Water Availability Analysis
County of Napa

Miller Vineyard #P22-00153-ECPA
3906 Silverado Trail
Calistoga, CA 94515
APN 021-030-006-000

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Miller Vineyard

Prepared by:

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REVIEW DRAFT

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Introduction

This Water Availability Analysis (WAA) supplements the WAA dated May 12, 2022 by Bartelt Engineering submitted to Napa County Planning, Building and Environmental Services (PBES) for proposed planting of 4.7 acres of vineyard at 3906 Silverado Trail (Miller Vineyard, APN 021-030-006-000). The parcel is about 4 miles southeast of Calistoga and lies outside of the boundary that defines the Napa Valley Groundwater Basin (Figure 1). The property comprises of 28.77 acres with approximately 1.2 acres of existing vineyard and one residence with a pool.

This supplemental WAA has been prepared to address the Information Request attached to the PBES Application Completeness Determination dated June 10, 2022, specifically items 5a through 5e. Substantial changes in County groundwater policy, including the emergency policy adopted June 7, 2022, and other new groundwater policy resulting from the Groundwater Sustainability Plan (GSP) completed for the Napa Valley Groundwater Basin (NVGB) created some confusion regarding aspects of the Tier 1 WAA preparation and review. The project parcel and the project well (herein identified as Well 1) are not located within the NVGB; hence, Information Request Items 5b and 5e are moot and do not require further discussion. The project well and project parcel are in the "hillside" groundwater zone where a site-specific analysis of groundwater availability is prepared to determine whether proposed use of groundwater is consistent with Napa County guidelines set forth in May 2015. In addition, PBES revised methods for the Tier 1 analysis by mandating the use of mean annual precipitation for the period 2012-2021 as the basis for estimating groundwater recharge; this supplemental WAA also addresses this new requirement.

The objectives of this supplemental WAA is to provide a Tier 3 WAA analysis pertaining to groundwater/surface water interaction per Information Request item 5a and to revise the Tier 1 WAA to incorporate the updated mean annual rainfall as required. Development of the Tier 3 analysis by O'Connor Environmental, Inc. (OEI) proceeds from a hydrogeologic characterization of the project parcel and a surrounding "recharge/project impact area". This characterization is OEI's base data for WAA analyses, including Tier 1 evaluation of groundwater availability. Given the uncertainty in the Bartelt Tier 1 WAA and PBES review (e.g., Information Request 5c), OEI chose to develop its own Tier 1 analysis as a secondary objective. Information Request item 5d identifies a minor inconsistency in reporting of proposed future groundwater use that is addressed separately by Bartelt Engineering in its revised WAA.

This supplemental 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 use 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 an analysis of the potential for well interference

at surface water bodies within 1500 ft of the project well (Tier 3). The Tier 2 analysis for this WAA was prepared by Bartelt Engineering in its revised WAA (Appendix A).

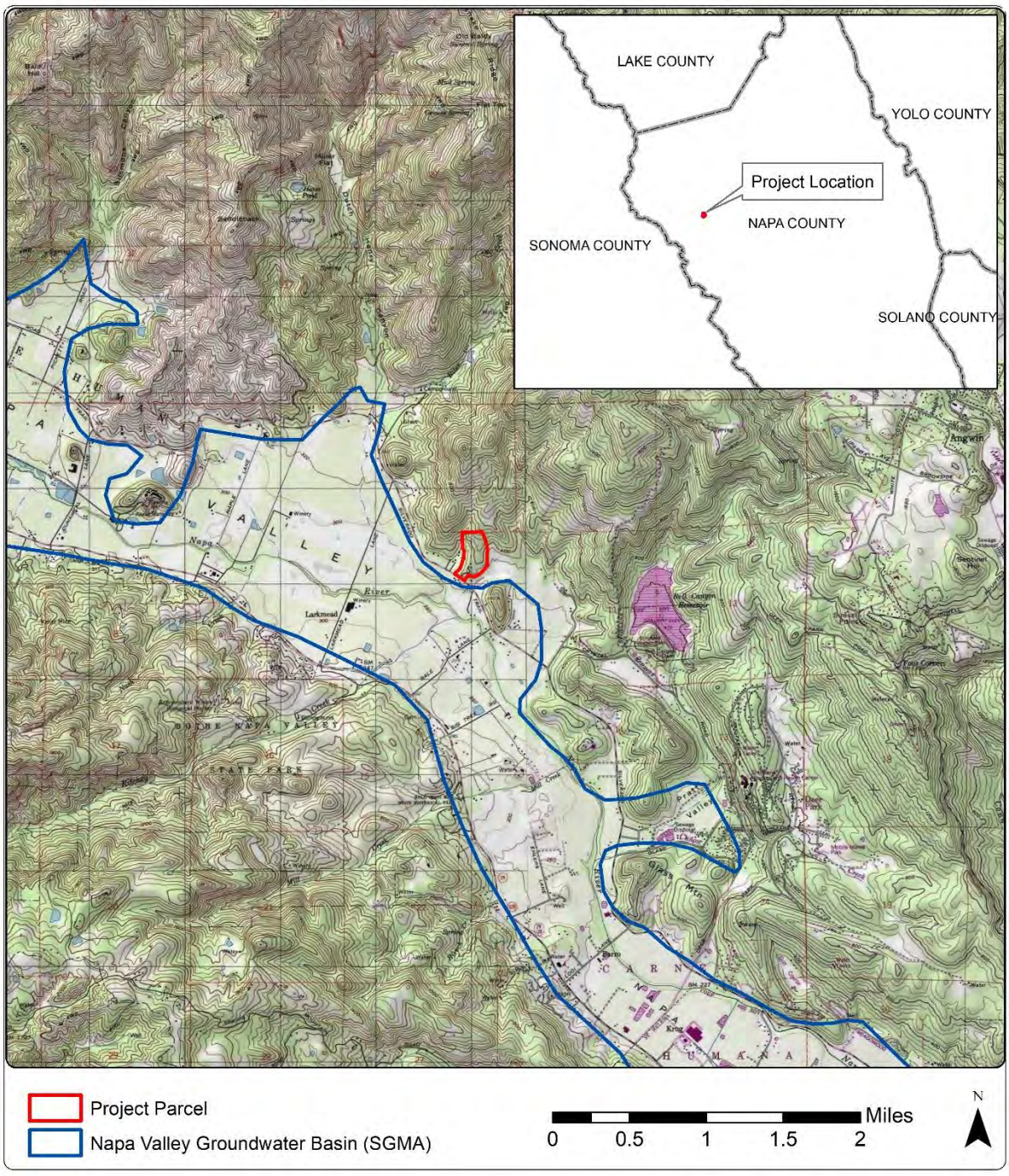


Figure 1. Project location map.

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 and County of Napa, available geologic maps and hydrogeologic studies, and professional judgment. Hydrogeologic interpretations are based on the drillers' reports made available to us through the DWR, 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.

Groundwater recharge processes, aquifer hydraulics, potential interaction between surface water and groundwater, and potential well interference are difficult to quantify in the absence of site-specific studies and/or state-of-the-art hydrologic modeling. Quantification and analysis of hydrogeologic parameters and processes presented in this document utilize available information for the project area and local aquifer. The analytical techniques applied are consistent with prior WAA's we have prepared and submitted to County of Napa. The resulting interpretations of hydrogeologic conditions and potential future conditions under proposed project conditions are consistent with the customary professional standard of care used for WAA's in the County of Napa; nevertheless, there may be substantial uncertainty in quantitative estimates of hydrogeologic parameters, processes, and conditions.

Hydrogeologic Conditions

The project parcel is located at the base of the mountainous area along the eastern edge of the Napa Valley in between the cities of Calistoga and St. Helena (Figure 1). The geology mapped in the area of the project parcel is typical of the mountains and hills located in the northern portion of the Napa Valley. The main geologic units mapped in the project area are Pliocene and late Miocene-aged Sonoma Volcanics Rhyolite flows (map unit Tsr) and Holocene-aged Alluvial fan Surficial Deposits (map unit Qhf) (Figure 2). Sonoma Volcanics underlie much of the upland terrain east of the Napa Valley.

Our site-specific evaluation of the area based on geologic maps and interpretation of Well Completion Reports (WCRs) indicates the parcel is underlain by Pliocene and late Miocene-aged Sonoma Volcanics Rhyolite flows (map unit Tsr). The project well, Well 1, and the two other wells on the project parcel, Well 2 and 3, intersect Sonoma Volcanics. This portion of the Pliocene and late Miocene-aged Sonoma Volcanics Rhyolite flows (map unit Tsr) is part of an approximately 14 square-mile block bound to the north, west and east by other Sonoma Volcanic geology units (Figure 2). The Tsr unit is described as "Rhyolite flows includes intercalated rhyolite tuff in places" (Graymer er al., 2007). To the west there are thin Holocene-aged alluvial fan deposits (map unit Qhf) near the valley margins. Napa River alluvial deposits are believed to be 400 feet deep but thin to about 50 feet or less on the eastern margin of the valley adjacent to the upland project site on (GSP Figure 4-11).

Wells completed on the valley floor in the deep alluvium with underlying Sonoma Volcanics have varying yields between 2 and 700 gpm. Many such valley floor wells are screened partially in alluvial deposits and partially in the Sonoma Volcanics. Wells in the upland areas surrounding the project parcel, including some of the flat-lying Quaternary deposits on the eastern margin of the valley floor, pump water from a bedrock aquifer comprised of various strata of the Sonoma Volcanics. This aquifer is considered to provide relatively low well yields compared to valley floor wells, typically ranging between 16 and 50 gallons per minute (gpm). However, yields in excess of 100 gpm have been reported (LSCE and MBK, 2013). Some units, such as unwelded tuff and volcanic sediments are somewhat more productive but overall are still considered low yielding. Specific yield estimates for the Sonoma Volcanics range from 0 to 15% (Nishikawa, 2013). Higher density units such as portions of the welded tuff along with andesitic and rhyolitic lava flows have very low primary porosity and groundwater occurs primarily in fractures, resulting in highly variable well production. Where these fracture networks are extensive, aquifers can have relatively high transmissivities (Nishikawa, 2013).

Well Data

Our search of the of the Department of Water Resources and County of Napa records found a total of 50 Well Completion Records on and around the project parcel (Figure 2, Appendix B). The project parcel has three wells, (Wells 1, 2, and 3, Figure 2). Well 1 is the project well, the proposed source of water for the existing and proposed vineyard acreage. Wells on surrounding parcels were located using the locations identified on the well logs as guidance. Locations are confirmed where possible using aerial photos of the area. Thirty-five of the wells are located within the recharge impact area. Relevant well information is compiled and summarized (Table 1 and Appendix B).

Well 1, the project well, is located on the southwest corner of the project parcel. It was drilled in April 2021 to a depth of 415 ft and cased to a depth of 420 ft. Well 1 is perforated between 120 to 160 ft, and 200 to 420 ft and had a static water level of 60 ft at its time of completion. Well 1 had a 3- hour airlift test resulting in an estimated yield of 60 gpm with a drawdown of 312 ft. The geologic log reports topsoil to a depth of 5 ft below ground surface (bgs) with volcanic ash to depths of 86 ft. Below the volcanic ash there was hard cemented conglomerate until 210 ft, hard black rock until 375 ft, and red cinder until 420 ft descriptions consistent with geology of Sonoma Volcanics.

Well 2 and Well 3 are located on the project parcel. Well 2 is located near the center of the project parcel, north of the end of the driveway and was completed in September 2016 to a depth of 440 ft. It is perforated from 100 to 200 ft and staggered from 220 to 440 ft with a reported static water level of 60 ft upon completion. A 2-hour airlift test conducted at the time of completion reported a yield of 12 gpm and 0 ft of drawdown. The geologic report for Well 2 indicates topsoil to 20 ft bgs and then 5 ft of boulders. From 25 to 510 ft there are different mixes of rock and ash, including white ash, gray ash, and red ash with rock. Well 3 is located southeast of Well 2, in the north corner of the existing vineyard. It was drilled in June 1987 to a depth of 275 ft and cased to a depth of 215 ft. Well 3 is perforated between 215 to 275 ft and had a static water level of

100 ft at its time of completion. Well 3 had an 8-hour airlift test with estimated yield of 50 gpm and drawdown of 275 ft. The geologic log reports topsoil to 2 ft below ground surface (bgs) with red brown rock to depths of 25 ft. From 25 to 100 ft there was a mix of red and green rock stringers, from 100 to 125 ft along with soft black rock stringers there was white ash. Below 125 ft there were alternating colors of soft and fractured rock including black, green, and red. Both well logs show geology and well yield consistent with a well completed in the Sonoma Volcanics that is present below the alluvium present at ground surface on the edge of Napa Valley.

The wells in the surrounding impact area have depths ranging from 75 to 965 ft and static water levels that vary from 12 to 300 ft (Table 1). Pump test information obtained at the time of well development was available for several of the wells in the area and indicate a wide range of specific capacities in the area ranging from 0.02 to 2.0 gpm/ft of drawdown. Wells near the Napa River and its tributary Dutch Henry Creek (also known on Biter Creek on some maps) located in the mapped geology unit Qhf, Holocene-aged Alluvial fan Surficial Deposits (Figure 2) penetrate about 20 to 50 feet of gravel, sand, clay and typically extend to depth in various strata of the Sonoma Volcanics, commonly reported as volcanic ash in Well Completion Reports. Few wells derive water from the shallow alluvial aquifer (e.g., Well 38); most of these wells extend to greater depth into the aquifer comprised of Sonoma Volcanics. These descriptions from well logs are not indicative of the relatively deep alluvium found nearer the center of Napa Valley that comprise the principal aquifer of the NVGB that is subject to provision of the GSP and the County emergency order adopted June 7, 2022.

The Well Completion Reports include a wide variety of rock descriptions, but the most common are various colors of clay mainly brown clay with embedded rock or gravel or sandy, various colors of volcanic ash and/or rhyolite tuff with harder various colored volcanic rock. The driller's descriptions are consistent with the thin sedimentary unit (Qhf) found at the surface and the underlying volcanic material (Tsr) as described by Graymer et al. (2007). Most wells in the upland areas east of Napa Valley penetrate volcanic rocks fitting the description above to depths up to 970 ft bgs. The hydrogeologic description of the area in the NVGB GSP are generally consistent with these well logs and indicate that alluvium deposited in the center of the Napa River corridor may extend as deep as 300 feet bgs and diminishes in depth near the edges of the valley, and that the Sonoma Volcanics extend at least 500 feet bgs (Figure 4-11, LSCE 2021).

Table 1: Well completion details for the project wells and wells on nearby parcels (see Figure 2).

Well No.	1	2	3	4	5	6	7	8
DWR WCR No.	001641	e0326213	245513	0949216	1073647	792300	39931	e03272606
Year Completed	2021	2016	1987	2013	2007	2002	1971	2019
Well Depth (ft)	415	440	275	260	350	195	120	965
Static Water Level (ft)	60	60	100	53	50	96	35	170
Estimated Yield (gpm)	60	12	50	30	50	150	10	35
Top of Screen (ft)	120	100	215	40	90	175	50	125
Bottom of Screen (ft)	420	440	275	260	350	195	120	405
Geologic Map Unit	Qhf/Tsr	Tsr	Tsr	Qhf	Tsr/Qhf	Tsr	Tsr	Tsr

Table 1 (cont.): Well completion details for the project wells and wells on nearby parcels (see Figure 2).

Well No.	9	10	11	12	13	14	15	16
DWR WCR No.	806870	475962	475948	474508	005573	271118	948352	319574
Year Completed	2002	1997	1997	1996	2018	1988	2008	1989
Well Depth (ft)	700	715	430	740	335	160	460	205
Static Water Level (ft)	178	300	125	200	12	80	65	33
Estimated Yield (gpm)	45	25	60	40	50	75	25	20
Top of Screen (ft)	140	160	145	180	60	60	60	105
Bottom of Screen (ft)	700	715	430	740	335	159	460	205
Geologic Map Unit	Tsr	Tsr	Tsr	Tsr	Qhf	Qhf	Qhf	Qhf

Well No.	17	18	19	20	21	22	23	24
DWR WCR No.	181693	239210	e0221137	e0181975	e066623	916323	782022	291426
Year Completed	1985	1983	2014	2013	2007	2004	2001	1988
Well Depth (ft)	240	80	498	545	150	130	195	220
Static Water Level (ft)	80	20	92	79	82	40	unk.	60
Estimated Yield (gpm)	12	100	60	50	5	15	2	30
Top of Screen (ft)	80	30	78	385	110	70	170	60
Bottom of Screen (ft)	240	80	478	545	150	130	180	220
Geologic Map Unit	Tsr	Tsr	Qhf/Qht	Qhf	Qhf	Qhf	Qhf	Qhf

Well No.	25	26	27	28	29	30	31	32
DWR WCR No.	319568	814577	384859	530544	781562	769464	535605	535606
Year Completed	1989	1999	1991	1997	2000	2001	1997	1997
Well Depth (ft)	176	403	300	320	190	274	228	158
Static Water Level (ft)	18	30	60	67	37	31	60	48
Estimated Yield (gpm)	3.5	700	150	15	400	100	100	7 - 1 0
Top of Screen (ft)	156	83	80	130	50	154	60	40
Bottom of Screen (ft)	176	403	300	300	190	274	233	158
Geologic Map Unit	Qhf	Qhf	Tsr	Qhf	Tsr	Qhf/Tsr	Qhf	Qhf

Well No.	33	34	35
DWR WCR No.	535604	792337	e008456
Year Completed	1997	2003	2003
Well Depth (ft)	285	80	75
Static Water Level (ft)	60	18	32
Estimated Yield (gpm)	80	5	2
Top of Screen (ft)	63	50	45
Bottom of Screen (ft)	285	80	75
Geologic Map Unit	Qhf	Qhf	Qhf

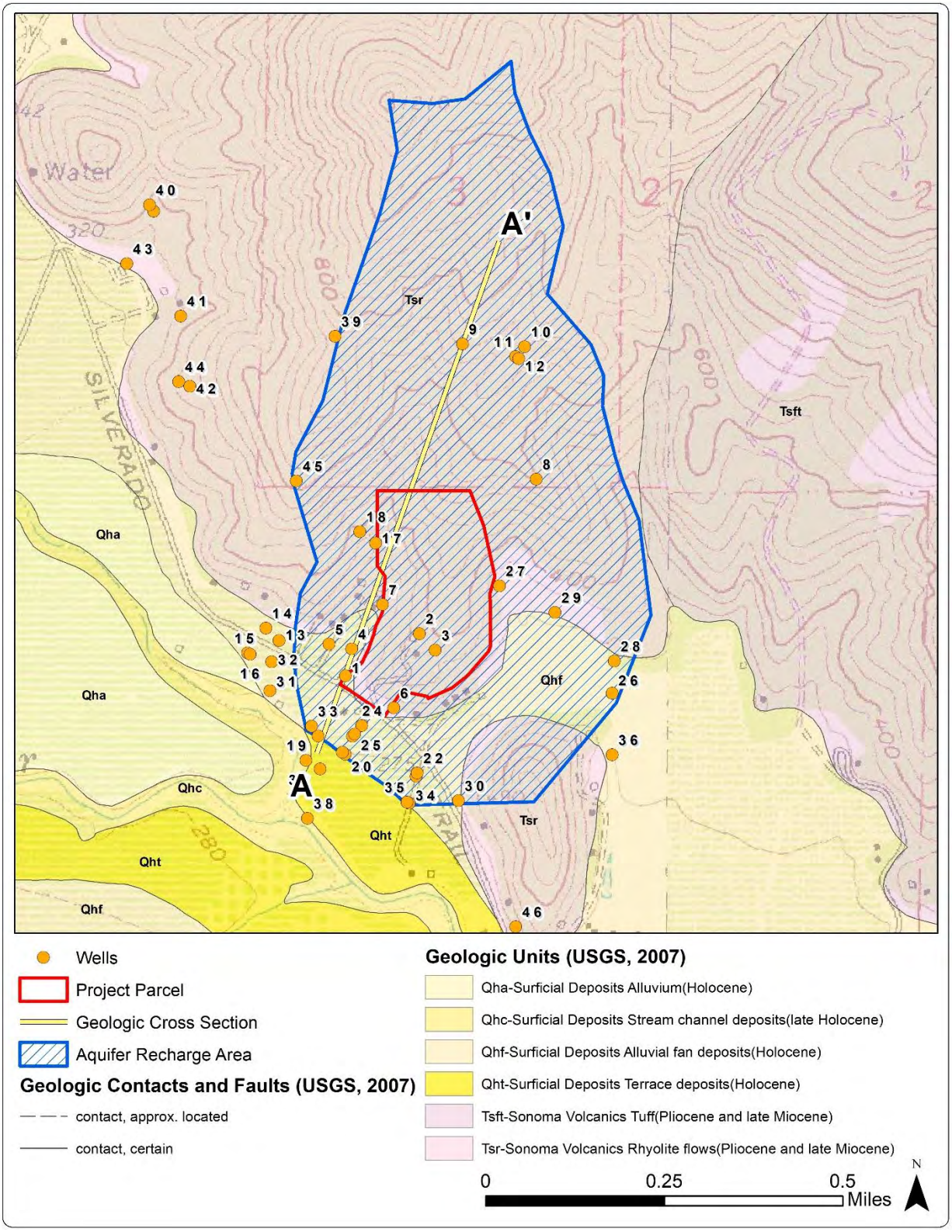


Figure 2: Surficial geology and locations of wells in the vicinity of the project parcel (Graymer et al., 2007).

Geologic Cross Sections

A generalized geologic cross section (Figure 3) oriented southwest to northeast (A-A') is shown in Figure 2; well construction details (well depth, well screen intervals, and depth to water in the well) obtained from Well Completion Reports. Well completion reports for wells located along the cross section indicate mostly shallow alluvium (Map unit Qhf) in the valley; moving northeast towards the uplands, well bores penetrate volcanic strata of the Rhyolite flows unit of the Sonoma Volcanics (Map unit Tsr). Water surface elevations at the time of completion of the wells are also shown. Wells 20, 19, and 33 penetrate shallow alluvial deposits (Map unit Qhf) and extend into the underlying Sonoma Volcanics; the depth of the contact is approximately 50 feet or less below ground surface. These wells are screened primarily in strata of the Sonoma Volcanics aquifer.

The project well, Well 1, is located along the cross section near the surface boundary between the mapped unit of the alluvium (Qhf, Figure 2) but is completed and screened entirely within Sonoma Volcanics aquifer. Well 4 is in a mapped portion of alluvial fan (Qhf, Figure 2); the Well Completion Report shows that the well is screened in underlying Sonoma Volcanics. Wells 2 and 3 on the project parcel are completed and screened in Sonoma Volcanics and are projected onto the cross-section as though in alignment with the other wells. Well 7 is mapped at the edge of Sonoma Volcanics and is screened in volcanic strata. Wells 17, 18, 45, 9 and 10 are completed and screened in Sonoma Volcanics (Figure 3).

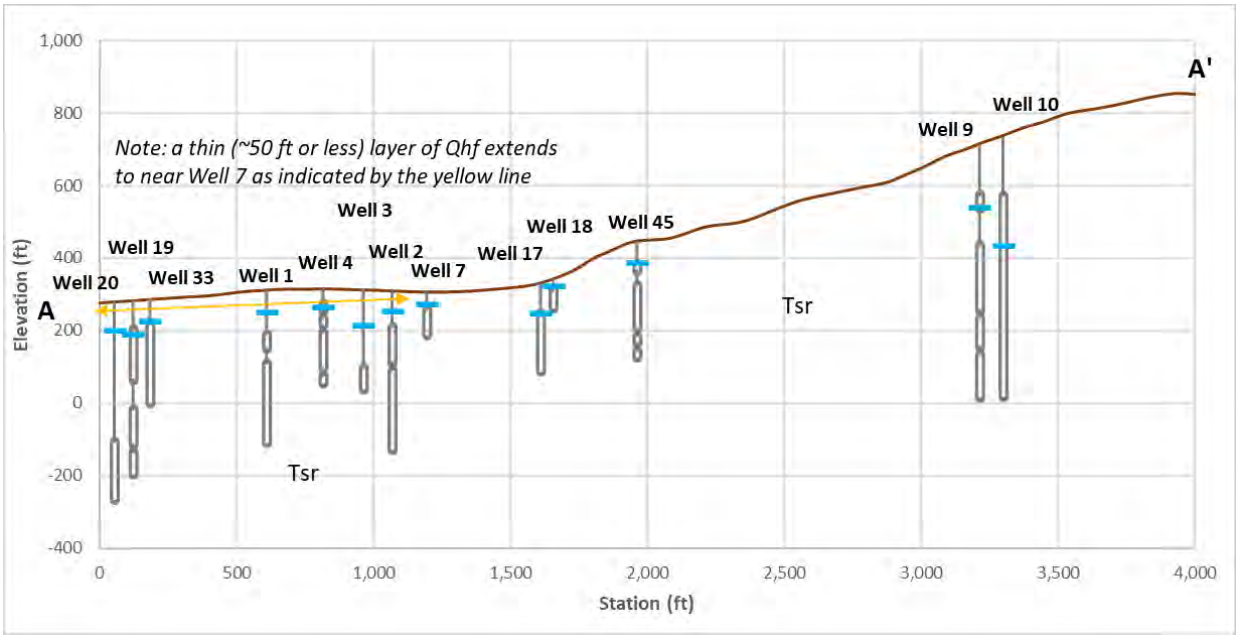


Figure 3: Hydrogeologic cross section A-A' through the vicinity of the project parcel (see Figure 2 for location)

Project Aquifer

The extent of the project impact area is defined in part by surface water drainage patterns and in part the extent of local geologic units. The southern boundary of the project impact area is defined by the contact between the alluvial deposits (Map unit Qhf) and terrace deposits (Map unit Qht). The northern, western, and eastern boundaries of the project aquifer are defined by surface topography of drainage. Surficial geology in the project area is mapped as Quaternary alluvial fan deposits (map unit Qhf) and Pliocene and late Miocene-aged Sonoma Volcanics Rhyolite flows (map unit Tsr). Geologic logs of almost all wells in the project area indicate a relatively thin layer of this alluvium underlain by Sonoma Volcanics. The geologic log for the project well (Appendix B and Figure 3) indicates that it penetrates volcanic strata of the Sonoma Volcanic mapped as the Rhyolite flows unit (Tsr). The screened intervals of Well 1 are entirely within the volcanics. The estimated surface area of the project aquifer/recharge/impact area is about 229 acres.

Water Demand

Water demand for the parcel was estimated for both the existing and proposed conditions. The project well (Well 1) on the parcel will be the water source for existing and proposed vineyard acreage. Water uses on the project parcel were determined using details provided in the Tier 1 WAA completed by Bartelt Engineering (Appendix A). Existing water uses on the neighboring parcels were identified using available satellite imagery and Napa County's public winery GIS layer. Water use rates have been applied using rates presented in the Napa County WAA Guidance document (Napa, 2015) and Tables 3 and 4 present rates used in the estimates.

Existing Use

The project parcel contains one existing primary residence with a pool with an assumed total water use rate 0.85 acre-ft/yr. The existing 1.2 acres of vineyard is estimated to use 0.42 acre-ft/yr for irrigation at a water use rate of 0.35 acre-ft/yr and 0.30 acre-ft/yr for heat protection at a water use rate of 0.25 acre-ft/yr. All of these uses combine to a total existing groundwater use of 1.57 acre-ft/yr (Table 2).

Neighboring parcels within the project recharge area contain six oversized residences, eight primary residences, three secondary residences, eight pools, and one winery. There is about 81,500 sq ft of lawn, around 3,200 sq ft of additional landscaping, and approximately 28.32 acres of vineyard on the neighboring parcels (Figure 4). The winery to the west of the project parcel at APN 021-030-047-000 is approved to use 20,000 gallons of process water and have 5,200 tasing room visitors a year. Table 4 summarizes uses and use rates for water demand on neighboring parcels within the project recharge area.

Based on these uses, water demand within the project recharge area is approximately 38.37 acre-ft/yr (Table 2). Of this, 1.57 acre-ft/yr is from the project parcel (Table 3). The remaining 36.80 acre-ft/yr comes from neighboring parcels, primarily residential use, and vineyard irrigation (Table 4).

Proposed Use

In the proposed condition, 4.7 acres of vineyard will be planted, increasing the total vineyard acreage to 5.9 acres. In this condition the estimated water use will increase by 2.82 acre-ft/yr to 4.39 acre-ft/yr for the project parcel (Table 4). Water for proposed and existing vineyard acreage will be supplied by Well 1 (Figure 1). Based on these uses, water demand within the project recharge area will increase to approximately 41.19 acre-ft/yr (Table 2).

Table 2: Existing and proposed groundwater uses within the project recharge area.

	Existing Condition (acre-ft/yr)	Proposed Condition (acre-ft/yr)
Project Parcel	**1.57**	**4.39**
Residential Use	0.85	0.85
Irrigation Use	0.72	3.54
Neighboring Parcels	**36.80**	**36.80**
Residential Use	22.16	22.16
Irrigation Use	14.16	14.16
Winery Use	0.43	0.43
Employee/Guest Use	0.05	0.05
Total	**38.37**	**41.19**

Table 3: Existing groundwater uses on the project parcel

	# of Units	Use per Unit	Annual Water Use (AF/yr)
Residential Use			**0.85**
Residences, Primary	1 Residence	0.75 AF/Residence	0.75
Pools	1 Pool	0.10 AF/Pool	0.10
Agricultural Use			**0.72**
Vineyard Irrigation	1.2 Acres	0.35 AF/acre/yr	0.42
Heat Protection	1.2 Acres	0.25 AF/acre/yr	0.30
Total			**1.57**

Table 4: Proposed groundwater uses on the project parcel.

	# of Units	Use per Unit	Annual Water Use (AF/yr)
Residential Use			**0.85**
Residences, Primary	1 Residence	0.75 AF/Residence	0.75
Pools	1 Pool	0.10 AF/Pool	0.10
Agricultural Use			**3.54**
Vineyard Irrigation	5.9 Acres	0.35 AF/acre/yr	2.07
Heat Protection	5.9 Acres	0.25 AF/acre/yr	1.48
Total			**4.39**

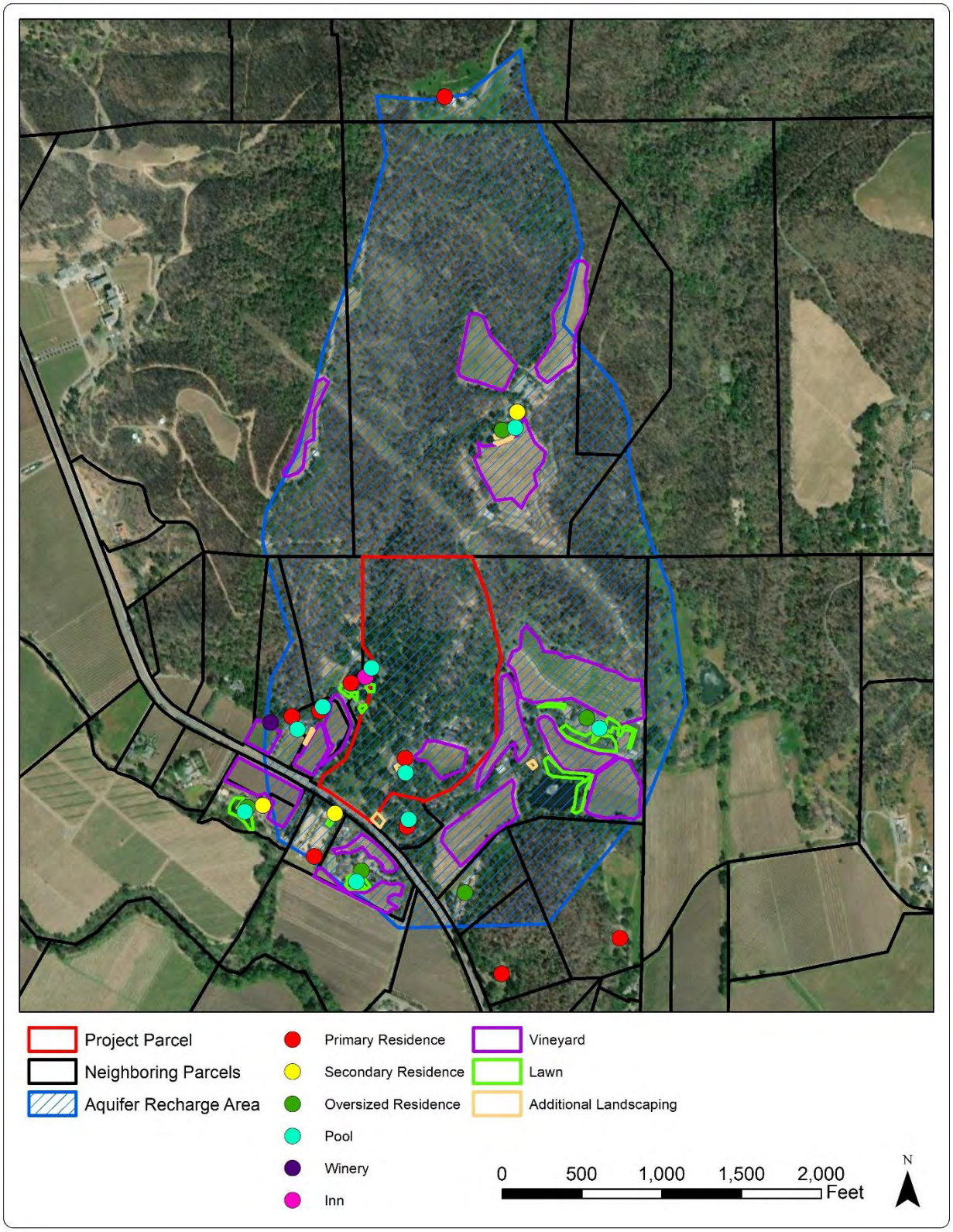


Figure 4: Existing water uses identified within the project recharge area.

Groundwater Recharge Analysis

Groundwater recharge within the project recharge area was estimated using a Soil Water Balance (SWB) of Napa County developed by OEI. This model implements the U.S. Geologic Survey's SWB modeling software and produces a spatially distributed estimate of annual recharge. 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). Details of this model are included in Appendix C.

To address elevated concerns regarding groundwater availability Napa County has adopted a 10-year precipitation average from Water Years 2012 to 2021 developed by the PRISM Group at Oregon State University. The PRISM data provides spatially distributed data adjusted for orographic factors based on gauged precipitation data.

Consistent with OEI's approach to estimating groundwater recharge for WAA's, groundwater recharge was simulated for two selected Water Years. The first, Water Year 2010, was selected to represent average year precipitation conditions because annual precipitation totals across most of Napa County were close to their long-term 30-year averages in WY 2010. The second, Water Year 2014, was selected to represent dry year conditions because annual precipitation totals were between 41 and 73% of long-term 30-year averages for Napa County in WY 2014. We used SWB model predictions of groundwater recharge for WY 2010 and WY 2014 rainfall and climate conditions to bracket rainfall conditions for the 2012-2021 average annual; this allowed us to estimate groundwater recharge for this hypothetical average year condition as described below.

