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## Water Availability Analysis

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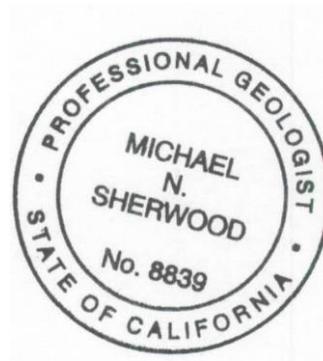
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A handwritten signature in blue ink that reads "Michael Sherwood".

Michael Sherwood PG #8839 (Exp. 6-30-19)



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## Introduction

Chappellet Winery is seeking to modify an existing County of Napa use permit to expand winery production, add employees, and increase the number of annual visitors to the winery for tours, tastings, and events. The subject property is located at 1581 Sage Canyon Road (Napa County APN 032-010-090) approximately one mile east of Lake Hennessey (Figure 1). The existing water supply for the winery is a well on a parcel (APN 032-010-092) approximately 1 mile to the southeast also owned by Chappellet Winery (Figure 1). This well (Well 1 in Figure 2) is also known as the Corral Well and only serves the winery parcel. The existing use permit P11-00138 was issued in 2014 with the creation of a State-regulated Transient Non-Community Water System. The proposed project will increase wine production by 100,000 gallons to a total annual production of 250,000 gallons. Annual visitors will increase by 21,835 to a total of 38,905. Six new employees will be added for a total of 30 employees.

This Water Availability Analysis (WAA) was developed based on the guidance provided in the Napa County Department of Planning, Building, & Environmental Services' Water Availability Analysis Guidance Document formally adopted by the Napa County Board of Supervisors in May 2015. The WAA includes the following elements: estimates of existing and proposed water uses within the project recharge area, compilation of drillers' logs from the area and characterization of local hydrogeologic conditions, analyses to estimate groundwater recharge relative to proposed uses (Tier 1), and a screening analysis of the potential for well interference at neighboring wells located within 500-ft of the project well (Tier 2).

## Limitations

Groundwater systems of Napa County and the Coast Range are typically complex, and available data rarely allows for more than general assessment of groundwater conditions and delineation of aquifers. Hydrogeologic interpretations are based on the drillers' reports made available to us through the California Department of Water Resources, available geologic maps and hydrogeologic studies, and professional judgment. This analysis is based on limited available data and relies significantly on interpretation of data from disparate sources of disparate quality.

Given the significant depths to water in the project well (350-ft), the relationship between groundwater recharge generated within the project parcel area and groundwater availability at the project wells is not expected to be very tightly coupled. It is likely that water flowing to the project wells is primarily supplied by groundwater inflows from surrounding areas rather than from recharge occurring on the overlying landscape. Analysis of the age and sources of the deep groundwater occurring beneath the project parcel is beyond the scope of this study.

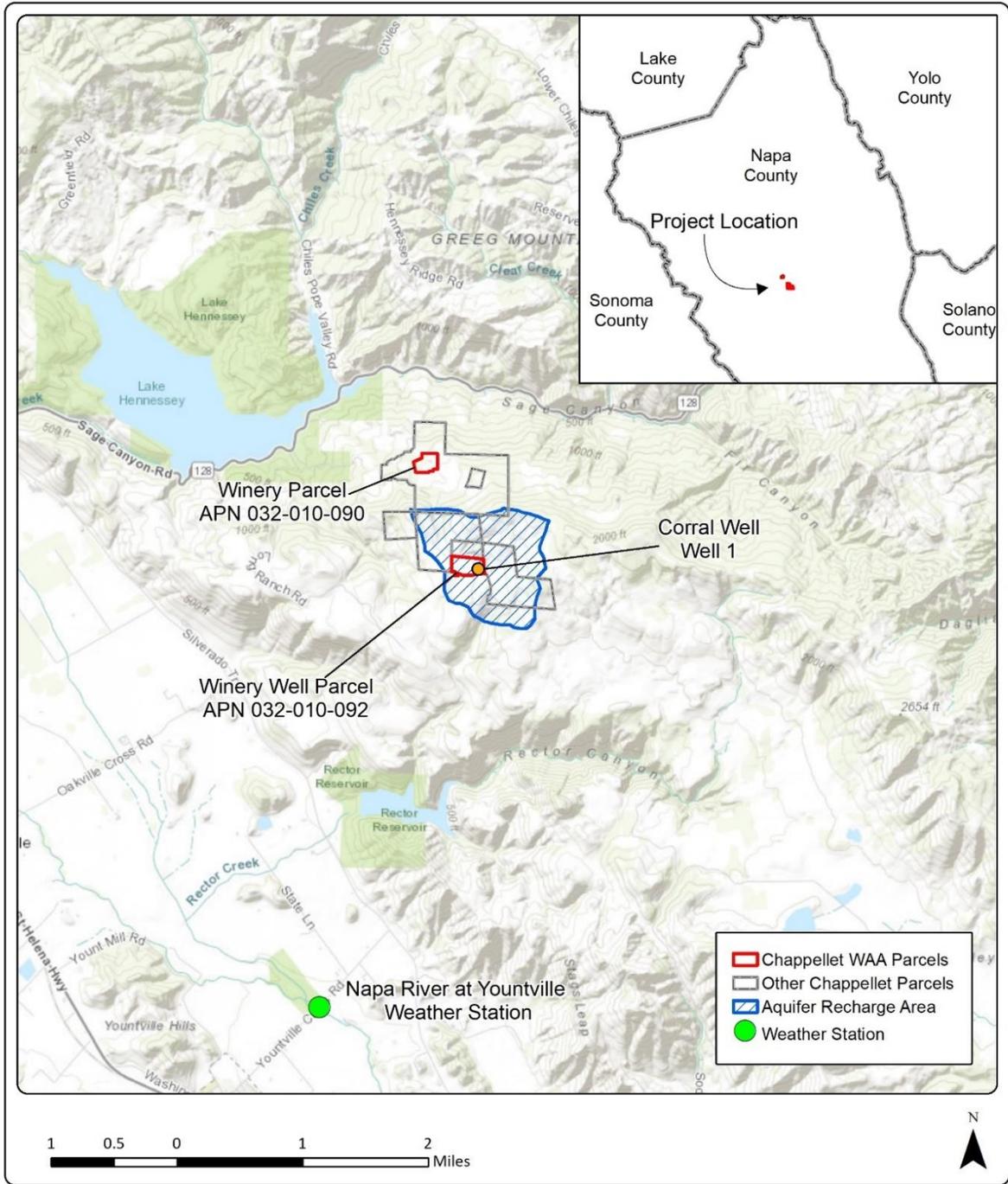


Figure 1: Project location map

## Hydrogeologic Conditions

The project parcel is located on Pritchard Hill east of Lake Hennessey on a topographic bench oriented northwest to southeast in the mountains east of the Napa Valley. The bedrock geology mapped in the area of the project parcels is typical of the uplands east of the southern half of Napa Valley. The main geologic unit mapped at the project site and intersected by the project well (Well 1) is andesitic and basaltic lava flows of the Tertiary-aged Sonoma Volcanics (Map unit Tsa, see Map 2). This portion of the Tsa unit is part of an approximately 32 square-mile northwest to southeast oriented block bound to the north and east by a contact with the older Mesozoic-aged rocks of the Coast Range Ophiolite which is a portion of the Great Valley Complex, the Franciscan Complex and a relatively large Quaternary landslide and to the west by overlying alluvium of the Napa Valley. The Tsa unit is part of the lower member of the Sonoma Volcanics which was described by Weaver (1949) as individual lava flows displaying great variability in thickness and texture over short distances. Given this heterogeneity it can be expected that hydrogeologic conditions exhibit similar spatial variability and yields from wells completed anywhere in the Tsa unit. Reconnaissance confirmed the mapped bedrock geology.

Rocks of the Sonoma Volcanics overlie the basement rocks of the Mesozoic-age Coast Range Ophiolite and the Franciscan Complex. Several drillers logs including that of the project well (Well 1) report encountering serpentine at depths of 600 ft or more (Appendix A). The Serpentinite (sp) unit of the Coast Range Ophiolite is of Jurassic (144-208 My) age and is mainly sheared serpentinite but also can include harzburgite (Graymer, 2007).

The rocks of the Coast Range Ophiolite are generally considered poor aquifer material; however, successful wells of generally limited capacity are common in this highly variable geologic unit. Primary porosity in the Coast Range Ophiolite is low and groundwater occurs primarily in fractures. Well yields are variable depending on the degree of fracturing; however, yields are generally low and on the order of a few gallons per minute; dry test holes are also common within these rocks (LCSE, 2013).

In general, wells drilled in the Sonoma Volcanics tend to have low to moderate yield. Typical yields range from 16 to 50 gallons per minute (gpm) with reported yields as high as several hundred gpm (LSCE 2013). Unwelded sections of tuff are considered to be good water producers (DWR 1982). Bedrock units such as the Andesite to Basalt Lava Flows (map unit Tsa) typically have low primary porosity and are only water yielding where fractured (DWR 1982).

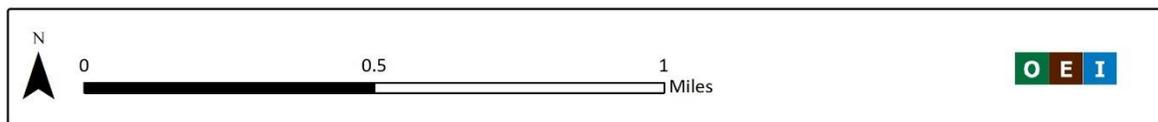
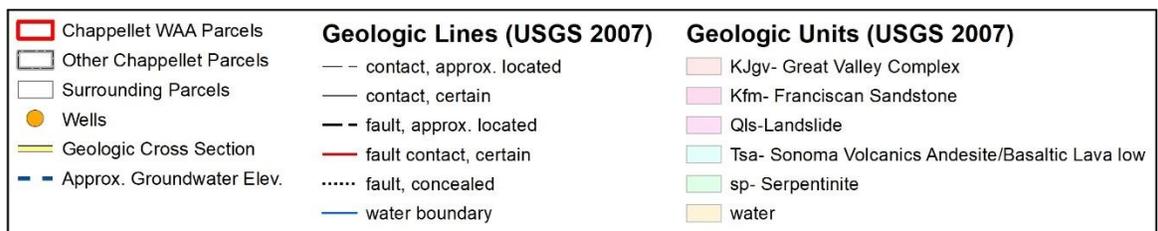
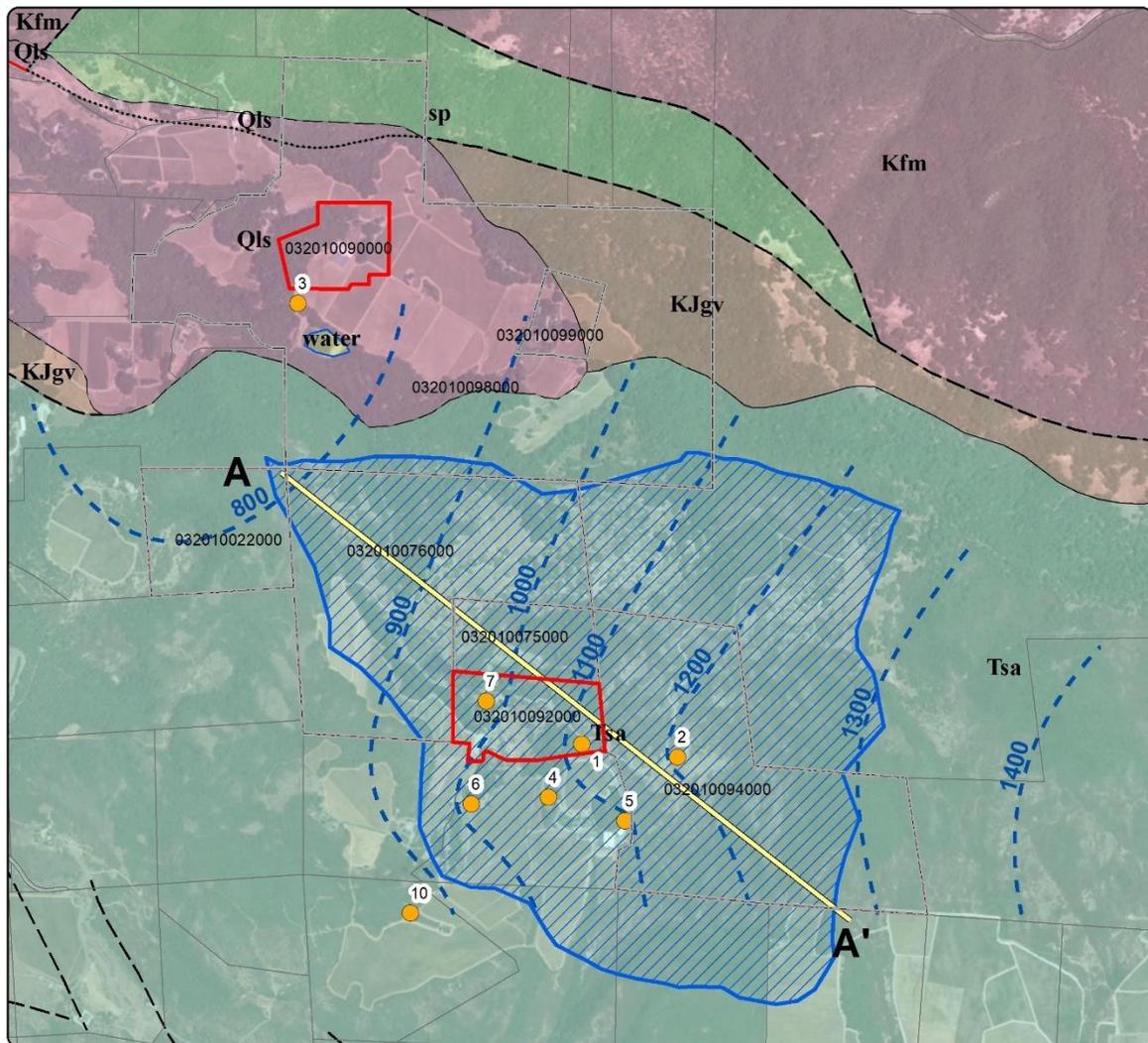


Figure 2: Surficial geology and locations of wells on and near the project parcel. Surficial geology based on data from the Geologic Map of Eastern Sonoma and Western Napa Counties (Graymer et al., 2007).

