a percentage of the total rainfall that occurred. As shown on Table 5, determining the amount of rain that might fall during a "prolonged drought" is variable, and depends on the period of record for the specific rain gage. Clearly, the WY 1975-76 to WY 1976-77 drought period recorded by the Napa State Hospital rain gage and reported by the WRCC had the lowest total rainfall at 48% (drought period average was 11.80 inches), compared to the long-term average (24.70 inches), and that specific drought lasted two years. The WY 1928-29 to WY 1933-34 drought period lasted for six years, but rainfall during this drought was 70% of the average annual rainfall at the WRCC rain gage. It is important to note that the drought year percentage listed on Table 5 is completely dependent on the period of record for each individual

[5] The DWR 2015 drought document was published in February 2015, and lists the recent significant drought through the 2013-14 water year only; the drought continued throughout the State into WY 2015-16. Due to rains in WY 2016-17, various sources, including the National Drought Mitigation Center website (NDMC 2018), declared an end to the drought in Northern California in 2017, which included Napa County. As of March 2020, the area of Napa County in which the subject property lies, is currently mapped as "Abnormally Dry" on the NDMC website (NDMC 2020).

gage. Examples of this are the data from the two Napa One Rain gages; because the period of record for these two gages is short, and includes many drought years, then the last available drought year period (WY 2011-12 to WY 2015-16) rainfall percentage is shown to be between 68% and 77% of the long-term average.

Hence, for the purposes of this analysis, a "prolonged" drought period rainfall is conservatively considered to be 48% of the average annual rainfall that occurred in the region (using the rainfall data from the WRCC Napa State Hospital rain gage). Further, to again be conservative, a "prolonged drought period" is estimated to last 6 years, which is the longest drought period on record according to DWR (DWR 2015); see Table 5. This six-year period is a conservative estimate, because the 48%-average figure corresponds with a two-year drought period, not a six-year drought period.

To meet six years of proposed groundwater demand for the proposed project, a total onsite groundwater extraction of 181.08 AF is estimated to be required for the subject property (30.18 AF/yr times 6 years). Assuming groundwater recharge is reduced to 48% of the average annual recharge during such a theoretical "prolonged drought period", then the resulting total of groundwater recharge that might occur during the six-year drought period for the subject property is calculated as follows:

- As shown above, under the heading "Estimate of Groundwater Recharge," a conservative estimate of the average annual groundwater recharge on the subject property is estimated to be 85.50 AF/yr. Taking 48% of this annual volume yields a drought period recharge volume of 41.04 AF/yr.
- Assuming a drought period duration of 6 continuous years, then a total of 246.24 AF (41.04 AF/yr times 6 years) of water would be available to recharge the volcanic rocks beneath the property by virtue of deep percolation of the direct rainfall that occurs solely within the boundaries of the subject property.

Therefore, assuming a theoretical six-year drought period during which only 48% of the average annual rainfall might occur, a conservative estimate of the total drought-period recharge at the subject property (246.24 AF) would be nearly 1.5 times greater than the estimated total onsite groundwater demand (181.08 AF) that may occur over the same six-year period. Drought period annual recharge estimates for individual parcels are shown on Table 1.

Key Conclusions and Recommendations

1. The existing property is currently developed with 77.20 acres of vineyards; one new onsite residence is currently under construction.
2. The proposed project consists of developing an additional 20.88 acres of vineyards bringing the total future onsite planted vineyard area to 98.08 acres.
3. Existing groundwater demands for the existing vineyards are estimated by the vineyard manager to be approximately 23.16 AF/yr. This demand does not include the 0.75 AF/yr for the fire-damaged residence that is currently being rebuilt; once completed, groundwater for the residence will be supplied by the onsite Residence Well.

4. The future average annual groundwater demand for the existing and proposed vineyards (which includes 20.88 acres of new vines) is estimated to be a total of 29.43 AF/yr.
5. Existing (and future) irrigation water demands for the proposed vineyard project will be met by pumping groundwater from the Ridgeback Well, the La Mesa Well, the Russler Well, and the School Bus Well.
6. To meet the estimated peak pumping rate for the project each year, these four irrigation-supply wells would need to pump at a combined rate of about 95 gpm to meet the irrigation demands during the assumed 140-day (20 week) irrigation season each year, assuming the four wells are pumped 12 hours per day, every day, during the 20-week period.
7. Based on the results of the separate, initial post-construction airlifting "test" rates for each of the onsite irrigation wells, the wells appear to be capable of pumping at rates needed to meet the future groundwater demands of the project (see Table 1 for parcel-specific details). It should be noted that RCS typically estimates that normal operational pumping rates for a 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.
8. Groundwater recharge at the subject property on an average annual basis is estimated to be 85.50 AF/yr; this value is based on conservative estimates of the average annual rainfall at the property (28.20 inches per year) and also on conservative estimates of average rainfall that could be available to deep percolate into the fractured and jointed rocks of the Sonoma Volcanics that underlie the subject property.
9. Conservative estimates of recharge that may occur during a "prolonged drought" (as defined herein) show that, over a theoretical six-year period of continuous drought in which only 48% of the average annual rainfall might occur, a total of 246.24 AF of rainfall recharge is estimated to occur strictly within the boundaries of the subject property. This theoretical drought period recharge estimate of 246.24 AF is nearly 1.5 times greater than the estimated groundwater demand of the proposed project of 181.08 AF for the same continuous six-year period.
10. In each onsite well for which initial, post-construction water level data are available, water level data are shown to have declined over time since construction. RCS recommends implementation of a groundwater monitoring program at the subject property. This would include the frequent, ongoing monitoring of static and pumping water levels, and also of the instantaneous flow rates and cumulative pumped volumes from each of the onsite wells. Each well should be equipped with an accurate dual-reading flow meter (that records both flow rate and totalizing values, respectively. Such flow meters should be purchased and installed at the wells that are currently not equipped with one. RCS also recommends that water level transducers be purchased and installed in each of the onsite wells to permit the automatic, frequent, and accurate recording of water levels in those 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 well production in the onsite wells, along with possible changes in operational pumping scenarios, can be addressed in a timely manner.