Results

Water Years 2012 to 2021 average precipitation is 33.1 inches across the project recharge area as determined by spatially averaging precipitation data from the PBES PRISM GIS data. For the simulated Water Year 2010 (average water year) precipitation averaged 41.0 inches across the project recharge area and simulated actual evapotranspiration (AET) averaged 22.7 inches. Simulated groundwater recharge varied from zero to 17.4 inches across the recharge area, with a spatial average of 10.3 inches (Table 5). Components of the water balance were also calculated for the project parcel and are very similar to those calculated for the project recharge area (Table 6). In simulated Water Year 2014 (dry water year), precipitation averaged 21.1 inches across the project recharge area and simulated AET averaged 16.1 inches. Simulated groundwater recharge varied from zero to 6.8 inches across the recharge area, with a spatial average of 2.9 inches (Table 5). Assuming a linear relationship between the precipitation of the selected average and dry year results of simulated recharge percent (Figure 5), Water Years 2012 to 2021 had an average of 6.8 inches of recharge (Table 5). The general linearity of this relationship was confirmed by a review of all prior WAA analyses using the SWB model to estimate groundwater recharge at individual project sites in Napa County. It is also consistent with the general interrelationship between precipitation, evapotranspiration, and water available for groundwater recharge. Nevertheless, the accuracy of the prediction of recharge embodied in Figure 5 remains uncertain.

Table 5: Summary of water balance results estimated by the SWB model for WY 2010 & 2014 and estimated recharge from the precipitation average of 2012-2021 WYs.

	2010 Normal Year		2014 Dry Year		2012-2021 WY Average	
	inches	% of precip	inches	% of precip	inches	% of precip
Precipitation	41.0	-	21.1	-	33.1	-
AET	22.7	55%	16.1	77%	-	-
Runoff	8.6	21%	5.9	28%	-	-
Δ Soil Moisture	-0.7	-2%	-3.9	-19%	-	-
Recharge	10.3	25%	2.9	14%	6.8	21%

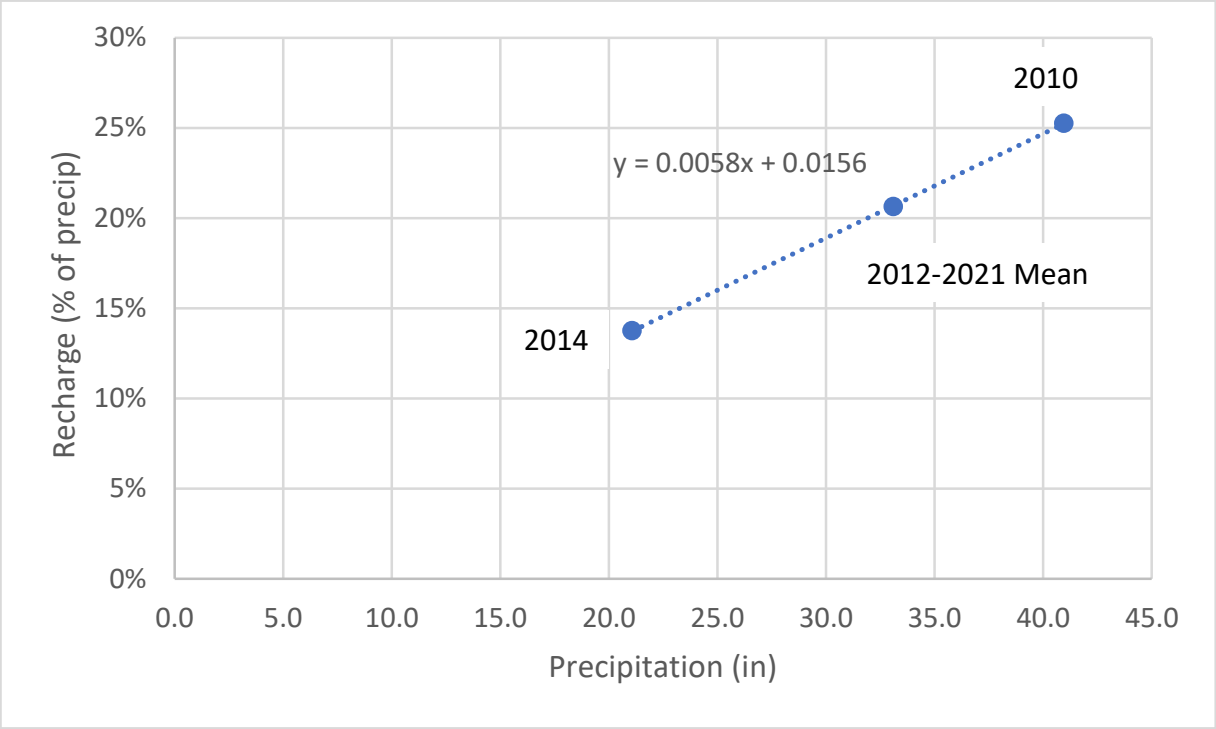


Figure 5: Relationship between precipitation and percent of precipitation as recharge from SWB models for Water Year 2010 and Water Year 2014 and interpolated for mean precipitation 2012-2021

Groundwater recharge estimates can also be expressed as a total volume by multiplying the estimated recharge rate by a representative area. For the 228.8-acre project recharge area, average annual groundwater recharge is estimated to be 197.3 acre-ft/yr. During dry years such as Water Year 2014, recharge is estimated to be 55.3 acre-ft/yr. For the 28.77-acre project parcel, estimated average annual recharge is 24.8 acre-ft/yr for WY 2010 and is 6.9 acre-ft/yr for WY 2014. Estimated recharge for the mean precipitation of WYs 2012-2021 is 130.3 acre-ft/yr for the project recharge/impact area and is 16.4 acre-ft/yr for the project parcel (Table 6).

Table 6: Comparison of proposed water use to average annual groundwater recharge for the project recharge area and for the project parcel.

Domain	Total Proposed Demand (ac-ft/yr)	Average Water Year (2010)			Dry Water Year (2014)			Mean Precipitation Water Years 2012-2021		
		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	Recharge (ac-ft/yr)	Recharge Surplus (ac-ft/yr)	Demand as % of Recharge
Project Recharge Area	41.2	197.3	156.1	21%	55.3	14.1	75%	130.3	89.1	46%
Project Parcel	4.4	24.8	20.4	18%	6.9	2.6	63%	16.4	12.0	27%

Comparison of Water Demand and Groundwater Recharge

The total proposed groundwater use within the project recharge area is estimated to be about 41.2 acre-ft/yr. Compared to the estimated annual groundwater recharge based on mean precipitation for WYs 2012-2021, average use is equivalent to 46% of the 130.3 acre-ft/yr mean annual recharge. A similar comparison can be drawn for the project parcel: estimated use of 4.4 acre-ft/yr represents 27% of the 16.4 acre-ft/yr of average annual recharge (Table 6). Groundwater use associated with the proposed project is believed unlikely to result in significant reductions in groundwater levels or depletion of groundwater resources over time.

Well Interference

The County of Napa requires an evaluation of potential well interference analysis (Tier 2 WAA) if neighboring wells lie within 500-feet of the project well. The Bartelt WAA (Appendix A) includes this Tier 2 analysis concluding that potential drawdown in neighboring wells is small and conforms with County policy. Figure 6 identifies wells identified in this supplemental WAA in relation to the Tier 2 analysis by Bartelt; see also Figure 8.

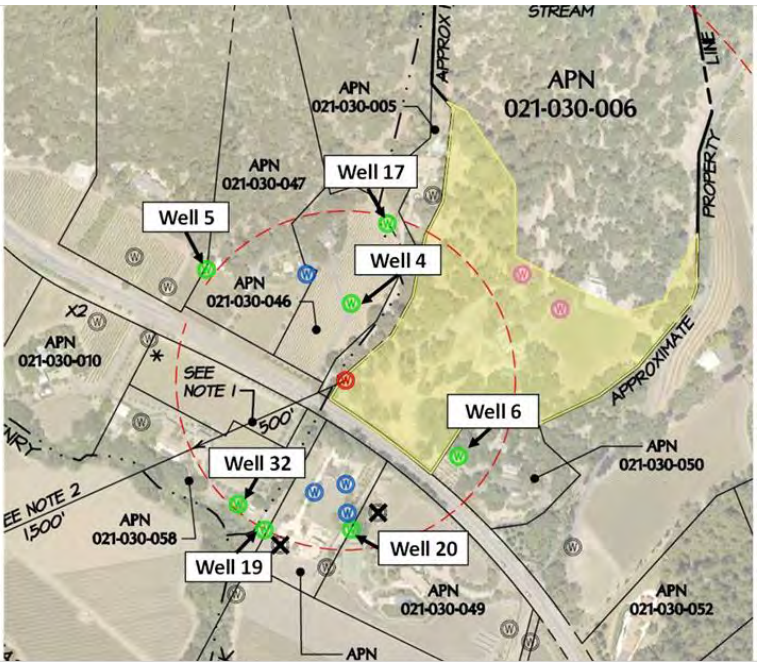


Figure 6: This map image is reproduced from Bartelt Engineering WAA (May 2022) to cross-reference well identification numbers used in this supplemental WAA.

Groundwater-Surface Water Interactions

Napa County Tier 3 WAA guidance for assessment of groundwater-surface water interactions was modified by the emergency policy adopted in June 2022. Figure 7 shows the relative positions of streams of concern with 1,500 ft setback, the boundary of the NVGB (also referred to as the "Napa Co. Groundwater Sustainability Agency (GSA) boundary"), and parcels in the project area. The project well is located within the area subject to Tier 3 WAA requirements.

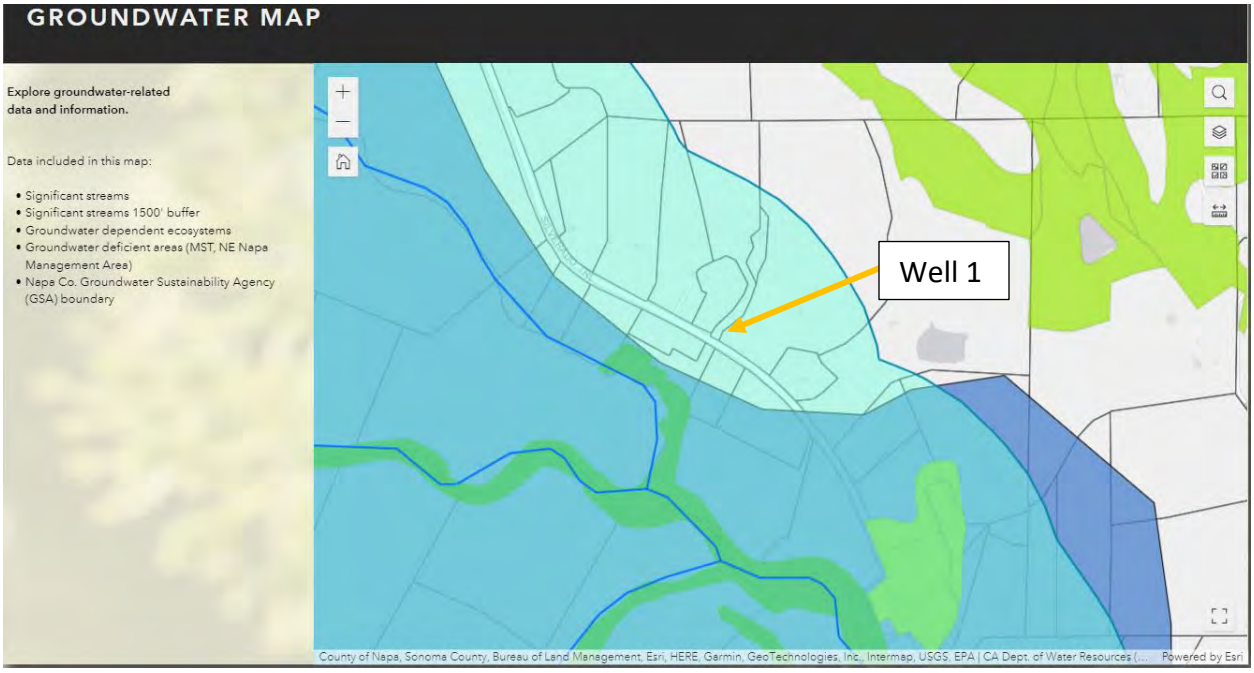


Figure 7: Project well location (image reproduced from PBES Map Explorer accessed 11/6/22)

Tier 3 WAA Guidance

The Tier 3 WAA guidance provides well set-back standards and construction assumptions that "if applicable would be expected to preclude any significant adverse effects on surface waters". Specifically, the "Tier 3 Groundwater Surface Water Interaction Criteria" section (pp. 10-13 of the Napa County guidance document dated May 12, 2015) states:

> *The groundwater/surface water criteria are presumptively met if the distance standards and project well construction assumptions are met (see Tables 3, 4, and 5).* (p. 10)

These standards consider the planned pumping rate of the project well along with the well depth, screened interval and seal depth along with aquifer hydraulic conductivity values and present acceptable distances based on specific combinations of all parameters. Tables 3, 4 and 5 in the Napa WAA guidance document present these distance standards and assumptions for wells constructed in unconsolidated (e.g. alluvium) aquifer materials and unconfined aquifers; these assumptions are intended primarily for wells in the NVGB. The project well in this case is not in alluvium and is outside the boundary of the NVGB.

The Tier 3 WAA guidance for wells drilled in bedrock in the "hillside zone" (All Other Areas excluding the MST aquifer in southeast Napa) is as follows:

> *All Other Areas, will be subject to other distance standards based on site-specific aquifer conditions. Distance standards for project wells completed in consolidated formations will generally be no more restrictive than those shown in* ***Tables 3, 4, and 5*** *for hydraulic conductivity values of 0.5 ft/day*. (p. 11)

In other words, standards described in Tables 3, 4 and 5 for wells in bedrock aquifers are to be considered as wells with hydraulic conductivity values of 0.5 ft/day. The Tier 2 analysis by Bartelt identified the operational pumping rate of the project well as 10 gpm; this is functionally equivalent to conditions described in Table 3 from the WAA Tier 3 guidance and reproduced below. The use of Table 3 implicitly acknowledges that operational pumping rates of the project well would be restricted to < 10 gpm (i.e., 9.9 gpm).

Table 3. Well Distance Standards and Construction Assumptions; Very low capacity pumping rates (i.e., less than 10 gpm), constructed in unconsolidated deposits in the upper part of the aquifer system (unconfined aquifer conditions).

Aquifer Hydraulic Conductivity (ft/day)	Acceptable Distance from Surface Water Channel			Minimum Surface Seal Depth (feet)	Depth of Uppermost Perforations (feet)
	500 feet	1000 feet	1500 feet		
80	✓			50	100
50	✓			50	100
30	✓			50	100
0.5	✓			50	100

As indicated in the table, wells pumping at rates < 10 gpm are not considered to have adverse effects on streamflow if located > 500 ft from stream channels of concern. The project well (Well 1) location is shown with a circle of 1,500 ft radius centered on the well (Figure 7). This circle extends beyond Biter Creek (also referred to as Dutch Henry Creek) and the Napa River. Also shown is a circle of 500 ft radius centered on the project well; this smaller circle does not extend as far as either stream channel. The project well seal extends to a depth of 30 feet and the depth of uppermost perforations is 120 ft, hence additional evaluation of local hydrogeologic conditions is necessary because the guidance suggests a minimum surface seal depth of 50 ft.

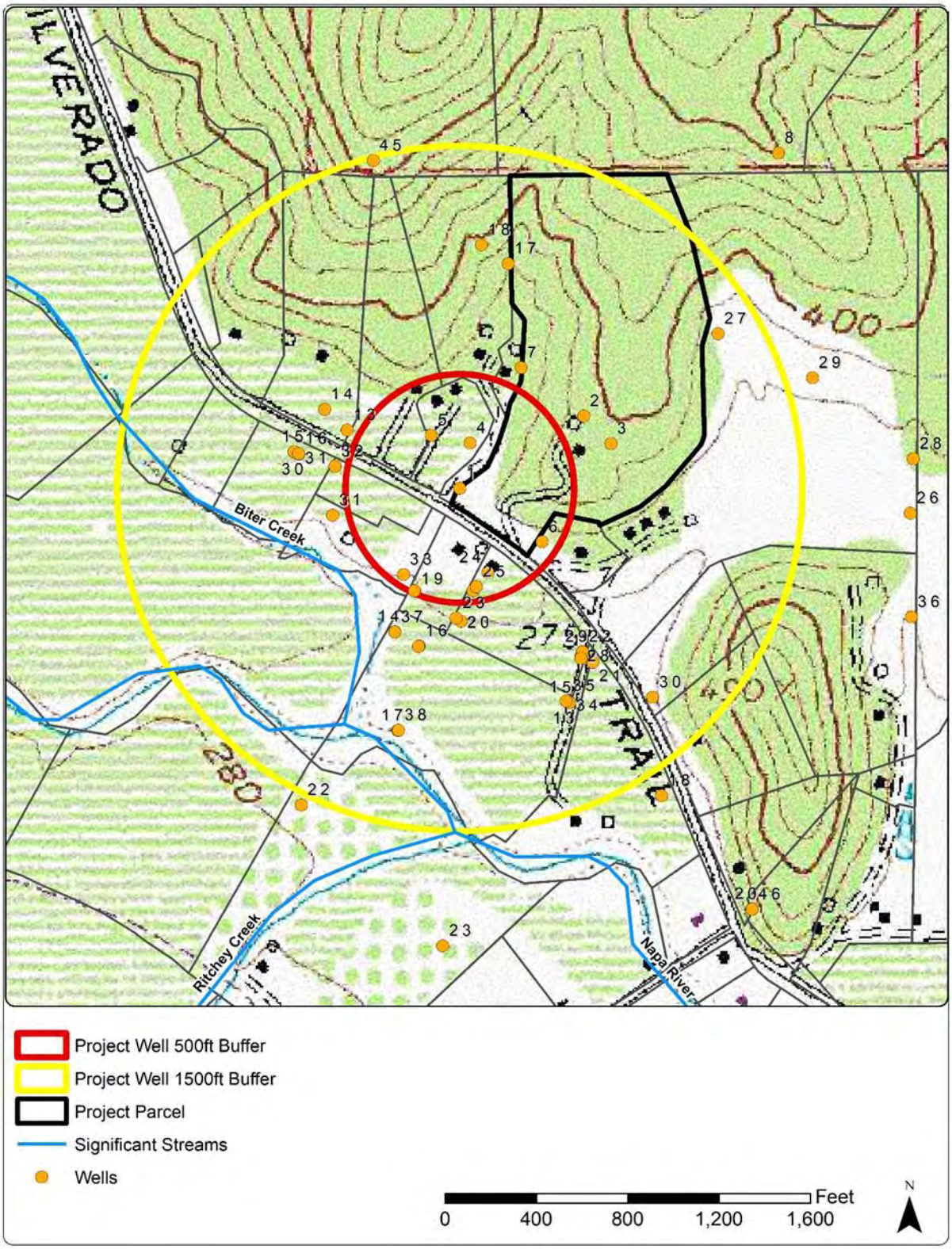


Figure 8: Locations of project Well 1 with 500ft and 1500ft buffers to show distances to neighboring wells and closest water bodies.

Hydrogeologic Conditions Affecting Potential Groundwater-Surface Water Interaction

This section provides an interpretation of local hydrogeologic conditions relevant to potential groundwater-surface water interaction associated with the project well derived from interpretation of Well Completion Reports, well locations, and estimated well head elevations. A sub-set of wells summarized in Table 1 and located in Figure 2 were analyzed in greater detail to evaluate potential connectivity of groundwater in the project area. Data pertaining to this sub-set of wells are summarized in Table 7 and shown graphically in a hydrogeologic section (Figure 9) aligned with the longer section in Figure 3. Appendix D summarizes selected data from geologic logs contained in Well Completion Reports used to interpret hydrogeologic conditions described below. All referenced Well Completion Reports are compiled in Appendix B.

The NVGB GSP characterized the depth and lateral extent of the unconfined alluvial aquifer underlying most of the Napa Valley. GSP Figure 4-6 shows the location of a hydrogeologic section K-K' about 1,000 ft north of the project site; GSP Figure 4-11 is the hydrogeologic section (see Appendix E). The hydrogeologic section shows the alluvial aquifer thinning to a narrow shelf at the eastern margin of the valley floor adjacent to the project site underlain by Sonoma Volcanics.

As summarized by Table 7, the geologic strata described in this sub-set of wells (Appendix D) have been interpreted by Dr. O'Connor, CEG #2449 with respect to geologic strata that are likely to be aquitards that restrict vertical movement of groundwater. As portrayed in Figure 8, the local groundwater system is comprised of a confined bedrock aquifer defined vertically by the elevation of the uppermost elevation of rock strata interpreted to be confining groundwater below this elevation. Furthermore, many of the wells (1, 2, 3, and 20) clearly exhibit characteristics indicative of a confined aquifer with water surface elevation in the well above than the uppermost well screen elevation. The interpretation of confined aquifer conditions based on comparison of water elevation and screen elevation in wells 4, 19 and 33 is less compelling, but these wells have most of their screened interval extending to depths of > 200 ft bgs indicating that much of the saturated aquifer lies at significant depth and is not derived from shallow groundwater that is most likely to interact with surface water.

Table 7: Summary of hydrogeologic characteristics; all elevation data converted to estimated elevation above mean sea level.

Well	Year Drilled	Ground Surface Elevation	Stream Bed Elevation	Well Seal Lowermost Elevation	Groundwater Elevation	Elevation of Uppermost Confining Stratum	Elevation of Uppermost Well Screen	Geologic Material Uppermost Confining Stratum	Geologic Material Uppermost Well Screen
1	2021	290	260	260	230	204	170	hard cemented conglomerate	hard cemented conglomerate
			Lower 220 ft section of well screen			204	90	hard cemented conglomerate	hard black rock
2	2016	370	260	350	310	310	270	brown rock and ash	solid white ash
			Lower longer section of well screen			310	150	solid white ash	solid white ash
3	1987	370	260	340	285	270	155	soft black rock stringers white ash	black green red rock fractured
4	2013	292	260	259	239	272	252	multicolor rock brown clay	multicolor rock brown clay
19	2014	282	260	247	190	262	204	sandy brown clay	coarse sand
20	2013	281	260	231	202	263	-104	clayey brown volcanics	clayey ash
33	1997	282	260	259	222	270	219	clay sand/gravel	clay sand/gravel

Compelling evidence that the groundwater in these wells does not interact with surface water is displayed in Figure 8. First, groundwater elevations in wells with well head elevations less than 300 ft are substantially lower than the thalweg elevation of the Napa River (~260 ft as shown in Figure 8); this is also true of the thalweg elevation of Biter/Dutch Bill Creek (~275 ft). Where the groundwater elevation is above the thalweg elevation (Wells 2 and 3), this is a consequence of the well head elevations (370 ft) substantially above the valley terrace/fan elevation (~280 to 300 ft) and is indicative of the upland groundwater source areas to the north and east of the valley. The relationship between topography and groundwater elevation is more readily apparent in Figure 3. Furthermore, the uppermost confining strata lie about 30 to >100 feet above the uppermost well screen in these wells.

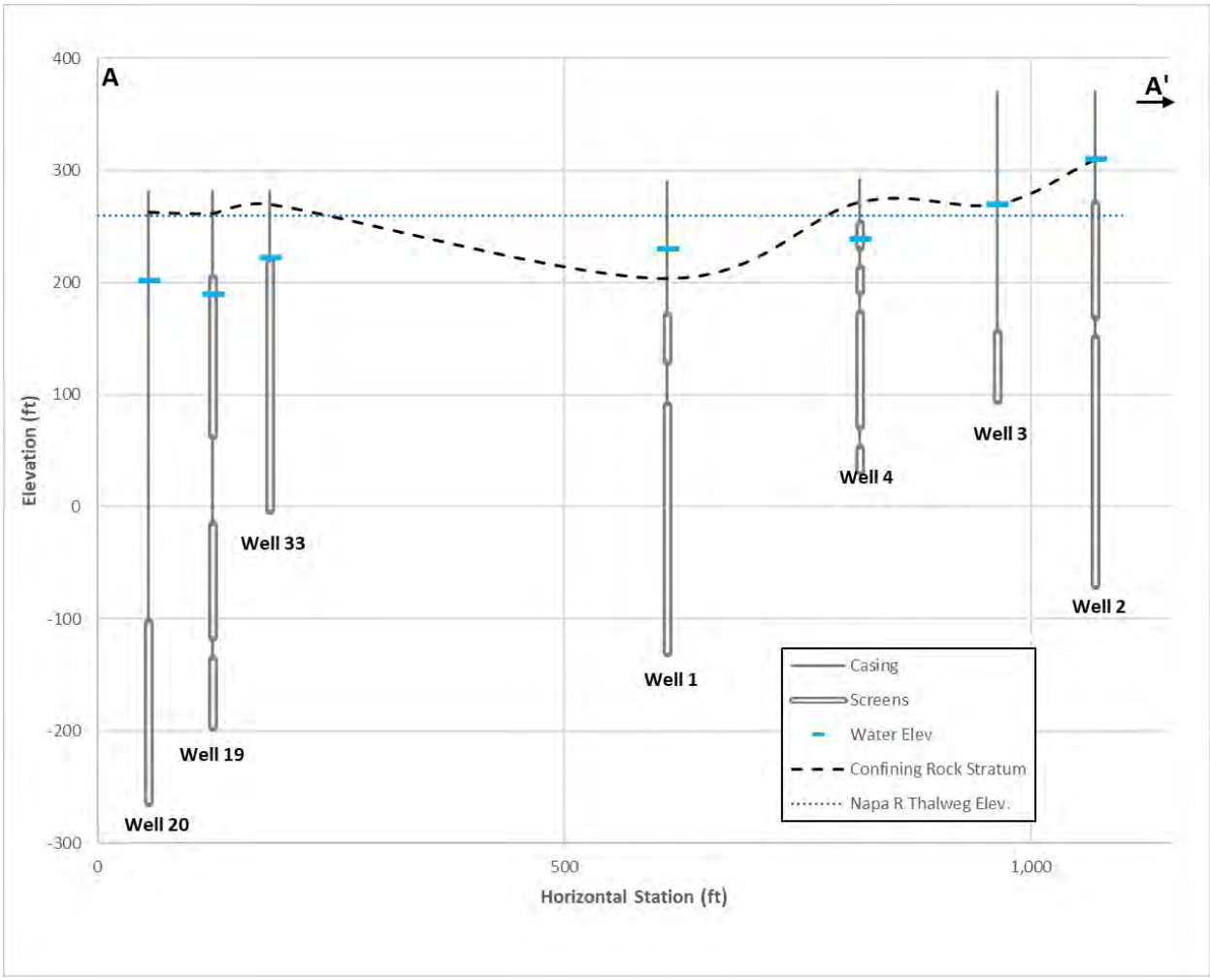


Figure 9: Hydrogeologic interpretation of the confined aquifer system underlying the project area. The hydrogeologic section extends from A (Figure 2 and 3) to the approximate center of the project parcel.

Conditions in Well 1, the project well, are clearly indicative of a confined aquifer where well screens and confining geologic strata are substantially below the Napa River thalweg elevation. Water elevation in this well is also 30 ft below the Napa River thalweg elevation. The well seal

extends 30 ft bgs to elevation 260 ft, essentially equal to the Napa River thalweg elevation. These observations and interpretations indicate that groundwater in Well 1 is vertically isolated from the bed of the Napa River, and the fact that the well seal is 30 ft bgs rather than 50 ft bgs as recommended in the Tier 3 WAA guidance (Table 3, p. 21) carries no practical significance. It is our conclusion that hydrogeologic conditions in the project aquifer, and at the project well in particular, are functionally equivalent to acceptable well conditions cited in Tier 3 WAA guidance Table 3.

Summary

The proposed 4.7 acres of vineyard will increase the vineyard acreage to 5.9 acres on the project parcel. This increase in vineyard will increase water demand on the project parcel by 2.82 acre-ft/yr supplied by Well 1 which is constructed in Sonoma Volcanics.

As a result of this project, water demand on the project parcel is estimated to increase from 1.57 to 4.39 acre-ft/yr. Analysis of the averaged 10-year period of precipitation for Water Years 2012 to 2021 resulted in recharge of 16.4 acre-ft/yr across the project parcel and 130.3 acre-ft/yr across the recharge/impact area. Proposed project use represents 27% of the mean annual recharge across the project parcel while use across the larger recharge/impact area is estimated to be 46% of average annual recharge for the WY 2012-2021 period. The analysis of groundwater recharge in relation to groundwater demand on the project parcel and in a larger groundwater recharge/impact area concluded that the project is unlikely to result in significant declines in groundwater elevations or depletion of groundwater resources over time.

There are several neighboring well to the project well (Well 1) is located within 500 ft. Bartelt Engineering conducted an analysis of well interference per Tier 2 WAA criteria indicating potential drawdown in area wells much less than the maximum recommended drawdown.

An analysis of potential interaction between groundwater in the project aquifer accessed from Well 1 and surface water in Dutch Henry/Biter Creek and the Napa River concluded that hydrogeologic conditions create significant vertical separation between the aquifer and surface water such that significant streamflow depletion is not expected to occur.

References

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APPENDIX A

BARTELT ENGINEERING WAA

Revised January 2023

BARTELT ENGINEERING

WATER AVAILABILITY ANALYSIS
FOR MILLER VINEYARD
3906 SILVERADO TRAIL, NAPA COUNTY, CA
APN 021-030-006

As required by Napa County Planning, Building & Environmental Services (PBES), this study outlines availability of groundwater for a potential vineyard development located on the above referenced parcel (APN) and associated address. This Water Availability Analysis has been revised to respond to the Application Completeness Determination letter from PBES dated June 10, 2022. A supplemental Water Availability Analysis has been prepared by O'Connor Environmental, Inc. addressing the Tier 1 and Tier 3 requirements for the proposed project.

PROJECT DESCRIPTION

The proposed project involves a Track I Vineyard Development and Erosion Control Plan that includes the planting of three (3) separate vineyard blocks (Vineyard Blocks B1, B2, and B3) located on the above referenced subject parcel that is located within the Agricultural Watershed (AW) zoning district. The 27.76± acre subject parcel is currently developed with a residence, barns, wells, driveway, access roads, pool, other residential structures, residential onsite wastewater dispersal field, and 1.2± acres of vineyard (Block A). The project will be constructed under a single (1) phase and includes a disturbed area of approximately 6.0± acres.

Permit records for the existing vineyard (Block A) could not be located; it is our understanding that the existing vineyard was planted in 2009 as shown on Google Earth's Historical Imagery. The Track I Vineyard Development and Erosion Control Plan proposes to develop 4.6± acres of new vineyard and continue to operate the existing 1.2± acres of vineyard that was installed without an approved Erosion Control Plan. The total proposed vineyard area is 5.8± acres. Refer to the attached Track I Vineyard Development and Erosion Control Plan (the Plan) prepared by Bartelt Engineering for the existing and proposed vineyard development.

There are three (3) existing groundwater wells located on the parcel. Well #1 (Project Well) will be the primary source of irrigation water for the existing and proposed vineyards. Well(s) #2 and #3 will provide supplemental vineyard irrigation if necessary; however, well(s) #2 and #3 will primarily be used to provide water for residential use.

EXHIBITS

The attached USGS "Topographic Site Location Information" exhibit shows the project site and approximate property line locations. Information regarding the proposed project is shown on the Plan including the location of the existing well(s). The approximate location of neighboring surface waters, springs, and wells are shown on the "Non-Project Well & Natural Spring Location Exhibit". All exhibits and drawings mentioned above were prepared by Bartelt Engineering.

SITE FEATURES

The subject parcel is located on the easterly side of the Napa Valley northwesterly of St. Helena and approximately 5± miles southeasterly from the Town of Calistoga, CA. More specifically, the parcel lies east of Silverado Trail between Bale Lane and Larkmead Lane. The parcel is surrounded by existing vineyards, woodlands, and grasslands. An unnamed ephemeral stream is located on the westerly side of the subject parcel and runs in a north and south direction towards Dutch Henry Creek and the Napa River. The proposed vineyards blocks are located within the Napa River – Bale Mill Reach and Dutch Henry Creek sub-watersheds of the Napa River Watershed which is not a municipal watershed. The project lies outside the boundary of the Napa Valley Groundwater Basin (NVGB) where proposed groundwater extraction must be evaluated on a parcel-specific basis. The boundary of the NVGB supersedes the Napa Valley Floor boundary.

The recent 2020 Glass Wildfire destroyed much of the vegetation on the parcel. The pre-Glass Wildfire vegetation within the project area consisted of woodland and grasses. The parcel cover was approximately 93% tree canopy (which mostly consisted of Douglas-fir), 3.5% grass, and 3.5% vineyard. Coverage areas are based on the subject parcel size and vegetated mapping provided by Napa County GIS shape files and the project Biologist. Refer to the Erosion Control Plan "70 Percent Vegetation Retention Exhibit" prepared by Bartelt Engineering and the Biological Resource Reconnaissance Survey prepared by Forest Ecosystem Management.

WATER USE CRITERIA

TABLE 1: SCREENING CRITERIA		
Parcel Zoning		Agricultural Watershed (AW)
Project Parcel Location		Napa Valley Floor[1] All Other Areas[2]
Parcel Size		10.1± acres (Napa Valley Floor) 17.66± acres (All other Areas) 27.76± acres (Total Parcel)
Water Use Criteria	Napa Valley Floor	0.3 acre-feet per acre per year
	All other Areas	Parcel Specific
Well and Spring Interference		None Anticipated
Groundwater/Surface Water Interaction		None Anticipated
Screening Tier		Tier 2

[1] As displayed on the Napa County Watershed Information & Conservation Council (WICC) website, November 2014 Updates, Interactive Map.
[2] Parcels located in "All Other Areas" are defined as not being located within the Napa Valley Floor or within a groundwater deficient area. Water use criterion for parcels termed "All Other Areas" are determined on a parcel specific basis. Projects located in "All Other Areas" shall complete a Tier 1 water analysis, then proceed to a Tier 2 analysis to estimate the average annual recharge

Since adoption of the Groundwater Sustainability Plan by the County of Napa, the NVGB boundary takes precedence in determining applicable policy regarding groundwater use for this project; the parcel and project well are in "All Other Areas." As summarized in Table 1, the subject parcel is located in the Agricultural Watershed (AW) Zoning District in "All Other Areas". As of June 7, 2022 the Napa Valley Floor has been reclassified and designated as a groundwater sustainability area and PBES adopted new Water Availability Analysis (WAA) policies in response to the drought emergency declaration released by the Governor of California. PBES Water Availability Analysis (WAA) – Guidance Document dated May 12, 2015 summarized as follows remains in effect with modifications pertaining to the Tier 1 and Tier 3 analyses as described and addressed in the supplemental Water Availability Analysis prepared by O'Connor Environmental, Inc. The water use criteria for a parcel located in "All Other Areas" will generally be required to conduct a Tier 2 evaluation and projects will be subject to Tier 3 analysis where specifically indicated by PBES GIS mapping of streams of concern for streamflow depletion that lie within 1,500 ft of project wells. The water use criteria for the proposed project is considered parcel specific and must be considered in relation to the average annual groundwater recharge available to the project property. The Tier 2 well interference criterion is presumptively met if there are no non-project wells located within 500 feet[3] of the existing or proposed project well(s). For those projects with neighboring wells located within 500 feet of the project well(s), additional evaluation will be required to assess the potential drawdown in those existing wells resulting from project well operation relative to the Tier 2 criterion; this document contains the required Tier 2 analysis.