## Well Data

Our search of the Department of Water Resources and County of Napa records found a total of 11 well completion reports for wells completed in similar geology and located within approximately one mile of the project parcels. Of the 11 wells, 10 were located specifically on surrounding parcels while one was only located generally in the Pritchard Hill area; data for this latter well was used to summarize local hydrogeologic characteristics but was not used in any geospatial analysis. Several well locations were identified by Chappellet staff while the remaining wells on surrounding parcels were located using the locations marked on the well logs as guidance and then confirmed using aerial photos of the area. Well locations are shown in Figure 2. Applicable well information was compiled (see Appendix A).

**Table 1: Well completion details for the project well (Well 1) and nearby wells.**

Well Number	1	2	3	4	5	6	7	8	9	10	11
Year Completed	2008	2014	1982	2010	2007	1995	1991	1992	1988	2008	2014
Depth (ft)	627	625	640	798	750	620	700	398	650	755	560
Estimated Yield (gpm)	45	30	10	35	25	20	30	40	20	45	150
Static Water Level (ft)	400	350	450	420	460	400	460	249	420	565	240
Top of Screen (ft)	447	225	420	500	300	420	440	258	440	605	280
Bottom of Screen (ft)	627	625	640	798	750	620	700	398	650	755	560
Geologic Unit	Tsa										

All wells identified were productive. Well bores range from 398 to 798 feet deep, with an average depth of about 648 feet. Geologic materials encountered in all wells are described by drillers as hard gray volcanic or dark rock interbedded with ash of varying color and/or red to brown hard rock. These descriptions are consistent with what we would expect to find in an area mapped as andesitic and basaltic lava flows within a larger geologic formation made up of various volcanic rocks. Geologic logs for all wells within the project recharge area report rocks consistent with the Sonoma Volcanics to depths of approximately 600 ft. Wells 1, 2 and 7 all report green rock or green serpentine with gray shale beginning at depths between 600 and 615 ft deep. This boundary is likely the contact between the Sonoma Volcanics and the underlying basement rocks of the serpentinite (sp) of the Coast Range ophiolite. Reported static water level for all 11 wells ranged between 240 and 565 feet below ground surface with an average depth of 401 feet. In several wells the depths at which water was encountered coincided with layers of ash or tuff and fractured lavas. Well yields reported on Well Completion Reports ranged from 10 to 150 gallons per minute, with an average of 41 gallons per minute. Typically, operational well yields are about half or less compared to yields reported on Well Completion Reports.

The project well, Well 1, is also known as the Corral Well and is located 0.95 miles south of the winery on parcel number 032-010-092. This parcel is owned by Alexa Chappellet et al, an official easement allowing the winery to use this water is included in the 2014 Transient Non-community Water System technical, managerial and financial report by Applied Engineering (Applied Civil Engineering, 2014). The Corral Well was drilled in 2008 to a depth of 710 ft and completed to a depth of 627 ft. The geologic log describes a sequence of clays and gray rock for the first 125 ft, ash and gray rock were encountered between 125 ft and 450 ft, and hard light gray and hard

green and gray rock from 450 ft to 615 ft. The sequence of rocks described to this depth is consistent with the Tsa unit. At 615 ft rocks described as “gray and green shale with streaks of serpentine” are recorded to the bottom of the hole at 710 ft, indicating that they penetrated the basement rocks of the Coast Range ophiolite. Well 1 is screened between 447 ft and 627 ft. Approximately 12 ft of the screened interval is within the serpentinite (sp). Due to the generally poor aquifer characteristics of this rock and the relatively short section of perforated well casing in the serpentinite, the project aquifer is assumed to be within the Sonoma Volcanics.

The well log reports depth to first water as 440 ft and a static water level of 400 ft after development in May 2008. A pump test was performed in August 2011 and reported a pre-pumping water level of 408 ft. After six hours of pumping at rate of 30 gallons per minute the water level had drawn down eight ft to 416 ft and remained stable for the last two hours of the test. Within four minutes after shutting off the pump the water level had recovered to its initial level of 408.

Well 2 is located on a parcel owned by Chappellet Vineyard about 900 ft east of Well 1 and is known as the Vineyard Well. The Vineyard Well was completed in 2014 to a depth of 625 feet and has a static water level of 350 feet below the ground surface. The well is completed in materials consistent with what would be expected in the Tsa unit: “Hard gray fractured rock”, “Hard purple rock” and “Soft green ash”, “Black ash” and “White ash” down to a depth of 600 feet. At 600 feet the driller reports “Green Serpentine with Gray Shale” which is evidence that they penetrated the basement rocks of the Coast Range ophiolite. Screened intervals begin at a depth of 225 ft and alternate every 20 feet with blank casing until the bottom of the well at 625 ft. From 605 to 625 ft the casing is blank while 585 to 605 ft is perforated, therefore only 5 ft of the screened interval is within the serpentinite (sp). Due to the small section of perforated pipe within the rocks of the sp and the generally poor aquifer characteristics of the sp the project aquifer is assumed to be within the Sonoma Volcanics. After four hours of pumping the well driller reported an estimated yield of 30 gallons per minute with a drawdown of 270 ft.

Using the spatial distribution of groundwater levels for the 10 specifically located wells an interpolated groundwater surface was generated using the Kriging method (a procedure fitting a surface to data) in ArcGIS. A contour layer is displayed in Figure 2. It should be noted that the groundwater elevation data used for this interpolation comes from well logs up to 36 years old and may not be representative of current conditions. However, more recent water elevations are generally consistent with older elevations. As shown in Figure 2, the groundwater contours indicate a general flow direction from east to west with a slight ridge of groundwater running east-west along a line from Well 2 to Well 7. This ridge marks a potential divide in the groundwater flow directions, one to the northwest and one to the southwest. Well 1 is located along this ridge due to the nature of the interpolation. A cross section displaying the ground surface, interpolated groundwater surface and well locations is shown in Figure 3.

## Geologic Cross Section

A geologic cross section oriented northwest by southeast is shown in Figure 3 (see Figure 2 for location). The interpolated groundwater surface is displayed along with the approximated contact between Tsa and sp. Depths and casing intervals are also shown for Wells 1, 2 and 7. This representation shows the groundwater table dipping to the northwest at a depth of approximately 400 to 700 feet below ground surface.

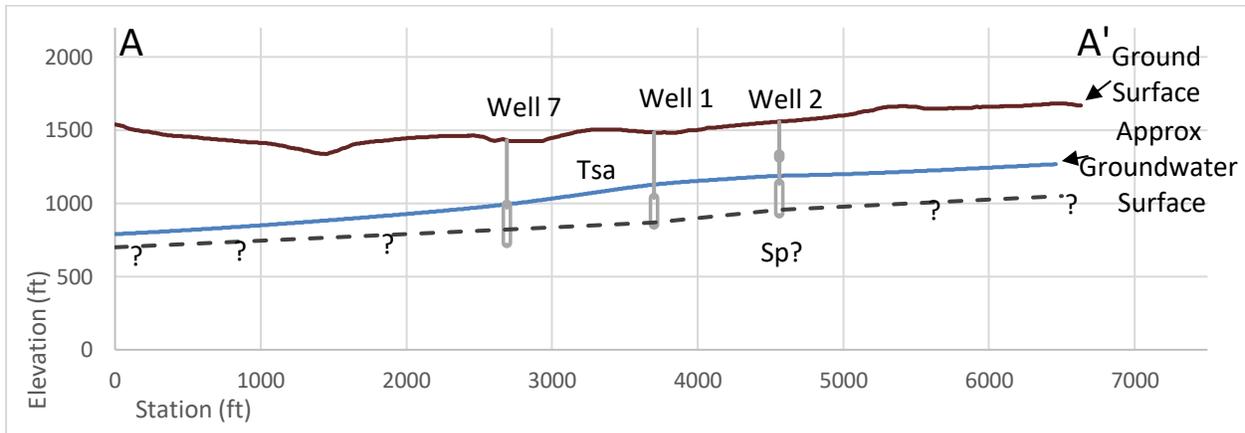


Figure 3: Hydrogeologic cross section A -A' through the vicinity of the project parcel (see Figure 2 for location).

## Project Aquifer

The extent of the project aquifer/project recharge area is defined by surface water drainage patterns and the interpolated groundwater surface. The northern, northwestern and eastern boundaries of the project aquifer are defined by surface drainage divides directing flows towards the main channel that flows through the northeast corner of the winery well parcel. The southern and southwestern boundary extends to include a portion of the drainage to the south of the winery well parcel to include a portion of the interpolated groundwater surface draining to the south that is potentially intersected by Well 1.

The total area of the project aquifer is 459 acres. The recharge area is underlain by the Tsa unit of the Sonoma Volcanics. The project well (Well 1, Corral Well) is screened within the Sonoma Volcanics. Given that depths to groundwater are relatively deep and given that impermeable layers of material including clays are present within the Sonoma Volcanics, the project aquifer is likely confined or semi-confined.

## Water Demand

Within the project recharge area, water demand was estimated for both the existing and proposed conditions. Water use at the winery and vineyards surrounding parcels owned by Chappellet was determined using site details provided by Chappellet and verified using available

satellite imagery. The project recharge area also includes portions of six neighboring parcels. Use on these parcels was estimated using Napa County agricultural and winery GIS database information along with satellite imagery. One additional parcel that has the same ownership and a contiguous vineyard with a parcel intersecting the recharge area was included in the existing water use estimate. Uses within the recharge area include winery use, residential use and irrigation for vineyards and small orchards.

### **Existing Use**

In the existing condition, the winery parcel (APN 032-010-090) contains a residence, a portion of vineyard, a barrel storage building and the winery. The demand of the modestly sized single family residence was 0.5 acre-ft annually; this rate is in the middle of the range provided by Napa County guidance for single family dwellings. The vineyard on the winery parcel part of a larger block of vines that extend onto the adjacent parcel APN 032-010-096 also owned by Chappellet. These vines are irrigated using surface water diversions and do not require groundwater from the project well. Irrigation practices of vineyards on adjacent parcels are discussed later in this report.

The following summary of existing groundwater use focuses on total uses within the project well recharge area (Figure 2), and therefore includes groundwater use estimated for other parcels along with the Chappellet parcels (Tables 3-8). Total existing water use by the Chappellet Winery parcel, served by Well 1, is described in detail below (Table 2).

Currently the winery is permitted to produce 150,000 gallons of wine a year with a total of 24 combined full time and part time employees. Based on Napa County water use guidelines, demand for winery processing water is 2.15 acre-ft per 100,000 gallons of wine while winery domestic and landscaping demand is an additional 0.5 acre-ft per. Annual production of 150,000 gallons gives a total demand of approximately 4 acre-ft. Employee daily use is estimated to be 15 gallons per employee per Napa County. Assuming the 24 employees work five days a week all year or 260 days the total demand equals 0.29 acre-ft annually in addition to the 4 acre-ft required by the winery (Table 2).

Daily tours and tastings at the winery are approved to host a maximum of 40 visitors a day. Assuming 40 visitors a day, 365 days a year this totals to a maximum of 14,600 tasting visitors annually. For marketing events that include on-site catering Chappellet is approved for several events with varying numbers of guests totaling to a maximum of 2,470 guests annually. Napa County guidance assumes a daily water use of 3 gallons per tasting visitor and 15 gallons per marketing events visitors. Using these rates the existing maximum annual demand for all 17,070 visitors to the winery is 0.25 acre-ft. Considering the uses above, the existing water use on the Chappellet Winery parcel totals to 5.01 acre-ft/yr (Table 2).

**Table 2: Existing and proposed groundwater uses associated with the Chappellet Winery Parcel (Well 1)**

	Irrigation Use (acre-ft/yr)	Residential use (acre-ft/yr)	Winery Use (acre-ft/yr)	Employee Use (acre-ft/yr)	Event Use (acre-ft/yr)	Total Use (acre-ft/yr)
<b>Existing Use Chappellet Winery Parcel</b>	0.0	0.50	3.98	0.29	0.25	<b>5.01</b>
<b>Proposed Use Chappellet Winery Parcel</b>	0.0	0.50	6.63	0.36	0.51	<b>8.00</b>

In addition to uses on the Chappellet winery parcel, use on the surrounding parcels within the project recharge area includes three additional residences, landscaping associated with these houses, vineyard, a small orchard, and the Continuum winery. Two residences are large and are assumed to have a demand of 0.75 acre-ft per year the upper limit suggested by Napa County guidance (Table 4). The third residence is located on the winery well parcel and is smaller so a demand of 0.5 acre-ft per year (similar to that of the winery parcel residence) is applied. Lawn and landscaping areas above the first 1,000 ft<sup>2</sup> on these parcels totals to 32,165 ft<sup>2</sup> and 5,050 ft<sup>2</sup> respectively (Table 4).