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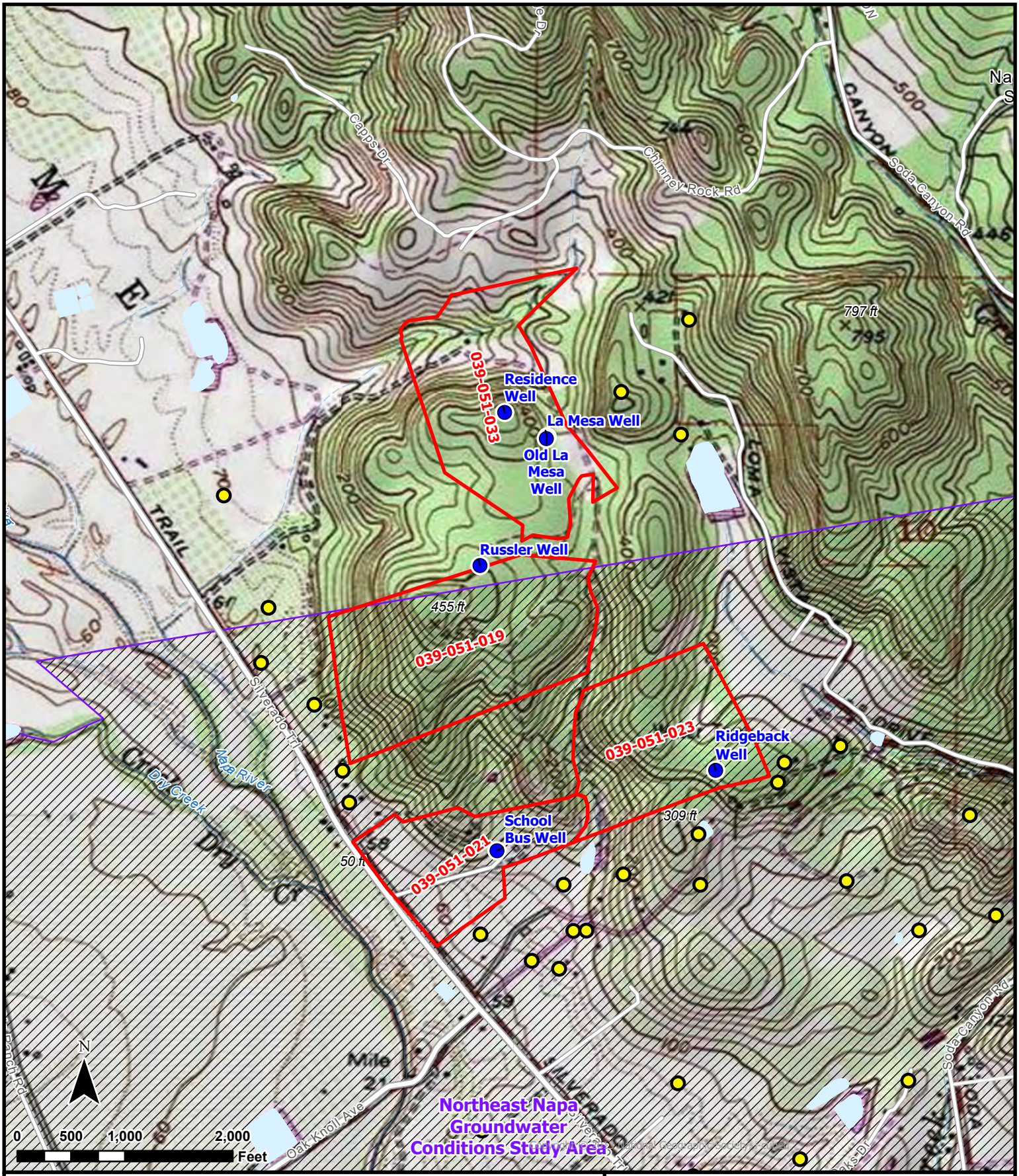

LEGEND

- Subject Property Boundaries
- Northeast Napa Study Area
- Onsite Well Location
- Offsite Well Location (Approximate)

RCS

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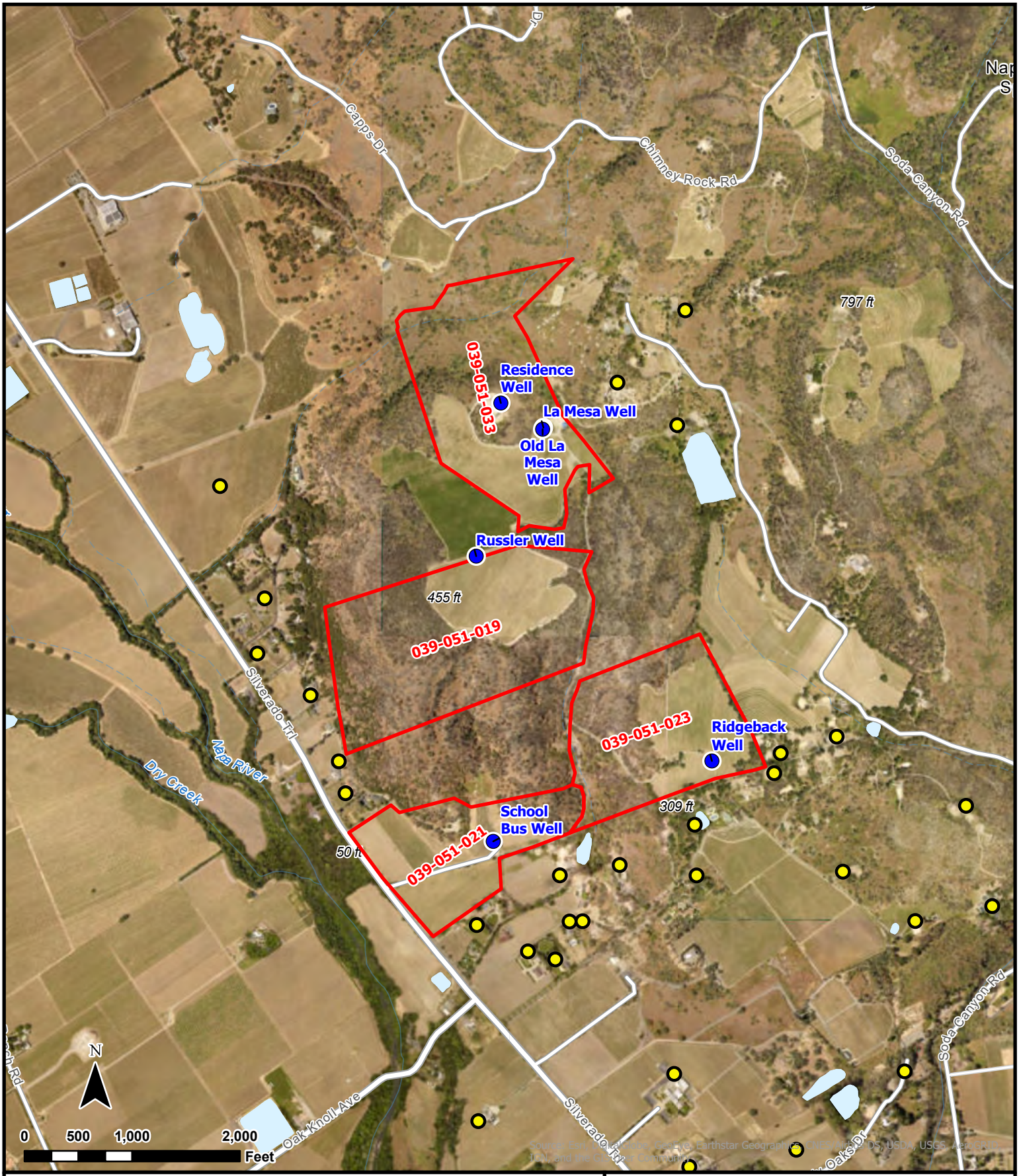
FIGURE 1
WELL LOCATION MAP