WATER DEMAND

Estimated Water Use

The total water demand for the existing and proposed uses for the project is calculated below based on the Guidelines for Estimating Residential and Non-residential Water Use from the WAA Guidance Document (2015):

TABLE 2A: EXISTING WATER DEMAND

Description	Estimated Water Usage (acre-feet/year)
Residential	
Primary Residence	0.75
Pool	0.10
Vineyard Block A (1.2± acres)[4]	
Irrigation	0.42
Heat Protection	0.30
Total Existing Water Demand =	1.57

[3] Distance is measured horizontally from the well.
[4] Vineyard irrigation water usage is referenced from *Appendix B: Estimated Water Use of Specified Land Use* from Napa County WAA-Guidance Document (2015).

TABLE 2B: PROPOSED WATER DEMAND	
Description	**Estimated Water Usage (acre-feet/year)**
Residential	
Primary Residence	0.75
Pool	0.10
Vineyard Blocks A, B1, B2, & B3 (5.9± acres)[5]	
Irrigation	2.07
Heat Protection	1.48
Total Proposed Water Demand =	4.40

As shown in Table 2A and Table 2B, the water demand is estimated to increase from 1.57 to 4.39 acre-feet per year as part of the proposed improvements. Refer to the attached Table I and Table II for existing and proposed water demand calculations.

SOURCE WATER INFORMATION

There are three (3) existing groundwater wells located on the parcel. Well #1 (Project Well) located near the driveway entrance to the parcel and residence and is shown on the "Non-Project Well & Natural Spring Location Exhibit" and the Plan prepared by Bartelt Engineering will be the primary source of irrigation water for the existing and proposed vineyards. Well(s) #2 and #3 will provide supplemental vineyard irrigation if necessary; however, well(s) #2 and #3 will primarily be used to provide water for residential use.

There is one (1) 34,882 gallon existing storage tank that will be utilized for vineyard irrigation; the irrigation tank can also be utilized for fire protection.

Well Description

Per the Well Completion Report, the existing project well was constructed in 2021 by DBess Pump and Well. This well is reported to be constructed of five (5) inch diameter SDR-21 PVC casing to a completed depth of 415 feet with a 30 foot bentonite annular seal. Refer to the attached Well Completion Report (WCR2022-001641) under permit E21-00151 for additional information.

Well Yield Test

A yield test was performed by DBess Pump and Well on the project well at the time of drilling, with an estimated yield of 60 gallons per minute (gpm). Prior to the start of the yield test, static water level was recorded at 60 feet below ground surface. A sustained yield of 60 gallons per minute (gpm) was recorded after three (3) hours of continuous pumping. Based on conversations with DBess Pump and Well, it is our understanding that the existing well pump installed in the project well is a three (3) horsepower pump rated at less than 10

[5] Vineyard irrigation water usage is referenced from *Appendix B: Estimated Water Use of Specified Land Use* from Napa County WAA-Guidance Document (2015).

gpm. For the purpose of this Water Availability Analysis, the project well is defined as a very low pumping capacity[6] well.

Neighboring Water Source(s)

Based on review of neighboring property records from the Napa County Planning, Building, and Environmental Services (PBES) Department, from the California State Water Resources Control Board (SWRCB) Electronic Water Rights Information Mapping System (eWRIMS), and from discussions with PBES staff, there appears to be a number of neighboring groundwater wells located within 500 feet of the project well as well as the Napa River, Dutch Henry Creek and an ephemeral stream located within 1,500 feet[7] of the project well. According to the records, there are ten (10) wells on neighboring parcels that are located within 500 feet of the project well, of which only seven (7) of the wells were able to be verified as operational. No operational well information was able to be verified for parcels APN 021-030-005 and APN 021-030-057. However, based on the well log for APN 021-030-042, it appears that the well on this parcel serves APN 021-030-005. Refer to the attached "Non-Project Well & Natural Spring Location Exhibit" prepared by Bartelt Engineering for the location of the existing project well and neighboring parcel wells.

Water Quality

Water quality results were not available for the existing well prior to completion of this Water Availability Analysis.

GROUNDWATER SUBAREA

According to the Napa County Watershed Information & Conservation Council (WICC), the subject parcel is partially located in the Napa Valley Floor – Calistoga Subarea and partially located in the Eastern Mountain Subarea within the 234,194± acre Napa River Basin Watershed. The Eastern Mountain Subarea includes some Tertiary Rocks, Sonoma Volcanics, and St. Helena Ryholite. The Napa County Groundwater Monitoring Program has a well in the proximity of Bale Lane (Well ID: 08N06W10Q001M) that has been monitoring groundwater levels since 1949. Over the time period from September 2002 to July 2021, the recorded groundwater depth in this well ranged from 4.5 feet to 47.7 feet from ground surface.

Ground elevations of the Napa Valley Floor – Calistoga and Eastern Mountain Subareas in the proximity of the project range from 285 feet to over 2,000 feet mean sea level. It has been reported that the groundwater quality available in this subarea is generally of good quality "with limited samples exceeding standards for constituents including various metals

[6] Under the Water Availability Analysis – Guidance Document (adopted on May 5, 2015): "very low pumping capacity wells" are defined as wells with a casing diameter of six (6) inches or less and an installed pump capable of producing less than 10 gpm; "low pumping capacity wells" are defined as wells with a casing diameter of six (6) inches or less and an installed pump capable of producing between 10 gpm up to 30 gpm; "moderate to high pumping capacity wells" are defined as wells with a casing diameter greater than six (6) inches and an installed pump capable of producing more than 30 gpm.

[7] The distance to surface waters within 500 feet of any Very Low pumping capacity project well(s) or 1,500 feet of project well(s) with a capacity greater than 10 gallons per minute (gpm). Details concerning potential streamflow depletion in unconsolidated alluvial settings were referenced from Technical Memorandum (LSCE, 2013).

and minerals" (Napa County Watershed Information & Conservation Council (WICC)). Elevated levels of iron and manganese levels have been recorded in the past.

GEOLOGICAL FEATURES

The attached "Geological Site Location Map" prepared by Bartelt Engineering shows the parcel boundaries, approximate well locations and geologic materials within the parcel boundary. The background for the exhibit is sourced from the "Geological Map of Napa County" from the USGS Investigations Map 2918. The project area appears to be primarily underlain with Sonoma Volcanics with the project well located within an area of Superficial Deposits.

Per the Napa County Baseline Data Report (2005), Sonoma Volcanics consist of dacite, rhyolite and andesite rock types. These rocks are commonly exposed over much of Napa Valley. In terms of groundwater resources, tuffaceous units within the Sonoma Volcanics host significant volumes of groundwater under both confined and unconfined conditions.

ALL OTHER AREAS ESTIMATED GROUNDWATER RECHARGE

The allowable water allotment for the subject parcel is determined by estimating the groundwater recharge rate and accounting for a portion of the parcel and the location of the project well being located on the "Valley Floor". Groundwater recharge can be estimated by understanding the soil properties and geological materials present and their ability to percolate groundwater to the saturated zone of the aquifer. Water flowing into the ground consists primarily of recharge from precipitation, surface water seepage, and artificial recharge. Water flowing out of the ground primary involves extraction from wells, spring discharge, and evapotranspiration. In Napa County, precipitation has been primarily established as the primary source of groundwater (Kunkel and Upson, 1960). Since the subject parcel is partially located in the Eastern Mountains Groundwater Subarea with an Ephemeral Stream located in the proximity of the project area, direct infiltration from rainfall is likely to be the most significant factor for groundwater recharge. Without having site recorded data showing the change in groundwater, this analysis models groundwater recharge as a percent of rainfall. The amount of rainfall that is estimated to recharge groundwater is impacted by a number of factors. Some of these factors include precipitation, soil properties and underlain geological materials.

Precipitation and Groundwater Recharge Analysis

Precipitation and Groundwater Recharge analysis is presented in the supplemental Water Availability Analysis prepared by O'Connor Environmental, Inc.

Estimated Neighboring Well Drawdown

The proximity of the project well relative to neighboring wells ranges from 200 feet to 500 feet. Information from the project and neighboring wells application/permit/completion documentations and soil properties from the subject parcels were used to estimate the well drawdown at the neighboring non-project wells. The Water Well Drillers Reports for each of the neighboring parcels are included with this analysis for reference.

The project well is estimated to have a pumping rate of less than 10 gpm. The project well and neighboring wells are assumed to be located within a confined aquifer. The following table summarizes the attached Neighboring Well Drawdown Tables included with this analysis. The estimated well drawdowns are calculated using the Theis Equation[8].

TABLE 3: CALCULATED WELL DRAWDOWN

Project well pumping rate < 10 gpm					
Aquifer thickness [9]= varies from 20 feet to 300 feet					
Time = 1 day					
Neighboring Well (APN)	**Aquifer Thickness (feet)**	**Hydraulic Conductivity[10] (ft/day)**	**Radial Distance Between Wells (feet)**	**Specific Storage[11]**	**Calculated Well Drawdown (feet)**
021-030-043	160	5.0E+1	450	1.10E-5	0.2
021-030-046	160	5.0E+1	200	1.10E-5	0.2
021-030-047	260	5.0E+1	500	1.10E-5	0.1
021-030-048	300	5.0E+1	500	1.10E-5	0.1
021-030-049	160	5.0E+1	400	1.10E-5	0.2
021-030-050	20	5.0E+1	400	1.10E-5	1.1
021-030-058	118	5.0E+1	450	1.10E-5	0.2

Using a Representative Hydraulic Conductivity Range, which is consistent with the WAA guidance Document's Table F-4, the estimated drawdown at the neighboring wells after one (1) day of continuous pumping of the project well is estimated to be between 0.1 feet and 1.1 feet which is less than the allowable 10 feet criteria; therefore, pumping of the project well is not anticipated to negatively impact the existing neighboring wells.

SUMMARY

The groundwater demand generated as a result of the proposed development is estimated to increase from 1.57 acre-feet per year (see Table 2A) to 4.39 acre-feet per year (see Table 2B). The available water for the subject parcel is the estimated groundwater recharge for the entire parcel area that is located in All Other Areas and underlain with Sonoma Volcanics.

[8] Drawdown after one (1) day is calculated using the Theis Equation and a series calculation of W(u) to u6.
[9] Aquifer thickness is based on the sum of the reported perforation sections listed on the Well Completion Reports for each of the neighboring wells individually.
[10] Referenced from Table F-4: Representative Hydraulic Conductivity Ranges for Selected Materials for Fractured Basalt (e.g., Sonoma Volcanics). The hydraulic conductivity represents the average value in the WAA Guidance Document (2015) for the selected material.
[11] Referenced from Table F-3: Representative Specific Storage Ranges for Selected Materials for Rock, Fissured. The storage coefficient represents the average value referenced in the WAA Guidance Document (2015) for the selected material and assumes the wells are in a confined aquifer.

Results of the Precipitation and Groundwater Recharge analysis is presented in the supplemental Water Availability Analysis prepared by O'Connor Environmental, Inc.

CONCLUSION

This analysis demonstrates that the groundwater demand for the proposed project can feasibly be sourced without any negative impact to the surrounding neighboring wells and satisfies the Tier 2 Water Use Criterion of the Napa County Water Availability Analysis.

ATTACHMENTS

USGS – Topographic Site Location Information

Geological Site Location Map

Neighboring Well & Natural Spring Location Exhibit

Table I – Existing Water Demand

Table II – Proposed Water Demand

Neighboring Well Drawdown Tables:

- Well Drawdown APN 021-030-043
- Well Drawdown APN 021-030-046
- Well Drawdown APN 021-030-047
- Well Drawdown APN 021-030-048
- Well Drawdown APN 021-030-049
- Well Drawdown APN 021-030-050
- Well Drawdown APN 021-030-058

NRCS Custom Soils Report

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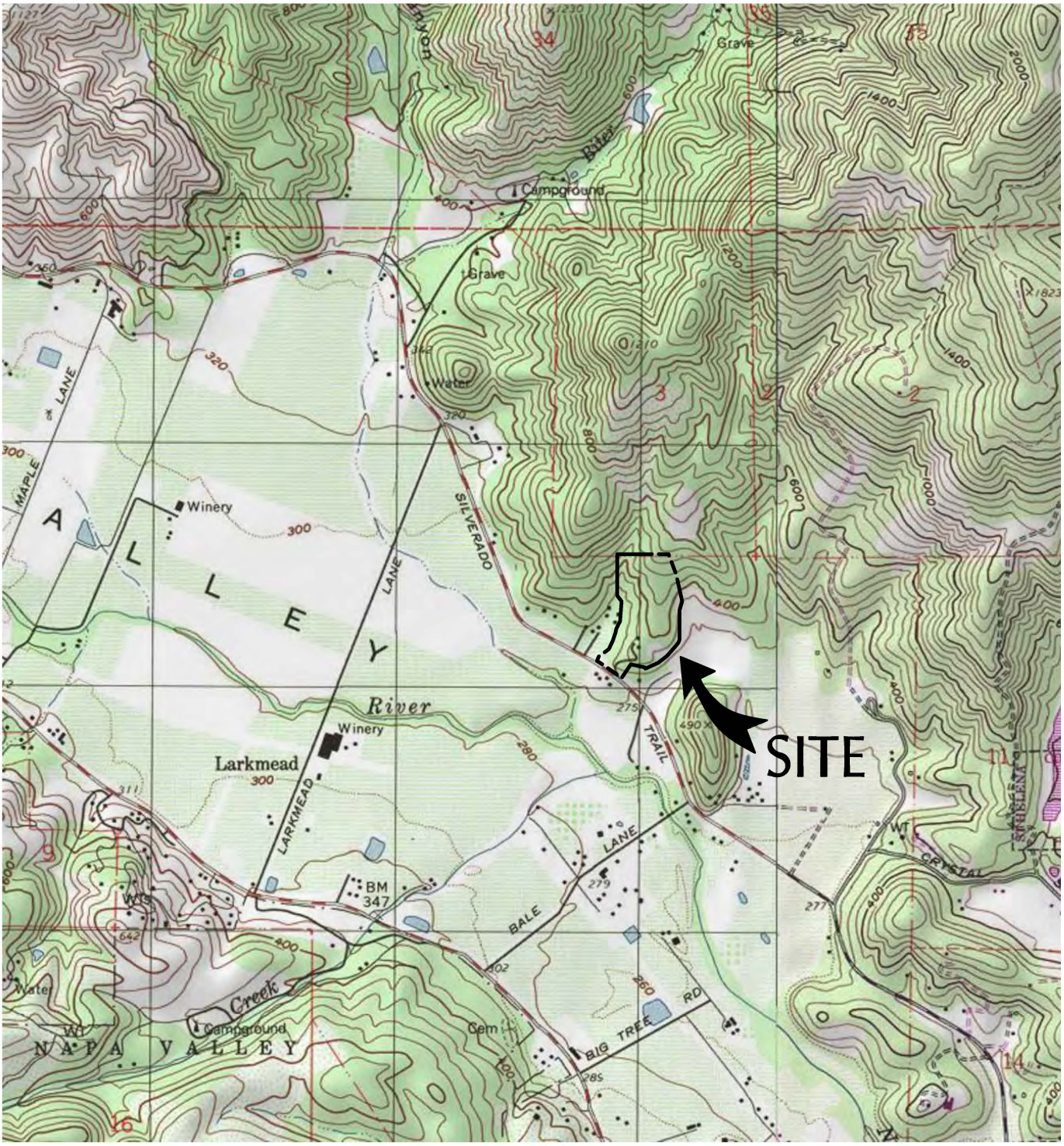
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TOPOGRAPHIC SITE LOCATION INFORMATION

USGS 7.5 MINUTE QUADRANGLE "CALISTOGA"

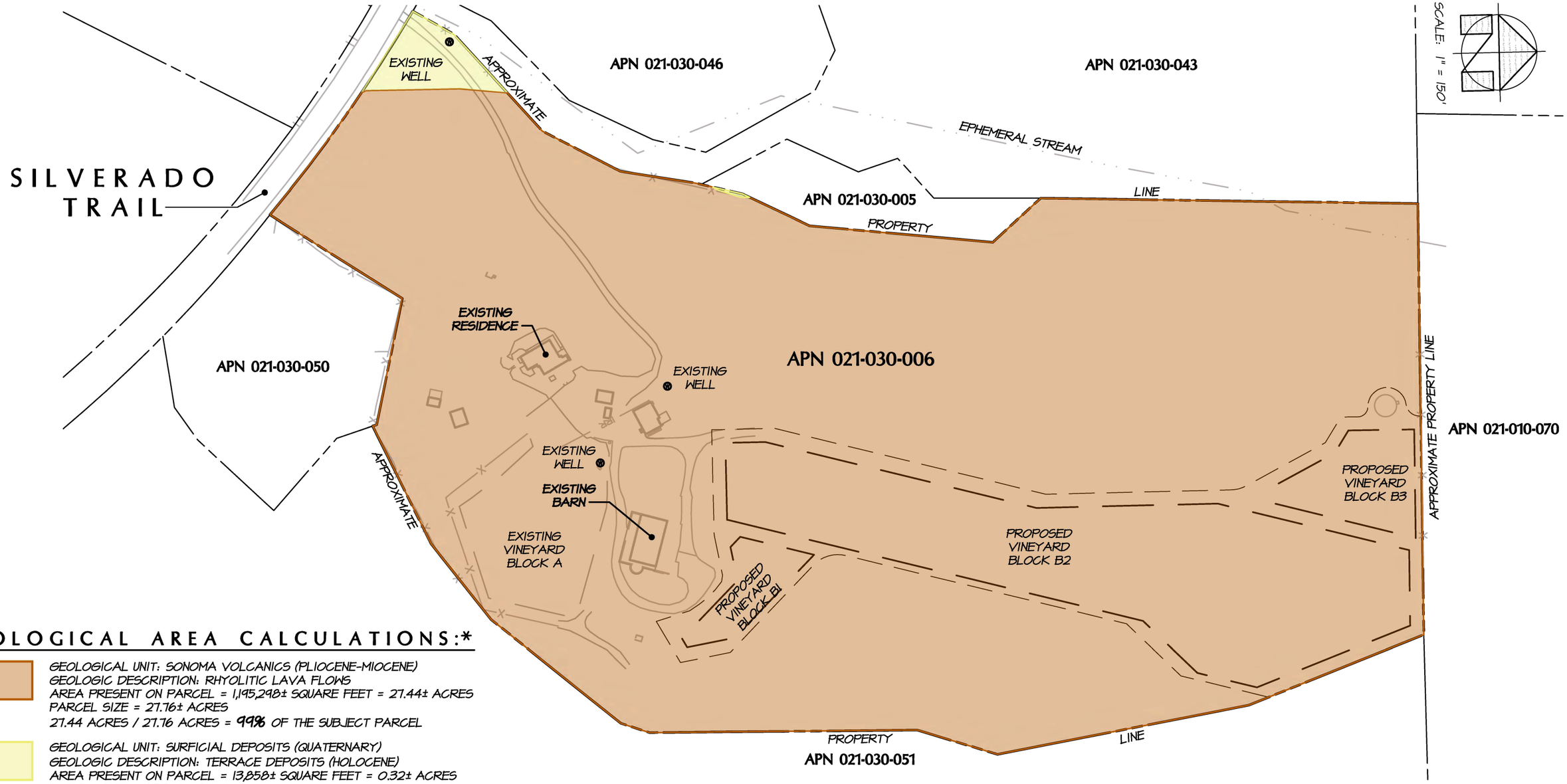
Scale: 1" = 2000'



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Miller Vineyard
3906 Silverado Trail
Napa County, CA
APN 021-030-006

Job No. 20-10



GEOLOGICAL AREA CALCULATIONS:*

GEOLOGICAL UNIT: SONOMA VOLCANICS (PLIOCENE-MIOCENE)
GEOLOGIC DESCRIPTION: RHYOLITIC LAVA FLOWS
AREA PRESENT ON PARCEL = 1,195,298± SQUARE FEET = 27.44± ACRES
PARCEL SIZE = 27.76± ACRES
27.44 ACRES / 27.76 ACRES = **99%** OF THE SUBJECT PARCEL

GEOLOGICAL UNIT: SURFICIAL DEPOSITS (QUATERNARY)
GEOLOGIC DESCRIPTION: TERRACE DEPOSITS (HOLOCENE)
AREA PRESENT ON PARCEL = 13,858± SQUARE FEET = 0.32± ACRES
PARCEL SIZE = 27.76± ACRES
0.32 ACRES / 27.76 ACRES = **1%** OF THE SUBJECT PARCEL

*THE SURVEYED SUBJECT PARCEL BOUNDARY AREA IS 27.76± ACRES WHEREAS THE ASSESSED PARCEL SIZE IS 28.77± ACRES.

GEOLOGICAL SITE LOCATION MAP

SCALE: 1" = 150'

NOTE:

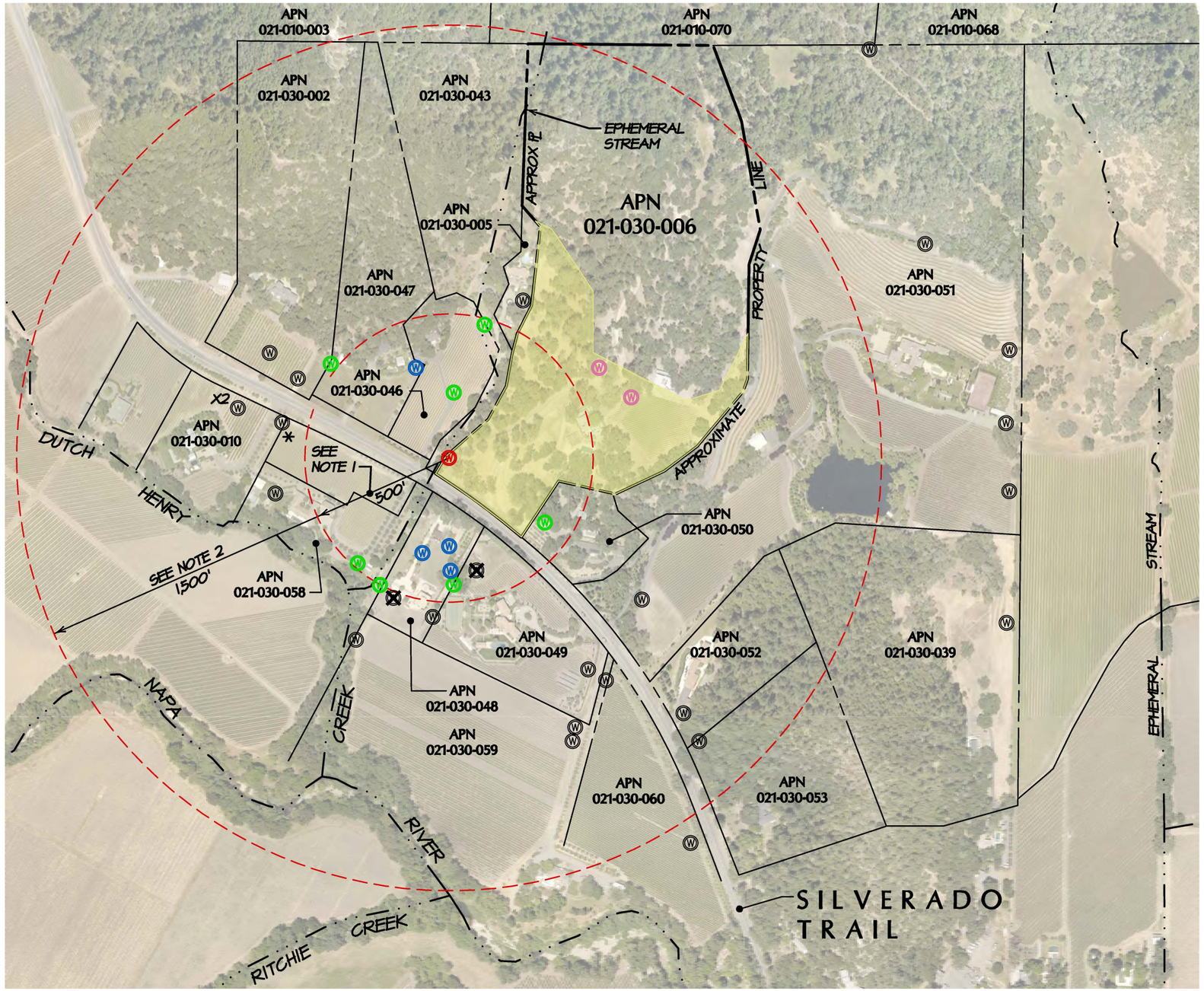
THE GEOLOGICAL MAP DATA USED AS A BASE FOR THIS EXHIBIT WAS TAKEN FROM THE "GEOLOGICAL MAP OF NAPA COUNTY" USGS INVESTIGATIONS MAP AND DOWNLOADED FROM WWW.NAPAWATERSHEDS.ORG.

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Sheet 1 of 1

1/25/2023 - 11:03 AM, stevenc, S:\LAND PROJECTS\2018-2022\2010\2020 ECP TRK 1\ACAD\EXHIBITS\2010-GEO MAPPING



SCALE: 1" = 400'

LEGEND:

- LIMITS OF PARCEL WITHIN VALLEY FLOOR (437,457± SQ FT OR 10.0± ACRES)
- PROJECT WELL
- NON-PROJECT WELL (SEE WATER AVAILABILITY ANALYSIS)
- NEIGHBORING NON-PROJECT WELL WITHIN 500 FEET OF PROJECT WELL (SEE NOTE 1)
- NEIGHBORING NON-PROJECT WELL WITHIN 500 FEET OF PROJECT WELL INCLUDED IN THE WATER AVAILABILITY ANALYSIS
- NEIGHBORING NON-PROJECT WELL OUTSIDE THE 500 FEET OF PROJECT WELL
- NEIGHBORING NON-PROJECT WELL DESTROYED PER NAPA COUNTY DOCUMENTS

NOTES:

* NO RECORDED WELL INFORMATION FOR THESE PARCELS (APN 021-030-005 AND 021-030-057).

1. REFER TO THE WATER AVAILABILITY ANALYSIS (WAA) GUIDANCE DOCUMENT FOR NEIGHBORING WELL(S) LOCATED WITHIN 500 FEET OF THE PROJECT WELL KNOWN AS THE WELL ZONE OF INFLUENCE (GROUNDWATER).
2. REFER TO THE WAA GUIDANCE DOCUMENT FOR THE PROPOSED PROJECT WELL LOCATED WITHIN 1,500 FEET OF NATURAL SPRINGS THAT ARE BEING USED FOR DOMESTIC OR AGRICULTURAL PURPOSES KNOWN AS THE WELL ZONE OF INFLUENCE (SURFACE WATER).
3. WELL LOCATIONS ARE APPROXIMATE AND ARE BASED ON DATA OBTAINED FROM NAPA COUNTY ENVIRONMENTAL HEALTH DIVISION RECORDS. WELL LOCATION RECORDS VARY IN ACCURACY. LOCATION OF WELLS SHOULD BE VERIFIED IN THE FIELD.

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NON-PROJECT WELL & NATURAL SPRING LOCATION EXHIBIT

SCALE: 1" = 400'

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APN 021-030-006
Job No. 20-10
Revised - January 2023
Sheet 1 of 1

1/25/2023 - 7:35 AM, steven, S:\LAND PROJECTS\2018-2022\2010\2020 ECP TRK \ACAD\EXHIBITS\2020-WELL IN INFLUENCI

Miller Vineyard
Existing Water Demand
Table I

Vineyard Area: Block A **1.2 acres**

EXISTING WATER DEMAND			
Description	**Water Usage Rate[1]**		**Water Demand (acre-feet/year)**
Residential			
Primary Residence	0.75	acre-feet/year (0.5 to 0.75)	0.75
Secondary Residence or Farm Labor Dwelling	0.2-0.5	acre-feet/year	
Pool	0.05 - 0.1	acre-feet/year (w/ & w/o cover)	0.1
Agricultural			
Vineyards			
Irrigation Only	0.35	acre-feet/acre-year (0.2 to 0.5)	0.42
Heat Protection	0.25	acre-feet/acre-year	0.30
Frost Protection	0.25	acre-feet/acre-year	-
Irrigated Pastures	4.0	acre-feet/acre-year	-
Orchards	4.0	acre-feet/acre-year	-
Livestock (sheep or cows)	0.01	acre-feet/acre-year	-
Winery			
Process Water	2.15	acre-feet/100,000 gallon of wine	-
Domestic & Landscaping	0.50	acre-feet/100,000 gallon of wine	-
Employees	15	gallons/per shift	-
Tasting Room Visitation	3	gallons per visitor	-
Events and Marketing, with on-site catering	15	gallons per visitor	-
Industrial			
Food Processing	31	acre-feet/employee-year	-
Printing/Publishing	0.60	acre-feet/employee-year	
Commercial			-
Office Space	0.01	acre-feet/employee-year	-
Warehouse	0.05	acre-feet/employee-year	-
Estimated Proposed Water Demand (acre-feet/year):			1.57
Estimated Proposed Water Demand (gallons/year):			511,586

1) Water usage rates referenced from *Appendix B: Estimated Water Use of Specified Land Use* from Napa County WAA-Guidance Document (2015) unless noted otherwise

Miller Vineyard
Proposed Water Demand
Table II

Vineyard Area: Blocks A, B1, B2, & B3 **5.9 acres**

PROPOSED WATER DEMAND			
Description	**Water Usage Rate[1]**		**Water Demand (acre-feet/year)**
Residential			
Primary Residence	0.75	acre-feet/year (0.5 to 0.75)	0.75
Secondary Residence or Farm Labor Dwelling	0.2-0.5	acre-feet/year	
Pool	0.05 - 0.1	acre-feet/year (w/ & w/o cover)	0.1
Agricultural			
Vineyards			
Irrigation Only	0.35	acre-feet/acre-year (0.2 to 0.5)	2.07
Heat Protection	0.25	acre-feet/acre-year	1.48
Frost Protection	0.25	acre-feet/acre-year	-
Irrigated Pastures	4.0	acre-feet/acre-year	-
Orchards	4.0	acre-feet/acre-year	-
Livestock (sheep or cows)	0.01	acre-feet/acre-year	-
Winery			
Process Water	2.15	acre-feet/100,000 gallon of wine	-
Domestic & Landscaping	0.50	acre-feet/100,000 gallon of wine	-
Employees	15	gallons/per shift	-
Tasting Room Visitation	3	gallons per visitor	-
Events and Marketing, with on-site catering	15	gallons per visitor	-
Industrial			
Food Processing	31	acre-feet/employee-year	-
Printing/Publishing	0.60	acre-feet/employee-year	
Commercial			-
Office Space	0.01	acre-feet/employee-year	-
Warehouse	0.05	acre-feet/employee-year	-

Estimated Proposed Water Demand (acre-feet/year):	4.39
Estimated Proposed Water Demand (gallons/year):	1,430,486

1) Water usage rates referenced from *Appendix B: Estimated Water Use of Specified Land Use* from Napa County WAA-Guidance Document (2015) unless noted otherwise

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NEIGHBORING WELL DRAWDOWN					
Project Well					
Constant pumping rate	Q	=	10	gpm	
Well diameter	Ø	=	9	inch	
Total depth of well		=	415	feet	
Screened interval		=	260	feet	
Neighboring Well					
Constant pumping rate	Q	=	12	gpm	
Well diameter	Ø	=	8	inch	
Total depth of well		=	240	feet	
Screened interval		=	160	feet	Assumed Value, See Note 1
Caluclated Drawdown in Neighboring Well					
Aquifer Thickness	D	=	160	ft	
Hydraulic Conductivity	K	=	5.00E+01	ft/day	K Value, See Note 2
Aquifer Transmissivity	T	=	8,001	ft^2/day	
Pumping Rate	Q	=	10	gpm	
		=	1,925	ft^3/day	
Radial distance from well	r	=	450	feet	
Time since pumping began	t	=	1	day	
Storage coefficient	S	=	1.10E-05		S Value, See Note 3
Allowable Drawdown		=	15	ft	
Calculated Drawdown		=	0.2	ft	

Notes:

1) Aquifer thickness is assumed to be equal to that of the neighboring well screened intervals being evaluated.
2) Referenced from Table F-4 Representative Hydraulic Conductivity Ranges for Selected Materials for Fractured Basalt (e.g., Sonoma Volcanics). The hydraulic conductivity represents the average value in the WAA Guidance Document (2015) for the selected material.
3) Referenced from Table F-3 Representative Specific Storage Ranges for Selected Materials for Rock, Fissured. The storage coefficient represents the average value referenced in the WAA Guidance Document (2015) for the selected material and assumes the wells are in a confined aquifer (conservative).

> Refer to Well Completion Report No. 181693 for well informaiton on APN 021-030-043
> Neighboring well drawdown is calculated using the Theis Equation as described in the WAA Guidance Document (2015).
> The Constant Pumping Rate Value for the Project Well is based on pump settings provided by Dbess Pump and Well, see enclosed email.

BARTELT ENGINEERING

NEIGHBORING WELL DRAWDOWN					
Project Well					
Constant pumping rate	Q	=	10	gpm	
Well diameter	Ø	=	9	inch	
Total depth of well		=	415	feet	
Screened interval		=	260	feet	
Neighboring Well					
Constant pumping rate	Q	=	30	gpm	
Well diameter	Ø	=	6	inch	
Total depth of well		=	260	feet	
Screened interval		=	160	feet	Assumed Value, See Note 1
Caluclated Drawdown in Neighboring Well					
Aquifer Thickness	D	=	160	ft	
Hydraulic Conductivity	K	=	5.00E+01	ft/day	K Value, See Note 2
Aquifer Transmissivity	T	=	8,001	ft^2/day	
Pumping Rate	Q	=	10	gpm	
		=	1,925	ft^3/day	
Radial distance from well	r	=	200	feet	
Time since pumping began	t	=	1	day	
Storage coefficient	S	=	1.10E-05		S Value, See Note 3
Allowable Drawdown		=	10	ft	
Calculated Drawdown		=	0.2	ft	

Notes:

1) Aquifer thickness is assumed to be equal to that of the neighboring well screened intervals being evaluated.
2) Referenced from Table F-4 Representative Hydraulic Conductivity Ranges for Selected Materials for Fractured Basalt (e.g., Sonoma Volcanics). The hydraulic conductivity represents the average value in the WAA Guidance Document (2015) for the selected material.
3) Referenced from Table F-3 Representative Specific Storage Ranges for Selected Materials for Rock, Fissured. The storage coefficient represents the average value referenced in the WAA Guidance Document (2015) for the selected material and assumes the wells are in a confined aquifer (conservative).

> Refer to Well Completion Report No. 0949216 for well informaiton on APN 021-030-046
> Neighboring well drawdown is calculated using the Theis Equation as described in the WAA Guidance Document (2015).
> The Constant Pumping Rate Value for the Project Well is based on pump settings provided by Dbess Pump and Well, see enclosed email.