A total of 88.1 acres of vineyard is located on or connected to parcels with wells within the project recharge area. Of this Chappellet owns 14.2 acres and irrigates with water collected via surface water diversions stored in existing reservoirs. Four existing water rights (A020616, A026508, A027298 and D032686) are registered to Chappellet Vineyard LLC in the California Department of Water Resources database with a total of 134 acre-ft allowed annually. Although the rights allow for the diversion of 134 acre-ft, the existing reservoirs are only able to capture approximately 50 acre-ft. In addition to diversions, 3 acre-ft of water is recycled from winery use and approximately 3 acre-ft of rain water is collected from roofs and stored in the onsite ponds. An additional 93.7 acres of vineyard owned by Chappellet is located on parcels to the north of the recharge area (032-010-090, 098, and 099). These vines are also irrigated using water collected into the reservoirs as mentioned above. Chappellet estimate irrigation demand varies between 30 and 40 acre-ft depending on the season.

Nearly all the water used for irrigation of all Chappellet vineyards is recycled, collected and diverted water; in addition, a very small amount of water from Well 2 may be used at the end of the growing season. Chappellet estimates this amount to be less than 1% of the total irrigation volume. If we assume conservatively that this amount is 1% of the upper end of the annual demand of 40 acre-ft this would be a demand of 0.4 acre-ft (Table 5).

The remaining 73.6 acres of vineyard within the project recharge area are located on three parcels west of the project well (APN's 03.2-010-091, 032-030-043 and 032-030-044) these parcels are all associated with the Continuum Winery. Although the parcel boundary for 032-030-043 does not intersect the recharge area it does have continuous vineyard with the adjacent parcel to the east (APN 032-030-044). To be conservative, it is assumed that this vineyard uses water from a well located within the recharge area. Two reservoirs are located on these parcels and are associated with three appropriative water rights totaling 25 acre-ft annually. Assuming annual vineyard irrigation demand of 0.5 acre-ft per acre per year, the 73.6 acres of vines would require 36.8 acre-ft annually. Although the specific practices are not known for these vineyards it is highly likely that this diverted water is used to irrigate these 73.6 acres of vineyard. The

allotted 25 acre-ft would be sufficient to meet about 68% of the estimated demand of 36.8 acre-ft; it is assumed that the remaining 11.8 acre-ft of vineyard irrigation (equivalent to 23.6 acres of vineyard) is supplied by one of the wells located on the Continuum parcels within the project recharge area.

In addition to the vineyards, 0.7 acres of orchard were identified on a parcel within the recharge area. Napa county guidance lists an annual demand of 4 acre-ft per acre for orchards which results in an annual demand of 2.8 acre-ft for the existing condition.

Water use for the Continuum winery was estimated using information reported in the Napa County Winery GIS shapefile. The current information associated with permit P10-00255-MOD for Continuum shows an annual production of 28,000 gallons with 16 employees which amounts to a total winery demand of 0.93 acre-ft. Tastings are by appointment only and a maximum of 2 visitors/day (728 annually) are allowed. For marketing events a maximum annual count of 450 visitors is listed. Assuming a usage of 3 gallons per visitor for tastings and 15 gallons per visitor for marketing events the maximum visitor use for Continuum is 0.03 acre-ft annually.

Based on these uses, the existing water demand within the project recharge area is estimated to be 26.4 acre-ft/yr (Table 3). Residential water demand is estimated to be 5.97 acre-ft/yr (Table 4), irrigation demand is estimated to be 15 acre-ft/yr (Table 5), winery use is estimated to be 4.72 acre-ft/yr (Table 6) winery guest use is estimated to be 0.28 acre-ft/yr (Table 7), and winery employee use is estimated to be 0.48 acre-ft/yr (Table 8).

**Table 3: Existing and proposed groundwater uses within the project recharge area.**

	Irrigation Use (acre-ft/yr)	Residential use (acre-ft/yr)	Winery Use (acre-ft/yr)	Employee Use (acre-ft/yr)	Event Use (acre-ft/yr)	Total Use (acre-ft/yr)
Existing Use	15.0	5.97	4.72	0.48	0.28	<b>26.4</b>
Proposed Use	15.0	5.97	7.37	0.55	0.54	<b>29.4</b>

**Table 4: Estimated existing and proposed residential groundwater use within the project recharge area.**

Use Category	# of Units	Use per Unit (ac-ft/yr)	Use per 1,000 square feet above first 1,000 (ac-ft/yr)	Annual Water Use (ac-ft/yr)
Oversized Main Residence	2	0.75		1.50
Main Residence	2	0.50		1.00
Lawn	32		0.10	3.22
Other Landscaping	5		0.05	0.25
<b>TOTAL</b>				<b>5.97</b>

**Table 5: Estimated existing and proposed vineyard and orchard irrigation use within the project recharge area.**

Use Category	Number of Acres	Use per Acre (ac-ft/yr)	Supplemental Chappellet Use (ac-ft/yr)	Annual Water Use (ac-ft/yr)
Existing Vineyard Irrigation	23.6	0.5	0.4	12.2
Existing Orchard Irrigation	0.70	4		2.8
<b>TOTAL</b>				<b>15.0</b>
Proposed Irrigation Total	23.6	0.5	0.4	12.2
Proposed Orchard Total	0.70	4.0		2.8
<b>TOTAL</b>				<b>15.0</b>

**Table 6: Estimated existing winery use within the project recharge area.**

Use Category	Annual Production (gal/yr)	Use per 100,000 gal of production	Annual Water Use (ac-ft/yr)
Winery Process Use	178,000	2.15	3.83
Winery Domestic Use	178,000	0.50	0.89
<b>TOTAL</b>			<b>4.72</b>

**Table 7: Estimated existing winery guest use within the project recharge area.**

Visitor Category	# of Visitors	Use per Visitor	Annual Water Use
Tours and Tastings	15,288	3	0.14
Marketing w/ Onsite Catering	2,920	15	0.13
<b>TOTAL</b>			<b>0.28</b>

**Table 8: Estimated existing employee use within the project recharge area.**

Work Category	# of Employees	# Work Days per Year	Use per Employee (gal/day)	Annual Water Use (ac-ft/yr)
Full-time	40	260	15	0.48
<b>TOTAL</b>				<b>0.48</b>

## Proposed Use

In the proposed condition, the Chappellet project will increase wine production by 100,000 gallons for a total annual production of 250,000 gallons. The total number of visitors annually will increase by 21,835 to 38,905. Six new employees will be added for a total of 30 employees. No other uses will change as part of the proposed project. In this condition the estimated water

use will increase by 3.0 acre-ft/yr to 8.0 acre-ft /yr for the project parcel (Table 2) and to 29.4 acre-ft/yr within the project recharge area (Table 3). All increases in groundwater use are from increases in winery processing and domestic use (Table 9), winery guest use (Table 10) and winery employees (Table 11).

**Table 9: Estimated proposed winery use within the project recharge area.**

<b>Use Category</b>	<b>Annual Production</b>	<b>Use per 100,000 gal of</b>	<b>Annual Water Use (ac-ft/yr)</b>
Winery Process Use	278,000	2.15	5.98
Winery Domestic Use	278,000	0.50	1.39
<b>TOTAL</b>			<b>7.37</b>

**Table 10: Estimated proposed winery guest use within the project recharge area.**

<b>Visitor Category</b>	<b># of Vistors</b>	<b>Use per Visitor</b>	<b>Annual Water Use</b>
Tours and Tastings	35,403	3	0.33
Marketing w/ Onsite Catering	4,680	15	0.22
<b>TOTAL</b>			<b>0.54</b>

**Table 11: Estimated proposed employee use within the project recharge area.**

<b>Work Category</b>	<b># of Employees</b>	<b># Work Days per Year</b>	<b>Use per Employee (gal/day)</b>	<b>Annual Water Use (ac-ft/yr)</b>
Full-time	46	260	15	0.55
<b>TOTAL</b>				<b>0.55</b>

## Groundwater Recharge Analysis

The Soil Water Balance (SWB) model developed by the U.S. Geological Survey (Westenbroek et al., 2010) was used to produce a spatially distributed estimate of annual recharge in the vicinity of the project parcel defined by the project recharge area. This model operates on a daily timestep and calculates runoff based on the Natural Resources Conservation Service (NRCS) curve number approach and Actual Evapotranspiration (AET) and recharge based on a modified Thornthwaite-Mather soil-water-balance approach (Westenbroek et al., 2010).

This approach simulates potential recharge from infiltration of precipitation and does not account for the capacity of the project aquifer materials to accept recharge. As discussed above under Limitations, groundwater occurring at significant depths may not be directly related to the recharge generated on the overlying landscape. Significant additional recharge may occur

through streambed infiltration, and/or groundwater inflows from outside the defined project recharge area, however quantifying these recharge components is beyond the scope of this analysis.

## Model Development

The project recharge area is 459 acres and is underlain by both the Sonoma Volcanics and by the Coast Range ophiolite Complex. The model was developed using a 10-meter resolution rectangular grid and water budget calculations were made on a daily time step. Key spatial inputs included a flow direction map developed from the USGS 10-meter resolution Digital Elevation Model (DEM), a land cover dataset developed from the U.S. Forest Service (USFS) CALVEG dataset and modified based on the Napa County shapefile of agricultural areas and interpretation of 2016 aerial photography (Figure 4), a distribution of Hydrologic Soil Groups (A through D classification from lowest to highest runoff potential; Figure 5), and Available Water Capacity (AWC) developed from the NRCS Soil Survey Geographic Database (SSURGO).

A series of model parameters were assigned for each land cover type/soil group combination including a curve number, dormant and growing season interception storage values, and a rooting depth (Table 12). Curve numbers were assigned based on standard NRCS methods. Interception storage values and rooting depths were assigned based on literature values and previous modeling experience. Infiltration rates for hydrologic soil groups A through D were applied based on Cronshey et al. (1986) (Table 13) along with default soil-moisture-retention relationships based on Thornthwaite and Mather (1957) (Figure 6).

Daily precipitation and daily minimum and maximum air temperature data were compiled for the Napa River at Yountville Cross Road Weather Station which is located approximately 3.7 miles southwest of the project parcel (Figure 1). This station was selected because it represents the best available weather station for the project site in terms of proximity, elevation, and exposure.

Based on the PRISM dataset which describes the spatial variations in long-term precipitation for the continental U.S., the 1980 to 2010 mean annual precipitation at the Angwin Weather Station was 31.6 inches versus 38 for the project parcel (PRISM, 2010). The precipitation data was scaled up by a factor of 1.2 to account for the difference in precipitation between the station location and the project parcel. Water Year 2010 was selected to represent average water year conditions for the analysis because it represents a recent year with near long-term average precipitation conditions (40.2 inches at the scaled Napa River at Yountville Cross Road Station). The model was also evaluated for Water Year 2014 to represent drought conditions. Water Year 2014 precipitation at the scaled Napa River at Yountville Cross Road Station was 18.0 inches or approximately 57% of long-term average conditions.

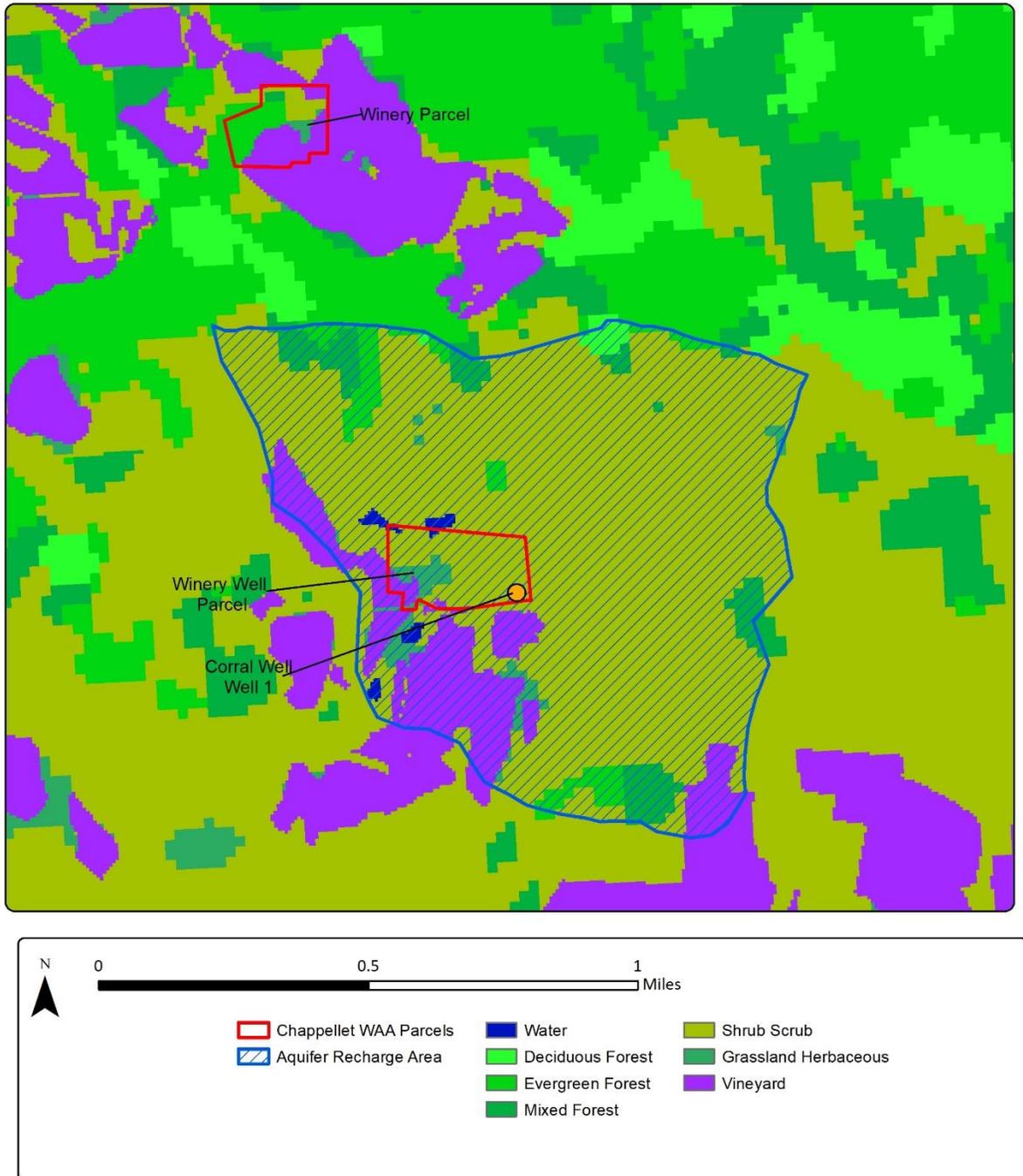


Figure 4: Land cover map used in the SWB model.