RCS Job No. 707-NPA01

March 2020



LEGEND

- Subject Property Boundaries
- Onsite Well Location
- Offsite Well Location (Approximate)

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FIGURE 2
AERIAL PHOTO MAP

RCS Job No. 707-NPA01

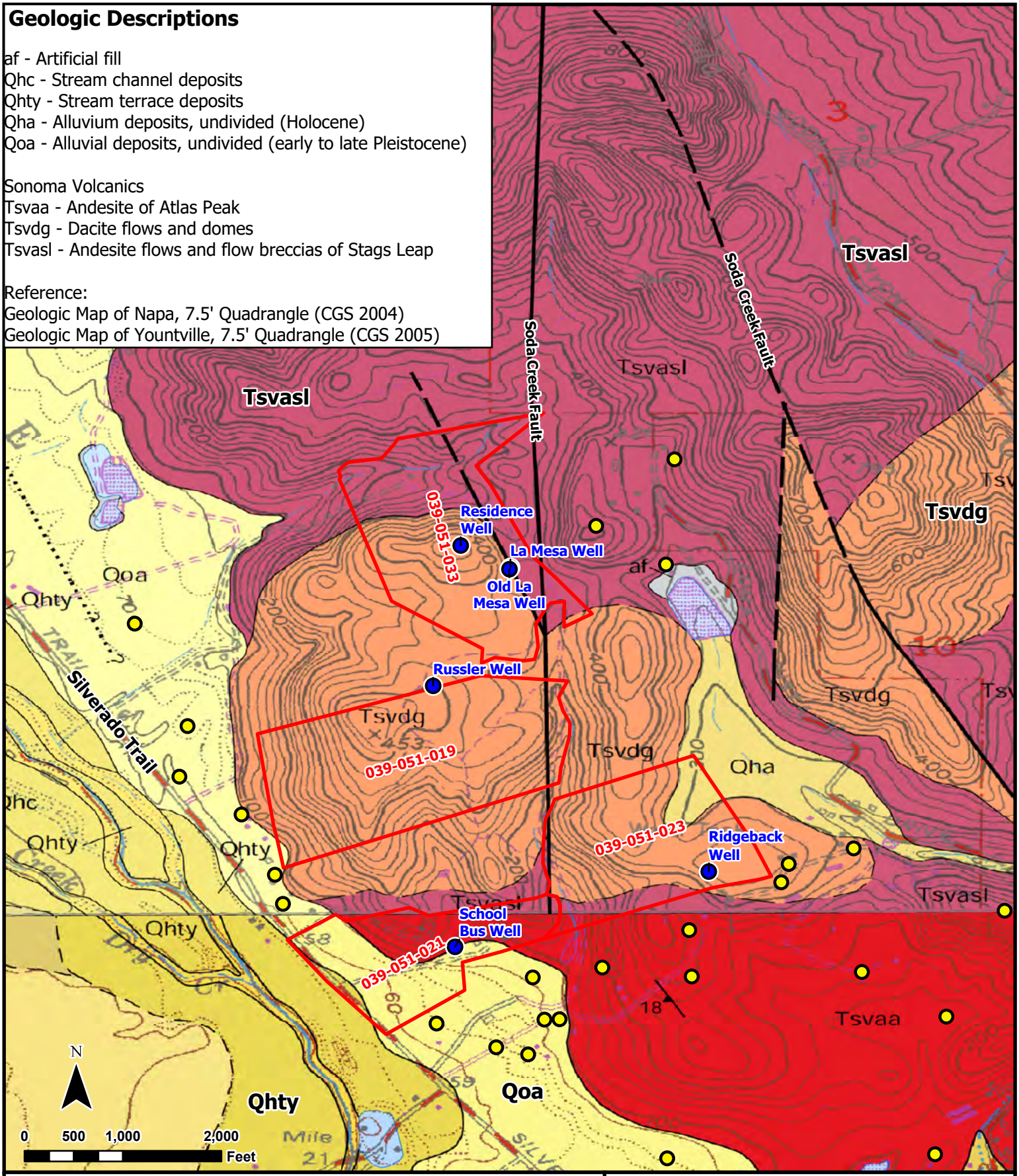
March 2020

Geologic Descriptions

af - Artificial fill
Qhc - Stream channel deposits
Qhty - Stream terrace deposits
Qha - Alluvium deposits, undivided (Holocene)
Qoa - Alluvial deposits, undivided (early to late Pleistocene)

Sonoma Volcanics
Tsvaa - Andesite of Atlas Peak
Tsvdg - Dacite flows and domes
Tsvasl - Andesite flows and flow breccias of Stags Leap

Reference:
Geologic Map of Napa, 7.5' Quadrangle (CGS 2004)
Geologic Map of Yountville, 7.5' Quadrangle (CGS 2005)



LEGEND

- Subject Property Boundary
- Onsite Well Location
- Offsite Well Location (Approximate)