BARTELT ENGINEERING

NEIGHBORING WELL DRAWDOWN					
Project Well					
Constant pumping rate	Q	=	10	gpm	
Well diameter	Ø	=	9	inch	
Total depth of well		=	415	feet	
Screened interval		=	260	feet	
Neighboring Well					
Constant pumping rate	Q	=	30	gpm	
Well diameter	Ø	=	5	inch	
Total depth of well		=	350	feet	
Screened interval		=	260	feet	Assumed Value, See Note 1
Caluclated Drawdown in Neighboring Well					
Aquifer Thickness	D	=	260	ft	
Hydraulic Conductivity	K	=	5.00E+01	ft/day	K Value, See Note 2
Aquifer Transmissivity	T	=	13,001	ft^2/day	
Pumping Rate	Q	=	10	gpm	
		=	1,925	ft^3/day	
Radial distance from well	r	=	500	feet	
Time since pumping began	t	=	1	day	
Storage coefficient	S	=	1.10E-05		S Value, See Note 3
Allowable Drawdown		=	10	ft	
Calculated Drawdown		=	0.1	ft	

Notes:

1) Aquifer thickness is assumed to be equal to that of the neighboring well screened intervals being evaluated.
2) Referenced from Table F-4 Representative Hydraulic Conductivity Ranges for Selected Materials for Fractured Basalt (e.g., Sonoma Volcanics). The hydraulic conductivity represents the average value in the WAA Guidance Document (2015) for the selected material.
3) Referenced from Table F-3 Representative Specific Storage Ranges for Selected Materials for Rock, Fissured. The storage coefficient represents the average value referenced in the WAA Guidance Document (2015) for the selected material and assumes the wells are in a confined aquifer (conservative).

> Refer to Well Completion Report No. 1073647 for well informaiton on APN 021-030-047
> Neighboring well drawdown is calculated using the Theis Equation as described in the WAA Guidance Document (2015).
> The Constant Pumping Rate Value for the Project Well is based on pump settings provided by Dbess Pump and Well, see enclosed email.

BARTELT ENGINEERING

NEIGHBORING WELL DRAWDOWN					
Project Well					
Constant pumping rate	Q	=	10	gpm	
Well diameter	Ø	=	9	inch	
Total depth of well		=	415	feet	
Screened interval		=	260	feet	
Neighboring Well					
Constant pumping rate	Q	=	30	gpm	
Well diameter	Ø	=	5	inch	
Total depth of well		=	498	feet	
Screened interval		=	300	feet	Assumed Value, See Note 1
Caluclated Drawdown in Neighboring Well					
Aquifer Thickness	D	=	300	ft	
Hydraulic Conductivity	K	=	5.00E+01	ft/day	K Value, See Note 2
Aquifer Transmissivity	T	=	15,002	ft^2/day	
Pumping Rate	Q	=	10	gpm	
		=	1,925	ft^3/day	
Radial distance from well	r	=	500	feet	
Time since pumping began	t	=	1	day	
Storage coefficient	S	=	1.10E-05		S Value, See Note 3
Allowable Drawdown		=	10	ft	
Calculated Drawdown		=	0.1	ft	

Notes:

1) Aquifer thickness is assumed to be equal to that of the neighboring well screened intervals being evaluated.
2) Referenced from Table F-4 Representative Hydraulic Conductivity Ranges for Selected Materials for Fractured Basalt (e.g., Sonoma Volcanics). The hydraulic conductivity represents the average value in the WAA Guidance Document (2015) for the selected material.
3) Referenced from Table F-3 Representative Specific Storage Ranges for Selected Materials for Rock, Fissured. The storage coefficient represents the average value referenced in the WAA Guidance Document (2015) for the selected material and assumes the wells are in a confined aquifer (conservative).

> Refer to Well Completion Report No. e0221137 for well informaiton on APN 021-030-048
> Neighboring well drawdown is calculated using the Theis Equation as described in the WAA Guidance Document (2015).
> The Constant Pumping Rate Value for the Project Well is based on pump settings provided by Dbess Pump and Well, see enclosed email.

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NEIGHBORING WELL DRAWDOWN					
Project Well					
Constant pumping rate	Q	=	10	gpm	
Well diameter	Ø	=	9	inch	
Total depth of well		=	415	feet	
Screened interval		=	260	feet	
Neighboring Well					
Constant pumping rate	Q	=	30	gpm	
Well diameter	Ø	=	5	inch	
Total depth of well		=	545	feet	
Screened interval		=	160	feet	Assumed Value, See Note 1
Caluclated Drawdown in Neighboring Well					
Aquifer Thickness	D	=	160	ft	
Hydraulic Conductivity	K	=	5.00E+01	ft/day	K Value, See Note 2
Aquifer Transmissivity	T	=	8,001	ft^2/day	
Pumping Rate	Q	=	10	gpm	
		=	1,925	ft^3/day	
Radial distance from well	r	=	400	feet	
Time since pumping began	t	=	1	day	
Storage coefficient	S	=	1.10E-05		S Value, See Note 3
Allowable Drawdown		=	10	ft	
Calculated Drawdown		=	0.2	ft	

Notes:

1) Aquifer thickness is assumed to be equal to that of the neighboring well screened intervals being evaluated.
2) Referenced from Table F-4 Representative Hydraulic Conductivity Ranges for Selected Materials for Fractured Basalt (e.g., Sonoma Volcanics). The hydraulic conductivity represents the average value in the WAA Guidance Document (2015) for the selected material.
3) Referenced from Table F-3 Representative Specific Storage Ranges for Selected Materials for Rock, Fissured. The storage coefficient represents the average value referenced in the WAA Guidance Document (2015) for the selected material and assumes the wells are in a confined aquifer (conservative).

> Refer to Well Completion Report No. e0181975 for well informaiton on APN 021-030-049
> Neighboring well drawdown is calculated using the Theis Equation as described in the WAA Guidance Document (2015).
> The Constant Pumping Rate Value for the Project Well is based on pump settings provided by Dbess Pump and Well, see enclosed email.

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NEIGHBORING WELL DRAWDOWN					
Project Well					
Constant pumping rate	Q	=	10	gpm	
Well diameter	Ø	=	9	inch	
Total depth of well		=	415	feet	
Screened interval		=	260	feet	
Neighboring Well					
Constant pumping rate	Q	=	30	gpm	
Well diameter	Ø	=	6	inch	
Total depth of well		=	195	feet	
Screened interval		=	20	feet	Assumed Value, See Note 1
Caluclated Drawdown in Neighboring Well					
Aquifer Thickness	D	=	20	ft	
Hydraulic Conductivity	K	=	5.00E+01	ft/day	K Value, See Note 2
Aquifer Transmissivity	T	=	1,000	ft^2/day	
Pumping Rate	Q	=	10	gpm	
		=	1,925	ft^3/day	
Radial distance from well	r	=	400	feet	
Time since pumping began	t	=	1	day	
Storage coefficient	S	=	1.10E-05		S Value, See Note 3
Allowable Drawdown		=	10	ft	
Calculated Drawdown		=	1.1	ft	

Notes:

1) Aquifer thickness is assumed to be equal to that of the neighboring well screened intervals being evaluated.
2) Referenced from Table F-4 Representative Hydraulic Conductivity Ranges for Selected Materials for Fractured Basalt (e.g., Sonoma Volcanics). The hydraulic conductivity represents the average value in the WAA Guidance Document (2015) for the selected material.
3) Referenced from Table F-3 Representative Specific Storage Ranges for Selected Materials for Rock, Fissured. The storage coefficient represents the average value referenced in the WAA Guidance Document (2015) for the selected material and assumes the wells are in a confined aquifer (conservative).

> Refer to Well Completion Report No. 792300 for well informaiton on APN 021-030-050
> Neighboring well drawdown is calculated using the Theis Equation as described in the WAA Guidance Document (2015).
> The Constant Pumping Rate Value for the Project Well is based on pump settings provided by Dbess Pump and Well, see enclosed email.

BARTELT ENGINEERING

NEIGHBORING WELL DRAWDOWN					
Project Well					
Constant pumping rate	Q	=	10	gpm	
Well diameter	Ø	=	9	inch	
Total depth of well		=	415	feet	
Screened interval		=	260	feet	
Neighboring Well					
Constant pumping rate	Q	=	7	gpm	
Well diameter	Ø	=	5	inch	
Total depth of well		=	158	feet	
Screened interval		=	118	feet	Assumed Value, See Note 1
Caluclated Drawdown in Neighboring Well					
Aquifer Thickness	D	=	118	ft	
Hydraulic Conductivity	K	=	5.00E+01	ft/day	K Value, See Note 2
Aquifer Transmissivity	T	=	5,901	ft^2/day	
Pumping Rate	Q	=	10	gpm	
		=	1,925	ft^3/day	
Radial distance from well	r	=	450	feet	
Time since pumping began	t	=	1	day	
Storage coefficient	S	=	1.10E-05		S Value, See Note 3
Allowable Drawdown		=	10	ft	
Calculated Drawdown		=	0.2	ft	

Notes:

1) Aquifer thickness is assumed to be equal to that of the neighboring well screened intervals being evaluated.
2) Referenced from Table F-4 Representative Hydraulic Conductivity Ranges for Selected Materials for Fractured Basalt (e.g., Sonoma Volcanics). The hydraulic conductivity represents the average value in the WAA Guidance Document (2015) for the selected material.
3) Referenced from Table F-3 Representative Specific Storage Ranges for Selected Materials for Rock, Fissured. The storage coefficient represents the average value referenced in the WAA Guidance Document (2015) for the selected material and assumes the wells are in a confined aquifer (conservative).

> Refer to Well Completion Report No. 535606 for well informaiton on APN 021-030-058
> Neighboring well drawdown is calculated using the Theis Equation as described in the WAA Guidance Document (2015).
> The Constant Pumping Rate Value for the Project Well is based on pump settings provided by Dbess Pump and Well, see enclosed email.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Napa County, California

Miller Vineyard



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

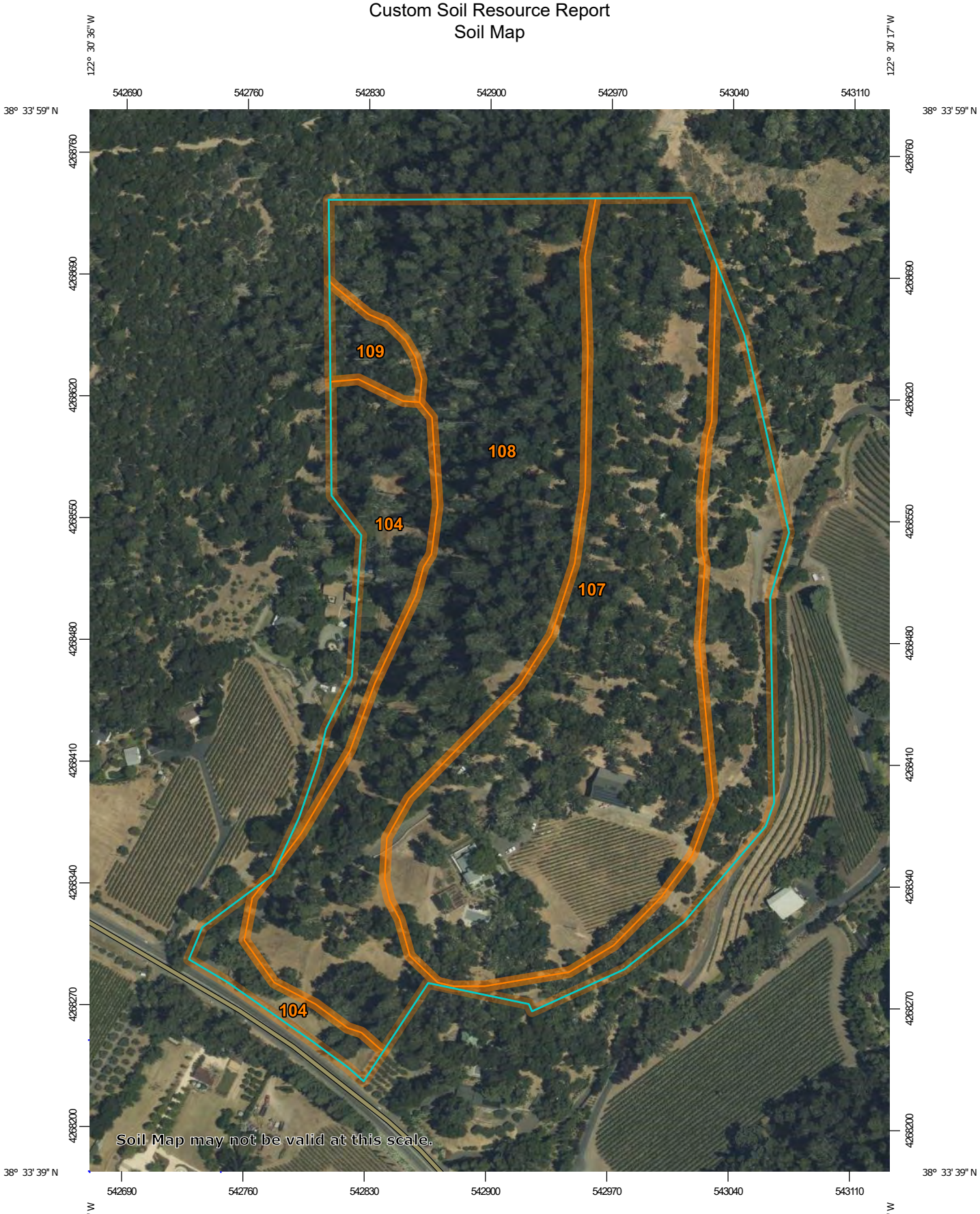
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,980 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 40 80 160 240

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 13, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 2, 2019—Jul 5, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
104	Bale clay loam, 0 to 2 percent slopes	2.8	9.8%
107	Boomer loam, volcanic bedrock, 2 to 35 percent slopes, MLRA 15	11.4	39.5%
108	Boomer gravelly loam, volcanic bedrock, 11 to 43 percent slopes, MLRA 15	14.0	48.9%
109	Boomer gravelly loam, volcanic bedrock, 14 to 60 percent slopes, MLRA 15	0.5	1.8%
Totals for Area of Interest		**28.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Napa County, California

104—Bale clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdk4
Elevation: 20 to 400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Bale and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bale

Setting

Landform: Alluvial fans, flood plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from rhyolite and/or alluvium derived from igneous rock

Typical profile

H1 - 0 to 24 inches: clay loam
H2 - 24 to 60 inches: stratified gravelly sandy loam to loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clear lake

Percent of map unit: 3 percent
Landform: Depressions

Hydric soil rating: Yes

107—Boomer loam, volcanic bedrock, 2 to 35 percent slopes, MLRA 15

Map Unit Setting

National map unit symbol: 2w8d7
Elevation: 530 to 1,840 feet
Mean annual precipitation: 34 to 45 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 283 to 324 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Boomer and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boomer

Setting

Landform: Plateaus, hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Residuum weathered from volcanic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 6 inches: loam
BAt - 6 to 13 inches: loam
Bt1 - 13 to 24 inches: clay loam
Bt2 - 24 to 36 inches: clay loam
Bt3 - 36 to 46 inches: clay loam
Cr - 46 to 58 inches: cemented bedrock

Properties and qualities

Slope: 2 to 35 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.2 to 0.5 mmhos/cm)
Sodium adsorption ratio, maximum: 0.2
Available water capacity: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Aiken

Percent of map unit: 5 percent
Hydric soil rating: No

Forward

Percent of map unit: 5 percent
Hydric soil rating: No

Kidd

Percent of map unit: 5 percent
Hydric soil rating: No

108—Boomer gravelly loam, volcanic bedrock, 11 to 43 percent slopes, MLRA 15

Map Unit Setting

National map unit symbol: 2w8cz
Elevation: 360 to 2,410 feet
Mean annual precipitation: 30 to 49 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 268 to 335 days
Farmland classification: Not prime farmland

Map Unit Composition

Boomer and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boomer

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from volcanic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 6 inches: gravelly loam
BAt - 6 to 13 inches: gravelly loam
Bt1 - 13 to 24 inches: gravelly clay loam

Bt2 - 24 to 36 inches: gravelly clay loam
Bt3 - 36 to 46 inches: gravelly clay loam
Cr - 46 to 58 inches: cemented bedrock

Properties and qualities

Slope: 11 to 43 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.2 to 0.5 mmhos/cm)
Sodium adsorption ratio, maximum: 0.2
Available water capacity: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Aiken

Percent of map unit: 5 percent

Kidd

Percent of map unit: 5 percent

Forward

Percent of map unit: 5 percent

109—Boomer gravelly loam, volcanic bedrock, 14 to 60 percent slopes, MLRA 15

Map Unit Setting

National map unit symbol: 2w8d3
Elevation: 370 to 2,300 feet
Mean annual precipitation: 34 to 52 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 262 to 330 days
Farmland classification: Not prime farmland

Map Unit Composition

Boomer and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boomer

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from volcanic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 6 inches: gravelly loam
BAt - 6 to 13 inches: gravelly loam
Bt1 - 13 to 24 inches: gravelly clay loam
Bt2 - 24 to 36 inches: gravelly clay loam
Bt3 - 36 to 46 inches: gravelly clay loam
Cr - 46 to 58 inches: cemented bedrock

Properties and qualities

Slope: 14 to 60 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.2 to 0.5 mmhos/cm)
Sodium adsorption ratio, maximum: 0.2
Available water capacity: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Aiken

Percent of map unit: 5 percent

Forward

Percent of map unit: 5 percent

Kidd

Percent of map unit: 5 percent

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Management

Land management interpretations are tools designed to guide the user in evaluating existing conditions in planning and predicting the soil response to various land management practices, for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture, and rangeland. Example interpretations include suitability for a variety of irrigation practices, log landings, haul roads and major skid trails, equipment operability, site preparation, suitability for hand and mechanical planting, potential erosion hazard associated with various practices, and ratings for fencing and waterline installation.

Erosion Hazard (Road, Trail)

The ratings in this interpretation indicate the hazard of soil loss from unsurfaced roads and trails. The ratings are based on soil erosion factor K, slope, and content of rock fragments.

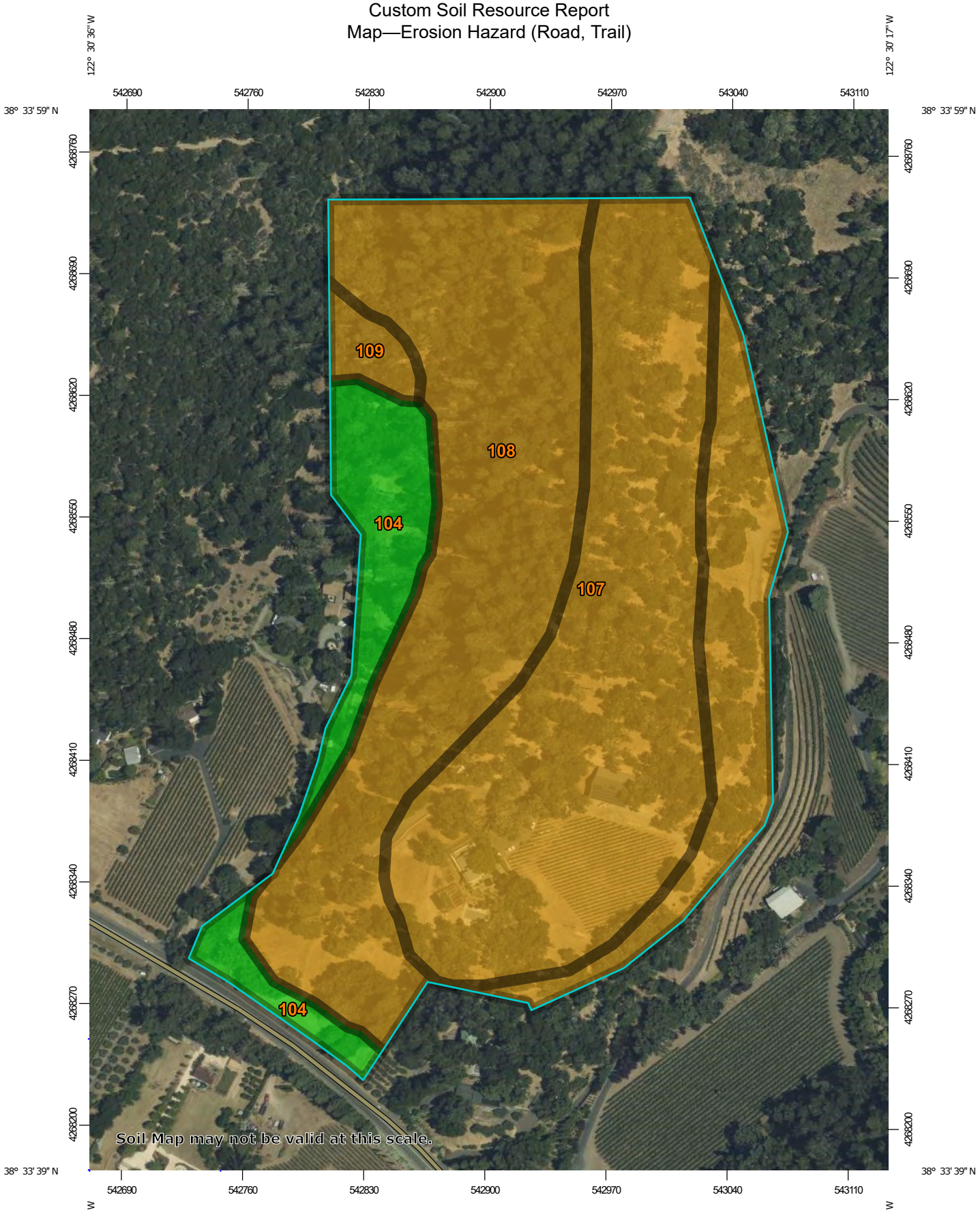
The ratings are both verbal and numerical. The hazard is described as "slight," "moderate," or "severe." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and "severe" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Erosion Hazard (Road, Trail)



Map Scale: 1:2,980 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 40 80 160 240

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Lines
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Points
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 13, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 2, 2019—Jul 5, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Erosion Hazard (Road, Trail)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
104	Bale clay loam, 0 to 2 percent slopes	Slight	Bale (85%)		2.8	9.8%
107	Boomer loam, volcanic bedrock, 2 to 35 percent slopes, MLRA 15	Severe	Boomer (85%)	Slope/erodibility (0.95)	11.4	39.5%
108	Boomer gravelly loam, volcanic bedrock, 11 to 43 percent slopes, MLRA 15	Severe	Boomer (85%)	Slope/erodibility (0.95)	14.0	48.9%
109	Boomer gravelly loam, volcanic bedrock, 14 to 60 percent slopes, MLRA 15	Severe	Boomer (85%)	Slope/erodibility (0.95)	0.5	1.8%
Totals for Area of Interest					**28.7**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Severe	25.9	90.2%
Slight	2.8	9.8%
Totals for Area of Interest	**28.7**	**100.0%**

Rating Options—Erosion Hazard (Road, Trail)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Erosion Factors

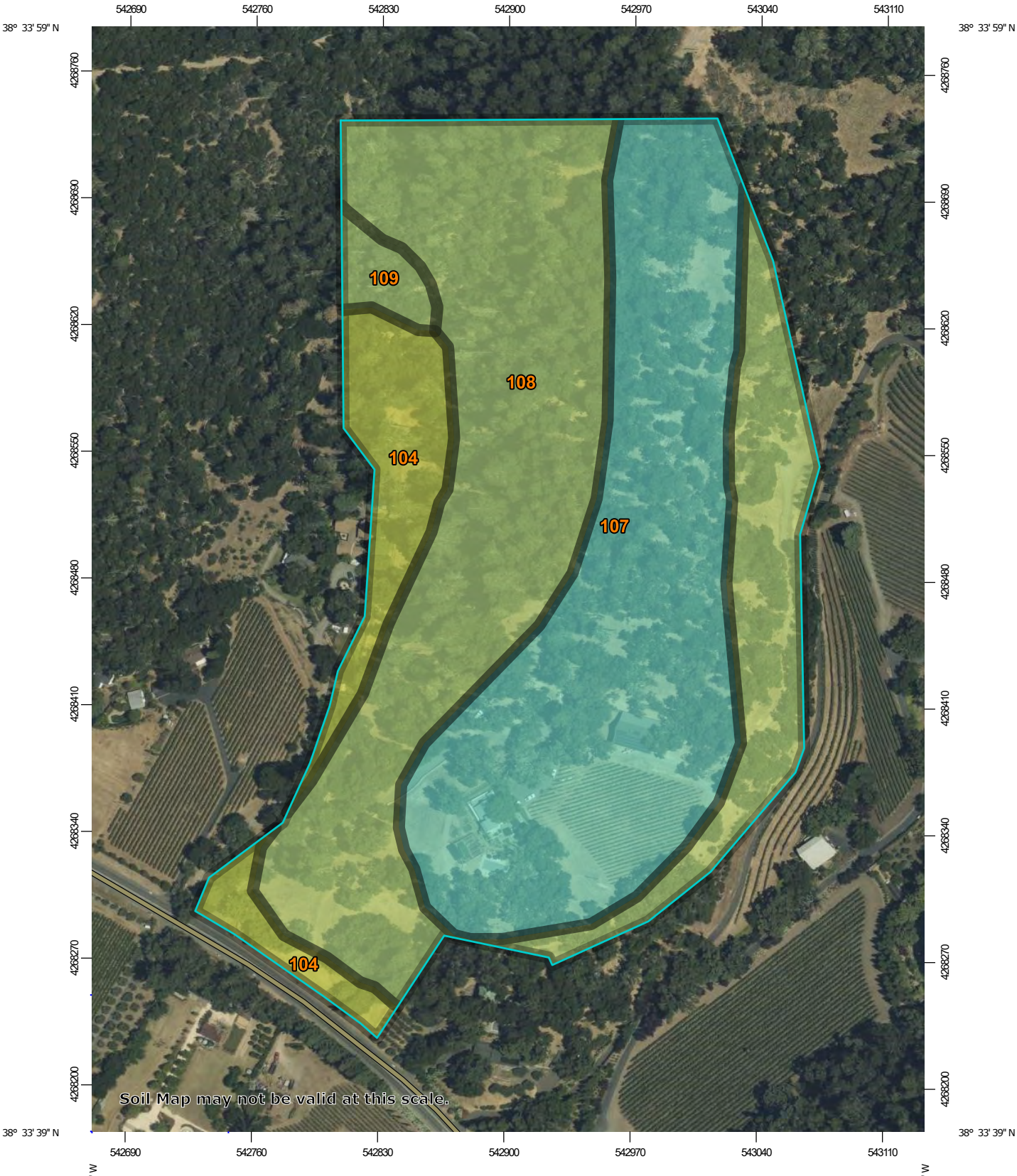
Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

K Factor, Whole Soil

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Custom Soil Resource Report
Map—K Factor, Whole Soil



Map Scale: 1:2,980 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 40 80 160 240

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Lines

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Points

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 13, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 2, 2019—Jul 5, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—K Factor, Whole Soil

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
104	Bale clay loam, 0 to 2 percent slopes	.20	2.8	9.8%
107	Boomer loam, volcanic bedrock, 2 to 35 percent slopes, MLRA 15	.32	11.4	39.5%
108	Boomer gravelly loam, volcanic bedrock, 11 to 43 percent slopes, MLRA 15	.24	14.0	48.9%
109	Boomer gravelly loam, volcanic bedrock, 14 to 60 percent slopes, MLRA 15	.24	0.5	1.8%
Totals for Area of Interest			**28.7**	**100.0%**

Rating Options—K Factor, Whole Soil

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

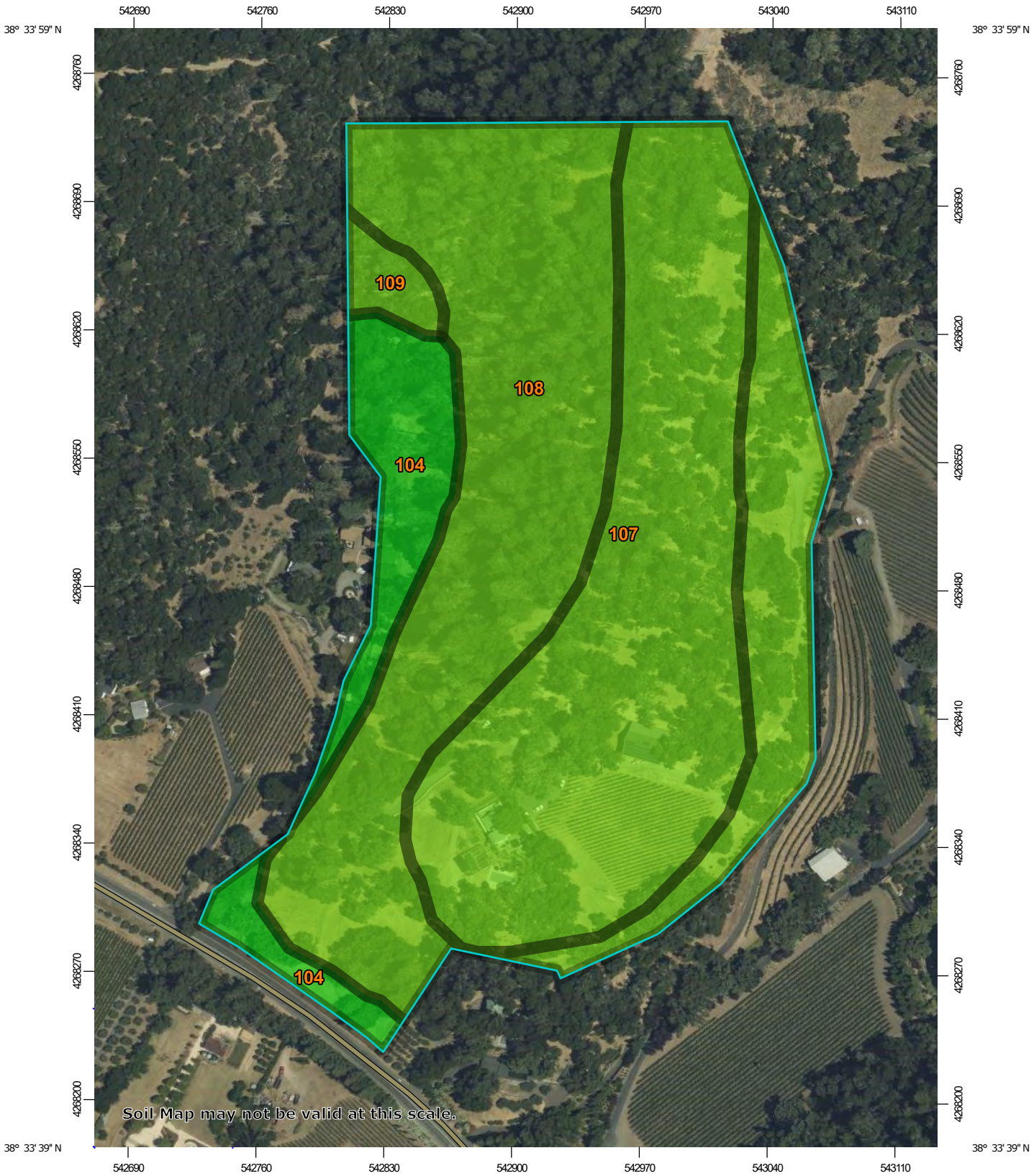
Top Depth: 0

Bottom Depth: 36

Units of Measure: Inches

T Factor

The T factor is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.



Map Scale: 1:2,980 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 40 80 160 240

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- 1
- 2
- 3
- 4
- 5
- Not rated or not available

Soil Rating Lines

- 1
- 2
- 3
- 4
- 5
- Not rated or not available

Soil Rating Points

- 1
- 2
- 3
- 4
- 5
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 13, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 2, 2019—Jul 5, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—T Factor

Map unit symbol	Map unit name	Rating (tons per acre per year)	Acres in AOI	Percent of AOI
104	Bale clay loam, 0 to 2 percent slopes	5	2.8	9.8%
107	Boomer loam, volcanic bedrock, 2 to 35 percent slopes, MLRA 15	4	11.4	39.5%
108	Boomer gravelly loam, volcanic bedrock, 11 to 43 percent slopes, MLRA 15	4	14.0	48.9%
109	Boomer gravelly loam, volcanic bedrock, 14 to 60 percent slopes, MLRA 15	4	0.5	1.8%
Totals for Area of Interest			**28.7**	**100.0%**

Rating Options—T Factor

Units of Measure: tons per acre per year

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

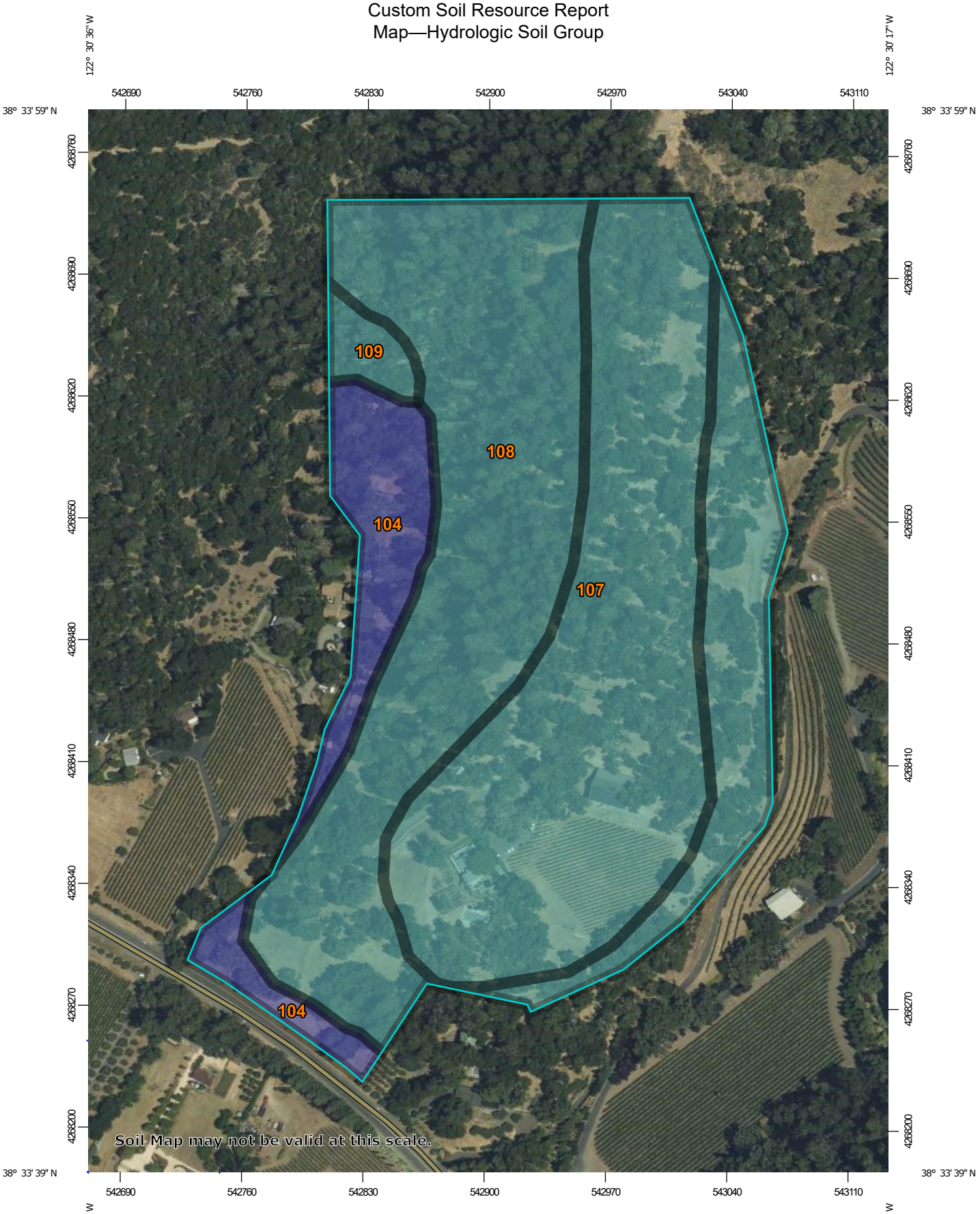
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:2,980 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 40 80 160 240

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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Please rely on the bar scale on each map sheet for map measurements.