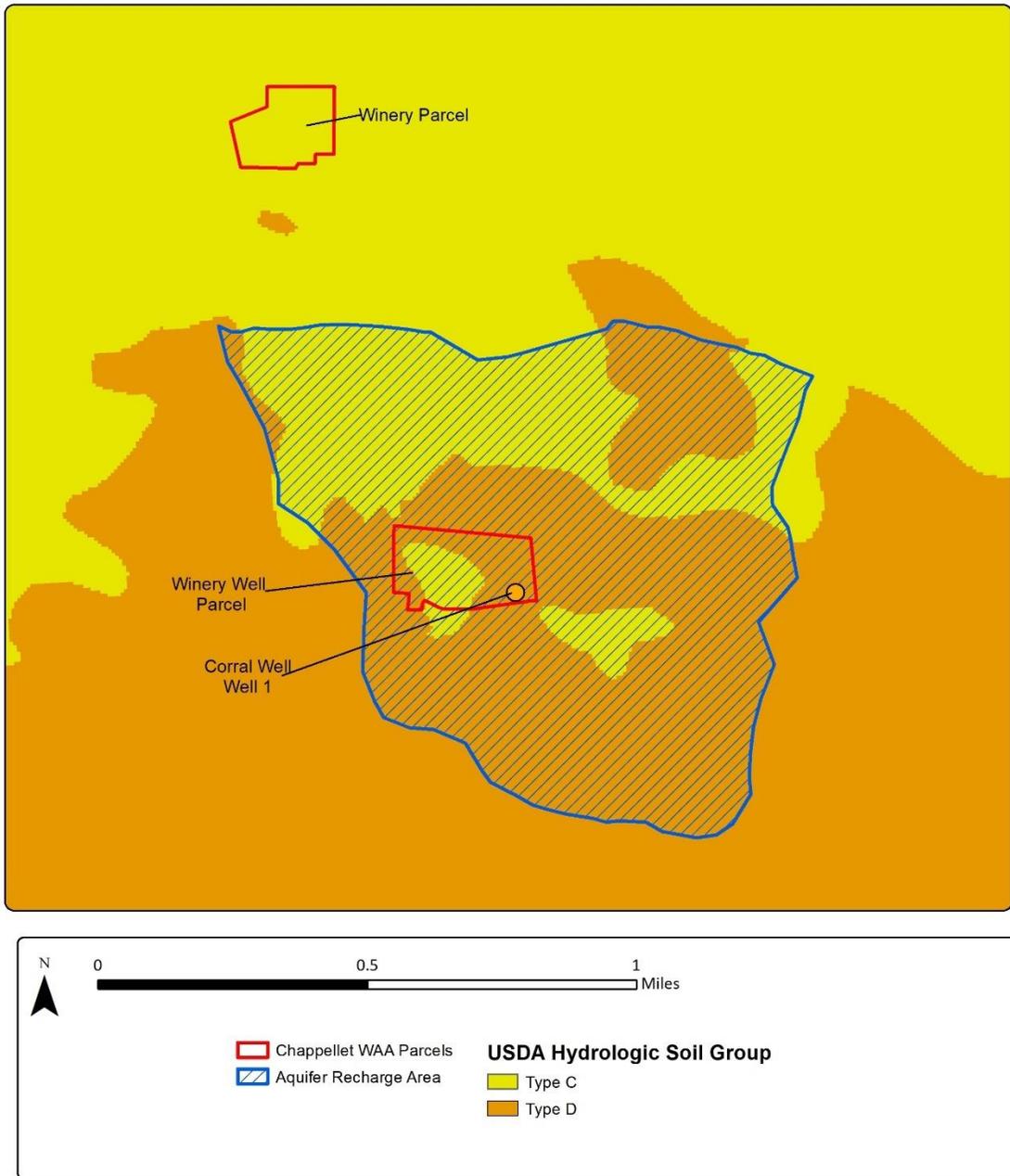


Figure 5: Soil map used in the SWB model.

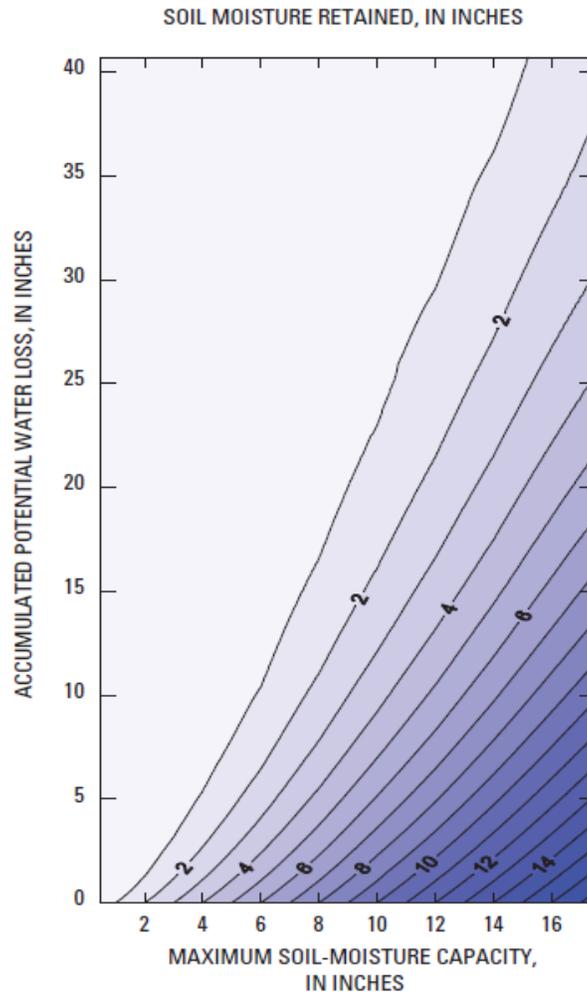


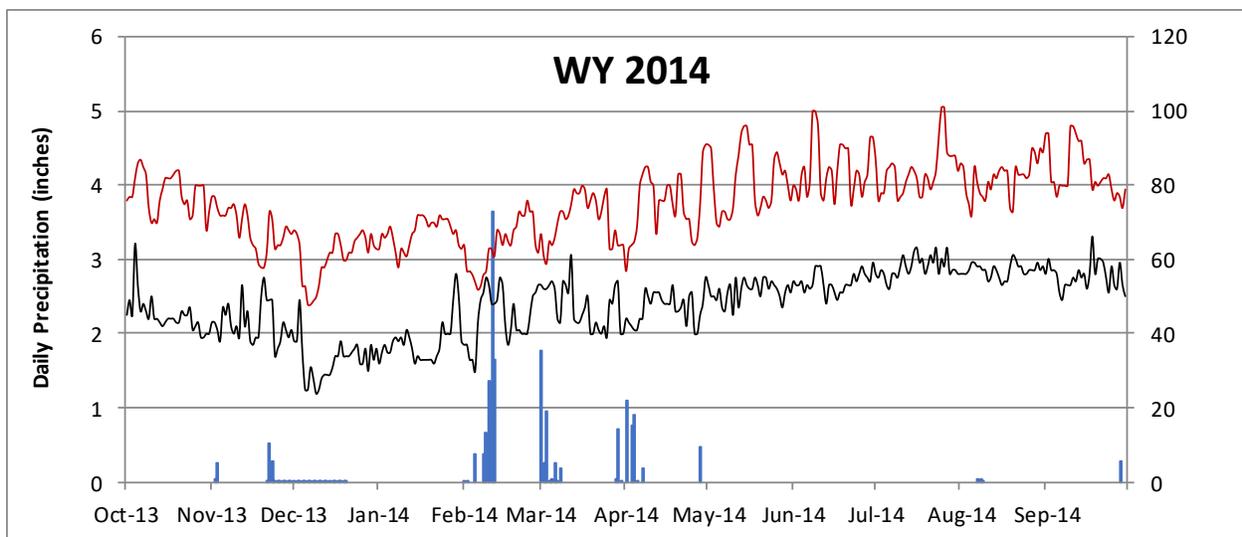
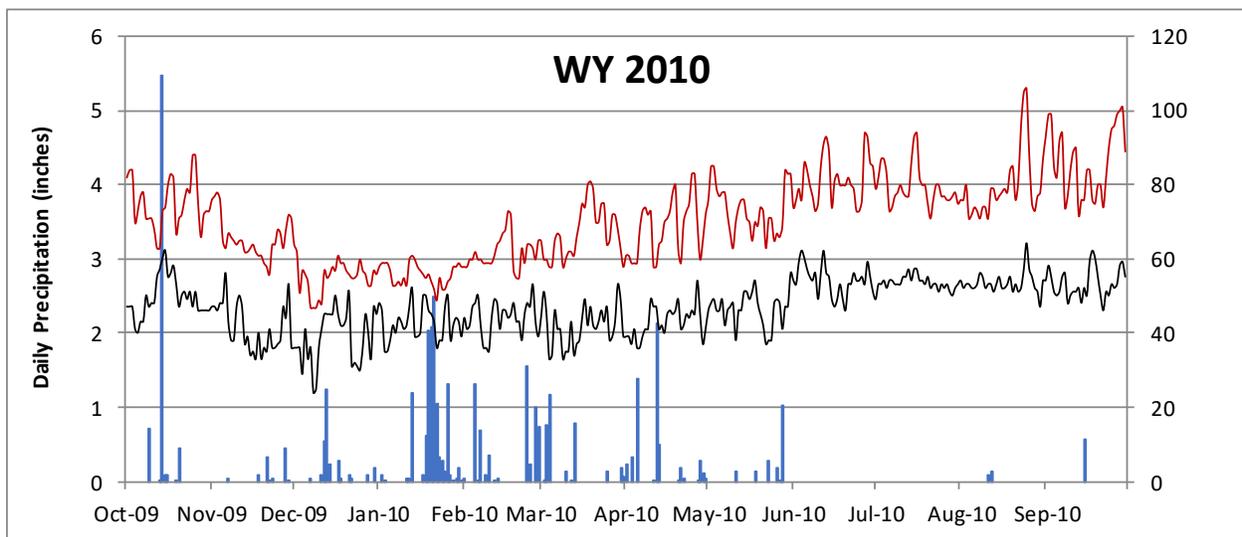
Figure 6: Soil-moisture-retention table (Thornthwaite and Mather, 1957).

Table 12: Soil and land cover properties used in the SWB model

Land Cover	Interception Storage Values		Curve Number			Rooting Depth (ft)		
	Growing Season	Dormant Season	B Soils	C Soils	D Soils	B Soils	C Soils	D Soils
Grassland/Herbaceous	0.005	0.004	58	71	78	1.1	1.0	1.0
Deciduous Forest	0.050	0.020	55	70	77	5.1	4.9	4.7
Evergreen Forest	0.050	0.050	55	70	77	4.2	4.0	3.9
Mixed Forest	0.050	0.035	55	70	77	4.7	4.5	4.3
Scrub/Shrub	0.080	0.015	48	65	73	2.8	2.7	2.6
Vineyard	0.080	0.015	61	75	81	2.1	2.0	1.9
Water	0.000	0.000	100	100	100	0.0	0.0	0.0

**Table 13: Infiltration rates for NRCS hydrologic soil groups (Cronshey et al., 1986)**

Soil Group	Infiltration Rate (in/hr)
A	> 0.3
B	0.15 - 0.3
C	0.05 - 0.15
D	<0.05



**Figure 7: Daily precipitation (blue bars) and minimum (black lines) and maximum (red lines) air temperatures used in the SWB model.**

## Results

The simulated Water Year 2010 (average water year) recharge results indicate that recharge varied across the project recharge area from 1 to 11.5 inches, excluding areas classified as water where the model assumes zero recharge (Figure 8). Spatially averaged over the project recharge area, recharge accounted for 4.9 of the 40.2 inches (12%) of precipitation in 2010. The simulated Water Year 2014 (dry water year) recharge results indicate that recharge varied across the project recharge area from near zero to 6.7 inches (Figure 9). Spatially averaged over the project recharge area, only 2.5 of the 18 inches of precipitation (14%) was recharge. Recharge as a percentage of annual precipitation ranged from 14% in the average water year to 7% in the dry water year (Table 14).