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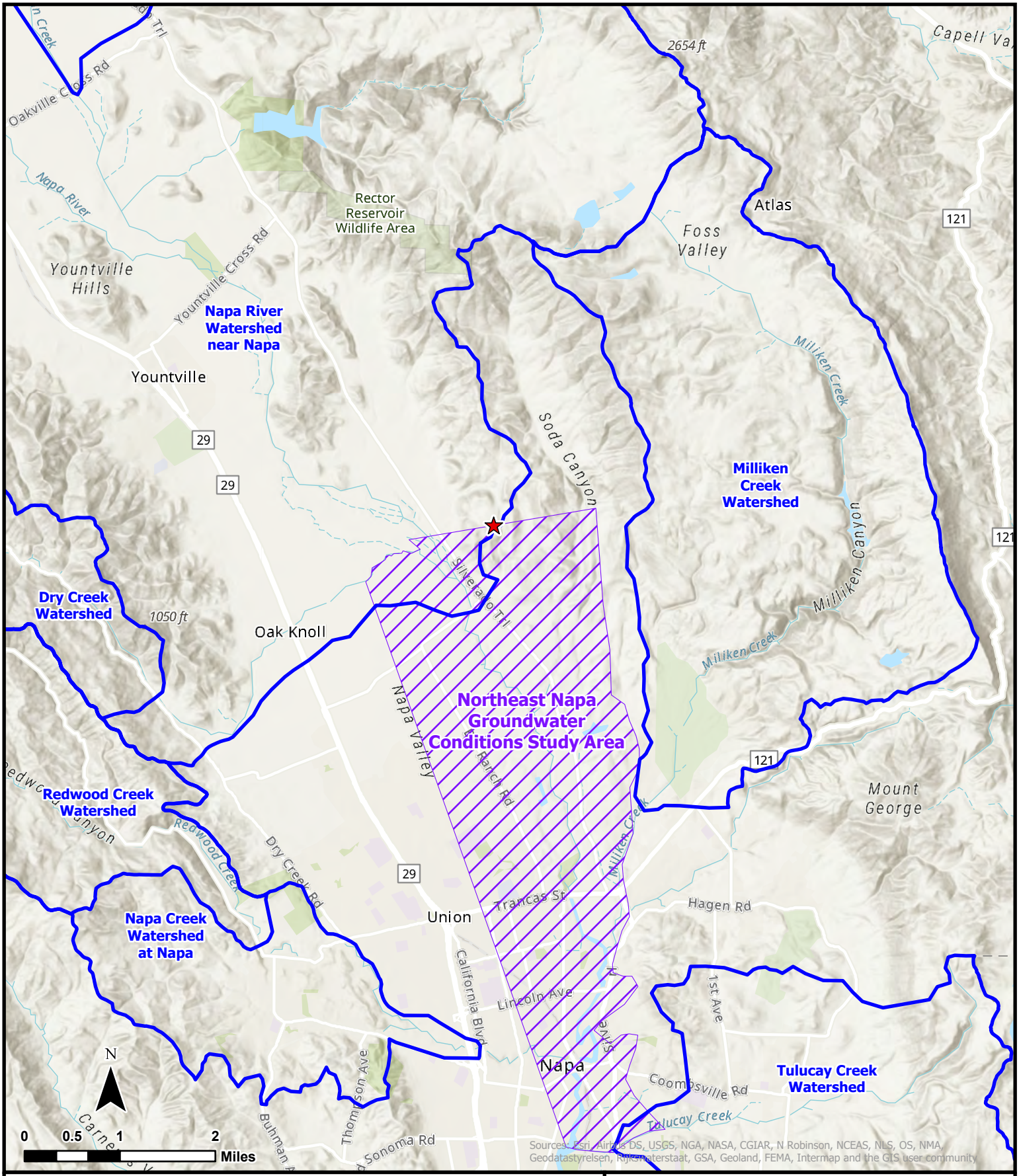
FIGURE 3
GEOLOGIC MAP

RCS Job No. 707-NPA01 March 2020



LEGEND

- ★ Subject Property
- Watershed Boundary
- Northeast Napa Study Area

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FIGURE 4
WATERSHED BOUNDARIES

RCS Job No. 707-NPA01 March 2020

Table 1
Parcel-Specific Data Summary
Shafer Vineyards-Blodgett

Parcel APN	Parcel Area Adjusted for Slope Reduction (acres)			Pumping Rate Required to Meet Estimated Future Irrigation Demand Assuming 50% Operational Basis for 20-week Irrigation Season (gpm)				Total Future Vineyard (acres)			Estimated Future GW Demand (AFY)					Estimate of Annual Parcel-Specific Recharge (AFY)	Estimate of Drought Period Recharge (AFY)	Estimated Groundwater in Storage Beneath Parcel (AF)
											Estimated Future Irrigation Demand (AFY)			Residential Demand (AFY)				
	Parcel Area (acres)	Approx. Area with Slope Exceeding 30 degrees (acres)		Well Used for Irrigation Purposes	Driller-Estimated Airlift Flow Rate (gpm)	Theoretical Operational Pumping Rate Based on Airlift Rate (gpm)		Existing Vineyards (acres)	Proposed Vineyards (acres)		Existing Irrigation Demand (AFY)	Proposed Additional Irrigation Demand (AFY)						
039-051-023	40.90	0.14	40.76	Ridgeback Well	110	55	23	18.60	5.26	23.86	5.58	1.58	7.16	0.00	7.16	16.28	7.81	330
039-051-033	60.93	1.28	59.65	La Mesa Well, Old La Mesa Well (formerly)	85	42	22	18.10	4.62	22.72	5.43	1.39	6.82	0.75	7.57	23.83	11.44	483
039-051-019	77.51	0.003	77.51	Russler Well	60	30	28	18.50	10.20	28.70	5.55	3.06	8.61	0.00	8.61	30.97	14.87	628
039-051-021	36.10	0.00	36.10	School Bus Well	ND	ND	22	22.00	0.80	22.80	6.60	0.24	6.84	0.00	6.84	14.42	6.92	292
TOTALS:	**215.44**	**1.42**	**214.02**		**255**	**127**	**95**	**77.20**	**20.88**	**98.08**	**23.16**	**6.27**	**29.43**	**0.75**	**30.18**	**85.50**	**41.04**	**1733**

Notes:

Average rainfall:	2.35 ft
Deep Percolation Percentage:	17%
Vineyard Irrigation Demands:	0.3 AF/ac

gpm - gallons per minute
AFY - acre-feet per year
AF - acre feet
GW - groundwater

Table 2
Summary of Well Construction and Pumping Data
Shafer Vineyards-Blodgett

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 Type
Old La Mesa Well	474531	April 1996	Air Rotary	640	635	PVC	6	9	25 (cement)	120-635	Factory-Cut 0.032	25-635 Pea Gravel
Ridgeback Well	814558	May 1999	Air Rotary	710	697	PVC	8	12	24 (cement)	267-697	Factory-Cut 0.032	24-697 Pea Gravel
La Mesa Well	1073632	June 2008	Air Rotary	740	740	PVC	8	12	23 (cement)	180-740	Factory-Cut 0.032	23-740 Pea Gravel
Russler Well	e0234971	September 2014	Air Rotary	790	784	PVC	6	9	24 (cement)	264-784 (screened every 20 ft, beginning at 264 ft bgs)	Factory-Cut 0.032	24-784 #6 Well Pack
Residence Well	WCR2019-003564	February 2019	Air Rotary	695	695	PVC	6	12	23 (cement)	315-695 (screened every other 20 ft, beginning at 315 ft bgs)	Factory-cut 0.032	23-695 Bird's Eye
School Bus Well	ND	ND	ND	ND	ND	Steel	8	ND	ND	ND	ND	ND

POST-CONSTRUCTION YIELD DATA

Reported Well Designation	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)
Old La Mesa Well	4/24/96 Airlift	3	130	80	ND	ND
	11/20/07 Pump	3	93	112	370	0.36
	12/29/16 Pump	2	80	117	235.5	0.68
Ridgeback Well	5/25/99 Airlift	4	110	220	ND	ND
La Mesa Well	6/9/08 Airlift	4	85	100	ND	ND
Russler Well	9/16/14 Airlift	5	60	190	ND	ND
Residence Well	2/20/19 Airlift	4	50	290	ND	ND
School Bus Well	ND	ND	ND	ND	ND	ND

Notes: 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
ND = no data available

Table 3
Groundwater Use Estimates
Shafer Vineyards-Blodgett

Groundwater Use	Estimated Groundwater Use (acre-feet/year)	
	Existing	Future
Residential Groundwater Use		
Existing Primary Residence[1]	0.75	0.75
Total Residential Groundwater Use	**0.75**	**0.75**
Irrigation Groundwater Use		
Vineyard - Existing 77.2 acres	23.16	23.16
Vineyard - Proposed 20.9 acres	---	6.27
Total Irrigation Groundwater Use	**23.16**	**29.43**
Total Combined Groundwater Use (Residential + Irrigation)	**23.91**	**30.18**