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Napa County, California
Survey Area Data: Version 13, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 2, 2019—Jul 5, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
104	Bale clay loam, 0 to 2 percent slopes	B	2.8	9.8%
107	Boomer loam, volcanic bedrock, 2 to 35 percent slopes, MLRA 15	C	11.4	39.5%
108	Boomer gravelly loam, volcanic bedrock, 11 to 43 percent slopes, MLRA 15	C	14.0	48.9%
109	Boomer gravelly loam, volcanic bedrock, 14 to 60 percent slopes, MLRA 15	C	0.5	1.8%
Totals for Area of Interest			**28.7**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

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APPENDIX B

WELL COMPLETION REPORTS

Project Well
Well #1

State of California

Well Completion Report

Form DWR 188 Submitted 2/2/2022
WCR2022-001641

Owner's Well Number 2 | Date Work Began 04/02/2021 | Date Work Ended 04/23/2021

Local Permit Agency Napa County Planning Building and Environmental Services

Secondary Permit Agency | Permit Number E21-00151 | Permit Date 04/02/2021

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

[redacted]

Planned Use and Activity

Activity New Well

Planned Use Water Supply Domestic

Well Location

Address 3906 N SILVERADO TR

City CALISTOGA | Zip 94558 | County Napa

Latitude 38 Deg. 33 Min. 44.1403 Sec. N | Longitude -122 Deg. 30 Min. 33.94 Sec. W

Dec. Lat. 38.5622612 | Dec. Long. -122.5094278

Vertical Datum | Horizontal Datum WGS84

Location Accuracy | Location Determination Method

APN 021 030 006 000

Township 08 N

Range 06 W

Section 10

Baseline Meridian Mount Diablo

Ground Surface Elevation

Elevation Accuracy

Elevation Determination Method

Borehole Information

Orientation Vertical | Specify

Drilling Method Direct Rotary | Drilling Fluid Bentonite

Total Depth of Boring 420 Feet

Total Depth of Completed Well 415 Feet

Water Level and Yield of Completed Well

Depth to first water 60 (Feet below surface)

Depth to Static Water Level 60 (Feet) | Date Measured 09/09/2021

Estimated Yield* 60 (GPM) | Test Type Air Lift

Test Length 3 (Hours) | Total Drawdown 312 (feet)

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

Geologic Log - Free Form

Depth from Surface Feet to Feet		Description
0	5	TOP SOIL
5	85	VOLCANIC ASH
85	86	ROCK & ASH
86	210	HARD CEMENTED CONGOMERATE
210	304	HARD BLACK ROCK
304	345	BLACK & WHITE ROCK
345	375	HARD BLACK ROCK
375	420	RED CINDER

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	120	Blank	PVC	OD: 5.563 in. | SDR: 21 | Thickness: 0.265 in.	0.265	5.563			
1	120	160	Screen	PVC	OD: 5.563 in. | SDR: 21 | Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	
1	160	200	Blank	PVC	OD: 5.563 in. | SDR: 21 | Thickness: 0.265 in.	0.265	5.563			
1	200	420	Screen	PVC	OD: 5.563 in. | SDR: 21 | Thickness: 0.265 in.	0.265	5.563	Milled Slots	0.032	

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	30	Bentonite	High Solids		
30	420	Filter Pack	Other Gravel Pack	3/8 MINIS PEA GRAVEL	REWASHED

Other Observations:

Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (Inches)
0	30	12
30	420	9

Certification Statement

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

Name: BESS D PUMP & WELL ELECT
Person, Firm or Corporation

1115 MT GEORGE AVE (Address) | NAPA (City) | CA (State) | 94558 (Zip)

Signed: *electronic signature received* (C-57 Licensed Water Well Contractor) | 02/02/2022 (Date Signed) | 487027 (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:

Well #2

*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. e0326213

Page 1 of 1

Owner's Well Number 1

Date Work Began 09/22/2016 Date Work Ended 9/28/2016

Local Permit Agency Planning, Building & Environmental

Permit Number E16-00674 Permit Date 9/21/16

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Air Drilling Drilling Fluid Air

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
0	20	soft brown top soil
20	25	solid boulder
25	60	Brown rock and ash
60	80	brown rock and white ash 2 gpm
80	130	solid white ash
130	200	Gray ash and rock
200	240	rock in gray ash 2 gpm
240	330	mix of ash with multi color rock
330	360	red ash and volcanic rock 8 - 10 gpm
360	460	gray ash and rock
460	510	white soft ash

Total Depth of Boring 510 Feet

Total Depth of Completed Well 440 Feet

Well Owner

Name Hank Miller

Mailing Address 3906 Silverado trail

City Calistoga State CA Zip

Well Location

Address 3906 Silverado trail

City Napa County Napa

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

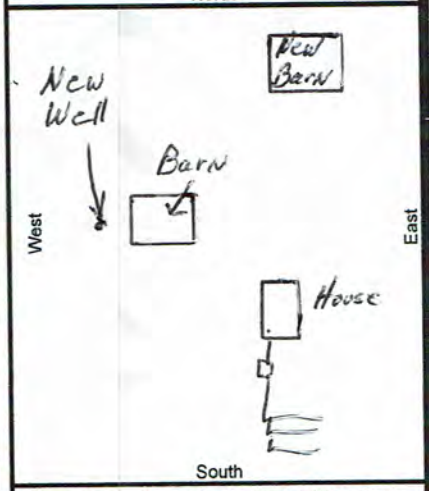
Datum Decimal Lat. Decimal Long.

APN Book 021 Page 030 Parcel 006

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 60 (Feet below surface)

Depth to Static Water Level 60 (Feet) Date Measured 09/28/2016

Estimated Yield * 12 (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 Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	20	12	Blank	PVC Sch. 80		5		
20	100	7 7/8	Blank	PVC Sch. 80		5		
100	200	7 7/8	Screen	PVC Sch. 80		5		0.032
200	220	7 7/8	Blank	PVC Sch. 80		5		
220	440	7 7/8	staggered	PVC Sch. 80		5		0.032

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	20	Bentonite	seal
20	510	Filter Pack	3/8 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 and well
Person, Firm or Corporation

1115 Mt. George ave napa CA 94558
Address City State Zip

Signed
C-57 Licensed Water Well Contractor

Date Signed

487027
C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #3

QUADRUPLICATE
Use of comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in
No. 245513

Notice of Intent No.
Local Permit No. or Date
State Well No.
Other Well No.

(1) OWNER:
Name [redacted]
Address [redacted]
City [redacted] Zip [redacted]

(2) LOCATION OF WELL (See instructions):
County Napa Owner's Well Number 21-030-06
Well address if different from above
Township Range Section
Distance from cities, roads, railroads, fences, etc.

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [X]
Irrigation [ ]
Industrial [ ]
Test Well [ ]
Stock [ ]
Municipal [ ]
Other [ ]

(5) EQUIPMENT:
Rotary [ ] Reverse [ ]
Cable [ ] Air [XX]
Other [ ] Bucket [ ]

(6) GRAVEL PACK:
Yes [XX] No [ ] Size 1/2"
Diameter of bore 9-7/8"
Packed from 30' to 275 ft.

(7) CASING INSTALLED:
Steel [ ] Plastic [XX] Concrete [ ]

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

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	215	6"	200	215	275	.032

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [XX] No [ ] If yes, to depth 30 ft.
Were strata sealed against pollution? Yes [X] No [ ] Interval ft.
Method of sealing grout

(10) WATER LEVELS:
Depth of first water, if known 220 ft.
Standing level after well completion 100 ft.

(11) WELL TESTS:
Was well test made? Yes [X] No [ ] If yes, by whom? driller
Type of test Pump [ ] Bailer [ ] Air lift [X]
Depth to water at start of test 100 ft. At end of test 275 ft
Discharge 50 gal/min after 8 hours Water temperature
Chemical analysis made? Yes [ ] No [X] If yes, by whom?
Was electric log made? Yes [ ] No [ ] If yes, attach copy to this report

(12) WELL LOG:
Total depth 275 ft. Depth of completed well 275 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	2	Topsoil
2	25	Red & Brwn rock soft
25	75	Red brwn rock stringers gray & red
75	100	Red & lt grn & gray rock strgrslay
100	125	Soft blck rock strgs white ash
125	150	Black rock soft
150	175	Black & green rock soft
175	220	Blck grn red rock fract
220	270	Drk red & lt red rock soft fract
270	275	Blk & grn & red rock soft

Work started 6-3- 1987 Completed 6-07 1987

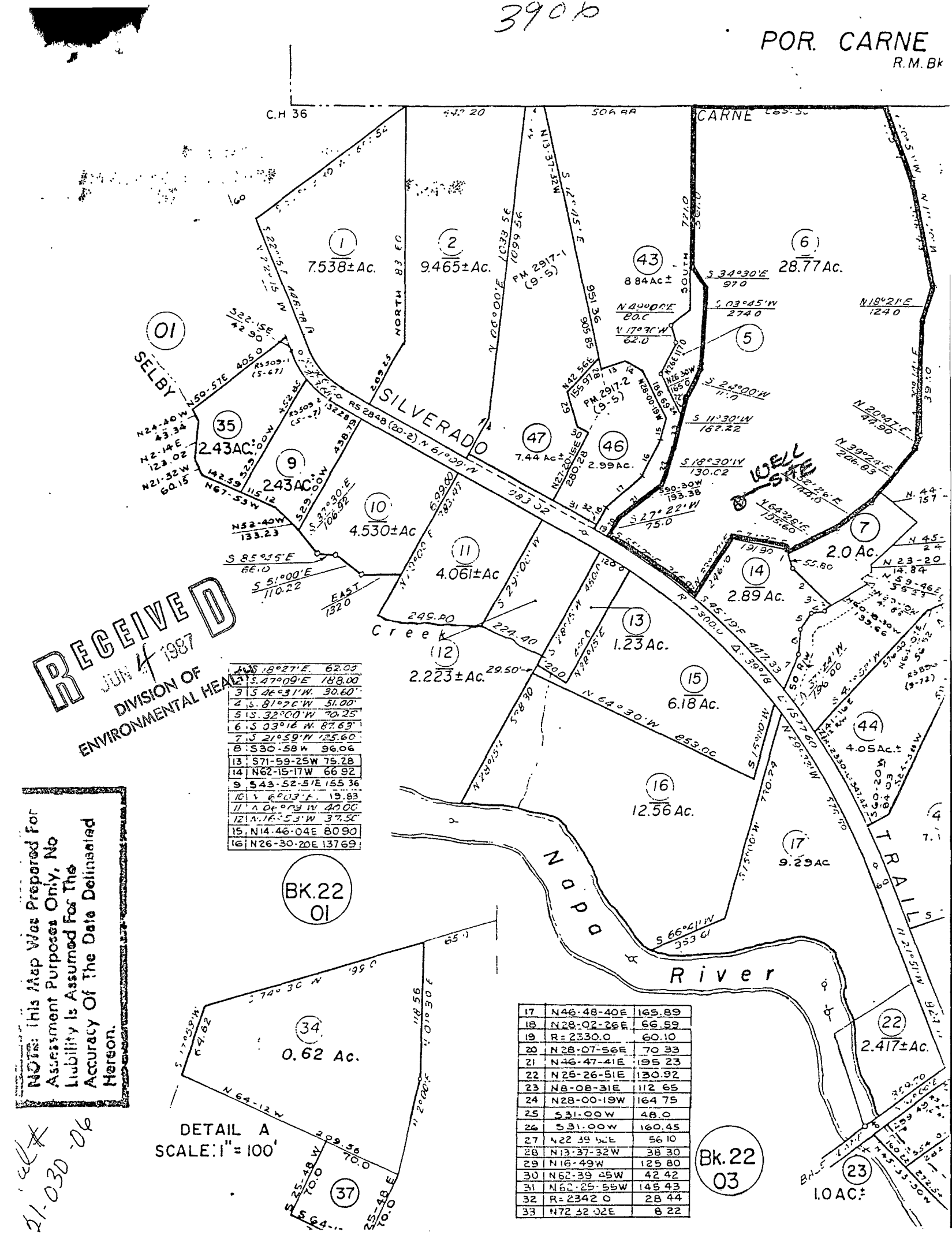
WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief

SIGNED (Well Driller)

NAME Doshier & Gregson Drilling, Inc.
(Person, firm, or corporation) (Typed or printed)

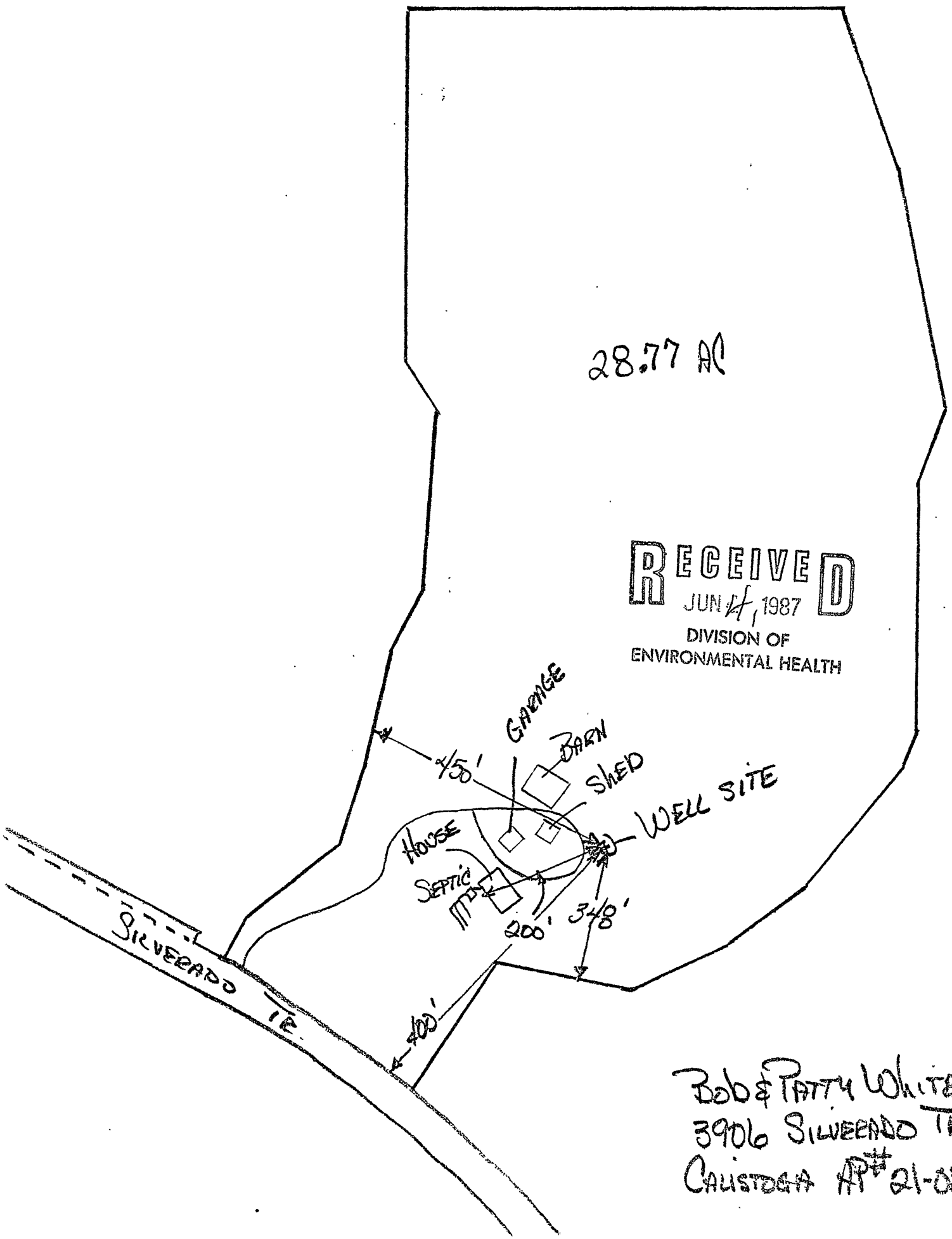
Address 5365 Napa-Vallejo Hwy
City Vallejo Zip 94589
License No. 294001 Date of this report 6/11/87

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM



1	S 18°27'E	62.03
2	S 47°09'E	188.00
3	S 46°31'W	30.60
4	S 81°26'W	51.00
5	S 32°00'W	70.25
6	S 03°16 W	87.63
7	S 21°59'W	135.60
8	S30-58 W	96.06
13	S71-59-25W	75.28
14	N62-15-17W	66 92
9	S43-52-51E	155 36
10	N 6°03'E	19.83
11	N 0°09'W	40.00
12	N 16°53'W	37.50
15	N14-46-04E	80 90
16	N26-30-20E	137 69

17	N46-48-40E	165.89
18	N28-02-26E	66.59
19	R=2330.0	60.10
20	N28-07-56E	70 33
21	N46-47-41E	195 23
22	N28-26-51E	130.92
23	N8-08-31E	112 65
24	N28-00-19W	164 75
25	S31-00W	48.0
26	S31-00W	160.45
27	N22 39 54E	56 10
28	N13-37-32W	38 30
29	N16-49W	125 80
30	N62-39 45W	42 42
31	N62-25-55W	145 43
32	R=2342 0	28 44
33	N72 32 02E	8 22



Bob & Patty White
3906 Silverado Tr.
Calistoga AP# 21-030-06

Well #4

QUADRUPLICATE
For Local Requirements

Page ___ of ___
Owner's Well No. ___

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 0949216

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

Date Work Began 1/03/13, Ended 1/24/13
Local Permit Agency Napa
Permit No. E12-00785 Permit Date 1/3/13

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Mud FLUID supergel

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	20	topsoil brown clay
20	60	multicolor rock brown clay
60	80	white brown gray black rock
80	100	white ash gray rock
100	140	brown white red lt green rock
140	160	gray hard rock
160	180	frac gray green red rock
180	200	green gray black white rock
200	260	gray black frac rock

RECEIVED
JUN 03 2015
Napa County Planning, Building & Environmental Services

CASING CONTINUED

120	220	9 7/8	Perf	F480	6"	200	factory
220	240	9 7/8	Blank	F480	6"	200	
240	260	9 7/8	Perf	F480	6"	200	factory

TOTAL DEPTH OF BORING 260 (Feet)
TOTAL DEPTH OF COMPLETED WELL 260 (Feet)

WELL OWNER

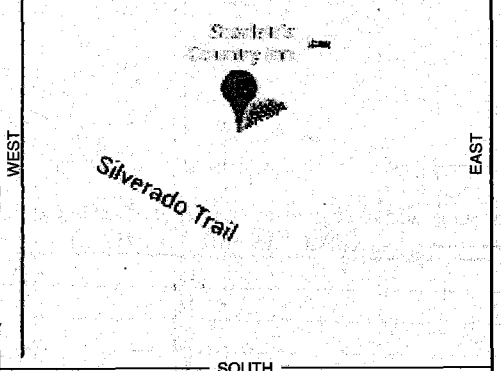
Name [redacted]
Mailing Address [redacted]
CITY [redacted] STATE ZIP

WELL LOCATION

Address 3940 Silverado Trail
City Calistoga
County Napa
APN Book 021 Page 030 Parcel 045
Township ___ Range ___ Section ___
Lat ___ N DEG. MIN. SEC. Long ___ W DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH



*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 (✓)

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

USES (✓)

WATER SUPPLY
X 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 ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 53 (Ft.) & DATE MEASURED 1/24/13
ESTIMATED YIELD * 30. (GPM) & TEST TYPE air
TEST LENGTH 17 (Hrs.) TOTAL DRAWDOWN 240 (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	33	12 3/4	X				F480	6	200	
33	40	9 7/8	X				F480	6	200	
40	60	9 7/8		X			F480	6	200	factory
60	80	9 7/8	X				F480	6	200	
80	100	9 7/8		X			F480	6	200	factory
100	120	9 7/8	X				F480	6	200	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	33	X			
33	260				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 McLean & Williams, Inc.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 878 El Centro Ave., CITY Napa, STATE CA ZIP 94558

Signed ___ DATE SIGNED 3/22/13
C-57 LICENSED WATER WELL CONTRACTOR

C-57 LICENSE NUMBER 396352

DWR 188 REV. 05-03

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

CONFIDENTIAL
PUBLIC DISCLOSURE
WATER CODE SEC. 13752

Well #5

QUADRUPLICATE
For Local Requirements

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Page ___ of ___
Owner's Well No. ___
No. 1073647
Date Work Began 09/1212/03/07 Ended 12/12/07
Local Permit Agency Napa County
Permit No. E-07-00815 Permit Date 11/01/2007

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

GEOLOGIC LOG

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

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	40	Brown Clay & Ash
40	60	Hard Gray Rock
60	110	Hard Brown & Gray Rock
110	120	Hard Gray Rock
120	170	Hard Brown, Gray & White Rock
170	190	Brown Ash
190	230	White Clay
230	300	Green Ash
300	370	Green Sandy Clay

RECEIVED
DEC 24 2007
DEPT. OF ENVIRONMENTAL MANAGEMENT

TOTAL DEPTH OF BORING 370 (Feet)
TOTAL DEPTH OF COMPLETED WELL 350 (Feet)

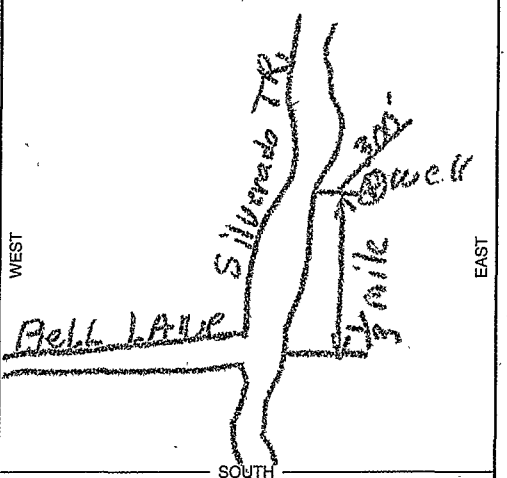
WELL OWNER

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

WELL LOCATION

Address 3942 Silverado TR
City Calistoga
County Napa
APN Book 021-07 Page 047-000 Parcel ___
Township ___ Range ___ Section ___
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 Unk (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 50 (Ft.) & DATE MEASURED 12-12-07
ESTIMATED YIELD * 50 (GPM) & TEST TYPE Air Lift
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN Unk (Ft.) GPM at day of test
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	52	11	✓				Plastic	5	PA80	
52	90	8	✓				"	"	"	
90	350	8		✓			"	"	"	.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	52	✓			
52	350			Well Rock	
					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
Signed Tom P. Pulliam
C-57 LICENSED WATER WELL CONTRACTOR
DATE SIGNED 12-23-07
C-57 LICENSE NUMBER 808508

DWR 188 REV. 05-03

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #6

QUADRUPLICATE
For Local Requirements

Page 1 of 1
Owner's Well No. _____
Date Work Began 9-4-02, Ended 9-6-02
Local Permit Agency Napa County Environmental Mgmt.
Permit No. 96-12186 Permit Date 8-27-02

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 792300

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

GEOLOGIC LOG

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

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	40	tan ash with embedded rock
40	60	tan & white volcanic rock
60	80	gray ash
80	140	tan & white volcanic rock
140	160	large fractured volcanic rock
160	175	tan & white volcanic rock
175	180	red volcanic rock
180	200	tan & white volcanic rock

TOTAL DEPTH OF BORING 200 (Feet)
TOTAL DEPTH OF COMPLETED WELL 195 (Feet)

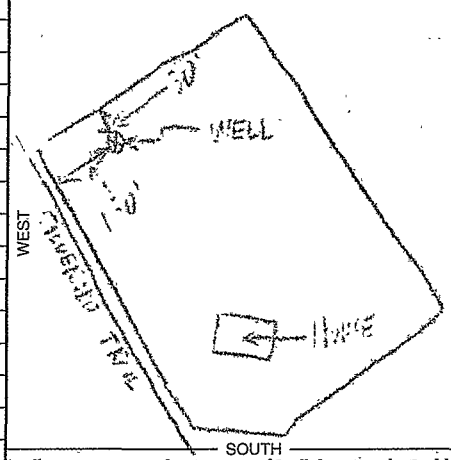
WELL OWNER

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

WELL LOCATION

Address same
City _____
County Napa
APN Book 21 Page 030 Parcel 50
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 (✓)

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

PLANNED USES (✓)

WATER SUPPLY
X 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 135 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 96 (Ft.) & DATE MEASURED 9-6-02
ESTIMATED YIELD * 150 (GPM) & TEST TYPE air lift
TEST LENGTH 1 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	25	12								
25	200	9								
0	175		X				PVC F480	6	SDR-21	
175	195			X			PVC F480	6	SDR-21	.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	23	X			concrete
23	195				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 HUCKFELDT WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

2110 Penny Lane Napa CA 94559
ADDRESS CITY STATE ZIP

Signed _____ 10-21-02 439-746
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #7

HEALTH DEPT. USE ONLY
FEE: 12.00
DATE: 9-13-71
RECEIPT NO: 39931
BY: J.C.

A.P. # 21-030-05

NAPA COUNTY HEALTH DEPARTMENT
DIVISION OF ENVIRONMENTAL HEALTH

Department of Health Services
Napa County
Division of Environmental Quality Control
1255 Pearl Street - 255-5966
Napa, Calif. 94558
OCT 4 1971

APPLICATION & PERMIT TO CONSTRUCT A WATER WELL
(ORDINANCE #)

NAME [redacted] (Owner) ADDRESS [redacted] (Job Location) DATE 9-21-71

NAME W. RATELLA (Well Driller) ADDRESS SANTA ROSA

TYPE OF WORK
NEW WELL X | RECONDITIONING ___ | DEEPENING ___
TEST HOLES ___ | DESTROYING ___ | OTHER ___
TYPE I PERMIT ___ | TYPE II PERMIT ___ | FEE ___

PROPOSED USE
DOMESTIC X | IRRIGATION ___ | INDUSTRIAL ___ | MUNICIPAL ___
TEST WELL ___ | OTHER ___

Sewage Disposal On Site (Existing or Proposed) Public ___ Individual ___ Private X
Distance from well to any part of nearest sewage disposal system 100 feet.
(Sketch of site to accompany application.

TYPE OF EQUIPMENT TO BE USED
Rotary ___ Cable X Hand Dug ___ Other ___

CONSTRUCTION PROPOSED
Diameter of casing 8" Material STEEL Annular Space: Size 2"
Sealed with: Concrete X Grout ___ Neat Cement ___ Puddled Clay ___ Other ___
Conductor Casing: Yes ___ No X Material ___
Chlorination By: Owner ___ Pump Co ___ Driller X

Ratella by WR (SIGNATURE OF APPLICANT) 9-21-71 (DATE)

NOTICE TO DRILLER: COMPLETE THIS PORTION AND RETURN TO DIVISION OF ENVIRONMENTAL HEALTH WITHIN 10 DAYS AFTER COMPLETION...

CASING
CONSTRUCTION 120
Total Depth 120 Ft.
Surface seal to 25 Ft.
Any Stratas sealed Yes ___ No 25
If yes, depth of Stratas
From ___ Ft. to ___ Ft.
From ___ Ft. to ___ Ft.
Perforations
From 50 Ft. to 120 Ft.
From ___ Ft. to ___ Ft.

WATER LEVELS
First water at 65 Ft.
Static level at 30 Ft.

WELL TESTS
How performed Bailer
Yield 10 GPM with ___ ft.
Drawdown 25 ft. after 1 Hrs.

WELL LOG

(Formation; describe by color, size of material, structure)	Ft. To Ft.
0 – 65	Boulders + yellow clay + gravel
65 – 120	yellow clay + rock

SIGNED: Walter Ratella
LICENSE #: 16305-2

Well #8

E19-00129 WL

ORIGINAL
File with DWR

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. e03272606

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

Owner's Well No. 1-2019
Date Work Began 3/21/2019, Ended 4/24/2019
Local Permit Agency Napa County Environmental Mgmt
Permit No. E19-00129 Permit Date 3/21/2019

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)
DRILLING METHOD ROTARY FLUID BENTONITE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	60	TAN VOLCANIC TUFF
60	65	GRAY, BLACK VOLCANIC ASH
65	90	GRAY VOLCANIC ROCK WITH ASH
90	105	GRAY, BLACK VOLCANIC ASH
105	120	GRAY SANDY ASH
120	130	GREEN VOLCANIC ROCK
130	140	GREEN, GRAY SANDY ASH
140	160	GRAY, BLACK ASH
160	190	HARD GRAY VOLCANIC ROCK
190	310	GREEN SANDY VOLCANIC ASH
310	405	50% GRAY VOLCANIC ROCK / 50% GRAY ASH
405	460	GRAY, BLACK SANDY ASH
460	615	BLUE, GRAY SANDY ASH
615	690	GREEN, GRAY ASH
690	705	STICKY GREEN, GRAY ASH
705	735	GREEN, GRAY SANDY ASH
735	775	WHITE SANDY ASH
775	810	GREEN, GRAY SANDY ASH
810	835	DARK GREEN ASH WITH ROCK
835	860	GRAY VOLCANIC ASH
860	895	GREEN, GRAY ASH
895	908	DARK GRAY MIXED VOLCANICS
908	970	GRAY MIXED VOLCANICS
		CONTINUED CASING LAYOUT
625	645	SCREEN PVC 6" .032 SLOT
645	785	BLANK PVC 6"
785	805	SCREEN PVC 6" .032 SLOT
805	885	BLANK PVC 6"
885	945	SCREEN PVC 6" .032 SLOT
945	965	BLANK PVC 6"

TOTAL DEPTH OF BORING 970 (Feet)
TOTAL DEPTH OF COMPLETED WELL 965 (Feet)

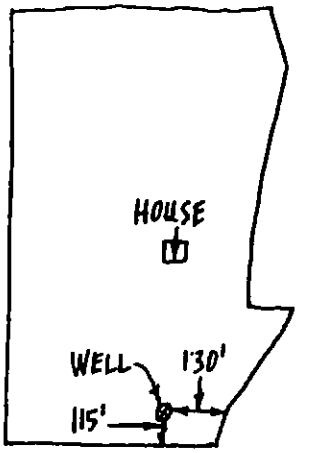
WELL OWNER

Name [redacted]
Mailing Address [redacted]
Calistoga CA 94515
CITY STATE ZIP

WELL LOCATION

Address 3884 Silverado Trail
City Calistoga CA
County Napa
APN Book 021 Page 010 Parcel 070
Township ____ Range ____ Section ____
Latitude ____ DEG. MIN. SEC. ____ DEG. MIN. SEC.