Groundwater recharge estimates can also be expressed as a total volume by multiplying the calculated recharge by the project aquifer recharge area of 459 acres. This calculation yields an estimate of total recharge of 95.6 acre-ft/yr during the drought conditions of Water Year 2014 and of 168.5 acre-ft/yr for the average Water Year of 2010.

LSCE (2013) estimated recharge based on water balance modeling in several watersheds in the county underlain primarily by Sonoma Volcanics (Milliken Creek, Tulucay Creek, Conn Creek and Napa River above Calistoga). The recharge estimates in these watersheds ranged from 5 to 21% of annual precipitation. The recharge estimates produced from this study (12% of average water year precipitation) using SWB fall within the range of the LSCE estimates for larger watershed areas underlain by Sonoma Volcanics and appear to be reasonable.

**Table 14: Summary of recharge results from the SWB model.**

	2010 Normal Year		2014 Dry Year	
	inches	% of precip	inches	% of precip
Precipitation	40.2		18.0	
Recharge	4.9	12%	2.5	14%

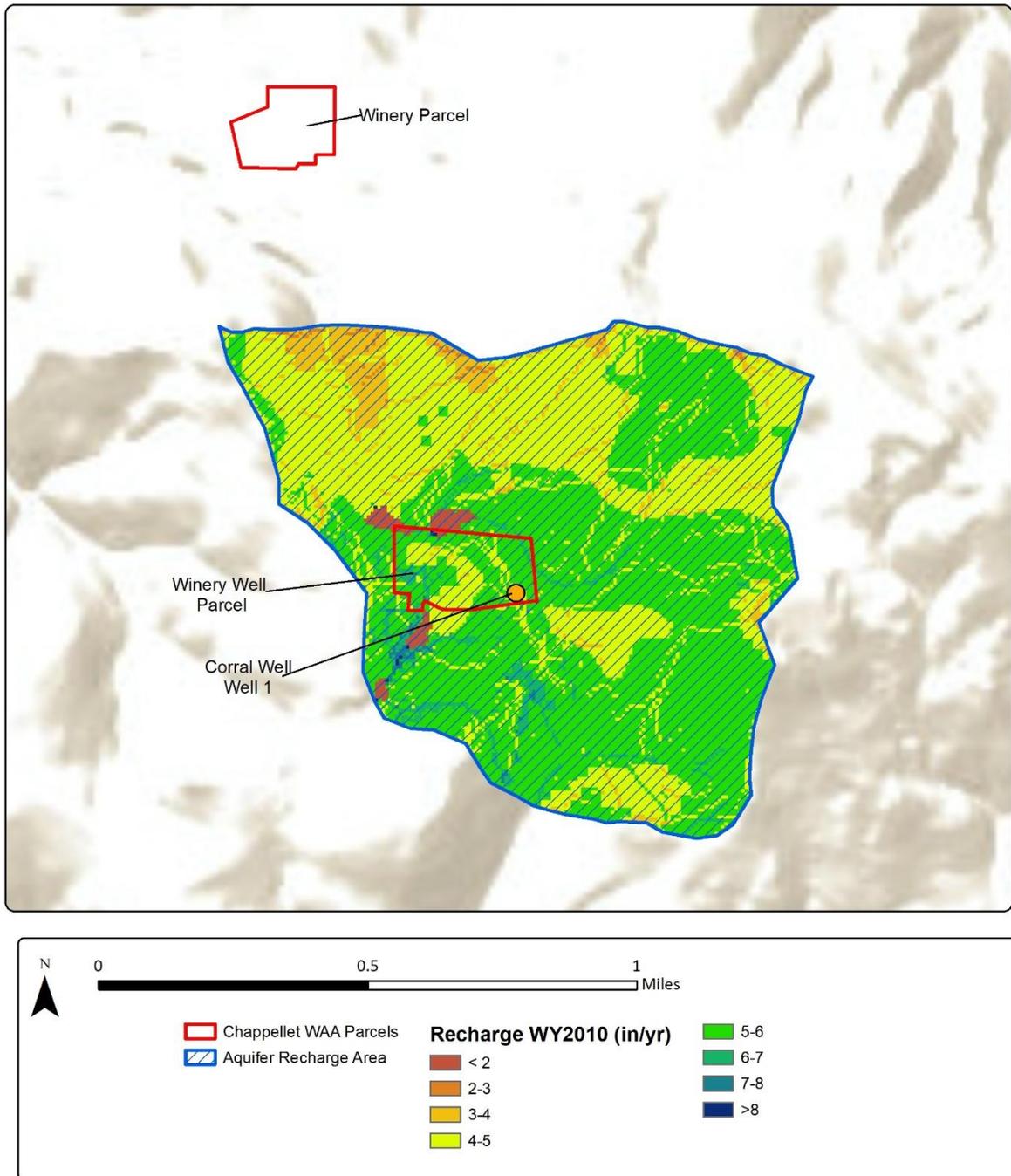


Figure 8: WY 2010 recharge simulated with the SWB model.

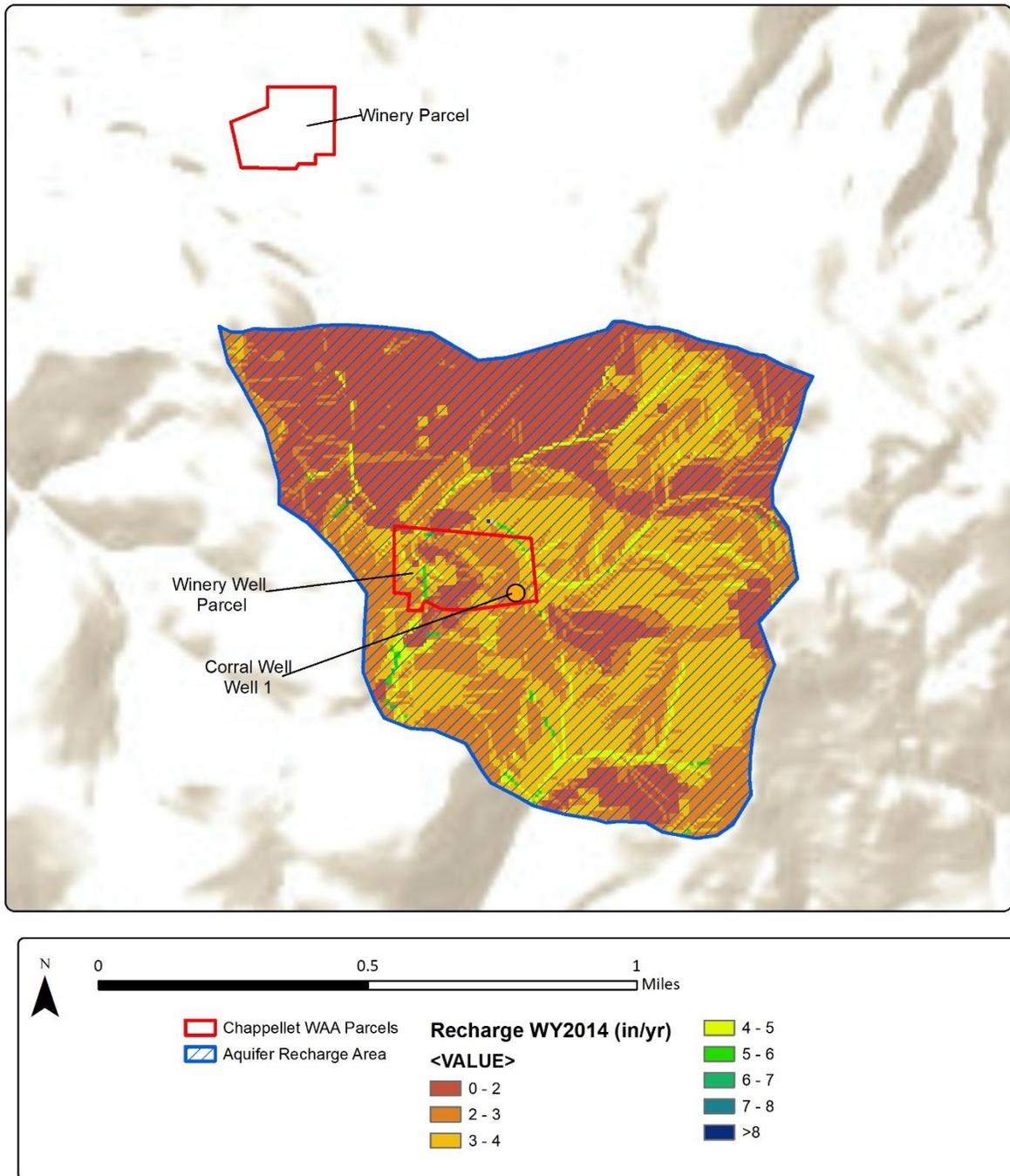


Figure 9: WY 2014 recharge simulated with the SWB model.

## Comparison of Water Demand and Groundwater Recharge

The total proposed groundwater use for the project recharge area is estimated to be 29.4 ac-ft/yr combined for seven parcels including the project parcel. Estimated groundwater use in the project recharge area is equivalent to 17% of the estimated average water year groundwater recharge of 168.3 acre-ft/yr and 31% of the estimated dry water year recharge of 95.6 acre-ft/yr (Table 15). At the project scale the proposed groundwater use for the Chappellet Winery is estimated to be 8 acre-ft/yr (Table 2) which is equivalent to 5% of the estimated average water year recharge and 8% of the estimated dry water year recharge. These comparisons indicate that there is a substantial surplus of groundwater resources in terms of estimated average annual groundwater recharge to the project recharge area. Given the magnitude of this surplus, the 3.0 acre-ft/yr increase in water use associated with the proposed increased winery production, employees and guest attendance is highly unlikely to result in reductions in groundwater levels or depletion of groundwater resources over time.

**Table 15: Comparison of proposed water use to average and dry year groundwater recharge in the project recharge area.**

Total Proposed Demand (ac-ft/yr)	Average Water Year (2010)			Dry Water Year (2014)		
	Recharge (ac-ft/yr)	Recharge Surplus (ac-ft/yr)	Demand as % of Recharge	Recharge (ac-ft/yr)	Recharge Surplus (ac-ft/yr)	Demand as % of Recharge
29.4	168.3	138.9	17%	95.6	66.2	31%

## Well Interference Analysis

There are no non-project wells within 500 feet of the project well. The nearest neighboring well that could be precisely located (Well 4) is 580 feet southwest of Well 1 (Figure 2). Based on the WAA guidance document, a Tier 2 well interference analysis is not required given that all non-project wells are located greater than 500-feet from the project wells.

## Summary

Application of the Soil Water Balance model (SWB) to the project recharge area revealed that average water year recharge was approximately 4.9 inches/yr or 168.3 acre-ft/yr. During drought conditions, recharge was significantly lower at 2.5 inches/yr or 95.6 acre-ft/yr. The total proposed water use for the project aquifer recharge area is estimated to be 29.4 acre-ft/yr. This represents about 17% of the mean annual recharge indicating that the project is unlikely to result in declines in groundwater elevations or depletion of groundwater resources over time. The nearest neighboring well is located more than 500-ft from the project well indicating that a Tier 2 well interference analysis is not required.

## References

Cronshey, R., McCuen, R., Miller, N., Rawls, W., Robbins, S., and Woodward, D., 1986. Urban hydrology for small watersheds - TR-55 (2nd ed.), Washington, D.C., U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Technical Release 55, 164 p.

Department of Water Resources (DWR), 1982. Evaluation of Ground Water Resources: Sonoma County. California Department of Water Resources in Cooperation with the County of Sonoma.

Graymer, R.W., Brabb, E.E., Jones, D.L., Barnes, J., Nicholson, R.S., and Stamski, R.E., 2007. Geologic Map and Database of Eastern Sonoma and Western Napa Counties, California. Pamphlet to accompany Scientific Investigations Map 2956. U.S. Department of the Interior U.S. Geological Survey

Luhdorff and Scalmanini Consulting Engineers (LSCE) and MBK Engineers, 2013. Updated hydrogeologic conceptualization and characterization of conditions. Prepared for Napa County.

PRISM, 2010. 30 arcsecond resolution gridded total precipitation data for the conterminous United States, PRISM Climate Group, Oregon State University, [www.prismclimate.org](http://www.prismclimate.org).

Thornthwaite, C.W., and Mather, J.R., 1957. Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance, Publications in Climatology, v. 10, no. 3, pgs 185-311.

Weaver, C.E., 1949. Geology of the Coast Ranges immediately north of the San Francisco Bay Region, California, California Department of Natural Resources, Division of Mines, Bulletin 149.

Westenbroek, S.M., Kelson, V.A., Dripps, W.R., Hunt R.J., and Bradbury, K.R., 2010. SWB - A Modified Thornthwaite-Mather Soil-Water-Balance Code for Estimating Groundwater Recharge, U.S. Geological Survey Techniques and Methods 6-A31, 60 pgs.