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
Comparison of Rainfall Data Sources
Shafer Vineyards-Blodgett

Rain Gage and/or Data Source	Years of Available Rainfall Record	Average Annual Rainfall in Inches (ft)	Elevation of Rain Gage (ft asl)	Distance of Rain Gage from Subject Property (miles)	Elevation Relative to Subject Property[1]
Napa OneRain Milliken Reservoir	WY 2000-01 through WY 2018-19[3] (19 years)	23.20 (1.93)	930	4.0	Higher
Napa OneRain Napa River at Yountville Cross Road	WY 2000-01 through WY 2018-19	30.50 (2.54)	94	4.0	Lower
WRCC Napa State Hospital	1893 through December 2019[2]	23.50 (1.96)	240	7.0	Lower
PRISM	1981 to 2010	28.20 (2.35)	---	---	---
Napa County Isohyetal Map	1900 to 1960	27.50 (2.29)	---	---	---

Notes:

1. The subject property is located at elevations between ±100 and ±460 ft asl
2. Missing rainfall data in: 1894 to 1901; and 1915 to 1916.
3. There are missing data from March 28 to August 28, 2013.

Table 5
Drought Period Rainfall as Percentage of Average
Shafer Vineyards-Blodgett

Statewide Drought Period as Defined by DWR (DWR 2005)	Drought Duration (years)	Average Rainfall by Raingage								
		Napa Hospital Raingage, WRCC Period of Record - 1893 through 2019			Milliken Reservoir, Napa One Rain Period of Record - WY 2000-01 through WY 2017-18			Napa River at Yountville Cross Road, Napa One Rain Period of Record - WY 2000-01 through WY 2018-19		
		[A] Total Gage Average (in)	[B] Drought Period Ave. (in)	[B÷A] Drought Period Rainfall as % of Average	[C] Total Gage Average (in)	[D] Drought Period Ave. (in)	[D÷E] Drought Period Rainfall as % of Average	[E] Total Gage Average (in)	[F] Drought Period Ave. (in)	[F÷E] Drought Period Rainfall as % of Average
WY 1928-29 to WY 1933-34	6	24.70	17.30	70%	ND	ND	ND	ND	ND	ND
WY 1975-76 to WY 1976-77	2	24.70	11.80	48%	ND	ND	ND	ND	ND	ND
WY 1986-87 to WY 1991-92	6	24.70	18.50	75%	ND	ND	ND	ND	ND	ND
WY 2006-07 to WY 2008-09	3	24.70	18.80	76%	23.20	17.90	77%	30.50	22.10	72%
WY 2011-12 to WY 2015-16	5	24.70	21.00	85%	23.20	15.80	68%	30.50	23.60	77%

ND = No rainfall data avaialble for the corresponding drought period.

DRAFT

APPENDIX 1

CALIFORNIA
DEPARTMENT OF WATER RESOURCES
WELL COMPLETION REPORTS (DRILLER'S LOGS)

DRAFT

QUADRUPLICATE
For Local Requirements

Page ____ of ____

Owner's Well No. ____

Date Work Began 4-18-96 Ended 4-23-96

Local Permit Agency Napa County

Permit No. 411867 Permit Date 4-15-96

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 474531

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE / LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

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

DEPTH TO FIRST WATER 80 (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION (Describe material, grain size, color, etc.)
0	80	brownish & black boulders
80	220	greenish
220	480	brownish & black rock
480	635	greenish, streaks of black broken up rock

RECEIVED
OCT 08 1996
DEPT. OF ENVIRONMENTAL MANAGEMENT

TOTAL DEPTH OF BORING 640 (Feet)

TOTAL DEPTH OF COMPLETED WELL 635 (Feet)

WELL OWNER

Name [redacted]

Mailing Address [redacted]

CITY STATE ZIP

WELL LOCATION

Address

City Napa

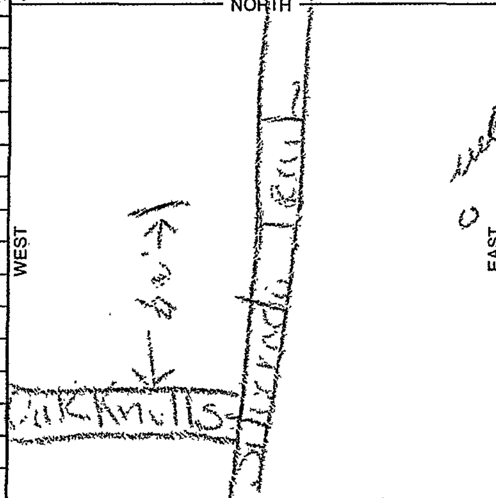
County Napa

APN Book ____ Page ____ Parcel 031-051-011

Township ____ Range ____ Section ____

Latitude ____ NORTH Longitude ____ WEST

LOCATION SKETCH



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

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
____ Deepen
____ Other (Specify)

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

PLANNED USE(S) (✓)

____ MONITORING

WATER SUPPLY
____ Domestic
____ Public
X Irrigation
____ Industrial
____ "TEST WELL"
____ CATHODIC PROTECTION
____ OTHER (Specify)

DRILLING METHOD Rotary FLUID Air

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 80 (Ft.) & DATE MEASURED 4-24-96

ESTIMATED YIELD* 130 (GPM) & TEST TYPE Air Lift

TEST LENGTH 3 (Hrs.) TOTAL DRAWDOWN 520 (Ft.)

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

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	25	10	X				Plain	6	.200	
25	130	9 7/8	X				"	"	"	
130	635	9 7/8		X			"	"	"	1/8

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	25	X			
25	635			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 Pullman Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

4377 Piedmont Ave Napa Ca 94558
ADDRESS CITY STATE ZIP

Signed [signature]
WELL DRILLER/AUTHORIZED REPRESENTATIVE

DATE SIGNED 6-4-96 C-57 LICENSE NUMBER 48471

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

QUADRUPLICATE
For Local Requirements

Page ___ of ___

Owner's Well No. ___

Date Work Began 5-12-99 Ended 5-26-99

Local Permit Agency [illegible]

Permit No. 71-[illegible] Permit Date 11-11-98

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 814558

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

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

DRILLING METHOD [illegible] FLUID [illegible]

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	10	Brown ash
10	20	Brown & Brown black
20	30	Brown ash
30	40	Brown black ash
40	50	Brown black ash
50	60	Brown black ash
60	70	Brown black ash
70	710	Brown black rock

TOTAL DEPTH OF BORING 710 (Feet)

TOTAL DEPTH OF COMPLETED WELL 697 (Feet)

WELL OWNER

Name [redacted]

Mailing Address [redacted]

City [redacted] STATE [redacted] ZIP

WELL LOCATION

Address [illegible]