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 130 (Ft.) BELOW SURFACE 1
DEPTH OF STATIC WATER LEVEL 170 (Ft.) & DATE MEASURED 4/24/2019
ESTIMATED YIELD * 35 (GPM) & TEST TYPE AIR LIFT
TEST LENGTH 3 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	970	12								
0	125		✓				PVC F480	6	SDR-17	
125	205			✓			PVC F480	6	SDR-17	.032
205	385		✓				PVC F480	6	SDR-17	
385	405			✓			PVC F480	6	SDR-17	.032
405	625		✓				PVC F480	6	SDR-17	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	58	✓			10 SK SAND
58	965			✓	#6 SAND

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— 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 HUCKFELDT WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
2110 Penny Lane ADDRESS Napa CITY CA STATE 94559 ZIP
Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE
05/29/19 DATE SIGNED
439-746 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #9

QUADRUPLICATE
For Local Requirements

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Page 1 of 1
Owner's Well No. _____
No. 806870

Date Work Began 8-27-02, Ended 9-3-02
Local Permit Agency Napa County Environmental Mgmt.
Permit No. 96-12164 Permit Date 8-02-02

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

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD rotary FLUID _____

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	60	tan ash
60	360	gray volcanic rhyolite
360	480	hard rhyolite
480	550	rhyolite
550	560	soft rhyolite
560	640	hard fractured rhyolite
640	720	green gray rhyoite

460	480	blank	PVC	6"	
480	560	screen	PVC	6"	.032 slot
560	580	blank	PVC	6"	
580	700	screen	PVC	6"	.032 slot

TOTAL DEPTH OF BORING 720 (Feet)
TOTAL DEPTH OF COMPLETED WELL 700 (Feet)

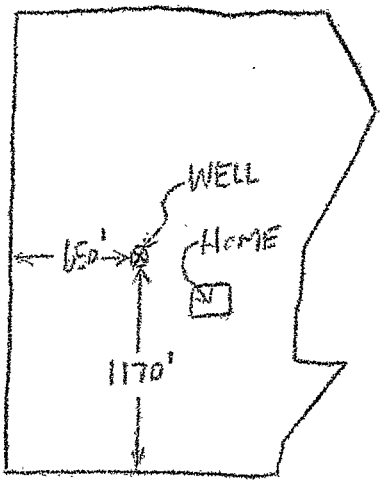
WELL OWNER

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

WELL LOCATION

Address 3884 Silverado Trail
City Calistoga
County Napa
APN Book 21 Page 010 Parcel 70
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 (✓)

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

PLANNED USES (✓)

WATER SUPPLY
X Domestic ___ Public
X 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 180 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 178 (Ft.) & DATE MEASURED 9-3-02
ESTIMATED YIELD * 45 (GPM) & TEST TYPE air lift
TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	25	12								
25	720	9								
0	140		X				PVC F480	6	SDR-21	
140	180			X			PVC F480	6	SDR-21	.032
180	280		X				PVC F480	6	SDR-21	
280	460			X			PVC F480	6	SDR-21	.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	23	X			concrete
23	700			X	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 HUCKFELDT WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

2110 Penny Lane Napa CA 94559
ADDRESS CITY STATE ZIP

Signed _____
WELL DRILLER/AUTHORIZED REPRESENTATIVE

9-2-02 DATE SIGNED

439-746 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #10

QUADRUPLICATE
For Local Requirements

Page ___ of ___
Owner's Well No. ___
Date Work Began 7-25-97 Ended 8-4-97
Local Permit Agency Napa
Permit No. 4534 Permit Date 7-21-97

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 475962

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 UK (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0 4	brn mash
4 20	gry cly/gry ash
20 60	gry/dk gry ash fm
60 80	gry/dk gry
80 Bdk	gry/dk gry sep fine

TOTAL DEPTH OF BORING 720 (Feet)
TOTAL DEPTH OF COMPLETED WELL 715 (Feet)

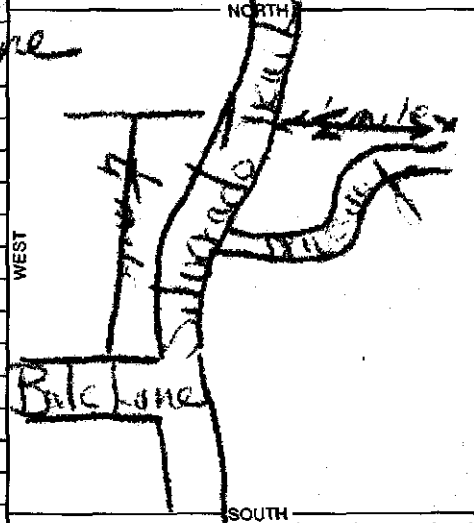
WELL OWNER

Name [redacted]
Mailing Addr [redacted]
CITY STATE ZIP

WELL LOCATION

Address 3244 Silverado Tr
City Napa
County Napa
APN Book ___ Page ___ Parcel 21-210-07
or Township ___ Range ___ Section ___
Latitude ___ DEG. ___ MIN. ___ SEC. NORTH Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



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

ACTIVITY (✓)

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

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
___ Domestic
___ Public
✓ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Air FLUID Air

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 300 (Ft.) & DATE MEASURED 8-4-97
ESTIMATED YIELD* 25 (GPM) & TEST TYPE Air Lift
TEST LENGTH 6 (Hrs.) TOTAL DRAWDOWN 400 (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 160	12	✓				Plastic	5	200	
660 715	11		✓			"	5	200	Factory 1/12

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 24	✓			
24 715				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 Fullum Well Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 3277 Fostoria Ave CITY Napa STATE Ca ZIP 94558
Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 9-24-97 C-57 LICENSE NUMBER 24677

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #11

QUADRUPLICATE
For Local Requirements

Page ___ of ___

Owner's Well No. 5-21-17

Date Work Began 5-21-17 Ended 6-6-17

Local Permit Agency Mono County

Permit No. 97-109 Permit Date 5-21-17

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 475948

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 120 (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0 45	brown ash
45 70	gray shot tight f
70 440	gray clay with gravel

TOTAL DEPTH OF BORING 440 (Feet)

TOTAL DEPTH OF COMPLETED WELL 430' (Feet)

WELL OWNER

Name [redacted]

Mailing Address [redacted]

CITY [redacted] STATE [redacted] ZIP

WELL LOCATION

Address [redacted]

City [redacted]

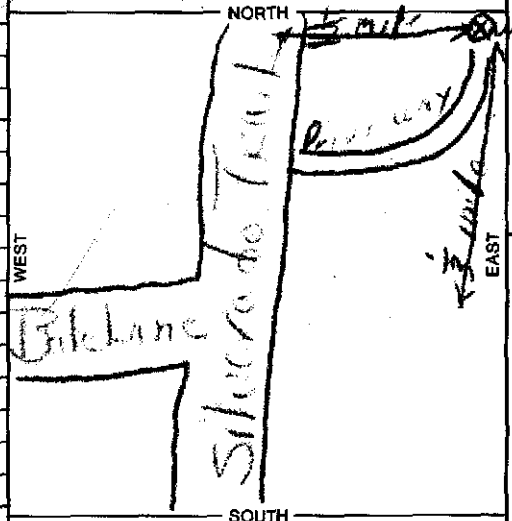
County Mono

APN Book ___ Page ___ Parcel 21-010-07

or Township ___ Range ___ Section ___

or Latitude ___ DEG. ___ MIN. ___ SEC. NORTH Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



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

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

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

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY

___ Domestic

___ Public

✓ Irrigation

___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD Air FLUID Air

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 125 (Ft.) & DATE MEASURED 6-6-97

ESTIMATED YIELD* 60 (GPM) & TEST TYPE Air LIFT

TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 300 (Ft.)

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

CASING(S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 145	17	✓				Plastic	6	200	
145 430	11		✓			11	11	Factory 1/32	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 21	✓	✓		
21 430				Re 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 Tom Pullin Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 2377 Fredonyer Rd. CITY Alturas STATE CA ZIP 96101

Signed Tom Pullin
WELL DRILLER/AUTHORIZED REPRESENTATIVE

DATE SIGNED 6-24-97

C-57 LICENSE NUMBER 244611

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #12

QUADRUPLICATE
For Local Requirements

Page ___ of ___

Owner's Well No. 8-2-96

Date Work Began 8-2-96, Ended 1-3-96

Local Permit Agency N/A

Permit No. 96171 Permit Date 8-21-96

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 474508

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 70 (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0 60	brown clay
60 520	gray clay, gravel, rock
520 670	fractured gray rock
670 740	fractured gray rock; water flow

RECEIVED
MAY - 5 1997
DEPT. OF ENVIRONMENTAL MANAGEMENT

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

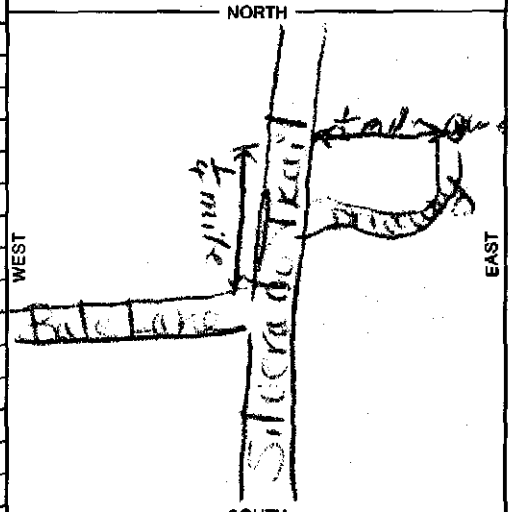
WELL OWNER

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

WELL LOCATION

Address [redacted]
City N/A
County
APN Book ___ Page ___ Parcel 31-010-010
or Township ___ Range ___ Section ___
or Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH



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

ACTIVITY (✓)

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

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
___ Domestic
✓ Public
___ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Air FLUID mud

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 200 (Ft.) & DATE MEASURED 9-3-96
ESTIMATED YIELD* 40 (GPM) & TEST TYPE Air Lift
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 440 (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	CONDUCTOR	FILL PIPE	MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 24	11"	✓				Plastic	6	200	
0 180	10"	✓				Plastic	6	"	
180 740	"		✓			"	6	"	1/32 Pack

DEPTH FROM SURFACE Ft. to Ft.	ANNULAR MATERIAL TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 24	✓			
24 740			✓	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 Fullam Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

2777 Highland Ave Rdg. Ca 96002
ADDRESS CITY STATE ZIP

Signed [signature]
WELL DRILLER/AUTHORIZED REPRESENTATIVE

1-8-96 436 11
DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #13

State of California

Well Completion Report

Form DWR 188 Submitted 7/17/2018

WCR2018-005573

Owner's Well Number | Date Work Began 04/13/2018 | Date Work Ended 04/23/2018

Local Permit Agency Napa County Planning Building and Environmental Services

Secondary Permit Agency | Permit Number E18-00145 | Permit Date 03/20/2018

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

Name ALPHA OMEGA, ROBIN BAGGETT

Mailing Address PO BOX 814

City RUTHERFORD State CA Zip 94573

Planned Use and Activity

Activity New Well

Planned Use Water Supply Domestic

Well Location

Address 3950 SILVERADO TR

City CALISTOGA Zip 94515 County Napa

Latitude ___ ___ ___ N Longitude ___ ___ ___ W

Deg. Min. Sec. Deg. Min. Sec.

Dec. Lat. 38.5630970 Dec. Long. -122.5110846

Vertical Datum | Horizontal Datum WGS84

Location Accuracy | Location Determination Method

APN 021-030-002-000

Township 08 N

Range 06 W

Section 10

Baseline Meridian Mount Diablo

Ground Surface Elevation

Elevation Accuracy

Elevation Determination Method

Borehole Information

Orientation Vertical Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite

Total Depth of Boring 335 Feet

Total Depth of Completed Well 335 Feet

Water Level and Yield of Completed Well

Depth to first water 7 (Feet below surface)

Depth to Static Water Level 12 (Feet) Date Measured 04/23/2018

Estimated Yield* 50 (GPM) Test Type Air Lift

Test Length 14 (Hours) Total Drawdown 67 (feet)

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

Geologic Log - Free Form

Depth from Surface Feet to Feet		Description
0	10	Topsoil
10	40	40% GRAVEL, 30% SAND, 30% CLAY
40	80	40% LARGE GRAVEL, 40% SAND, 20% CLAY
80	120	50% GRAVEL, 40% SAND, 10% CLAY
120	260	80% SMALL & LARGE GRAVEL, 20% SAND
260	310	50% SHALE, 30% SAND, 20% SMALL GRAVEL
310	315	50% WHITE ROCK, 50% RED ROCK
315	335	60% SHALE, 25% SAND, 15% SMALL GRAVEL

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	60	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	60	180	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0	
1	180	200	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	200	300	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0	
1	300	320	Blank	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625			
1	320	335	Screen	PVC	OD: 6.625 in. | SDR: 21 | Thickness: 0.316 in.	0.316	6.625	Milled Slots	0	

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	51	Cement	Other Cement	6 SACK CEMENT	
51	335	Filter Pack	Other Gravel Pack	3/8" Pea Gravel	

Other Observations:

Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	51	14
51	335	11

Certification Statement

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

Name: MC LEAN & WILLIAMS INC
Person, Firm or Corporation

878 EL CENTRO AVENUE (Address) | NAPA (City) | CA (State) | 94558 (Zip)

Signed: *electronic signature received* (C-57 Licensed Water Well Contractor) | 07/17/2018 (Date Signed) | 396352 (C-57 License Number)

Attachments

3950 Silverado Trail Well Location Map.pdf - Location Map

DWR Use Only

CSG #	State Well Number	Site Code	Local Well Number

				N						W
Latitude Deg/Min/Sec					Longitude Deg/Min/Sec					

TRS:

APN:

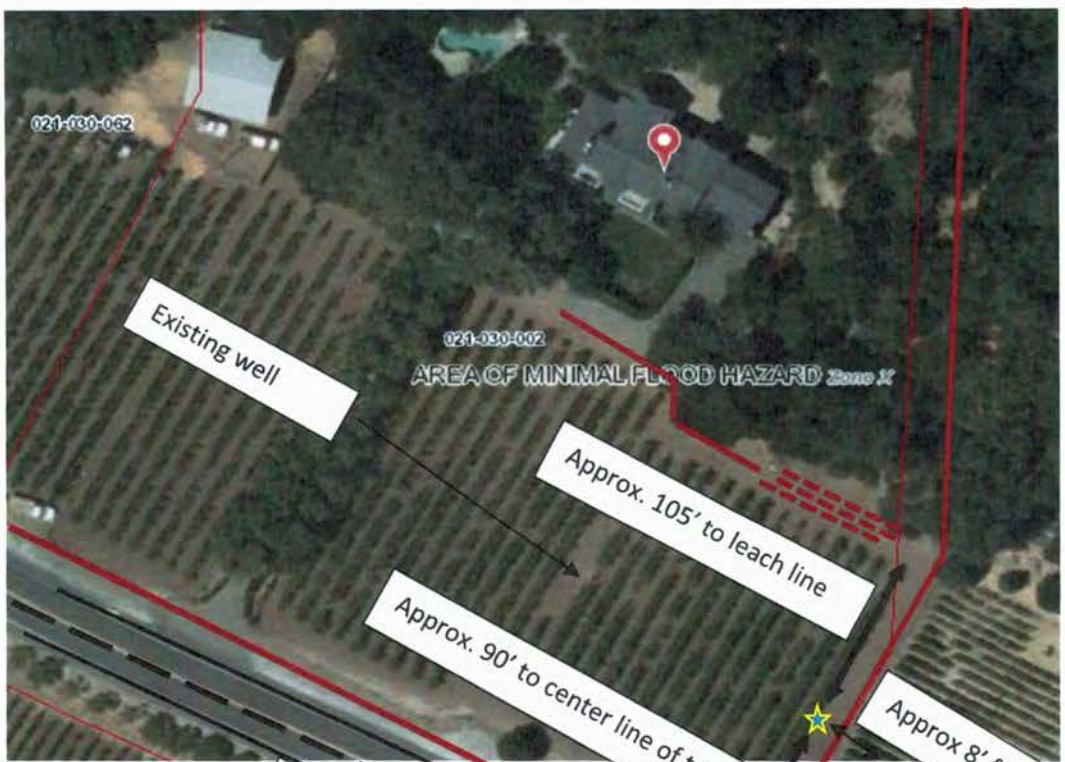
E18-00145

Well Drilling & Pump Service
878 El Centro Ave. Napa Ca, 94558
Office 707-255-6450
Fax 707-255-6489
Lic. #396352

3950 Silverado Trail Calistoga Ap # 021-030-002



PLANS APPROVED
Division of Environmental Health
COUNTY OF NAPA
By: _____ Date: 03/20/18

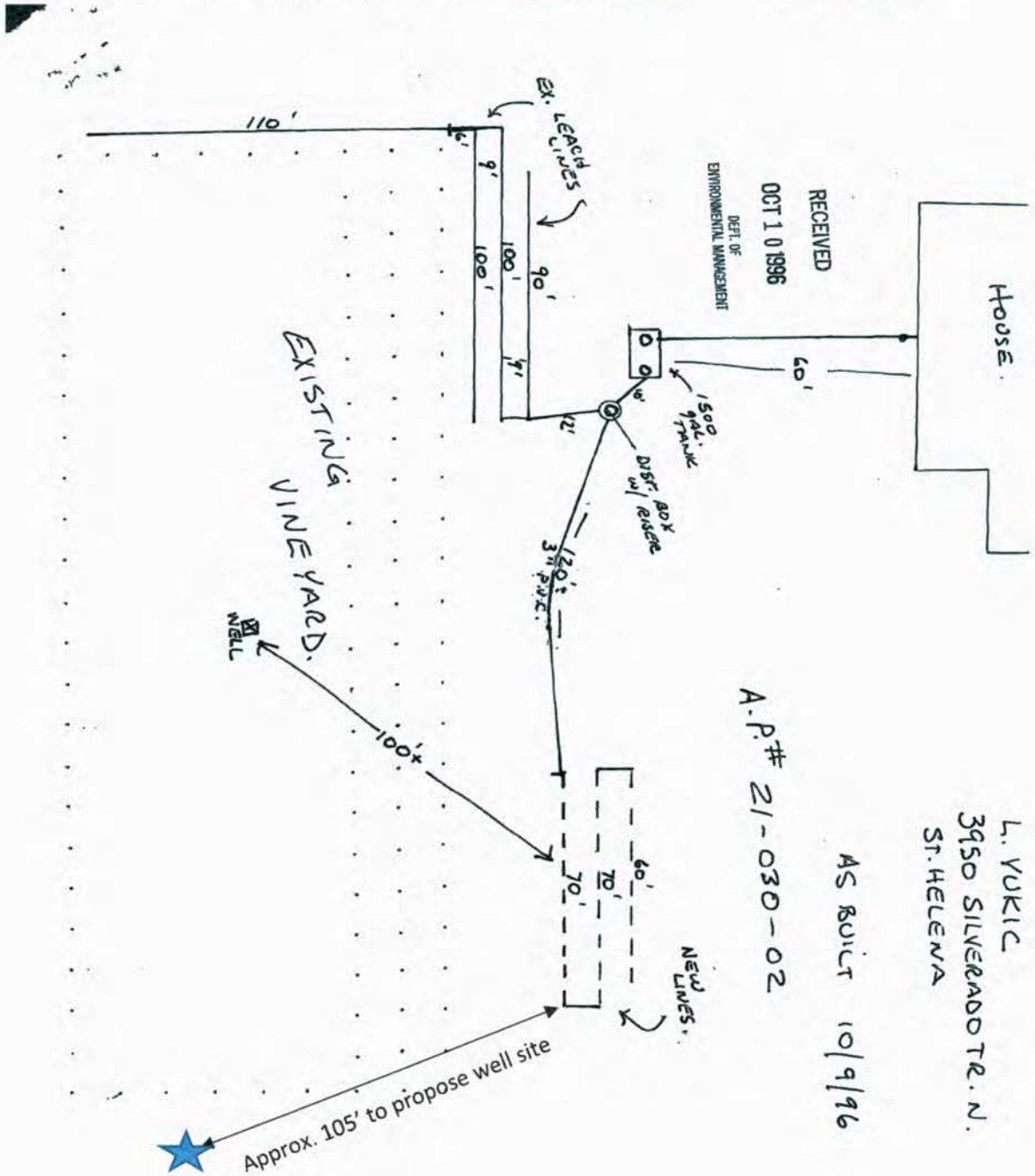


PLANS APPROVED
Division of Environmental Health
COUNTY OF NAPA
By: ___ Date: 03/20/18

E18-00145

McLEAN & WILLIAMS
SINCE 1949

3950 Silverado Trail Calistoga Ap # 021-030-002 page 2 of 2



Well #14

QUADRUPLICATE
Use to comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in
No. 271118

Notice of Intent No. _____
Local Permit No. or Date 9-12-1988

State Well No. _____
Other Well No. _____

(1) OWNER: Name [redacted]
Address 3960 Silverado Trail
City [redacted] Calif. ZIP [redacted]

(2) LOCATION OF WELL (See instructions):
County Napa Owner's Well Number _____
Well address if different from above _____
Township 8 North Range 6 West Section Rancho
Distance from cities, roads, railroads, fences, etc. Carneros

A.P. # 21-030-02

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [X]
Irrigation [ ]
Industrial [ ]
Test Well [ ]
Municipal [ ]
Other [ ]
(Describe)

(5) EQUIPMENT:
Rotary [X] Reverse [ ]
Cable [ ] Air [X]
Other [ ] Bucket [ ]

(6) GRAVEL PACK:
Yes [X] No [ ] Size 3/8pea
Diameter of bore 8"
Packed from 21 ft. to 160 ft.

(7) CASING INSTALLED:
Steel [ ] Plastic [X] Concrete [ ]

From ft.	To ft.	Dia. in.	Gage or Wall
+1	160	5	F-480

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

From ft.	To ft.	Slot size
60	139	1/8

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth 21 ft.
Were strata sealed against pollution? Yes [ ] No [X] Interval _____ ft.
Method of sealing concrete

(10) WATER LEVELS:
Depth of first water, if known 80 ft.
Standing level after well completion 20 ft.

(11) WELL TESTS:
Was well test made? Yes [X] No [ ] If yes, by whom? Driller
Type of test Pump [ ] Bailer [ ] Air lift [X]
Depth to water at start of test 80 ft. At end of test 140 ft.
Discharge 75 gal/min after 2 hours Water temperature _____
Chemical analysis made? Yes [X] No [ ] If yes, by whom? Cal Test
Was electric log made Yes [ ] No [X] If yes, attach copy to this report

(12) WELL LOG: Total depth 160 ft. Completed depth 160 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	3	Top Soil
3	20	Clay
20	40	Clay, Rock
40	60	Clay, Rock
60	160	Volcanic Molaz

Work started 9-10 19 88 Completed 9-14 19 88

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 [signature] (Well Driller)
NAME Huckfeldt Well Drilling (Person, firm, or corporation) (Typed or printed)
Address 2110 Penny Lane
City Napa, Calif. ZIP 94559
License No. 439746 Date of this report 10-7-1988

CONFIDENTIAL
NOT FOR PUBLIC USE
WATER CODE SEC. 13752

RECEIVED
OCT 14 1988
DEPT. OF ENVIRONMENTAL MANAGEMENT

DWR 188 (REV. 12-86) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM 86 96355

Well #15

ORIGINAL
File with DWR

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 0948352

DWR USE ONLY — DO NOT FILL IN
08N06W10
STATE WELL NO./STATION NO.
LATITUDE 383344 LONGITUDE 1223044
APN/TRS/OTHER

Page ___ of ___
Owner's Well No. ___
Date Work Began 10/8/08, Ended 10/20/08
Local Permit Agency Napa
Permit No. E08-00326 Permit Date 6/26/08

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD mud FLUID supergel

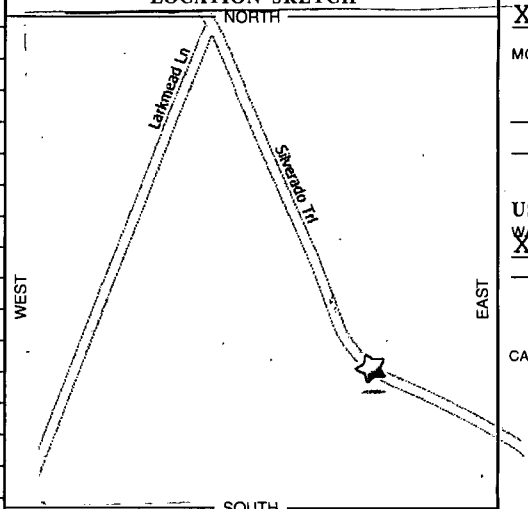
DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	20	topsoil gravel brown sandy clay
20	140	gravel brown sandy clay
140	160	gravel gray rock brown sandy clay
160	220	gray black rock brown sandy clay
220	240	gray green black white yellow rock clay
240	280	gray black brown sandy clay
280	300	gray yellow black green teel rock clay
300	320	gray orange black green clay
320	360	gray black green rock
360	400	black gray white rock
400	440	gray green black rock
440	460	black gray rock

TOTAL DEPTH OF BORING 460 (Feet)
TOTAL DEPTH OF COMPLETED WELL 460 (Feet)

WELL LOCATION

CITY ___ STATE ___ ZIP ___
Address 3959 Silverado Trail
City Calistoga
County Napa
APN Book 021 Page 030 Parcel 010
Township ___ Range ___ Section ___
Lat ___ N DEG. MIN. SEC. Long ___ W DEG. MIN. SEC.

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

USES (✓)
WATER SUPPLY
X 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 ___ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 65 (Ft.) & DATE MEASURED 10/20/08
ESTIMATED YIELD * 25. (GPM) & TEST TYPE air
TEST LENGTH 12 (Hrs.) TOTAL DRAWDOWN 450 (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	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	60	13	X				F480	6	200	
60	80	9 7/8		X			F480	6	200	factory
80	100	9 7/8	X				F480	6	200	
100	120	9 7/8		X			F480	6	200	factory
120	140	9 7/8	X				F480	6	200	
140	160	9 7/8		X			F480	6	200	factory

DEPTH FROM SURFACE Ft.	to Ft.	ANNULAR MATERIAL TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	57	X			
57	460				#6sandpack

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 McLean & Williams, Inc. (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 878 El Centro Ave., CITY Napa STATE CA ZIP 94558
Signed ___ C-57 LICENSED WATER WELL CONTRACTOR
DATE SIGNED 11/15/08
C-57 LICENSE NUMBER 396352

DWR 188 REV. 05-03
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM
OSP 03 78836

State of California Well Completion Report No.0948352

continue casing:

160 - 180	9 7/8	Blank	F480	6"	200	
180 - 200	9 7/8	Perf	F480	6"	200	factory
200 - 220	9 7/8	Blank	F480	6"	200	
220 - 240	9 7/8	Perf	F480	6"	200	factory
240 - 260	9 7/8	Perf	F480	6"	200	factory
260 - 280	9 7/8	Blank	F480	6"	200	
280 - 300	9 7/8	Perf	F480	6"	200	factory
300 - 320	9 7/8	Blank	F480	6"	200	
320 - 340	9 7/8	Perf	F480	6"	200	factory
340 - 360	9 7/8	Blank	F480	6"	200	
360 - 380	9 7/8	Perf	F480	6"	200	factory
380 - 400	9 7/8	Blank	F480	6"	200	
400 - 420	9 7/8	Perf	F480	6"	200	factory
420 - 440	9 7/8	Blank	F480	6"	200	
440 - 460	9 7/8	Perf	F480	6"	200	factory

A.P.#021-030-010
3959 Silverado TRail, Calistoga,CA
Laurie Shelton

Well #16

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

ORIGINAL
File with DWR

Do not fill in

No. 319574

Notice of Intent No. _____
Local Permit No. or Date 8-30-89

State Well No. _____
Other Well No. 08N06W10C

(2) LOCATION OF WELL (See instructions):
County Napa Owner's Well Number _____
Well address if different from above _____
Township 8 N. Range 6 W. Section 21
Distance from cities, roads, railroads, fences, etc. 93' from center-line of Silverado Trail

A.P.# 21-030-10

WELL LOCATION SKETCH

(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 ☐
Municipal ☐
Other ☐
(Describe)

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
Cable ☐ Air ☒
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☒ No ☐ Size 3/8" pea
Diameter of bore 9"
Packed from 22 to 205 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☒ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall
+2	205	5"	F480
			CLS.
			200

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

From ft.	To ft.	Slot size
105	205	1/8"

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 22 ft.
Were strata sealed against pollution? Yes ☐ No ☒ Interval _____ ft.
Method of sealing concrete

(10) WATER LEVELS:
Depth of first water, if known 160 ft.
Standing level after well completion 33 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 33 ft. At end of test 175 ft.
Discharge 20 gal/min after 2 hours Water temperature _____
Chemical analysis made? Yes ☒ No ☐ If yes, by whom? Cal Test
Was electric log made Yes ☐ No ☒ If yes, attach copy to this report

(12) WELL LOG: Total depth 260 ft. Completed depth 205 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	20	clay w/ embedded rock
20	55	volcanic mix w/ 20% clay
55	120	volcanic sands & gravels
120	140	volcanic mix
140	165	vol. tuff & gravels
165	210	vol. sand & gravel
210	222	volcanic tuff
222	260	black fractured vol. rock

Work started 8-23 19 89 Completed 8-30 19 89

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 Lloyd Huckfeldt (Well Driller)

NAME HUCKFELDT WELL DRILLING (Person, firm, or corporation) (Typed or printed)

Address 2110 Penny Lane

City Napa ZIP 94559

License No. 439-746 Date of this report Sept. 11, 89

DWR 188 (REV. 12-86) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM 86 96355

COPY NOT FOR PUBLIC USE
POTENTIAL
WATER CODE SEC. 13752

Well #17

QUADRUPLICATE
Use of comply with local requirements

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

Do not fill in
No. 181693

Notice of Intent No.
Local Permit No. or Date
State Well No.
Other Well No.

(1) OWNER: Name [redacted]
Address [redacted]
City [redacted] Zip [redacted]

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

21-030-43

WELL LOCATION SKETCH

(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 3/8
Diameter of bore
Packed from 20 to 240 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☒ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall
0	240	8"	c160 psi

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

From ft.	To ft.	Slot size
80	240	1/8

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 20 ft.
Were strata sealed against pollution? Yes ☐ No ☒ Interval ft.
Method of sealing cement

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 80 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 80 ft. At end of test 240 ft
Discharge 12 gal/min after 3 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

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

0 - 2 top soil
2 - 8 boulders
8 - 15 lt. green volcanic rock
15 - 25 blue volcanic tuffs
25 - 240 blue volcanic tuffs

NOT FOR PUBLIC USE
INCLUDES WATER QUALITY
RECEIVED
AUG 26 1985
PUBLIC HEALTH DEPARTMENT
DIV. OF ENV.
RECEIVED
SEP 1985
DIVISION OF ENVIRONMENTAL HEALTH

Work started July 19 85 Completed July 8 19 85

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 JOHN FISCH by kathy baker (Well Driller)
NAME FISCH BROS. DRILLING INC. (Person, firm, or corporation) (Typed or printed)
Address 5001 Gravenstein Hwy. N.
City Sebastopol, Ca. Zip 95472
License No. 399226 Date of this report 8-23-85

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #18

21-030-43

ADRUPLICATE
se of comply with
ocal requirements

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

Do not fill in
No. 239210

Notice of Intent No.
Local Permit No. or Date
State Well No.
Other Well No.

(1) OWNER: Name [redacted]
Address [redacted]
City [redacted] Zip [redacted]

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

WELL LOCATION SKETCH

(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 3/8
Diameter of bore
Packed from 20 to 80 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☒ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	80	5"	c160 psi	30	80	1/8

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

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 20 ft.
Were strata sealed against pollution? Yes ☐ No ☒ Interval ft.
Method of sealing cement

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 20 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 20 ft. At end of test 60 ft
Discharge 100 gal/min after 2 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

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

0 - 2 top soil
2 - 5 loose rock
5 - 18 pumice
18 - 24 ft. blue clay
24 - 80 volcanic tuffs

RECEIVED
NOV 14 1983
DIVISION OF ENVIRONMENTAL HEALTH

Work started 9-10 19 83 Completed 9-24-83 19

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 ED FISCH by kathy baker (Well Driller)
NAME FISCH BROS. DRILLING INC. (Person, firm, or corporation) (Typed or printed)
Address 5001 Gravenstein Hwy N.
City Sebastopol, Ca. Zip 95472
License No. 399226 Date of this report

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #19

ORIGINAL
File with DWR

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. e0221137

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

Owner's Well No. 1-2014
Date Work Began 7/17/2014 Ended 7/28/2014
Local Permit Agency Napa County Environmental Mgmt
Permit No. E14-00554 Permit Date 7/17/2014

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD ROTARY FLUID BENTONITE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 3	BROWN CLAY
3 20	SAND & GRAVEL
20 45	SANDY BROWN CLAY
45 70	COURSE SAND
70 75	TAN CLAY
75 220	COURSE SAND
220 230	BROWN CLAY
230 245	GREEN CLAY
245 260	BROWN CLAY
260 275	GREEN CLAY
275 305	BROWN CLAY
305 345	HARD BLACK FRACTURED ROCK
345 370	MIXED VOLCANICS
370 390	BLACK FRACTURED VOLCANICS
390 400	BLACK VOLCANICS
400 420	GRAY VOLCANIC ASH
420 480	BLACK VOLCANICS
480 500	GRAY, GREEN VOLCANIC ASH
	CONTINUED CASING LAYOUT
418 478	SCREEN PVC 5" .032 SLOT
478 498	BLANK PVC 5"

RECEIVED
SEP 26 2014
Napa County Planning, Building & Environmental Services

TOTAL DEPTH OF BORING 500 (Feet)
TOTAL DEPTH OF COMPLETED WELL 498 (Feet)

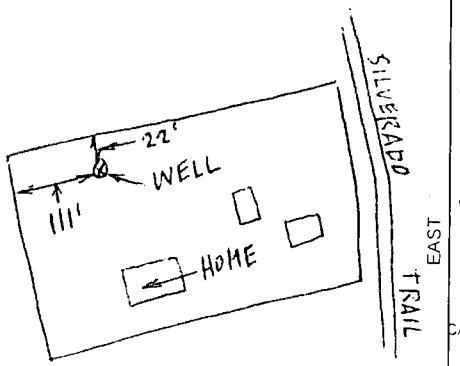
WELL OWNER

Name Robert & Sharon Mowat
Mailing Address 140 Valle Vista Drive
Danville CA 94526
CITY STATE ZIP

WELL LOCATION

Address 3911 Silverado Trail
City Calistoga CA
County Napa
APN Book 021 Page 030 Parcel 048
Township Range Section
Latitude DEG. MIN. SEC. DEG MIN SEC

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 N/A (Ft.) BELOW SURFACE 1
DEPTH OF STATIC WATER LEVEL 92 (Ft.) & DATE MEASURED 7/28/2014
ESTIMATED YIELD 60 (GPM) & TEST TYPE AIR LIFT
TEST LENGTH 3 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 500	10								
0 78		✓				PVC F480	5	SDR-21	
78 218			✓			PVC F480	5	SDR-21	.032
218 298		✓				PVC F480	5	SDR-21	
298 398			✓			PVC F480	5	SDR-21	.032
398 418		✓				PVC F480	5	SDR-21	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 5	✓			CONCRETE
5 35		✓		CHIPS
35 498			✓	#6 SAND

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ 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 HUCKFELDT WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
2110 Penny Lane Napa CA 94559
ADDRESS CITY STATE ZIP
Signed
WELL DRILLER/AUTHORIZED REPRESENTATIVE
08/11/14 439-746
DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #20

QUADRUPLICATE
For Local Requirements

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. e0181975

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

Owner's Well No. WELL #7
Date Work Began 6/6/2013, Ended 6/28/2013
Local Permit Agency Napa County Environmental Heal
Permit No. E13-00272 Permit Date 6/10/2013

GEOLOGIC LOG

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

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	6"	Topsoil
6"	18	Brown clay and embedded gravels
18	70	Clayee brown volcanics
70	82	Brown clayee ash
82	145	Clayee brown volcanics
145	210	Blue gray clayee volcanics
210	219	Brown clayee ash, some volcanics
219	255	Blue gray clayee ash
255	322	White clayee ash and volcanics
322	340	Blue clayee volcanics
340	375	Black & red volcanics streak,
		clayee ash
375	390	Clayee ash
390	550	Black volcanics rock & ash
550	600	Clayee ash , some volcanics

RECEIVED
JUL 12 2013
Napa County Planning, Building & Environmental Services
EM-2 DK MSB

TOTAL DEPTH OF BORING 600 (Feet)
TOTAL DEPTH OF COMPLETED WELL 545 (Feet)

WELL OWNER

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

WELL LOCATION

Address 3887 Silverado Trail
City Calistoga CA
County Napa
APN Book 021 Page 030 Parcel 049
Township ___ Range ___ Section ___
Latitude ___ DEG. MIN. SEC. ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

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 N/A (Ft.) BELOW SURFACE 1
DEPTH OF STATIC WATER LEVEL 79 (Ft.) & DATE MEASURED 6/28/2013
ESTIMATED YIELD * 50 (GPM) & TEST TYPE Air Lift
TEST LENGTH 1 (Hrs.) TOTAL DRAWDOWN 220 (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	320	11"								
320	370	9 7/8"								
370	600	7 7/8"								
+2	385		✓				PVC	5	SDR17	
385	545			✓			PVC	5	SDR17	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	1	✓			CONCRETE
1	50	✓			
50	53		✓		
53	315			✓	3/8" Pea Gravel
315	345		✓		Grout
345	545			✓	#6 Sand

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ 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 Weeks Drilling & Pump (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
P.O. Box 176 ADDRESS Sebastopol CITY CA STATE 95473 ZIP
Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE
07/11/13 DATE SIGNED
177681 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #21

21-030-049

QUADRUPLICATE
For Local Requirements

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. e066623

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

Owner's Well No. WELL
Date Work Began 12/6/2007, Ended 12/21/2007
Local Permit Agency Napa County Environmental
Permit No. E07-00887 Permit Date 11/28/2007

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)
DRILLING METHOD Mud Rotary FLUID Bentonite

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	3	Red volcanic dirt
3	15	Red, orange volcanic multi
15	35	Tan, orange volcanic conglomerate (soft)
35	60	Orange volcanic conglomerate, clayee ash
60	105	Orange multi volcanic conglomerate, harder dense
105	115	Orange multi volcanic conglomerate, harder dense rock, fractured
115	130	Harder orange multi volcanic conglomerate, harder dense rock, fractured
130	150	Bluish gray with white and orange volcanic rock, some fractured zones
150	167	Bluish gray with white volcanic rock
167	200	Harder volcanic rock, ash