**APPENDIX A**  
**WELL COMPLETION REPORTS**

ORIGINAL  
File with DWR

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**

Refer to Instruction Pamphlet

No. **1073634**

DWR USE ONLY — DO NOT FILL

**Well 1**

07N104W08

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

Page \_\_\_ of \_\_\_

Owner's Well No. \_\_\_\_\_

Date Work Began 05/09/2008, Ended 05/15/2008

Local Permit Agency Napa County

Permit No. E07-00092 Permit Date 01/01/2008

**GEOLOGIC LOG**

ORIENTATION (°)		XX	VERTICAL	HORIZONTAL	ANGLE	(SPECIFY)
DEPTH FROM SURFACE		DRILLING METHOD	FLUID			
Ft.	to Ft.	DESCRIPTION				
Describe material, grain size, color, etc.						
0	38	Rotary	Air		Hard Gray Clay	
38	42				Brown Clay & Gray Rock	
42	125				Hard Gray Rock	
125	295				Hard Gray Rock & Yellow Ash	
295	330				Red Ash	
330	375				Red Ash & Gray Rock	
375	435				Hard Gray Rock	
435	450				Red Ash	
450	510				Hard Light Gray Rock	
510	615				Hard Green & gray Rock	
615	710				Gray & Green Shale with streaks of Serpentine	
TOTAL DEPTH OF BORING		<u>710</u> (Feet)				
TOTAL DEPTH OF COMPLETED WELL		<u>627</u> (Feet)				

**WELL LOCATION**

Address 1581 Sage Canyon Road

City Saint Helena

County Napa

APN Book 032 Page 010 Parcel 074-000

Township 10 Range \_\_\_\_\_ Section \_\_\_\_\_

Lat \_\_\_\_\_ Deg. Min. Sec. N Long \_\_\_\_\_ Deg. Min. Sec. W

**LOCATION SKETCH**

**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)**

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.**

**WATER LEVEL & YIELD OF COMPLETED WELL**

DEPTH TO FIRST WATER 410 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 400 (Ft.) & DATE MEASURED 5-15-08

ESTIMATED YIELD 45 (GPM) & TEST TYPE QUALITY

TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 4K (Ft.) GPM at day of Test

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

DEPTH FROM SURFACE	BORE-HOLE DIA. (Inches)	CASING (S)							
		TYPE (°)				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
Ft.	to Ft.	BLANK	SCREEN	CONDUIT	FILL PIPE				
0	50	12	✓			Plastic	6	PL80	
50	447	9	✓			"	"	"	
447	627	9	✓			"	"	.072	

DEPTH FROM SURFACE	ANNULAR MATERIAL TYPE				
		CE-MENT (°)	BEN-TONITE (°)	FILL (°)	FILTER PACK (TYPE/SIZE)
Ft.	to Ft.	(°)	(°)	(°)	(TYPE/SIZE)
0	53	✓			
53	627				Well Pack Gravel

**ATTACHMENTS (°)**

Geologic Log

Well Construction Diagram

Geophysical Log(s)

Soil/Water Chemical Analyses

Other \_\_\_\_\_

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**

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

NAME Pulliam Well Exploration

(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 5110 State Highway 128 Napa, CA 94558

CITY STATE ZIP

Signed Tom Pulliam DATE SIGNED 5-30-08 808-508 C-57 LICENSE NUMBER



08 E/F  
M/L

ORIGINAL  
File with DWR

STATE OF CALIFORNIA  
THE RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES  
WATER WELL DRILLERS REPORT

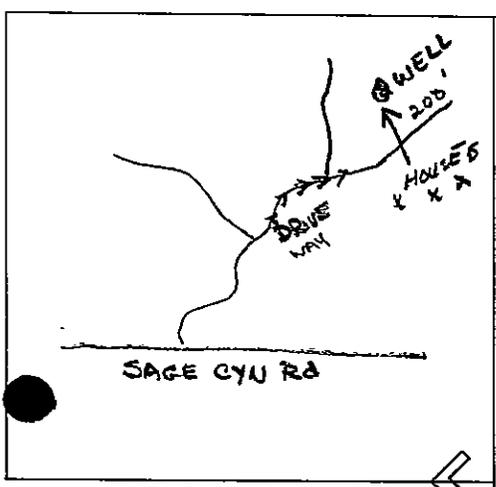
Do not fill in

No. 119501

No. of Intent No. \_\_\_\_\_  
Local Permit No. or Date \_\_\_\_\_

State Well No. \_\_\_\_\_  
Other Well No. 07NO4W08

(2) LOCATION OF WELL (See instructions):  
County Napa Owner's Well Number 32-010-27  
Well address if different from above \_\_\_\_\_  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
Distance from cities, roads, railroads, fences, etc. \_\_\_\_\_



(3) TYPE OF WORK:  
New Well  Deepening   
Reconstruction   
Reconditioning   
Horizontal Well   
Destruction  (Describe destruction materials and procedures in Item 12)  
(4) PROPOSED USE:  
Domestic   
Irrigation   
Industrial   
Test Well   
Stock   
Municipal   
Other

(12) WELL LOG: Total depth 640 ft. Depth of completed well 640 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	25	topsoil-gray rock
25	50	gray & red rock-med hard
50	100	gray rock hard
100	175	gray rock stringers brwn clay
175	200	gray red & brown rock-med hard
200	275	brown black & gray rock-med hard
275	300	red rock-med hard
300	325	red black green & brown rock-med hard
325	375	black brown rock-med hard fract
375	450	black brown & red rock fract-med hard
450	475	black red rock stringers-green hard fract
475	575	gray green red brown black rock med hard fract
575	600	gray & black rock-med hard
600	620	green red & black rock
620	640	black gray & green rock-med hard

(5) EQUIPMENT:  
Rotary  Reverse   
Cable  Air   
Other  Bucket

(6) GRAVEL PACK:  
Yes  No  Size \_\_\_\_\_  
Diameter of bore 8 1/2  
Packed from \_\_\_\_\_ to \_\_\_\_\_ ft.

(7) CASING INSTALLED:  
Steel  Plastic  Concrete

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	420	6	160	420	640	1/8 x 3

(8) PERFORATIONS:  
Type of perforation or size of screen \_\_\_\_\_

(9) WELL SEAL:  
Was surface sanitary seal provided? Yes  No  If yes, to depth 21 ft.  
Were strata sealed against pollution? Yes  No  Interval \_\_\_\_\_ ft.  
Method of sealing cement

(10) WATER LEVELS:  
Depth of first water, if known 475 ft.  
Standing level after well completion 450 ft.

(11) WELL TESTS:  
Was well test made? Yes  No  If yes, by whom? driller  
Type of test Pump  Bailer  Air lift   
Depth to water at start of test 450 ft. At end of test \_\_\_\_\_ ft.  
Gage 10 gal/min after \_\_\_\_\_ hours Water temperature \_\_\_\_\_  
Chemical analysis made? Yes  No  If yes, by whom? \_\_\_\_\_  
Was electric log made? Yes  No  If yes, attach copy to this report

Work started 3/19 1982 Completed 4/7 1982

WELL DRILLER'S STATEMENT:  
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED J. Doshier (Well Driller)  
NAME Doshier & Gregson Drilling, Inc  
(Person, firm, or corporation) (Typed or printed)  
Address 5365 Napa Vallejo Hwy  
Vallejo, Ca Zip 94589  
City \_\_\_\_\_ License No. 294001 Date of this report 4/9/82

ORIGINAL  
File with DWR

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

DWR USE ONLY DO NOT  
**Well 4**  
07 NOMINO 8  
STATE WELL NO./STATION NO.  
LATITUDE LONGITUDE  
APN/TRS/OTHER

Page \_\_\_ of \_\_\_

Owner's Well No. \_\_\_\_\_

No. **0945281**

Date Work Began 05/07/2010, Ended 05/14/2010

Local Permit Agency Napa County

Permit No. E10-00143 Permit Date 05/06/2010

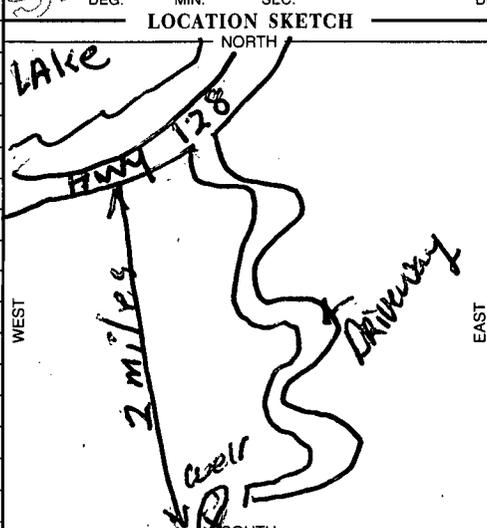
**GEOLOGIC LOG**

**WELL OWNER**

ORIENTATION ( )  VERTICAL  HORIZONTAL  ANGLE \_\_\_\_\_ (SPECIFY)  
DRILLING METHOD Rotary FLUID Air

DEPTH FROM SURFACE		DESCRIPTION <i>Describe material, grain size, color, etc.</i>
Ft.	to Ft.	
0	3	Red Dirt & Rocks
3	20	Hard Gray Rocks & Clay
20	120	Yellow Clay & Black Ash
120	240	Red & Black Ash
240	280	Red Ash
280	400	Hard Dark Gray Rock
400	420	Black Ash
420	440	Red Ash
440	470	Black Ash
470	500	Black, Red Ash
500	680	Dark Gray Fractured Rock
680	760	Dark Gray Rock & Black Fractured rock
760	800	Hard Green Rock

Address 1683 Sage Canyon Road  
City St. Helena  
County Napa  
APN Book 032 Page 010 Parcel 061-000  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
Lat \_\_\_\_\_ DEG. MIN. SEC. N Long \_\_\_\_\_ DEG. MIN. SEC. W



**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 \_\_\_\_\_  
REMEDICATION \_\_\_\_\_  
OTHER (SPECIFY) \_\_\_\_\_

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.**

**WATER LEVEL & YIELD OF COMPLETED WELL**

DEPTH TO FIRST WATER 490 (Ft.) BELOW SURFACE  
DEPTH OF STATIC WATER LEVEL 420 (Ft.) & DATE MEASURED 5-14-10  
ESTIMATED YIELD 35 (GPM) & TEST TYPE Air Lift  
TEST LENGTH 5 (Hrs.) TOTAL DRAWDOWN UK (Ft.) GPM at day of test  
*\* May not be representative of a well's long-term yield.*

TOTAL DEPTH OF BORING 900 (Feet)  
TOTAL DEPTH OF COMPLETED WELL 798 (Feet)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	CASING (S)						DEPTH FROM SURFACE Ft. to Ft.	ANNULAR MATERIAL TYPE					
		TYPE ( )				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)		GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	CE-MENT ( )	BEN-TONITE ( )	FILL ( )	FILTER PACK (TYPE/SIZE)
0	55	12 1/4	✓											
55	500	9	✓				"	"	"					
500	798	9	✓				"	"	"	0072				Well Pack Gravel

- ATTACHMENTS ( )**
- Geologic Log
  - Well Construction Diagram
  - Geophysical Log(s)
  - Soil/Water Chemical Analyses
  - Other \_\_\_\_\_
- ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

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

NAME Pulliam Well Exploration Inc  
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)  
5110 State Highway 128 Napa CA 94558  
ADDRESS \_\_\_\_\_ CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
Signed Tom Pulliam 5-19-10 808-508  
C-57 LICENSED WATER WELL CONTRACTOR DATE SIGNED C-57 LICENSE NUMBER

ORIGINAL  
File with DWR

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**

DWR USE ONLY - DO NOT  
07N04W08  
STATE WELL NO./STATION NO.  
LATITUDE LONGITUDE  
APN/TRS/OTHER

Page \_\_\_ of \_\_\_

Owner's Well No. \_\_\_\_\_

No. **0938182**

Date Work Began **03/21/2007**, Ended **03/29/2007**

Local Permit Agency **Napa County**

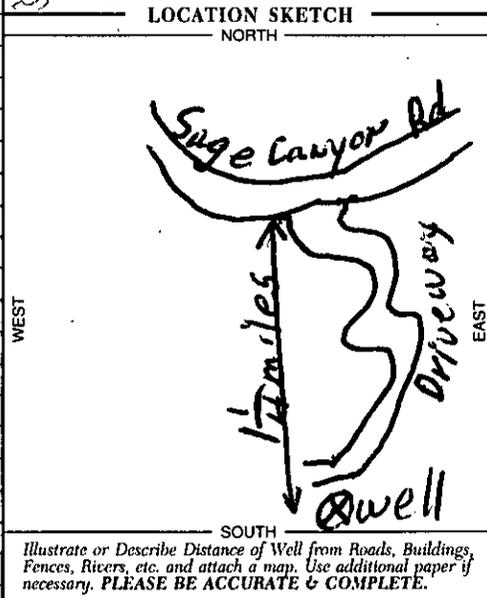
Permit No. **E67-00091** Permit Date **03/12/2007**

**GEOLOGIC LOG**

DEPTH FROM SURFACE		DESCRIPTION
Ft.	to Ft.	
0	13	Brown Clay & Gray Rock
13	30	Red Clay & Red Ash
30	125	Hard Gray, Red & Brown Ash
125	215	Hard Gray Volcanic Rock
215	225	Red Ash
225	340	Green & Black Ash, Yellow Clay
340	360	Red Ash & Red Clay
360	500	Hard Gray & Black Rock, some Yellow Ash
500	512	Red Ash
512	630	Gray Rock
630	655	Gray Rock & Gray Clay
655	715	Green & Gray Ash
715	730	White Ash
730	750	Gray & Green Shale
750	790	Green Shale

TOTAL DEPTH OF BORING **790** (Feet)  
TOTAL DEPTH OF COMPLETED WELL **750** (Feet)

**WELL LOCATION**  
Address **1683 Sage Canyon Road**  
City **Saint Helena**  
County **Napa**  
APN Book **032** Page **010** Parcel **061-000**  
Township **00** Range **00** Section **00**  
Lat. **38** DEG. **00** MIN. **00** SEC. **N** Long. **122** DEG. **00** MIN. **00** SEC. **W**



**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 \_\_\_\_\_  
REMEDICATION \_\_\_\_\_  
OTHER (SPECIFY) \_\_\_\_\_

**WATER LEVEL & YIELD OF COMPLETED WELL**  
DEPTH TO FIRST WATER **490** (Ft.) BELOW SURFACE  
DEPTH OF STATIC WATER LEVEL **460** (Ft.) & DATE MEASURED **3-29-07**  
ESTIMATED YIELD **25** (GPM) & TEST TYPE **Air LIFT**  
TEST LENGTH **3** (Hrs.) TOTAL DRAWDOWN **UK** (Ft.) GPM at day of test  
\* May not be representative of a well's long-term yield.