City [illegible]

County [illegible]

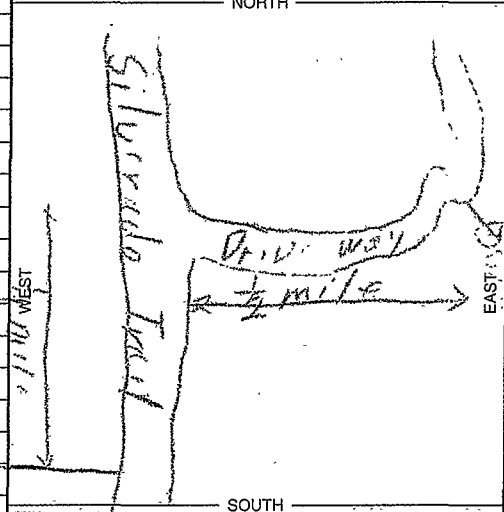
APN Book ___ Page ___ Parcel 031-051-023

Township ___ Range ___ Section ___

Latitude ___ DEG. ___ MIN. ___ SEC. NORTH

Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc and attach a map. Use additional paper if necessary ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
✓ Irrigation ___ Industrial

___ MONITORING
___ TEST WELL
___ CATHODIC PROTECTION
___ HEAT EXCHANGE
___ DIRECT PUSH
___ INJECTION
___ VAPOR EXTRACTION
___ SPARGING
___ REMEDIATION
___ OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 200 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 224 (Ft.) & DATE MEASURED 5-25-99

ESTIMATED YIELD * 110 (GPM) & TEST TYPE Air lift

TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 420 (Ft.)

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

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	CASING (S) TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	267	12¼	✓				Plastic	8	200	
267	697	12¼		✓			Plastic	8	200	Factory 1/32

DEPTH FROM SURFACE Ft.	to Ft.	ANNULAR MATERIAL TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	24	✓			
24	697				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 [illegible] (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS [illegible] CITY [illegible] STATE [illegible] ZIP [illegible]

Signed [illegible] (WELL DRILLER/AUTHORIZED REPRESENTATIVE) DATE SIGNED 6-11-99 C-57 LICENSE NUMBER [illegible]

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

QUADRUPLICATE
For Local Requirements

Page ___ of ___
Owner's Well No. ___
Date Work Began 06/02/2008, Ended 06/09/2008
Local Permit Agency Napa County
Permit No. R08-0072 Permit Date 06/02/2008

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 1073632

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE / LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Rotary FLUID Air

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	95	Gray Rock & Ash
95	110	Gray & Brown Rock
110	250	Gray Volcanic Rock
250	280	Red & Gray Ash
280	420	Hard Gray & Light Gray Rock
420	455	Brown Ash & Hard Gray Rock
455	605	Hard Purple & Gray Rock & Ash
605	625	Red Ash
625	725	Hard Gray & Green Volcanic Rock
725	740	Black Ash

RECEIVED
AUG 26 2008
DEPT. OF ENVIRONMENTAL MANAGEMENT

TOTAL DEPTH OF BORING 740 (Feet)
TOTAL DEPTH OF COMPLETED WELL 740 (Feet)

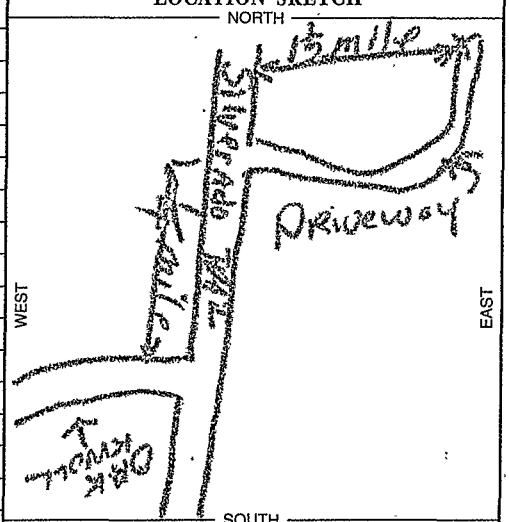
WELL OWNER

Name [redacted]
Mailing Address [redacted]
CITY [redacted] ZIP

WELL LOCATION

Address 5096 Silverado Trail
City
County Napa
APN Book Napa Page 039 Parcel 051
Township Range Section 011-000
Lat ___ DEG. ___ MIN. ___ SEC. N
Long ___ DEG. ___ MIN. ___ SEC. W

LOCATION SKETCH



*Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

USES (✓)
WATER SUPPLY
___ Domestic ___ Public
✓ Irrigation ___ Industrial
___ MONITORING
___ TEST WELL
___ CATHODIC PROTECTION
___ HEAT EXCHANGE
___ DIRECT PUSH
___ INJECTION
___ VAPOR EXTRACTION
___ SPARGING
___ REMEDIATION
___ OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 130 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 100 (Ft.) & DATE MEASURED 6-9-08
ESTIMATED YIELD * 85 (GPM) & TEST TYPE Air Lift
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 100 (Ft.)
** May not be representative of a well's long-term yield.*
GPM at day

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	23	19½	✓				Steel	8	Full	
23	100	12¼	✓				"	"	"	
100	740	12¼		✓			"	"	"	.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	23	✓			
23	740			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 [redacted] (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
5110 Highway 128 Napa CA 94558
ADDRESS CITY STATE ZIP
Signed [redacted] C-57 LICENSED WATER WELL CONTRACTOR
DATE SIGNED 8-11-08 C-57 LICENSE NUMBER 808509

DWR 188 REV. 05-03

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

Page _____ of _____

Owner's Well Number _____

Date Work Began 09/05/2014 Date Work Ended 9/16/2014

Local Permit Agency Napa County

Permit Number E14-00228 Permit Date 8/4/14

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0234971

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify _____

Drilling Method Rotary Drilling Fluid Air

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
0	135	Brown Ash & Boulders
135	180	Black Basalt
180	240	Fractured Gray Rock
240	280	Black Basalt
280	380	Purple Hard Rock
380	520	Whiter & Gray Rock with Rust signs
520	600	Black & Green Fractured Rock
600	700	Black & Red Ash
700	750	Black Ash
750	790	Black Basalt
		Peforation lay out
		B = Blank
		P = Perforation
		0 to 264 Blank
		P P
		P 304 ft B 604 ft
		B P
		P P
		B B
		P P
		P 404 ft P 704 ft
		B B
		P P
		B B
		P P 784 ft
		B 504 ft
		P
		B
		P

Total Depth of Boring 790 Feet

Total Depth of Completed Well 784 Feet

RECEIVED
OCT 06 2014
Napa County Planning, Building & Environmental Services

Well Owner

Name [redacted]

Mailing Address [redacted]

City [redacted]

Well Location

Address 5100 Silverado Trail

City Napa County Napa

Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W

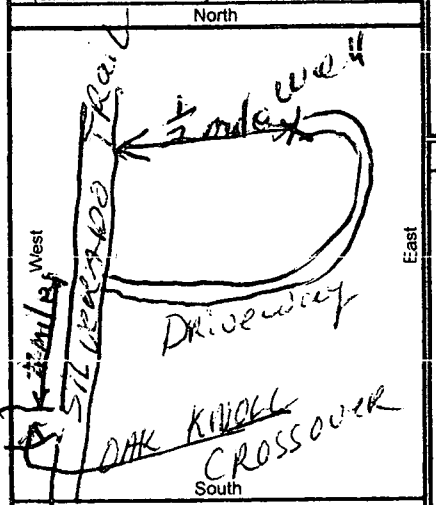
Datum _____ Dec. Lat. _____ Dec. Long. _____

APN Book 039 Page 051 Parcel 019-000

Township _____ Range _____ Section _____

Location Sketch

(Sketch must be drawn by hand after form is printed.)



Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

◉ New Well
○ Modification/Repair
○ Deepen
○ Other _____
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

◉ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other _____

Water Level and Yield of Completed Well

Depth to first water 220 (Feet below surface)

Depth to Static Water Level 190 (Feet) Date Measured 09/16/2014

Estimated Yield * 60 (GPM) Test Type Air Lift

Test Length 5.0 (Hours) Total Drawdown 585 (Feet)

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

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size If Any (Inches)
0	24	11	Blank	PVC Sch. 40	R21	6		
24	264	9	Blank	PVC Sch. 40	R21	6		
264	784	9	Screen	PVC Sch. 40	R21	6	Milled Slots	0.032

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	24	Cement	
24	784	Filter Pack	# 6 well pack

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 Exploration Inc
Person, Firm or Corporation

4371 Cantelow Road Vacaville CA 95688
Address City State Zip

Signed _____ 10/01/2014 808-508
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

E19-00032 well WL

State of California

Well Completion Report

Form DWR 188 Submitted 3/13/2019

WCR2019-003564

Owner's Well Number 039-051-033-000 Date Work Began 02/01/2019 Date Work Ended 02/20/2019

Local Permit Agency Napa County Planning Building and Environmental Services

Secondary Permit Agency Permit Number E19-00032 Permit Date 01/22/2019

Well Owner (must remain confidential pursuant to Water Code 13752)

Name [redacted]

Mailing Address [redacted]

City NAPA State CA Zip 94581

Planned Use and Activity

Activity New Well

Planned Use Water Supply Domestic

Well Location

Address 5096 SILVERADO TR APN 039-051-033-000

City NAPA Zip 94581 County Napa Township 06 N

Latitude 38 Deg. 23 Min. 7.2718 Sec. N Longitude -122 Deg. 18 Min. 1.125 Sec. W Range 04 W

Section 09

Baseline Meridian Mount Diablo

Dec. Lat. 38.3853533 Dec. Long. -122.3003125 Ground Surface Elevation

Vertical Datum Horizontal Datum WGS84 Elevation Accuracy

Location Accuracy Location Determination Method Elevation Determination Method

Borehole Information

Orientation Vertical Specify

Drilling Method Direct Rotary Drilling Fluid Air

Total Depth of Boring 695 Feet

Total Depth of Completed Well 695 Feet

Water Level and Yield of Completed Well

Depth to first water 340 (Feet below surface)

Depth to Static Water Level 290 (Feet) Date Measured 02/20/2019

Estimated Yield* 50 (GPM) Test Type Air Lift

Test Length 4 (Hours) Total Drawdown 100 (feet)

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

Geologic Log - Free Form

Depth from Surface Feet to Feet		Description
0	20	BROWN ASH CLAY
20	100	HARD BASALT BLACK
100	120	BLACK BASALT
120	160	BROWN AND BLACK BASALT
160	200	BLACK WHITE ASH
200	220	YELLOW ASH
220	280	WHITE AND BROWN ASH
280	300	WHITE AND BROWN ASH
300	340	RED ASH
340	420	BLACK AND RED ASH
420	500	BLACK ASH
500	540	BLACK AND YELLOW ASH
540	660	BLACK AND GREEN ASH
660	680	BROWN ASH
680	695	BLACK AND BLUE ASH

Casings

Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	315	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	315	335	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	
1	335	355	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	355	375	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	
1	375	395	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	395	415	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	
1	415	435	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	435	455	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	
1	455	475	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	475	495	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	
1	495	515	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	515	535	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	
1	535	555	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	555	575	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	
1	575	595	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	595	615	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	
1	615	635	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	635	655	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	
1	655	675	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	675	695	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0.032	

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	23	Cement	10.3 Sack Mix	10.3 Sack Mix	
0	695	Filter Pack	Other Gravel Pack	10	Bird's Eye Gravel Well Pack

Other Observations:

Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (Inches)
0	695	12

Certification Statement

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

Name: PULLIAM WELL EXPLORATION INC
Person, Firm or Corporation

Address	City	State	Zip
1663 HOWELL MTN RD	ANGWIN	CA	94508

Signed: *electronic signature received* (C-57 Licensed Water Well Contractor) | 08/13/2019 (Date Signed) | 808508 (C-57 License Number)

DWR Use Only

CSG #	State Well Number	Site Code	Local Well Number

N — Latitude Deg/Min/Sec

W — Longitude Deg/Min/Sec

TRS:

APN:

APPENDIX 2

IMBODEN PUMP
PUMPING REPORT FOR
NOVEMBER 2007 PUMPING TEST
&
RAY'S WELL TESTING SERVICE
PUMPING REPORT FOR
DECEMBER 2016 PUMPING TEST
OF THE OLD LA MESA WELL

DRAFT

IMBODEN PUMP

SINCE 1946

1030 PUEBLO AVENUE • NAPA, CALIFORNIA 94558
(707) 252-6493 • LIC. # 404594
FAX (707) 226-1580

WELL TEST & REPORT

DATE: 11/20/07

OWNER: BRAD SHAFER

ADDRESS: 5096 SILVERADO TRAIL NAPA, CA 94558

WELL LOCATION: LAMESA

WELL DEPTH: 630' DIAMETER: 6" CASING: PVC

PUMP SETTING: 441' PUMP HP: 15 DROP PIPE: 2"GALV.

POWER & VOLTAGE: 230V DROP CABLE: 4/4

PUMP MODEL: 70J15

TANK SIZE & MODEL: IC-366

RECEIVED
JAN 29 2008
DEPT. OF
ENVIRONMENTAL MANAGEMENT

WATER LEVEL AT START OF TEST: 112' GPM: 120

WATER LEVEL AT END OF TEST: 365' GPM: 95

LENGTH OF TEST: 3 HOURS

THIS TEST IS BASED ON THE WELL PRODUCTION AS OF THE DAY OF THE TEST ONLY. THE WELL MAY PRODUCE MORE OR LESS WATER THROUGHOUT THE YEAR.