TOTAL DEPTH OF BORING 200 (Feet)
TOTAL DEPTH OF COMPLETED WELL 150 (Feet)

WELL OWNER

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

WELL LOCATION

Address 3887 Silverado Trail N
City Calistoga CA
County Napa
APN Book 021 Page 030 Parcel 049
Township ____ Range ____ Section ____
Latitude ____ DEG. MIN. SEC. ____ DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

RECEIVED
JAN 09 2008
DEPT. OF ENVIRONMENTAL MANAGEMENT

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 — Industrial
— Irrigation
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 N/A (Ft.) BELOW SURFACE 1
DEPTH OF STATIC WATER LEVEL 82 (Ft.) & DATE MEASURED 12/21/2007
ESTIMATED YIELD * 5 (GPM) & TEST TYPE Air Developed
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 150 (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	11"								
50	200	9-7/8"								
+1.5	150		✓				PVC	5	SDR21	
110	150			✓						.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	4	✓			CONCRETE
4	60		✓		GROUT
60	150			✓	12X20 SAND
150	200		✓		

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— 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 Weeks Drilling & Pump
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
P.O. Box 176 Sebastopol CA 95473
ADDRESS CITY STATE ZIP
Signed Melissa G Lopez
WELL DRILLER/AUTHORIZED REPRESENTATIVE
01/07/08 DATE SIGNED
177681 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #22

QUADRUPLICATE
For Local Requirements
Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 0916323

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

Owner's Well No. Well
Date Work Began 11/16/2004, Ended 11/22/2004
Local Permit Agency Napa County Environ Health
Permit No. E04-0463 Permit Date 9/23/2004

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD MUD ROTARY FLUID Bentonite

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	5	Dark clay
5	14	Brown clayee sand and gravel
14	42	Brown clay
42	47	Gray clay
47	50	Green clay with rock
50	68	Gray clay with rock
68	70	Green clay with rock
70	82	Fractured bluish white volcanic rock
82	116	Hard bluish white volcanic rock
116	123	White clayee ash
123	132	Hard bluish white volcanic rock

RECEIVED
DEC 17 2004
DEPT. OF
ENVIRONMENTAL MANAGEMENT

TOTAL DEPTH OF BORING 132 (Feet)
TOTAL DEPTH OF COMPLETED WELL 130 (Feet)

WELL OWNER

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

WELL LOCATION

Address 3887 North Silverado Trail
City Calistoga CA
County Napa
APN Book 021 Page 030 Parcel 049
Township ___ Range ___ Section ___
Latitude ___ DEG. MIN. SEC. ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

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 ___ (Ft.) BELOW SURFACE 1
DEPTH OF STATIC WATER LEVEL 40 (Ft.) & DATE MEASURED 11/22/2004
ESTIMATED YIELD * 15 (GPM) & TEST TYPE AIR DEVELOP
TEST LENGTH 1.5 (Hrs.) TOTAL DRAWDOWN 120 (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	132	9 7/8								
+1	130		✓				PVC	5	CL200	
70	90			✓						.032
110	130			✓						.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	1	✓			concrete
1	20	✓			
20	26		✓		
26	130			✓	12 x 20 sand

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ 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 Weeks Drilling & Pump (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
P.O. Box 176 ADDRESS, Sebastopol CITY, CA STATE, 95473 ZIP
Signed Melissa G Lopez WELL DRILLER/AUTHORIZED REPRESENTATIVE
11/24/04 DATE SIGNED
177681 C-57 LICENSE NUMBER

DWR 188 REV. 11-97
IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #23

RIGINAL
le with DWR

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 782022

Owner's Well No. _____

Date Work Began 7/12/01, Ended _____

Local Permit Agency Napa Co. Dept of Environment

Permit No. _____ Permit Date _____

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

GEOLOGIC LOG

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

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	10	Clay & Gravel
10	44	Gravel
44	63	Clay
63	66	Gravel
66	67	Clay
67	72	Lime Stone
72	93	Frac. Clay
93	98	Volcanic Rock
98	99	Frac Clay
99	102	Volcanic Rock
102	150	Frac Clay
150	155	White Clay w/ Frac
155	160	Frac
160	163	Soft Clay
163	167	Frac
167	170	Very hard limestone
170	178	Limestone
178	182	Hard limestone
182	186	Soft white clay & yellow clay
186	188	Hard Clay
188	200	Soft white clay w/ little gravel

RECEIVED
OCT 22 2001
ENVIRONMENTAL MANAGEMENT

TOTAL DEPTH OF BORING 200 (Feet)
TOTAL DEPTH OF COMPLETED WELL 195 (Feet)

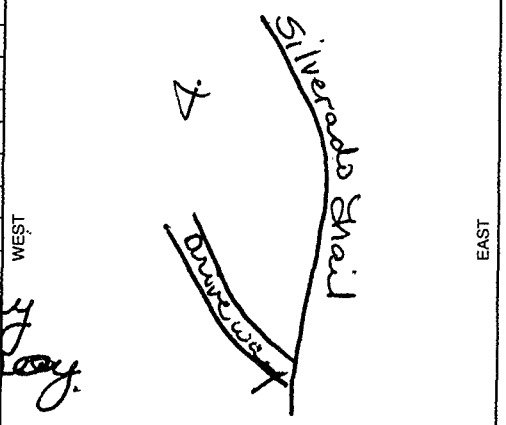
WELL OWNER

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

WELL LOCATION

Address 3905 Silverado Trail
City Calistoga
County Napa
APN Book 21 Page 030 Parcel 49
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 (✓)

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

PLANNED USES (✓)

X 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 _____ (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL _____ (Ft.) & DATE MEASURED _____
ESTIMATED YIELD 2 (GPM) & TEST TYPE Air Lift
TEST LENGTH 3 (Hrs.) TOTAL DRAWDOWN _____ (Ft.)
* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	170		✓				Class 200	4"	200	
170	140			✓			Class 200	4"	200	.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	24		✓		
24	200				Birdseye

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 Spectrum Exploration (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS P.O. Box 471 CITY Zamora STATE Ca ZIP 95698
Signed Charles Borches (WELL DRILLER/AUTHORIZED REPRESENTATIVE) DATE SIGNED 10/2/01 C-57 LICENSE NUMBER 512768

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #24

QUADRUPLICATE
Use to comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in
No. 291426

Notice of Intent No. _____
Local Permit No. or Date 9-14-88

State Well No. _____
Other Well No. _____

(1) OWNER: Name [redacted]
Address [redacted] ve
City [redacted] se ZIP [redacted]

(2) LOCATION OF WELL (See instructions):
County Napa Owner's Well Number _____
Well address if different from above Silverado Tr.
Township 8 N. Range 6 W. Section 21
Distance from cities, roads, railroads, fences, etc. county road setback 176' from centerline

A.P. NO. 21-030-49

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [X]
Irrigation [ ]
Industrial [ ]
Test Well [ ]
Municipal [ ]
Other [ ]
(Describe)

(5) EQUIPMENT:
Rotary [X] Reverse [ ]
Cable [ ] Air [X]
Other [ ] Bucket [ ]

(6) GRAVEL PACK:
Yes [X] No [ ] Size 3/8 pea
Diameter of bore 12"
Packed from 24 to 220 ft.

(7) CASING INSTALLED:
Steel [ ] Plastic [X] Concrete [ ]

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

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
+2	220	5"	F480	60	220	1/8"

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No. [ ] If yes, to depth 24 ft.
Were strata sealed against pollution? Yes [ ] No [X] Interval _____ ft.
Method of sealing concrete

(10) WATER LEVELS:
Depth of first water, if known 100 ft.
Standing level after well completion 60 ft.

(11) WELL TESTS:
Was well test made? Yes [X] No [ ] If yes, by whom? driller
Type of test Pump [ ] Bailer [ ] Air lift [X]
Depth to water at start of test 60 ft. At end of test 174 ft.
Discharge 30 gal/min after 2 hours. Water temperature _____
Chemical analysis made? Yes [X] No [ ] If yes, by whom? CAL TEST
Was electric log made Yes [ ] No [X] If yes, attach copy to this report

(12) WELL LOG: Total depth 220 ft. Completed depth 220 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	3	top soil
3	15	clay
15	21	gravel
21	80	brown clay
80	120	volcanic mix
120	160	yellow & brown clay
160	220	volcanic mix

CONFIDENTIAL
NOT FOR PUBLIC USE
WATER CODE SEC. 13752

RECEIVED
FEB 21 1989
DEPT. OF
ENVIRONMENTAL MANAGEMENT

Work started 9-14 19 88 Completed 9-28 19 88

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 _____ (Well Driller)
NAME HUCKFELDT WELL DRILLING (Person, firm, or corporation) (Typed or printed)
Address 2110 Penny Lane
City Napa ZIP 94558
License No. 439746 Date of this report 12-28-88

DWR 188 (REV. 12-86) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM. 86 96355

Well #25

8/14/89 #1941

QUADRUPLICATE
Use to comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in
No. 319568

Notice of Intent No. _____
Local Permit No. or Date 7-20-89

State Well No. _____
Other Well No. _____

(1) OWNER: Name [redacted] & Patricia Christine
Address [redacted] e.
City [redacted] e ZIP [redacted]

(2) LOCATION OF WELL (See instructions):
County Napa Owner's Well Number _____
Well address if different from above Silverado Trail
Township 8 N. Range 6 W. Section 21
Distance from cities, roads, railroads, fences, etc. _____

AP.# 21-030-49

WELL LOCATION SKETCH

(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 ☐
Municipal ☐
Other ☐
(Describe)

(5) EQUIPMENT:
Rotary ☒ Reverse ☐
Cable ☐ Air ☒
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☒ No ☐ Size 3/8" pea.
Diameter of bore 8" in.
Packed from 23 ft. to 176 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☒ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall
+2	176	5"	F480

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

From ft.	To ft.	Slot size
156	176	1/8"

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 23 ft.
Were strata sealed against pollution? Yes ☐ No ☒ Interval _____ ft.
Method of sealing concrete

(10) WATER LEVELS:
Depth of first water, if known 150 ft.
Standing level after well completion 18 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 18 ft. At end of test 153 ft.
Discharge 35 gal/min after 4 hours Water temperature _____
Chemical analysis made? Yes ☒ No ☐ If yes, by whom? Cal Test
Was electric log made Yes ☐ No ☒ If yes, attach copy to this report

(12) WELL LOG: Total depth 180 ft. Completed depth 176 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	3	top soil
3	20	clay
20	23	gravel
23	80	brown clay
80	155	yellow & brown clay
155	180	volcanic mix

INITIAL
PUBLIC USE
SEC. 13752
NOT FOR PUBLIC USE
WATER CODE SEC. 13752
COPY

RECEIVED
AUG 11 1989
DEPT. OF ENVIRONMENTAL MANAGEMENT

Work started 7-20 19 89 Completed 7-25 19 89

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 Lloyd Huckfeldt (Well Driller)
NAME HUCKFELDT WELL DRILLING (Person, firm, or corporation) (Typed or printed)
Address 2110 Penny Lane
City Napa ZIP 94559
License No. 439-746 Date of this report 8-10-89

DWR 188 (REV. 12-86) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM 86 96355

Well #26

QUADRUPLICATE
For Local Requirements

Page ___ of ___

Owner's Well No. ___

Date Work Began 10-13-11 Ended 10-25-11

Local Permit Agency ___

Permit No. 11-1116 Permit Date 7-21-11

21-30-5L

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 814577

GEOLOGIC LOG

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

DRILLING METHOD rotary FLUID mud

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	10	topsoil
10	80	brown ash
80	105	green ash
105	130	hard rock
130	300	green ash
300	325	hard rock
325	375	green ash hard green rock
375	385	green ash
385	430	green rock with green ash

TOTAL DEPTH OF BORING 430 (Feet)

TOTAL DEPTH OF COMPLETED WELL 403 (Feet)

RECEIVED
JAN 3 2000
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

WELL OWNER

Name [redacted]

Mailing Address [redacted]

CITY [redacted] STATE [redacted] ZIP [redacted]

WELL LOCATION

Address [redacted]

City [redacted]

County [redacted]

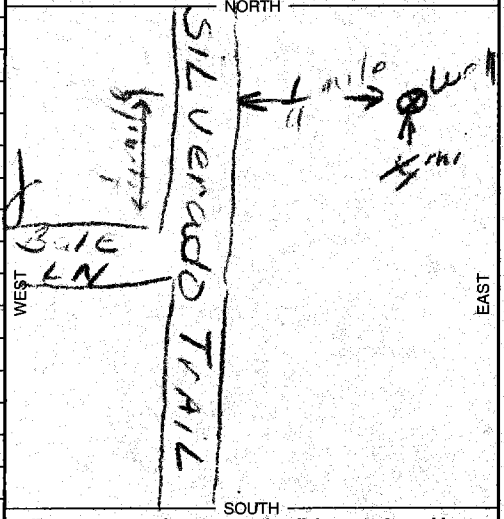
APN Book ___ Page ___ Parcel 21-030-5L

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 UN (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 30 (Ft.) & DATE MEASURED 10-25-99

ESTIMATED YIELD * 20 (GPM) & TEST TYPE Air lift

TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN 350 (Ft.)

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

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	83	12¼	✓				Plastic	8	200	
83	403	12¼		✓			Plastic	8	200	Factory 1/32

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	23	✓			
23	403				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 Fullmer Well Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

2177 South Hill Rd. Vacaville CA 95688
ADDRESS CITY STATE ZIP

Signed Tom Fullmer WELL DRILLER/AUTHORIZED REPRESENTATIVE

11/8/99 DATE SIGNED

1077 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #27

#3631 21-30-5

QUADRUPLICATE
Use to comply with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do not fill in

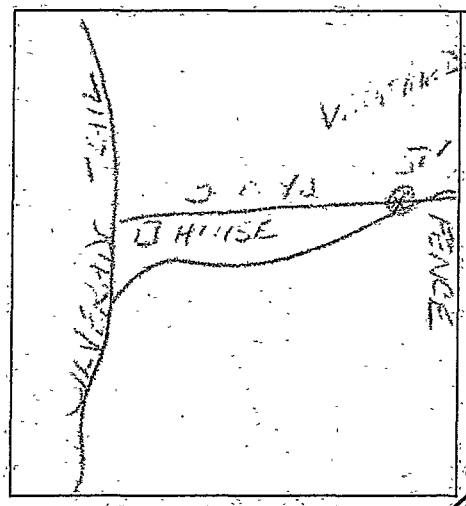
No. 384859

Notice of Intent No. _____ State Well No. _____

Local Permit No. or Date _____ Other Well No. _____

(1) OWNER: Name [redacted]
Address [redacted]
City [redacted] ZIP [redacted]

(2) LOCATION OF WELL (See instructions):
County Napa Owner's Well Number AP#21 030-51
Well address if different from above _____
Township _____ Range _____ Section _____
Distance from cities, roads, railroads, fences, etc. _____



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [ ]
Irrigation [X]
Industrial [ ]
Test Well [ ]
Municipal [ ]
Other [ ]
(Describe)

(5) EQUIPMENT:
Rotary [ ] Reverse [ ]
Cable [ ] Air [X]
Other [ ] Bucket [ ]

(6) GRAVEL PACK:
Yes [X] No [ ] Size Pea
Diameter of bore 12 in.
Packed from 300 ft. to 24 ft.

(7) CASING INSTALLED:
Steel [ ] Plastic [X] Concrete [ ]

(8) PERFORATIONS: .032
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	80	8	200	80	140	032
140	200			200	300	

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth 24 ft.
Were strata sealed against pollution? Yes [ ] No [X] Interval _____ ft.
Method of sealing Bentonite Pellet Concrete

(10) WATER LEVELS:
Depth of first water, if known 80 ft.
Standing level after well completion 60 ft.

(11) WELL TESTS:
Was well test made? Yes [X] No [ ] If yes, by whom? Driller
Type of test Pump [ ] Bailer [ ] Air lift [ ]
Depth to water at start of test 60 ft. At end of test complete ft.
Discharge 150 gal/min after 3 hours Water temperature _____
Chemical analysis made? Yes [X] No [ ] If yes, by whom? Cal-Test
Was electric log made Yes [X] No [ ] If yes, attach copy to this report

(12) WELL LOG: Total depth 310 ft. Completed depth 300 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	2	Topsoil
2	20	Dark Brown Clay & Brown Sand Stone
20	40	Brown Tuffa Stringer & Brown Clay
40	60	Gray Rock Soft
60	80	Gray & Black Rock Soft
80	160	Green, Red & Black Rock Med Fract
160	220	Dark Green & Black Rock Hard Fract
220	250	Dark Green & Black Stringers Red Hard Fract
250	300	Dark & Light Green Rock
300	310	Green Hard & Soft Shale Stringer Gray Rock

NOT FOR PUBLIC USE UNTIL WATER CODE SEC. 13752

RECEIVED
OCT 03 1991
DEPT. OF ENVIRONMENTAL MANAGEMENT

Work started 9-25 19 91 Completed 9-28 19 91

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 [signature] (Well Driller)

NAME DOSHER-OREGON, INC. (Person, firm, or corporation) (Typed or printed)
Address 5365 Napa-Vallejo Highway
City Vallejo, CA ZIP 94589
License No. 258826 Date of this report 9-30-91

DWR 188 (REV. 12-86) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM 86 96355

Well #28

21-30-51

QUADRUPLICATE
For Local Requirements

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Page 1 of 1
Owner's Well No. _____
No. 530544
Date Work Began 10-24-97, Ended 10-28-97
Local Permit Agency Napa County Environmental Mgmt.
Permit No. 45804 Permit Date 10-8-97

DWR USE ONLY — DO NOT FILL IN
RECEIVED
STATE WELL NO./STATION NO.
NOV 20 1997
LATITUDE LONGITUDE
ENVIRONMENTAL MANAGEMENT
CALIFORNIA OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER 140 (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	39	light brown clay w/ embedded rock
39	85	brownish green clay
85	104	light gray clay
104	140	green clay with embedded rock
140	195	light colored volcanics
195	200	red volcanics
200	265	light volcanics
265	305	dark colored volcanics
305	345	green ash/clay
345	400	light gray ash/clay

CONT. CASING LAYOUT

240	300	Screen PVC 5" .032
300	320	Blank PVC 5"

TOTAL DEPTH OF BORING 400 (Feet)
TOTAL DEPTH OF COMPLETED WELL 320 (Feet)

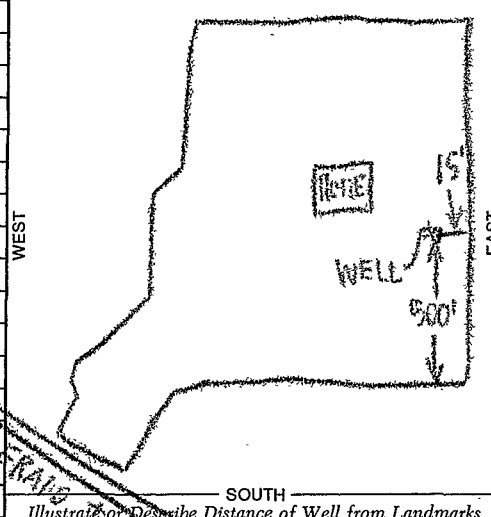
WELL OWNER

Name [redacted]ata
Mailing Address [redacted]09
CITY [redacted] STATE [redacted] ZIP

WELL LOCATION

Address 3886 Silverado Trail
City Calistoga
County Napa
APN Book 21 Page 030 Parcel 51
or Township ___ Range ___ Section ___
or Latitude ___ DEG. ___ MIN. ___ SEC. NORTH Longitude ___ DEG. ___ MIN. ___ SEC. 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 Air FLUID ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 67 (Ft.) & DATE MEASURED 10-28-97
ESTIMATED YIELD* 15 (GPM) & TEST TYPE air lift
TEST LENGTH 3 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	25	10								
25	400	9								
0	130		X				PVC F480	5	SDR-21	
130	220			X			PVC F480	5	SDR-21	.032
220	240		X				PVC F480	5	SDR-21	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	20	X			concrete
20	400			X	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 HUCKFELDT WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 2110 Penny Lane CITY Napa STATE CA ZIP 94559

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 11-1-97
C-57 LICENSE NUMBER 439-746

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #29

21-30-51

QU DRUPLICATE
Fo Local Requirements

Page 1 of 1

Owner's Well No. _____

Date Work Began 6-20-00, Ended 6-23-00

Local Permit Agency Napa County Environmental Mgmt.

Permit No. 96-11532 Permit Date 6-20-00

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 781562

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

GEOLOGIC LOG

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

DRILLING METHOD rotary air FLUID _____

DEPTH FROM SURFACE Ft	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	20	brown clay with embedded boulders
20	45	tan volcanic rock
45	80	gray volcanic rock
80	85	black volcanics
85	130	gray volcanics
130	170	black volcanics
170	200	gray volcanics

RECEIVED
JUL 19 2000
DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT

TOTAL DEPTH OF BORING 200 (Feet)

TOTAL DEPTH OF COMPLETED WELL 190 (Feet)

WELL OWNER

Name [redacted]

Mailing Address [redacted]

CITY [redacted] STATE [redacted] ZIP

WELL LOCATION

Address same

City _____

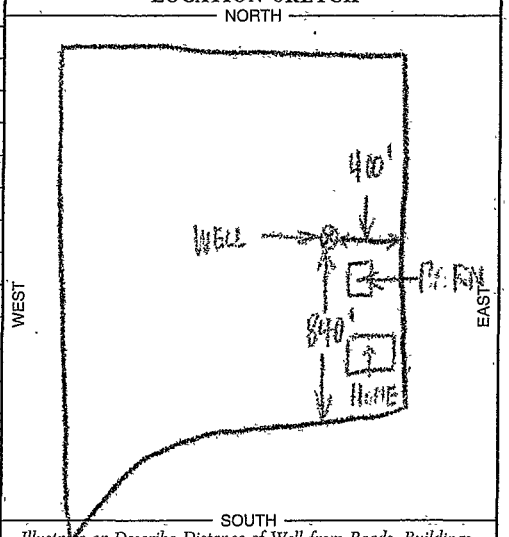
County Napa

APN Book 21 Page 030 Parcel 51

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 (✓)

X NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

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

PLANNED USES (✓)

WATER SUPPLY
X Domestic ___ Public
X 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 70 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 37 (Ft.) & DATE MEASURED 6-23-00

ESTIMATED YIELD * 400 (GPM) & TEST TYPE air lift

TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN N/A (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	25	15								
25	200	12¼								
0	50		X				PVC F480	8	SDR-21	
50	130			X			PVC F480	8	SDR-21	.032
130	150		X				PVC F480	8	SDR-21	
150	190			X			PVC F480	8	SDR-21	.032

DEPTH FROM SURFACE Ft.	to Ft.	ANNULAR MATERIAL TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	30	X			concrete
30	190			X	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 HUCKFELDT WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

2110 Penny Lane Napa CA 94559
ADDRESS CITY STATE ZIP

Signed _____ 7-11-00 439-746
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #30

QUADRUPLICATE
Local Requirements

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 769464

Page 1 of 1

Owner's Well No. _____

Date Work Began 12-7-01, Ended 12-12-01

Local Permit Agency Napa County Environmental Mgmt.

Permit No. 96-11993 Permit Date 12-6-01

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

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD rotary FLUID _____

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	18	gray fractured volcanics
18	40	tan volcanics
40	120	gray & tan volcanics
120	180	black sandy volcancis
180	280	green volcanics rock

TOTAL DEPTH OF BORING 280 (Feet)
TOTAL DEPTH OF COMPLETED WELL 274 (Feet)

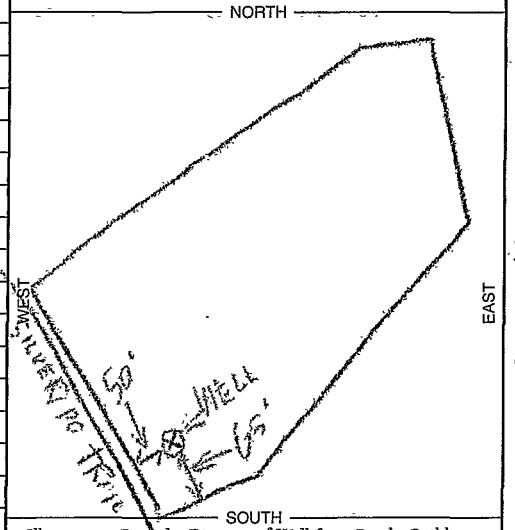
WELL OWNER

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

WELL LOCATION

Address Silverado Trail
City Calistoga
County Napa
APN Book 21 Page 030 Parcel 44 57
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 (✓)

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

PLANNED USES (✓)

WATER SUPPLY
X 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 190 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 31 (Ft.) & DATE MEASURED 12-12-01
ESTIMATED YIELD * 100 (GPM) & TEST TYPE air lift
TEST LENGTH 1 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	25	12								
25	280	9								
0	154		X				PVC F480	5	SDR-21	
154	274			X			PVC F480	5	SDR-21	.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	22	X			concrete
22	274			X	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 HICKFELDT WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

2110 Penny Lane ADDRESS — Napa CITY — CA STATE — 94559 ZIP

Signed _____ WELL DRILLER/AUTHORIZED REPRESENTATIVE

12-31-01 DATE SIGNED

439-746 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #31

ORIGINAL
File with DWR

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 535605

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

Owner's Well No. # 2
Date Work Began 10-10-97, Ended 10-17-97
Local Permit Agency Co of Napa Environmental Management
Permit No. 45891 Permit Date 10-10-97

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	3	Top Soil
3	28	Sand Gravel & Clay
28	42	Sand Mixed in Clay
42	72	Sand - Gravel in Clay
72	100	White Ash mixed in Clay - Gravel
100	118	Purple / orange, Black Vol
118	145	Orange, Black Vol Rock
145	154	Black Vol Rock
154	233	Orange cinder Hard Volcanics

TOTAL DEPTH OF BORING 233 (Feet)
TOTAL DEPTH OF COMPLETED WELL 228 (Feet)

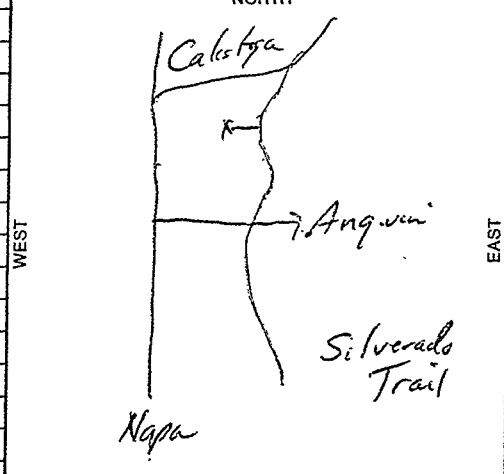
WELL OWNER

Name [redacted]
Mailing Address [redacted]
City [redacted] STATE ZIP

WELL LOCATION

Address 3939 Silverado Trail
City Calistoga
County Napa
APN Book 021 Page 030 Parcel 047 58
or Township ___ Range ___ Section ___
or Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH



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

ACTIVITY (✓)

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

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
✓ Domestic
___ Public
✓ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD ___ FLUID

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 60 (Ft.) & DATE MEASURED 12-1-97
ESTIMATED YIELD* 100 (GPM) & TEST TYPE Air Lift
TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN 233 (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	23	11"	X				PVC F480	5	200	—
23	60	9"	X				PVC F480	5	200	—
60	233	9"		X			PVC F480	5	200	032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	23	✓			
23	233			✓	3/8 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) (TYPED OR PRINTED)
ADDRESS 1115 MT George Ave CITY Napa STATE Ca ZIP 94558
Signed David W Bess WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 12-21-97 C-57 LICENSE NUMBER 487027

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #32

ORIGINAL
File with DWR

21-030-058

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

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 535606

Owner's Well No. # 1
Date Work Began 9-6-97 Ended 9-10-97
Local Permit Agency Co of Napa Environmental Management
Permit No. 45801 Permit Date 10-8-97

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	2	Top Soil
2	49	Red Clay / Sand
49	95	Red Clay / Mixed with Sand
95	142	Brown Clay / With Ash
142	162	Hard Blk Purple Cinder Mixed With Volcanic Rock

TOTAL DEPTH OF BORING 162 (Feet)
TOTAL DEPTH OF COMPLETED WELL 158 (Feet)

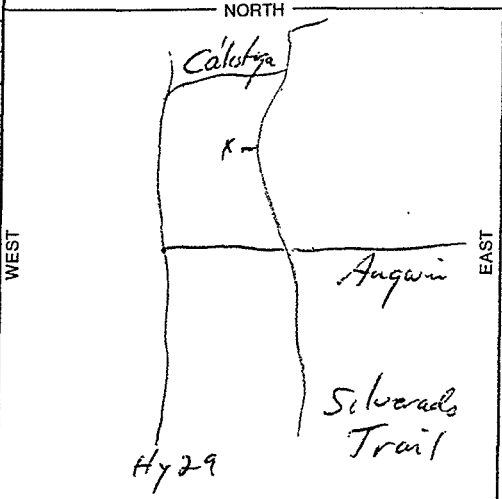
WELL OWNER

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

WELL LOCATION

Address 3929 Silverado Trail
City Calistoga
County Napa
APN Book 21 Page 030 Parcel 12
or Township ___ Range ___ Section ___
or Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH



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

ACTIVITY (✓)

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

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
✓ Domestic
___ Public
___ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD ___ FLUID

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 48 (Ft.) & DATE MEASURED 11-28-97
ESTIMATED YIELD* 7-10 (GPM) & TEST TYPE Air Lift
TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	23	11	X				PVC F480	5	200	
23	40	9	X				" "	5	"	
40	158			X			" "	5	"	032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	23	✓			
23	160			✓	3/4 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) (TYPED OR PRINTED)
ADDRESS 1115 Mt George Ave CITY Napa STATE Ca ZIP 94558
Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 12-2-97
C-57 LICENSE NUMBER 487027

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #33

ORIGINAL
File with DWR

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 535604

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

Owner's Well No. # 1
Date Work Began 10-2-97, Ended 10-6-97
Local Permit Agency Co of Napa Environmental Managent
Permit No. 45762 Permit Date 10-2-97

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	2	Top Soil
2	12	Clay / Sand
12	85	Clay Sand / Gravel
85	100	Sand Gravel
100	172	Sand / Clay
172	189	White Ash
189	290	Hard Black & orange fractured Volcan Rock mixed with Vol Cinder

TOTAL DEPTH OF BORING 290 (Feet)
TOTAL DEPTH OF COMPLETED WELL 285 (Feet)

WELL OWNER

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

WELL LOCATION

Address 3939 Silverado Trail
City ST Helena Calistoga
County Napa
APN Book 21 Page 030 Parcel 458
or
Township ___ Range ___ Section ___
or
Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH

NORTH
Calistoga
WEST
X
EAST
Angwin
29
Silverado Trail
SOUTH

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

ACTIVITY (✓)

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

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
✓ Domestic
___ Public
___ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD (FLUID)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 60 (Ft.) & DATE MEASURED 12-20-97
ESTIMATED YIELD* 80 (GPM) & TEST TYPE Air Lift
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 285 (Ft.)
* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	23	11"	X				PVC F480	5	200	
23	63	8 3/4	X				PVC F480	5	200	
63	285			X			PVC F480	5	200	032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	23	✓			
23	285			✓	3/8 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 G Bess Pump & Well
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 1115 MT George Ave CITY Napa STATE Ca ZIP 94558

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 12-20-97
C-57 LICENSE NUMBER 457027

DWR 188 REV 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #34

QUADRUPLICATE
For Local Requirements

Page 1 of 1
Owner's Well No. _____
Date Work Began 4-3-03, Ended 4-10-03
Local Permit Agency Napa County Environmental Mgmt.
Permit No. 96-12346 Permit Date 4-3-03

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 792337

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

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD rotary FLUID _____

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	15	dark brown clay
15	50	light brown clay with gravel
50	70	mixed alluvium,
70	85	light brown sandy clay
85	160	mixed volcanics with sandy clay

RECEIVED
MAY 07 2003
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

TOTAL DEPTH OF BORING 160 (Feet)
TOTAL DEPTH OF COMPLETED WELL 80 (Feet)

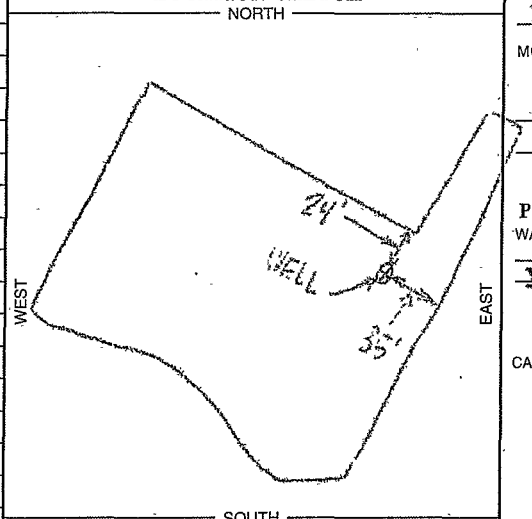
WELL OWNER

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

WELL LOCATION

Address 3861 Silverado Trail
City Calistoga
County Napa
APN Book 21 Page 030 Parcel 16
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 (✓)

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

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
X 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 60 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 18 (Ft.) & DATE MEASURED 4-10-03
ESTIMATED YIELD * 5 (GPM) & TEST TYPE air lift
TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	85	12								
85	160	9								
0	50		X				PVC F480	6	SDR-21	
50	80			X			PVC F480	6	SDR-21	.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	15	X			concrete
15	31		X		chips
31	82			X	#6 sand
82	85		X		chips
85	160			X	#6 sand

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 HUCKFELDT WELL DRILLING (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 2110 Penny Lane CITY Napa STATE CA ZIP 94559
Signed _____ WELL DRILLER/AUTHORIZED REPRESENTATIVE
DATE SIGNED 4-13-03
C-57 LICENSE NUMBER 439-746

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #35

ORIGINAL
File with DWR

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. e008456

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

Owner's Well No. Well #1-'03
Date Work Began 10/3/2003, Ended 10/6/2003
Local Permit Agency Napa County Environmental Mgmt
Permit No. 96-12506 Permit Date 10/2/2003

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)
DRILLING METHOD ROTARY FLUID bentonite

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0 – 15	DARK BROWN CLAY
15 – 50	LT. BROWN CLAY & GRAVEL
50 – 80	TAN CLAY & LARGE GRAVEL

RECEIVED
DEC 23 2003
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

TOTAL DEPTH OF BORING 80 (Feet)
TOTAL DEPTH OF COMPLETED WELL 75 (Feet)

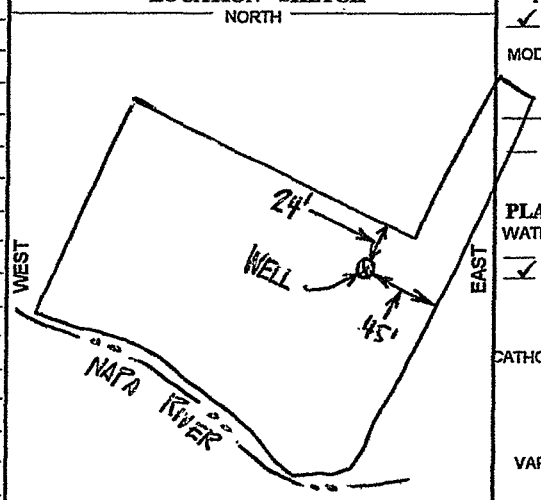
WELL OWNER

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

WELL LOCATION

Address 3861 Silverado Trail
City Calistoga CA 94515
County Napa
APN Book 21 Page 030 Parcel 10 59
Township — Range — Section —
Latitude DEG. MIN. SEC. DEG. MIN. SEC.