DEPTH FROM SURFACE	BORE-HOLE DIA. (Inches)	CASING (S)						
		TYPE (✓)				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS
Ft.	to Ft.	BLANK	SCREEN	CONDUIT	FILL PIPE			
0	30	11	✓			Plastic	6	F480
30	300	9	✓			"	"	"
300	750	9	✓			"	"	0032

DEPTH FROM SURFACE	ANNULAR MATERIAL				
	TYPE				
Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	26	✓			
26	750				Well Pack Gravel

**ATTACHMENTS (✓)**  
 — Geologic Log  
 — Well Construction Diagram  
 — Geophysical Log(s)  
 — Soil/Water Chemical Analyses  
 — Other \_\_\_\_\_  
 ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

**CERTIFICATION STATEMENT**  
 I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.  
 NAME **Pulliam Well Exploration**  
 (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)  
 ADDRESS **5110 Highway 128 Napa CA 94558**  
 CITY STATE ZIP  
 Signed **Jam Pulliam** DATE SIGNED **4-1-07** 808-508  
 C-57 LICENSED WATER WELL CONTRACTOR C-57 LICENSE NUMBER

ORIGINAL  
File with DWR

Page 1 of 1

Owner's Well No. 1

Date Work Began 2/27/95, Ended 3/31/95

Local Permit Agency Napa County Environmental Health

Permit No. 38402 Permit Date 2/17/95

STATE OF CALIFORNIA  
WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 547433

DWR USE ONLY - DO NOT WRITE  
07104W08  
STATE WELL NO./STATION NO.  
LATITUDE LONGITUDE  
APN/TRS/OTHER

Well 6

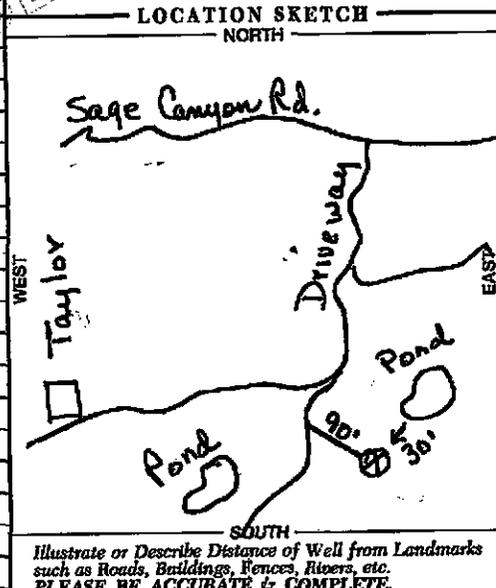
GEOLOGIC LOG

ORIENTATION ( )  VERTICAL  HORIZONTAL  ANGLE  (SPECIFY)

DEPTH TO FIRST WATER (Fl.) BELOW SURFACE

DEPTH FROM SURFACE		DESCRIPTION <i>Describe material, grain size, color, etc.</i>
Ft.	to Ft.	
0	5	Boulders
5	20	Gray rock fract.
20	40	Red rock soft
40	55	Gray rock, brown soil
55	70	Black rock, stringers brown soft
70	85	Lt brown and black rock soft
85	100	Dk brown rock soft
100	115	Brown & black rock soft
115	145	Dk red, black & brown rock hard
145	160	Black & red rock soft
160	175	Black, Brown & red rock fract.
175	190	Black, dk red rock fract med
190	220	Gray, red & black rock fract.
220	250	Gray rock hard fract.
250	280	Gray & black rock hard fract.
280	295	Gray & red rock hard & fract.
295	310	Gray, black & red rock fract.
310	355	Gray, black & brown rock hard fract.
355	400	Gray & brown rock hard fract.
400	415	Red, black, brown, gray rock hard
415	445	Gray rock hard & fract.
445	460	Black, brown & gray rock fract hard
460	505	Black rock fract & hard
505	550	Gray, black rock hard fract.
550	605	Gray rock stringers black hard
605	625	Black & gray rock med hard
625	665	Gray rock stringers black med

WELL LOCATION  
Address 1677 Sage Canyon Road  
City St. Helena  
County Napa  
APN Book 32 Page 010 Parcel 61  
Township Range Section  
Latitude Longitude  
NORTH WEST  
DEG. MIN. SEC. DEG. MIN. SEC.



ACTIVITY ( )  
 NEW WELL  
MODIFICATION/REPAIR  
 Deepen  
 Other (Specify)  
DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")  
PLANNED USE(S) ( )  
 MONITORING  
WATER SUPPLY  
 Domestic  
 Public  
 Irrigation  
 Industrial  
"TEST WELL"  
CATHODIC PROTECTION  
OTHER (Specify)

DRILLING METHOD Air Rotary FLUID Wter foam  
WATER LEVEL & YIELD OF COMPLETED WELL  
DEPTH OF STATIC WATER LEVEL 400 (Fl.) & DATE MEASURED 3/30/95  
ESTIMATED YIELD\* 20 (GPM) & TEST TYPE Air  
TEST LENGTH 5 (hrs.) TOTAL DRAWDOWN complete  
\* May not be representative of a well's long-term yield.

TOTAL DEPTH OF BORING 665 (Feet)  
TOTAL DEPTH OF COMPLETED WELL 620 (Feet)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	CASING(S)							DEPTH FROM SURFACE Fl. to Ft.	ANNULAR MATERIAL					
		TYPE ( )				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS		SLOT SIZE IF ANY (Inches)	TYPE				
		BLANK	SCREEN	DRY	DUCTOR				FILL PIPE				CE- MENT ( )	BEN- TONITE ( )	FILL ( )
620	420		X				I-C-1	6	F-480	.032	665	30		X	Pea gravel
420	1		X				I-C-1	6	F-480		30	29		X	
2	1	12 3/4			X						29	1	X		

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 Doshier-Gregson Inc. 220  
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)  
5365 Napa Valjejo Highway, American Canyon, CA. 94589  
ADDRESS CITY STATE ZIP  
Sign Raymond Stebster 3/30/95 258826  
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

**ORIGINAL**  
File with DWR

STATE OF CALIFORNIA  
THE RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES  
**WATER WELL DRILLERS REPORT**

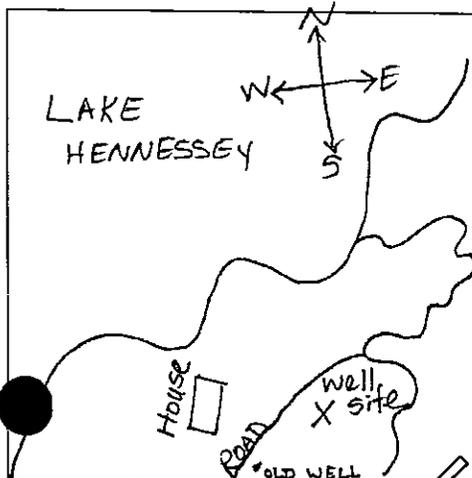
Well 7  
Do not fill in

No. 120020

Permit No. or Date \_\_\_\_\_

State Well No. \_\_\_\_\_  
Other Well No. 07N04W08

(2) LOCATION OF WELL (See instructions):  
County Napa Owner's Well Number 032-010-27  
Well address if different from above \_\_\_\_\_  
Township 07N Range 04W Section 08  
Distance from cities, roads, railroads, fences, etc. \_\_\_\_\_



(3) TYPE OF WORK:

- New Well  Deepening
  - Reconstruction
  - Reconditioning
  - Horizontal Well
  - Destruction  (Describe destruction materials and procedures in Item 12)
- (4) PROPOSED USE:
- Domestic
  - Irrigation
  - Industrial
  - Test Well
  - Stock
  - Municipal
  - Other

(12) WELL LOG: Total depth 710 ft. Depth of completed well 700 ft.  
from ft. to ft. Formation (Describe by color, character, size or material)

0	-	30	Br. rock hard
30	-	75	Red & Black rock m-hard
75	-	90	Black rock some red hard
90	-	148	Black rock hard to m-hard
148	-	206	Red & Black rock m-hard
206	-	237	Black & brown rock m-hard
237	-	263	Black & br. some stringers of red rock
263	-	285	Black & hard green rock stringers of brown & red rock
285	-	340	Black rock hard
340	-	427	Red rock with hard stringers of black rock
427	-	450	Black rock with hard stringers of green rock
450	-	464	Red rock
464	-	604	Hard black rock fractured
604	-	611	Red rock soft
611	-	670	Green rock soft
670	-	695	Green rock with m-hard stringers of grey rock
695	-	710	Soft green rock

(5) EQUIPMENT:

Rotary  Reverse  Air  Bucket   
Cable  Diameter of bore 12 1/2"  
Other  Roped from 25 to 700 ft.

(6) GRAVEL PACK:

Yes  No  Size 12"  
Type of perforation or size of screen \_\_\_\_\_

(7) CASING INSTALLED:

Steel  Plastic  Concrete

(8) PERFORATIONS:

From ft.	To ft.	Dia. in.	Cage or Wall	From ft.	To ft.	Slot size
0	440	6	200	440	460	.032
460	480	6	200	480	580	.032
580	600	6	200	600	700	.032

(9) WELL SEAL:

Was surface sanitary seal provided? Yes  No  If yes, to depth 25 ft.  
Were strata sealed against pollution? Yes  No  Interval \_\_\_\_\_ ft.  
Method of sealing Bentonite & Concrete

Work started 12-16 19 90 Completed 1-14 19 91

(10) WATER LEVELS:

Depth of first water, if known 470 ft.  
Standing level after well completion 460 ft.

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

(11) WELL TESTS:

Was well test made? Yes  No  If yes, by whom? driller  
Type of test Pump  Bailer  Air lift   
Depth of water at start of test 460 ft. At end of test 460 ft.  
Discharge 30 gal/min after 4 hours Water temperature \_\_\_\_\_  
Chemical analysis made? Yes  No  If yes, by whom? \_\_\_\_\_  
Was electric log made? Yes  No  If yes, attach copy to this report

SIGNED Doshier-Gregson (Well Driller)  
NAME Doshier-Gregson, Inc.  
(Person, firm, or corporation) (Typed or printed)  
Address 5365 Napa-Vallejo Hwy.  
City Vallejo, CA Zip 94589-9679  
License No. 258826 Date of this report 1-21-91

**ORIGINAL**  
File with DWR

STATE OF CALIFORNIA **08 N/P**  
THE RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES  
**WATER WELL DRILLERS REPORT**

Well 8

Do not fill in

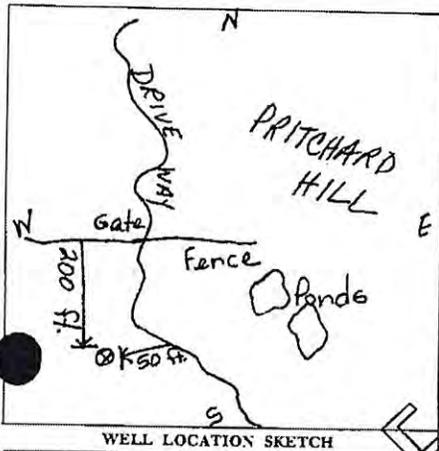
No. 120017

State Well No. \_\_\_\_\_  
Other Well No. 07N04W08N

File of Intent No. \_\_\_\_\_  
Permit No. or Date. \_\_\_\_\_

1677 Sage Canyon (032-010-691)

(2) LOCATION OF WELL (See instructions):  
County Napa Owner's Well Number 32-010-29  
Well address if different from above Pritchard Hill  
Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_  
Distance from cities, roads, railroads, fences, etc. \_\_\_\_\_



(3) TYPE OF WORK:  
New Well  Deepening   
Reconstruction   
Reconditioning   
Horizontal Well   
Destruction  (Describe destruction materials and procedures in Item 12)  
(4) PROPOSED USE:  
Domestic   
Irrigation   
Industrial   
Test Well   
Stock   
Municipal   
Other

(12) WELL LOG: Total depth 610 ft. Depth of completed well 610 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
2	20	Red & Brown clay
20	55	Gray & Black rock med hard
55	70	Gray & black rock stringer brown clay
70	130	Black brown & red rock med hard
130	160	Black & red rock hard fract
160	220	Black red & gray rock hard fract
220	265	Brown red & black rock hard fract
265	295	Black brown red rock hard fract
295	390	Black gray red rock stringers dark & light
390	495	Black gray red rock hard fract brown
495	600	Black red dk. green brown rock hard fract
600	610	Gray rock hard

(5) EQUIPMENT:  
Rotary  Reverse   
Cable  Air   
Other  Mud Bucket

(6) GRAVEL PACK:  
Yes  No  Size 20  
Diameter of bore 9 7/8"  
Packed from 610 to 25 ft.