RESPECTFULLY,
IMBODEN PUMP

ATE: 11/20/07

OWNER: BRAD SHAFER

ADDRESS: 5096 SILVERADO TRAIL NAPA, CA 94558

TIME	WATER LEVEL	BACK PRESSURE	WATER COLOR	SAND	GPM
8:30am	112'	0	CLEAR	YES	120
8:35am	197'	0	CLEAR	YES	120
8:40am	240'	0	CLEAR	YES	107
8:50am	278'	0	CLEAR	YES	107
9:00am	295'	0	CLEAR	YES	100
:20am	324'	0	CLEAR	YES	100
9:40am	341'	0	CLEAR	YES	100
10:00am	356'	0	CLEAR	YES	100
10:20am	370'	0	CLEAR	YES	93
10:40am	370'	0	CLEAR	YES	93
11:00am	370'	0	CLEAR	YES	93
11:30am	370'	0	CLEAR	YES	93

REMARKS:

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

B16- 01795

CUSTOMER INFORMATION

APN: 039-051-033, Well, YT, E17-00016

REPORT #: 8803 - By: Matt Owens	DATE OF TEST: 12/29/16
CUSTOMER NAME: Brad Shafer	CONTACT: 707 688 5377
AGENT NAME: N/A	CONTACT: N/A
PROPERTY ADDRESS: 5096 Silverado Trail, Napa CA 94558	SENT TO: dennis@imbodenpump.com

WELL DATA

LOCATION OF WELL:	To right of vineyard road near drainage swale
TYPE OF WELL:	Drilled
DEPTH OF COMPLETED WELL:	630 Feet - as indicated by installer records
DIAMETER OF WELL CASING:	6" PVC with 8" PVC stub at surface
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:	15 HP 230V 3PH Submersible, 2" galvanized pipe, #4-4 cable
DEPTH OF PUMP SUCTION:	441 Feet - as indicated by installer records

RECEIVED
March 28, 2017
Napa County Planning, Building & Environmental Services

WATER PRODUCTION RESULTS

WATER LEVEL AT START (STATIC LEVEL):	117 Feet	FLOW RATE AT START:	95 GPM
FINAL PUMPING LEVEL:	235.5 Feet	FINAL FLOW RATE:	**80 GPM**
WATER LEVEL DRAWDOWN:	118.5 Feet	TOTAL LENGTH OF TEST:	2 Hours

CONSTANT PUMPING LEVEL INFORMATION

STABILIZED PUMPING LEVEL:	235.5 Feet	STABILIZED FLOW RATE (YIELD):	**80 GPM**
DURATION OF CONSTANT PUMPING LEVEL:	1 Hour	TOTAL YIELD:	see pumping log

WATER SYSTEM INSPECTION

WELL PUMP	Functional	TECHNICAL INFO: Goulds 70J15, 80 GPM @ 70 PSI @ 235.5', 36 amps
ELECTRICAL	Functional	TECHNICAL INFO: 100 amp breaker in drive panel
PRESSURE TANK	Functional	TECHNICAL INFO: 119 gallon Hays #366, dated 1997, 27 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: 12/29/16	TURNAROUND: Standard - Due: 1/13/16
	DATED:	TURNAROUND:
	DATED:	TURNAROUND:
	DATED:	TURNAROUND:

SEE NEXT PAGE FOR FURTHER INFORMATION...

DATE: 12/29/16

ADDRESS: 5096 Silverado Trail, Napa CA 94558

COMMENTS:
1. The recharge rate at the end of the test was 80 gallons per minute. This test may not represent the long term or seasonal yield.
2. The well pump pressurizes the 119 gallon PC 366 pressure tank. The pressure set point is set at 60 psi. The well pump is controlled by a Yaskawa CIMRP7U2015 variable frequency drive. This system pressurizes water for vineyard irrigation use.
3. There is a 3" Amiad irrigation sediment filter installed on the main irrigation line.

PUMPING LOG

TIME	WATER LEVEL	COLOR	SEDIMENT	ODOR	GPM
10:40 AM	117'	CLEAR	NO	NO	95
10:55 AM	180'	CLEAR	NO	NO	95
11:10 AM	215'	CLEAR	NO	NO	95
11:25 AM	227'	CLEAR	NO	NO	95
11:40 AM	235.5'	CLEAR	NO	NO	85
11:55 AM	235.5'	CLEAR	NO	NO	80
12:10 PM	235.5'	CLEAR	NO	NO	80
12:25 PM	235.5'	CLEAR	NO	NO	80
12:40 PM	235.5'	CLEAR	NO	NO	80

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.

This report is for informational use only and is in lieu of and supercedes any other representation or statements of the agent or employee of the company, and all other such representations or statements shall be relied upon at the customer's own risk. The data and conclusions provided herein are based upon the best information available to the company using standard and accepted practices of the water well drilling industry. However, conditions in water wells are subject to dramatic changes in short periods of time. Therefore, the data and conclusions are valid only as of the date of the test and should not be relied upon to predict either the future quantity or quality the well will produce. The company makes no warranties either expressed or implied as to future water production and expressly disclaims and excludes any liability for consequential or incidental damages arising out of the breach of any expressed or implied warranty of future water production or out of any further use of the report by the customer.

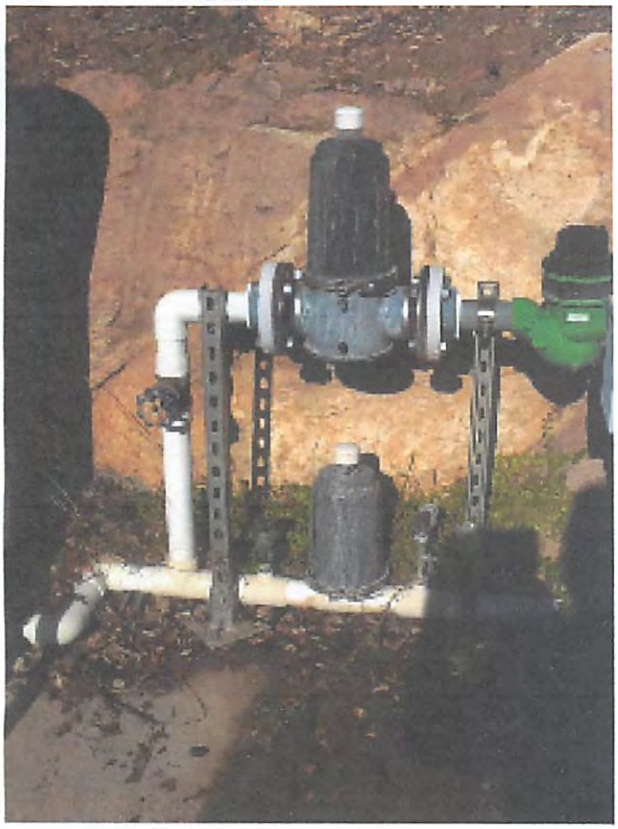
Well Head

Variable Frequency Drive

Pressure Tank

Main Shut Off Valve

Sediment
Filter



Total Usage
Meter