(7) CASING INSTALLED:  
Steel  Plastic  Concrete

From ft.	To ft.	Dia. in.	Cage or Wall
0	480	6	200

(8) PERFORATIONS:  
Type of perforation or size of screen

From ft.	To ft.	Slot size
480	610	.032

(9) WELL SEAL:  
Was surface sanitary seal provided? Yes  No  If yes, to depth 25 ft.  
Were strata sealed against pollution? Yes  No  Interval \_\_\_\_\_ ft.  
Method of sealing Bentonite Pellets & concrete

(10) WATER LEVELS:  
Depth of first water, if known 495 ft.  
Standing level after well completion 470 ft.

(11) WELL TESTS:  
Was well test made? Yes  No  If yes, by whom? driller  
Type of test Pump  Bailor  Air lift   
Depth to water at start of test 495 ft. At end of test \_\_\_\_\_ ft.  
Flow 50 gal/min after 3 hours Water temperature \_\_\_\_\_  
Chemical analysis made? Yes  No  If yes, by whom? lab  
Was electric log made? Yes  No  If yes, attach copy to this report

Work started 12-14 1990 Completed 1-8 1991

WELL DRILLER'S STATEMENT:  
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.  
SIGNED Raymond Ziebler (Well Driller)  
NAME Doshier - Gregson, Inc.  
Address 5365 Napa-Vallejo Hwy.  
City Vallejo, CA Zip 94589-9679  
License No. 258826 Date of this report 1-11-91

ORIGINAL

File with DWR

STATE OF CALIFORNIA

THE RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES  
WATER WELL DRILLERS REPORT

Well 9

Do not fill in

No. 245581

E/F  
MLL

Permit No. or Date \_\_\_\_\_

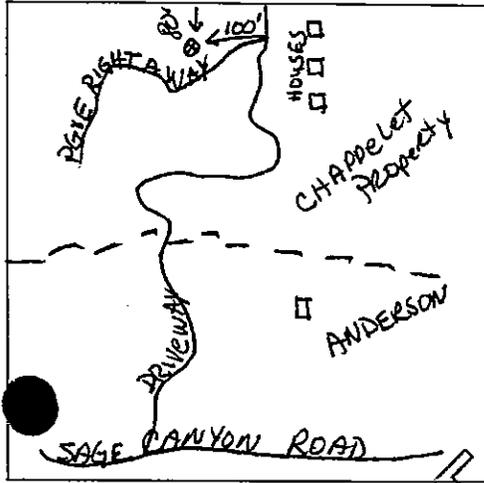
State Well No. \_\_\_\_\_  
Other Well No. 07NO4W08

FRICHARD 4SL

(2) LOCATION OF WELL (See instructions):  
County Napa Owner's Well Number 32-010-27  
Well address if different from above \_\_\_\_\_  
Township St. Helena Range \_\_\_\_\_ Section \_\_\_\_\_  
Distance from cities, roads, railroads, fences, etc. \_\_\_\_\_

(12) WELL LOG: Total depth 665 ft. Depth of completed well 650 ft.  
from ft. to ft. Formation (Describe by color, character, size or material)

0	-	1	Top Soil
1	-	3	Gray rock hard
3	-	20	Red rock stringer brown clay
20	-	40	Red and black hard
40	-	55	Red rock med hard
55	-	85	Black red and gray rock med hard
85	-	145	Red black rock med hard
145	-	175	Brown and gray rock hard
175	-	245	Black brown gray hard
245	-	305	Black and brown rock hard
305	-	325	Dk red rock hard fract
325	-	365	Dk red black and brown rock hard fract
365	-	425	Black rock hard fract
425	-	485	Dk red and black rock hard fract
485	-	505	Dk red rock med hard fract
505	-	525	Green white and gray rock med hard fract
525	-	585	lt green and gray hard fract
585	-	615	Gray rock hard
615	-	650	Black red green gray stringers white rock soft
650	-	665	Black green white stringers shale



(3) TYPE OF WORK:  
New Well  Deepening   
Reconstruction   
Reconditioning   
Horizontal Well   
Destruction  (Describe destruction materials and procedures in Item 12)  
(4) PROPOSED USE:  
Domestic   
Irrigation   
Industrial   
Test Well   
Stock   
Municipal   
Other

(5) EQUIPMENT:  
Rotary  Reverse   
Cable  Air   
Other  Bucket

(6) GRAVEL PACK:  
Yes  No  Size Pea  
Diameter of bore 9 7/8 & 8 3/4  
Packed from 650 to 26 ft.

(7) CASING INSTALLED:

Steel <input type="checkbox"/>	Plastic <input checked="" type="checkbox"/>	Concrete <input type="checkbox"/>
--------------------------------	---	-----------------------------------

From ft.	To ft.	Dia. in.	Gage of Wall
0	440	6	200
500	520	6	200

(8) PERFORATIONS: Machine

From ft.	To ft.	Slot size
440	500	.032
520	650	.032

(9) WELL SEAL:  
Was surface sanitary seal provided? Yes  No  If yes, to depth 26 ft.  
Were strata sealed against pollution? Yes  No  Interval \_\_\_\_\_ ft.  
Method of sealing Bentinite Pellets and Concrete

(10) WATER LEVELS:  
Depth of first water, if known 450 ft.  
Standing level after well completion 420 ft.

(11) WELL TESTS:  
Was well test made? Yes  No  If yes, by whom? Driller  
Type of test Pump  Bailer  Air lift   
Depth to water at start of test 420 ft. At end of test 650 ft.  
Discharge 20 gal/min after 4 hours Water temperature \_\_\_\_\_  
Chemical analysis made? Yes  No  If yes, by whom? \_\_\_\_\_  
Was electric log made? Yes  No  If yes, attach copy to this report

Work started 7/1/88 Completed 7/12/88 19

WELL DRILLER'S STATEMENT:  
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.  
SIGNED Harold Gregson (Well Driller)  
NAME Doshier-Gregson, Inc.  
(Person, firm, or corporation) (Typed or printed)  
Address 5365 Napa Vallejo Hwy  
City Vallejo Zip 94589  
License No. 258826 Date of this report 7/14/88

ORIGINAL  
File with DWR

STATE OF CALIFORNIA  
**WELL COMPLETION REPORT**  
Refer to Instruction Pamphlet

DWR USE ONLY - DO **Well 10**  
07N09W18  
STATE WELL NO./STATION NO.  
LATITUDE LONGITUDE  
APN/TRS/OTHER

Page      of       
Owner's Well No.       
Date Work Began 05/16/2008, Ended 05/28/2008  
Local Permit Agency Napa County  
Permit No. E07-00121 Permit Date 03/21/2007

GEOLOGIC LOG			WELL OWNER		
ORIENTATION ( ) XX VERTICAL HORIZONTAL ANGLE (SPECIFY)			Name	TE	ZIP
DEPTH FROM SURFACE			Mailing Address		
DRILLING METHOD <u>Rotary</u> FLUID <u>Air</u>			CITY		
DESCRIPTION			WELL LOCATION		
Describe material, grain size, color, etc.			Address <u>1677 Sage Canyon Road</u>		
			City <u>St. Helena</u>		
			County <u>Napa</u>		
			APN Book <u>032</u> Page <u>030</u> Parcel <u>043-000</u>		
			Township <u>    </u> Range <u>    </u> Section <u>    </u>		
			EAST WEST LONG. DEG. MIN. SEC. N Long. DEG. MIN. SEC. W		
			LOCATION SKETCH NORTH SOUTH		
			ACTIVITY ( ) NEW WELL MODIFICATION/REPAIR (Deepen, Other) DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")		
			USES ( ) WATER SUPPLY (Domestic, 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 <u>600</u> (Ft.) BELOW SURFACE		
			DEPTH OF STATIC WATER LEVEL <u>565</u> (Ft.) & DATE MEASURED <u>5-28-08</u>		
			ESTIMATED YIELD <u>45</u> (GPM) & TEST TYPE <u>Air Lift</u>		
			TEST LENGTH <u>4</u> (Hrs.) TOTAL DRAWDOWN <u>AK</u> (Ft.) GPM at day of test		
			* May not be representative of a well's long-term yield.		
0	25	Red Clay & Red Ash			
25	70	Brown Clay & hard Gray Rock			
70	115	Hard Gray Volcanic Rock			
115	150	Brown Ash			
150	255	Hard Gray & Green Volcanic Rock			
255	290	Red, Brown, & White Ash			
290	360	Hard Gray Rock & Red Volcanic Ash			
360	440	Hard Gray Rock			
440	495	Red Ash & Gray Rock			
495	530	Hard Gray Rock			
530	590	Red & Green Volcanic Rock			
590	660	Green Hard Rock			
660	755	Hard Black & Green Rock			
TOTAL DEPTH OF BORING <u>755</u> (Feet)					
TOTAL DEPTH OF COMPLETED WELL <u>755</u> (Feet)					

DEPTH FROM SURFACE	BORE-HOLE DIA. (Inches)	CASING (S)						DEPTH FROM SURFACE	ANNULAR MATERIAL				
		TYPE ( )				MATERIAL / GRADE	INTERNAL DIAMETER (Inches)		GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	TYPE		
Ft. to Ft.		BLANK	SCREEN	SOFT	DUCTOR			FILL PIPE			Ft. to Ft.	CE-MENT ( )	BEN-TONITE ( )
0	53	12	✓					0	53	✓			
53	608	9	✓					53	755			Well Pack Gravel	
608	755	9	✓										

- 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  
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 5110 State Highway 128 Napa, CA 94558 CITY STATE ZIP

Signed Tom Pulliam DATE SIGNED 5-30-08 808-508  
C-57 LICENSED WATER WELL CONTRACTOR C-57 LICENSE NUMBER

E14-00578

\*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

State of California  
**Well Completion Report**

Refer to Instruction Pamphlet  
No. e0260575

Page 1 of 1

Owner's Well Number Krupp Knief #2

Date Work Began 03/05/2015

Date Work Ended 3/25/2015

Local Permit Agency Planning, Building and Environmental

Permit Number E14-00578

Permit Date 7/21/14

DWR Use Only - Do Not Fill In

State Well Number/Site Number

Latitude Longitude

APN/TRS/Other

Geologic Log		
Orientation <input checked="" type="radio"/> Vertical <input type="radio"/> Horizontal <input type="radio"/> Angle Specify _____		
Drilling Method <u>Air Drilling</u> Drilling Fluid <u>Air</u>		
Depth from Surface	Description	
Feet to Feet	Describe material, grain size, color, etc	
0	200	Soft volcanics
200	250	Hard black rock
250	300	Same rock but fractured and <u>20 gpm</u>
300	400	soft yellow ash
400	490	Hard fractured black, green and brown rock
490	510	soft red volcanics
510	565	soft yellow volcanics and ash
565	580	Hard fractured black rock
Total Depth of Boring <u>590</u> Feet		
Total Depth of Completed Well <u>560</u> Feet		

RECEIVED  
MAR 31 2015  
Napa County Planning, Building & Environmental Services

**Well Owner**

Name Krupp Vineyards

Mailing Address Soda canyon rd

City napa State ca Zip 94558

**Well Location**

Address Soda canyon rd

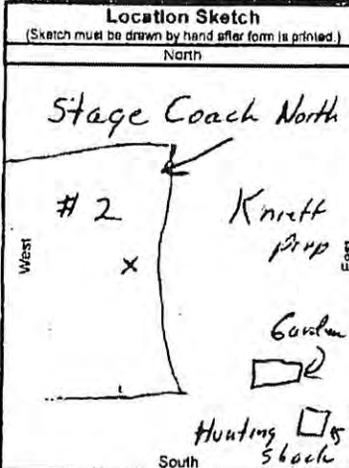
City napa County Napa

Latitude \_\_\_\_\_ N Longitude \_\_\_\_\_ W

Datum \_\_\_\_\_ Decimal Lat. \_\_\_\_\_ Decimal Long. \_\_\_\_\_

APN Book 032 Page 010 Parcel 086

Township \_\_\_\_\_ Range \_\_\_\_\_ Section \_\_\_\_\_



**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 240 (Feet below surface)

Depth to Static Water Level 240 (Feet) Date Measured 03/26/2015

Estimated Yield \* 150 (GPM) Test Type Air Lift

Test Length 2.0 (Hours) Total Drawdown 0 (Feet)

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

Casings						
Depth from Surface	Borehole Diameter	Type	Material	Wall Thickness	Outside Diameter	Screen Type
Feet to Feet	(Inches)			(Inches)	(Inches)	Slot Size If Any (Inches)
0	20	14	Blank	PVC Sch. 80	8	
20	280	14	Blank	PVC Sch. 80	8	
280	560	14	Staggered	PVC Sch. 80	8	Milled Slots 0.032

Annular Material			
Depth from Surface	Fill	Description	
Foot to Foot			
0	20	Bentonite	seal
20	590	Filter Pack	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 D. Bess pump & Well  
Person, Firm or Corporation

1115 mt george ave napa CA 94558  
Address City State Zip

Signed [Signature] City napa State CA Zip 94558  
C-57 Licensed Water Well Contractor Date Signed 487027 C-57 License Number