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 60 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 32 (Ft.) & DATE MEASURED 10/6/2003
ESTIMATED YIELD * 2 (GPM) & TEST TYPE air lift
TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN N/A (Ft.)
May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 – 80	12								
0 – 45			✓			PVC-F480	6	SDR-21	
45 – 75			✓			PVC-F480	6	SDR-21	.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 – 20	✓			CONCRETE
20 – 22		✓		CHIPS
22 – 75			✓	#6 SAND

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— 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 HUCKFELDT WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
2110 Penny Lane Napa CA 94559
ADDRESS CITY STATE ZIP
Signed _____ 10/29/03 439-746
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

APPENDIX C

SOIL WATER BALANCE ANALYSIS

Napa County Groundwater Recharge Analysis

Introduction

Developing accurate estimates of the spatial and temporal distribution of groundwater recharge is a key component of sustainable groundwater management. Efforts to quantify recharge are inherently difficult owing to the wide variability of factors controlling hydrologic processes, the wide range of available tools/methods for estimating recharge, and the difficulty in assessing the accuracy of estimates because direct measurement of recharge rates is, for the most part, infeasible (Healy 2010, Seiler and Gat 2007).

Numerical modeling is a common approach for developing recharge estimates. Soil-water-balance modeling is one category of numerical models particularly well-suited for estimating recharge across large areas with modest data requirements. This study describes an application of the U.S. Geological Survey's (USGS) Soil Water Balance Model (SWB) (Westenbroek et al. 2010) to develop spatial and temporal distributions of groundwater recharge across Napa County. This model operates on a daily timestep and calculates surface runoff based on the Natural Resources Conservation Service (NRCS) curve number method and potential evapotranspiration based on the Hargreaves-Samani methods (Hargreaves and Samani 1985). Actual evapotranspiration (AET) and recharge are calculated using a modified Thornthwaite-Mather soil-water-balance approach (Westenbroek et al. 2010).

It is important to note that the SWB model focuses on surface and soil-zone processes and does not simulate the groundwater system or track groundwater storage over time. The model also does not simulate surface water/groundwater interaction or baseflow; thus, the runoff estimates represent only the surface runoff component of streamflow resulting from rainstorms and the recharge estimates represent only the infiltration recharge component (also referred to as diffuse recharge) of total recharge (stream-channel recharge is not simulated).

This modeling work and summary report has been prepared by O'Connor Environmental, Inc., for it's private use in relation to Water Availability Analyses (WAA) prepared on behalf of private clients for projects using groundwater in "hillside" areas of Napa County as required by Napa Planning, Building & Environmental Services. The modeling to-date is complete in its current form but remains subject to revision; it is considered a working draft with information suitable for use to support WAA projects. Parties interested in obtaining more information regarding the modeling or who may wish to offer comments should contact O'Connor Environmental, Inc.

Model Development

The model was developed using a 30-meter (98.4 ft) resolution rectangular grid. Water budget calculations were made on a daily time step. Key spatial inputs included a flow direction map developed from the USGS 1 arc-second resolution Digital Elevation Model (DEM), a land cover map derived from the U.S. Forest Service (USFS) CALVEG dataset that was supplemented by a database of agricultural areas maintained by the County of Napa (Figure 1), a distribution of Hydrologic Soil Groups (A through D classification from lowest to highest runoff potential; Figure 2), and a distribution of Available Water Capacity (AWC) developed from the NRCS Soil Survey Geographic Database (SSURGO) (Figure 3).

A series of model parameters were assigned for each land cover type/soil group combination including an infiltration rate, a curve number, dormant and growing season interception storage values, and a rooting depth (Table 1).

Infiltration rates for hydrologic soil groups A through D were applied based on Cronshey et al. (1986) (Table 2) along with default soil-moisture-retention relationships based on Thornthwaite and Mather (1957) (Figure 4). Curve numbers were assigned based on standard NRCS methods. Interception storage values and rooting depths were assigned based on literature values and from previous modeling experience including a SWB model covering Sonoma County and calibrated using runoff volumes from several stream gages (OEI 2017).

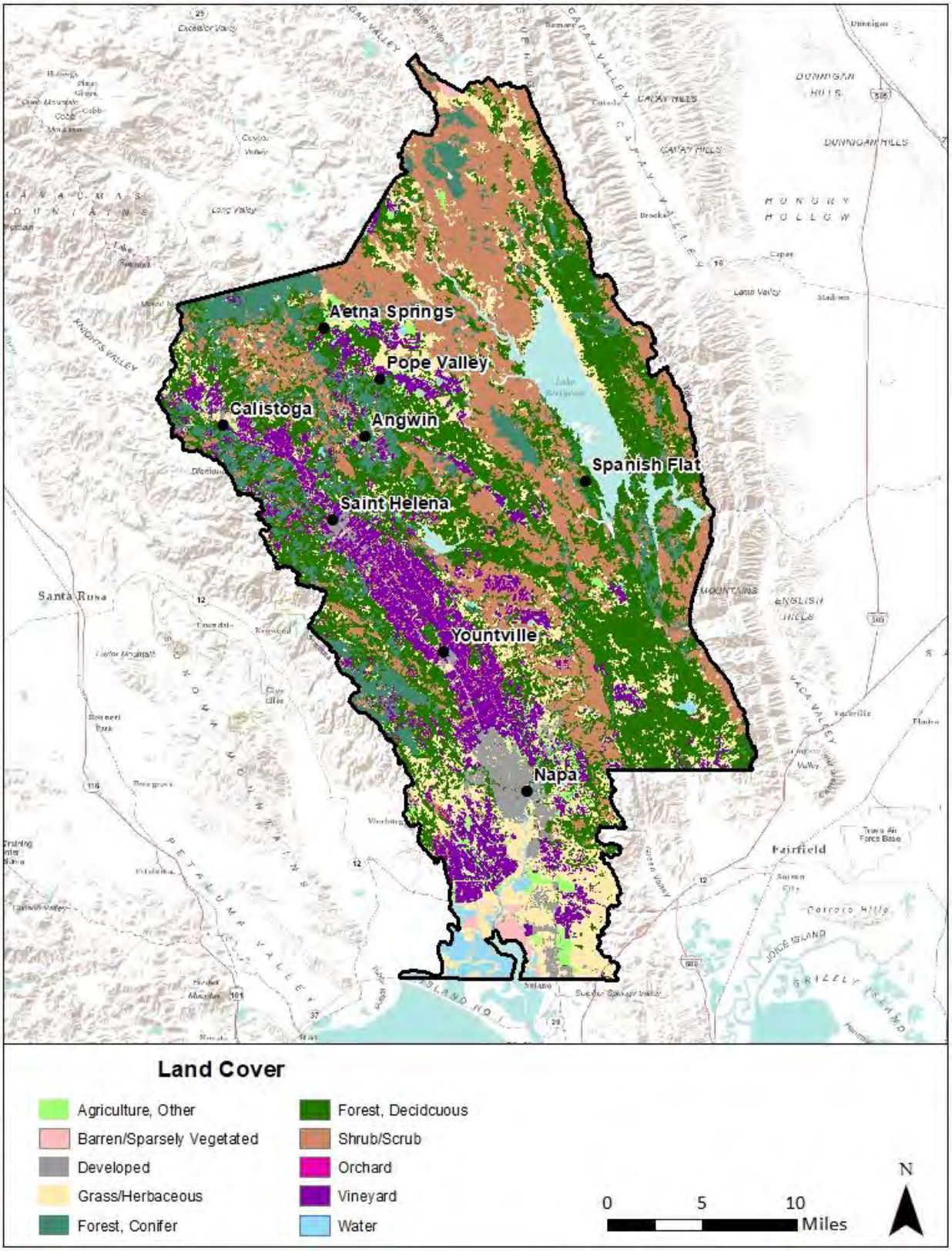


Figure 1: Land cover distribution used in the Napa County SWB model.

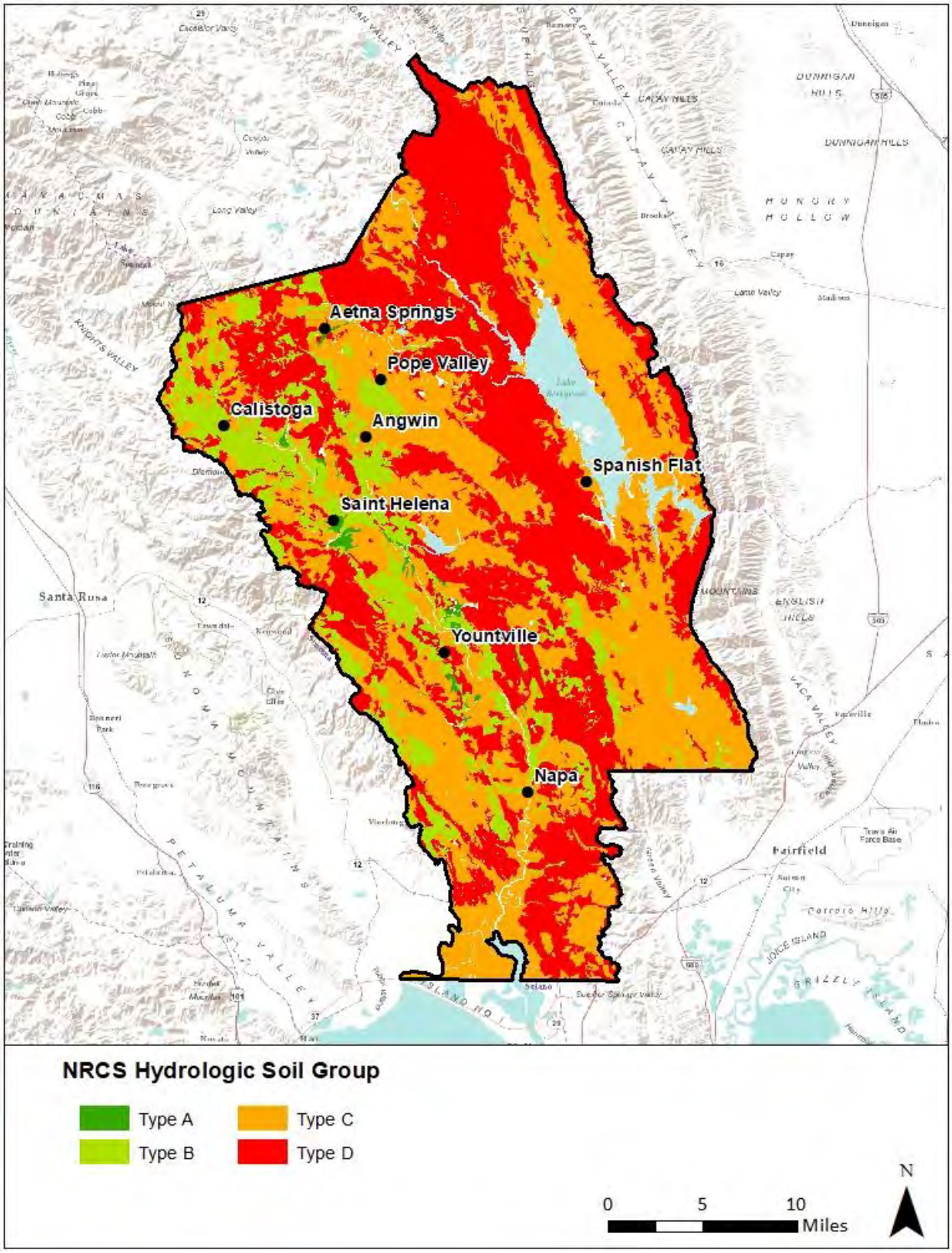


Figure 2: Hydrologic soil group distribution used in the Napa County SWB model.

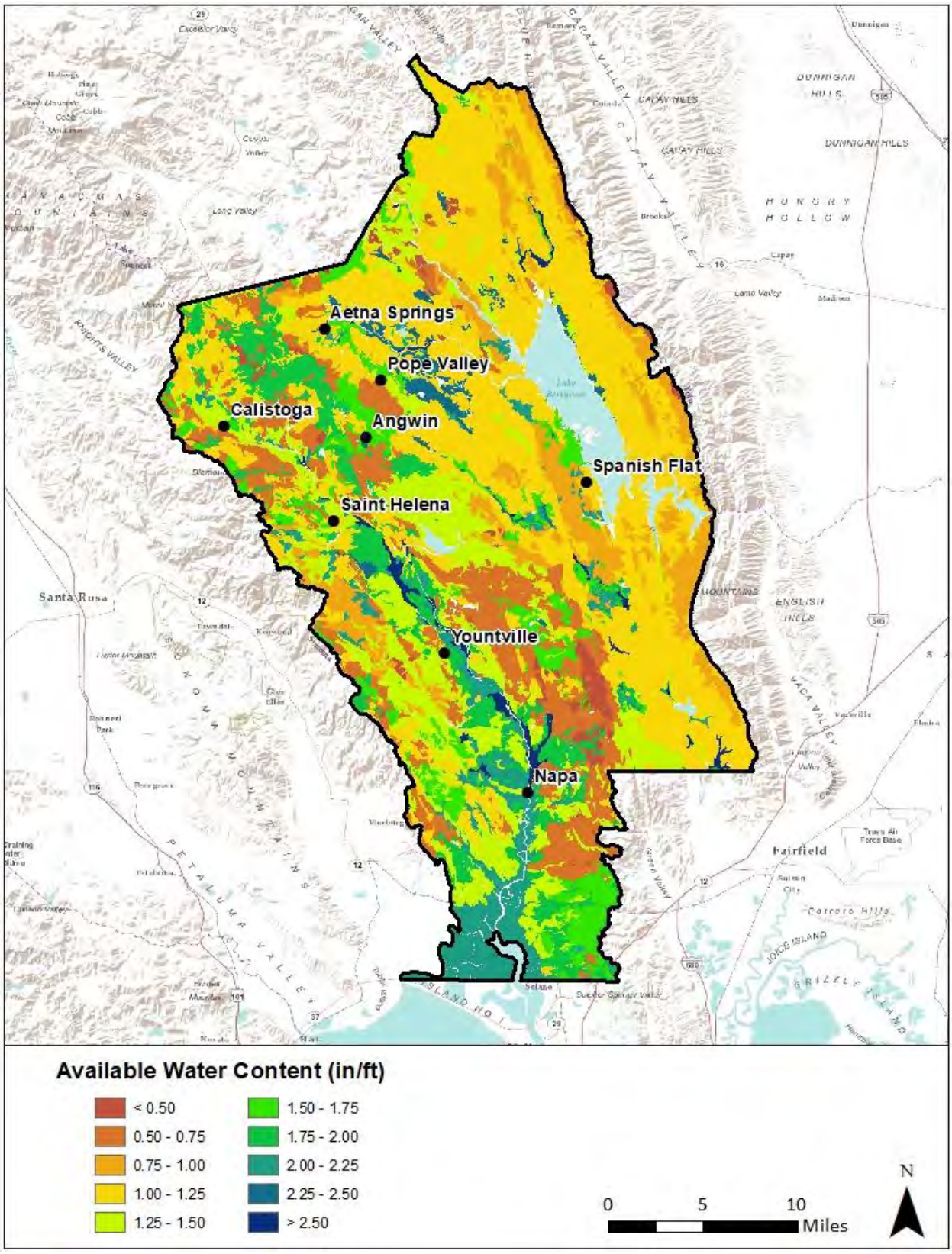


Figure 3: Available water capacity distribution used in the Napa County SWB model.

Table 1: Soil and land cover properties used in the Napa County SWB model.

Land Cover	Interception Storage Values ()		Curve Number by NRCS Soil Type ()				Rooting Depth by NRCS Soil Type (ft)			
	Growing Season	Dormant Season	Type A	Type B	Type C	Type D	Type A	Type B	Type C	Type D
Agriculture, Other	0.080	0.040	38	61	75	81	2.0	1.9	1.8	1.7
Barren	0.000	0.000	77	86	91	94	0.0	0.0	0.0	0.0
Developed	0.005	0.002	61	75	83	87	2.3	2.1	2.0	1.8
Grassland/Herbaceous	0.005	0.004	30	58	71	78	1.3	1.1	1.0	1.0
Forest, Coniferous	0.050	0.050	30	55	70	77	5.9	5.1	4.9	4.7
Forest, Deciduous	0.050	0.020	30	55	70	77	5.9	5.1	4.9	4.7
Shrub/Scrub	0.080	0.015	30	48	65	73	3.2	2.8	2.7	2.6
Orchard	0.050	0.015	38	61	75	81	3.2	2.8	2.7	2.6
Vineyard	0.080	0.015	38	61	75	81	2.2	2.1	2.0	1.9
Water	0.000	0.000	100	100	100	100	0.0	0.0	0.0	0.0

Table 2: 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

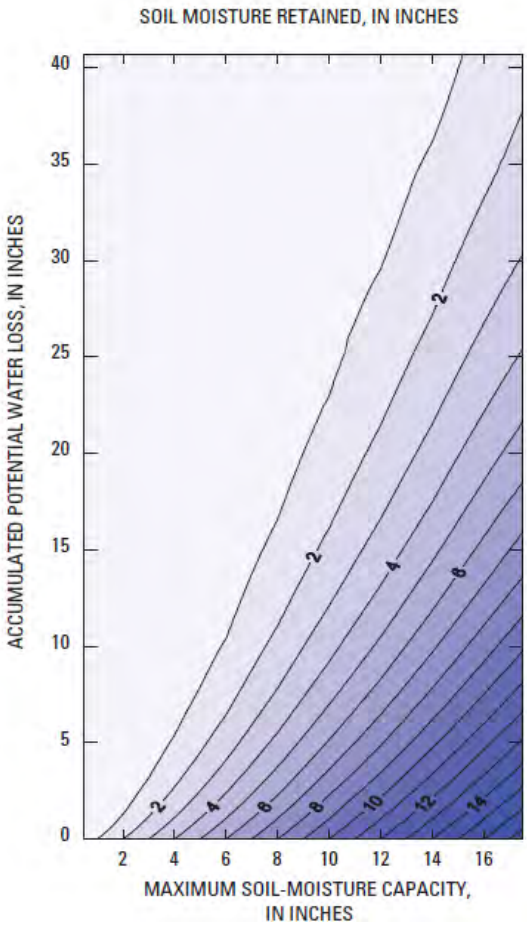


Figure 4: Soil-moisture-retention table (Thornthwaite and Mather 1957).

The SWB model utilizes daily precipitation and mean daily temperature data derived from climate stations. To account for the spatial variability of these parameters, daily precipitation and mean daily temperature were input as gridded (spatially-distributed) time-series. The gridded precipitation time-series was created using data from 15 weather stations in Napa County, and the gridded mean temperature time-series was created using data from 8 stations (Table 3). These stations were selected based on completeness of the records and to provide station data representative of the range of climates experienced in the county. Data was obtained from the California Data Exchange Center (CDEC), the National Climatic Data Center (NCDC), and from Napa One Rain.

To create the gridded time-series, the model domain was divided into discrete areas represented by individual weather stations (Figures 5 and 6). This delineation was based on climate variations described by existing gridded mean annual (1981-2010) precipitation and temperature data (PRISM 2010) and local knowledge of climatic variations across the county.

For the precipitation time-series, each area representing a weather station was subdivided into four to twenty-three zones based on 1-inch average annual precipitation contours. Within each zone the raw station data was multiplied by a unique scaling factor. This scaling factor was calculated as the ratio of average annual precipitation within a zone to average annual precipitation at the representative rain gage. In certain locations, typically near the boundary of areas represented by gages located on the valley bottom and at higher elevations, this scaling was unable to smoothly resolve differences in annual and event precipitation totals. To more accurately estimate precipitation near these boundaries, precipitation records from the two gages in question were averaged using weights calculated proportionally to the difference between PRISM mean annual precipitation at a rain gage and within a selected zone. The resulting gridded time-series is comprised of 220 individual time-series based on the scaled station data from 15 stations.

The assignment of temperature stations was based on the understanding that the spatial variability of temperatures across Napa County is relatively homogenous, with elevation being the primary variable. Temperature records were classified either as Mountain, Valley Bottom, or East County and applied within areas the PRISM datasets described as being similar. To smooth the transition from Mountain zones to Valley Bottom and East County zones, Hillside zones were created where the temperature records of the two nearest gages were averaged.

Missing and suspect data was encountered in the raw precipitation and temperature data from the weather stations used by the model. Values that were significantly outside the typical range, and where similar observations were not found at nearby stations, were removed from the datasets. These and missing values were filled using scaled data from other nearby stations. Precipitation data used for gap filling was scaled using the ratio of the 1981 to 2010 mean annual precipitation (PRISM 2010) between the two stations. Temperature data was scaled using the ratio of the 1981 to 2010 mean monthly minimum and maximum temperatures (PRISM 2010) between the two stations.

The current analysis focuses on Water Year 2010 (October 1, 2009 – September 30, 2010) and Water Year 2014 (October 1, 2013 – September 30, 2014). These years were selected because they represent periods with data available from most weather stations in the county and where most stations reported annual precipitation totals close to the long-term average (WY 2010) and significantly below the long term average (WY 2014). Based on a comparison between station data and PRISM average precipitation depths during Water Year 2010, rainfall averaged 101% of long-term average conditions and ranged from 78% at Lake Hennessey to 111% at the Napa County Airport. In Water Year 2014, rainfall averaged 55% of long-term average conditions and ranged from 41% at Lake Hennessey to 73% at the Napa State Hospital (Table 3).

Table 3: Weather stations used in the Napa County SWB model. See Figures 7- 9 for associated timeseries.

Station	Data Used	1981 - 2010 Mean Annual Precip (in)	WY 2010		WY 2014	
			Precip (in)	% Avg	Precip (in)	% Avg
Angwin[1]	Precip & Temp	42.54	44.64	105%	25.04	59%
Atlas Peak[1]	Precip & Temp	41.76	39.04	93%	20.08	48%
Berryessa[1]	Precip & Temp	28.97	28.16	97%	13.97	48%
Calistoga[2]	Precip	39.41	41.75	106%	18.18	46%
Knoxville Creek[1]	Temp Only	-	-	-	-	-
Lake Hennessey[3]	Precip Only	34.09	26.52	78%	13.92	41%
Mt. George[3]	Precip Only	31.15	29.64	95%	18.24	59%
Mt. Veeder[3]	Precip Only	44.81	46.44	104%	28.6	64%
Napa County Airport[2]	Precip & Temp	21.14	23.56	111%	9.87	47%
Napa River at Yountville Cross Rd[3]	Precip Only	31.86	32.72	103%	14.93	47%
Napa State Hospital[2]	Precip & Temp	26.81	28.85	108%	19.66	73%
Petrified Forest[3]	Precip Only	42.39	46.6	110%	22.84	54%
Redwood Creek At Mt. Veeder Road[3]	Precip Only	34.71	37.36	108%	23.48	68%
Saint Helena[2]	Precip & Temp	37.43	39.11	104%	19.11	51%
Saint Helena 4WSW[1]	Precip & Temp	45.44	47.88	105%	28.88	64%
Sugarloaf Peak[3]	Precip Only	32.20	26.16	81%	17.12	53%

1 – Data accessed from California Data Exchange Center (CDEC)
2 – Data accessed from National Climate Data Center (NCDC)
3 – Data access from Napa One Rain

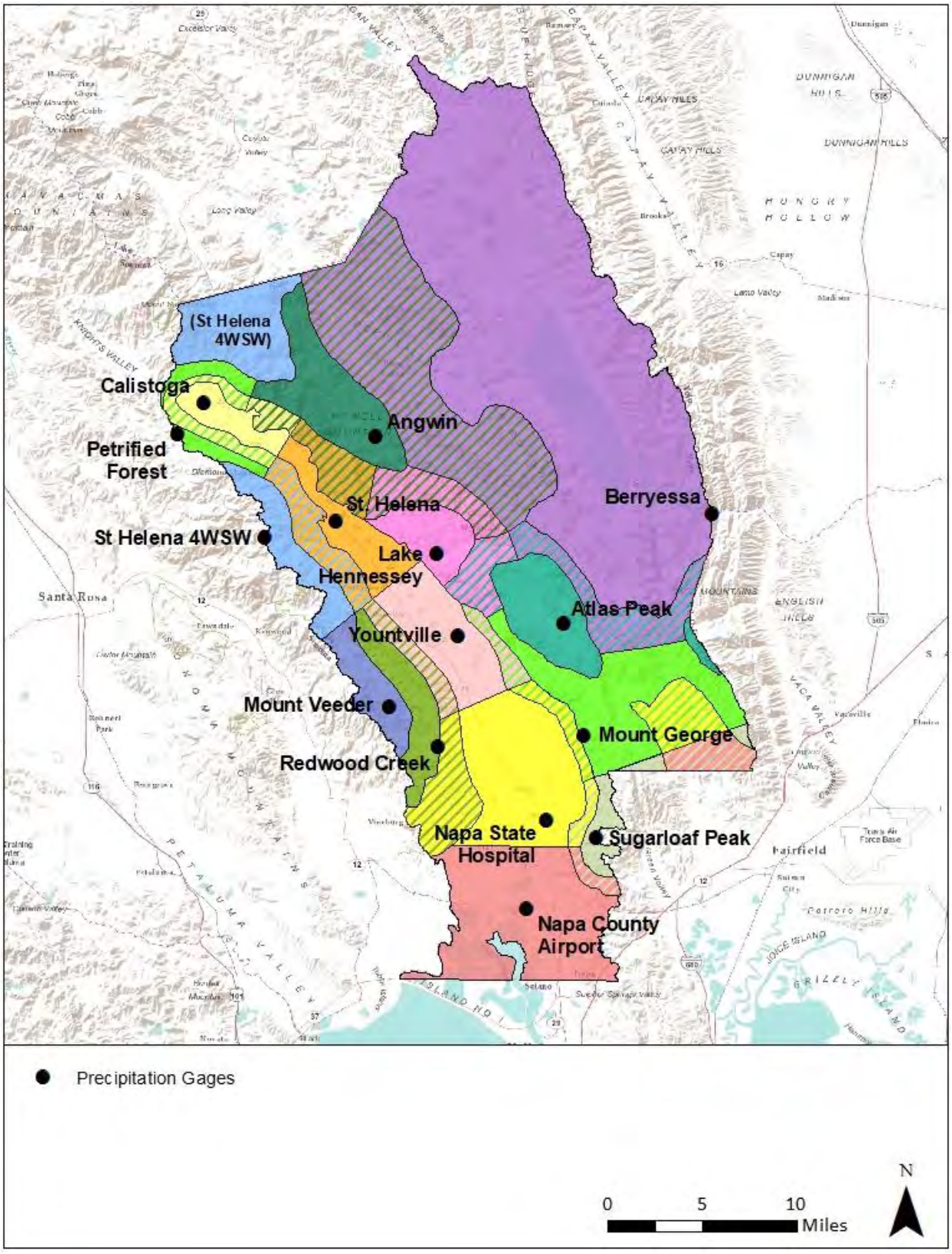


Figure 5: Precipitation zones used in the Napa County SWB model. Hatching indicates areas where two precipitation records were averaged across a zone.

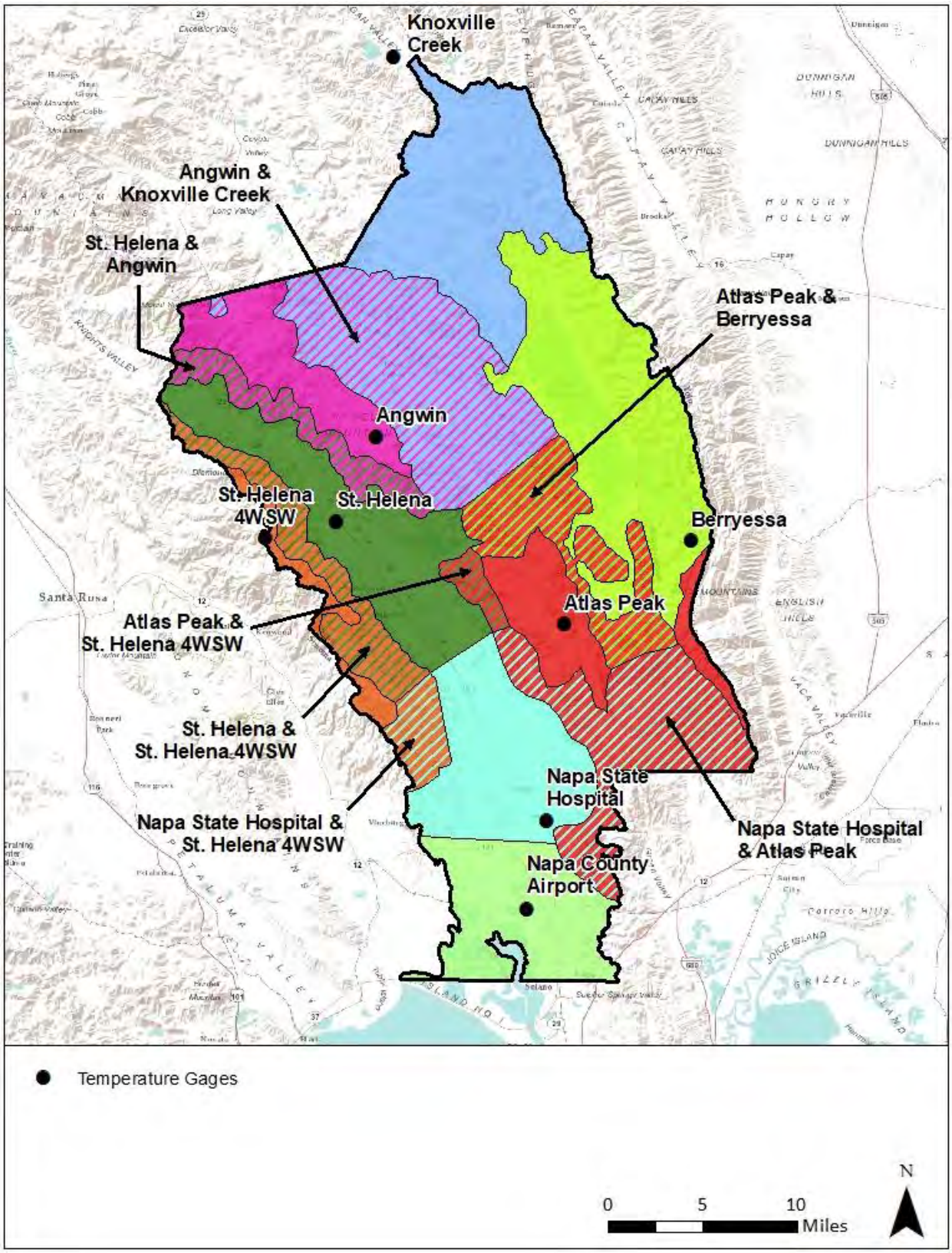


Figure 6: Temperature zones used in the Napa County SWB model. Hatching indicates areas where two temperature records were averaged across a zone.

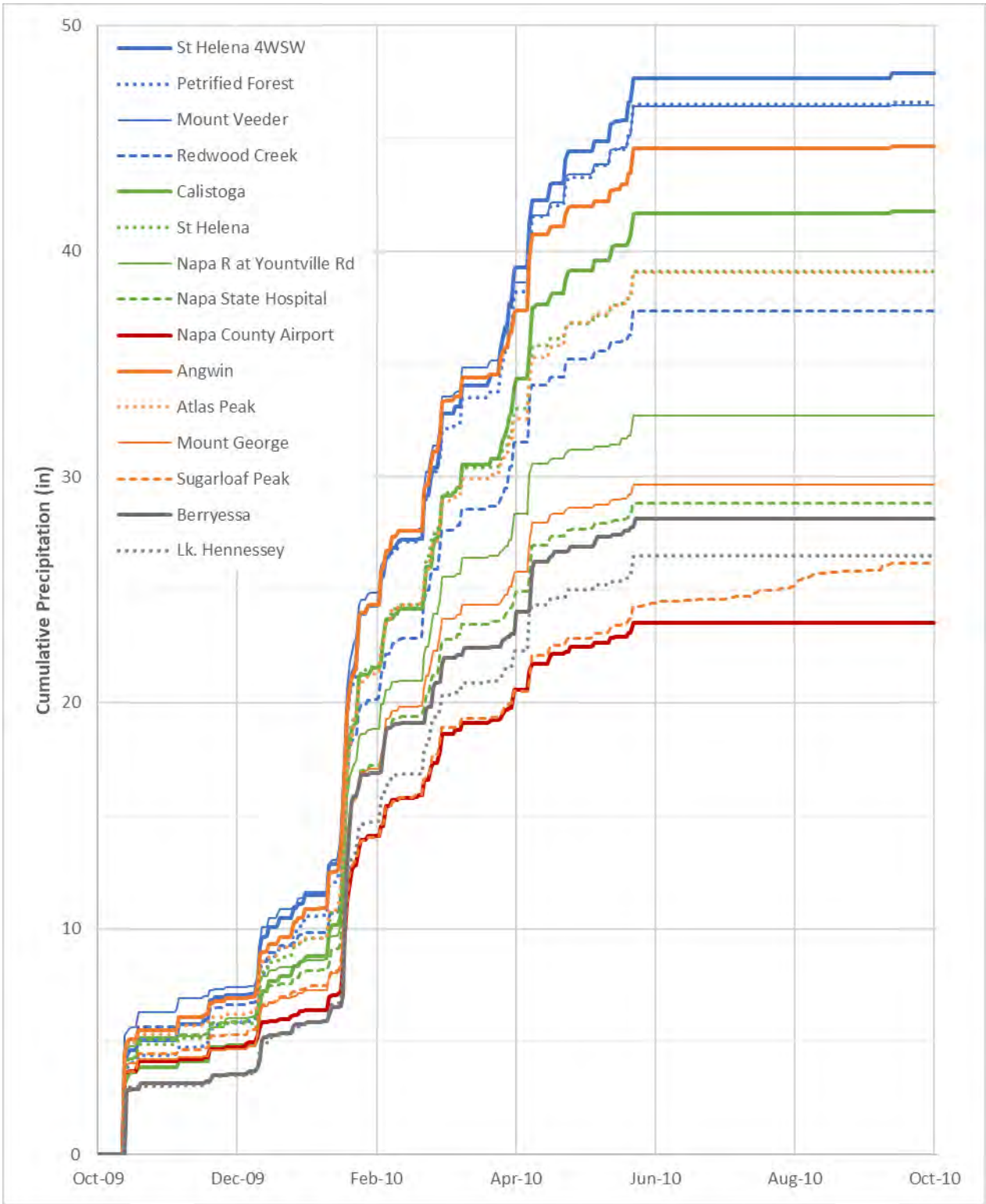


Figure 7a: Daily precipitation data used in the Napa County SWB model for WY 2010.

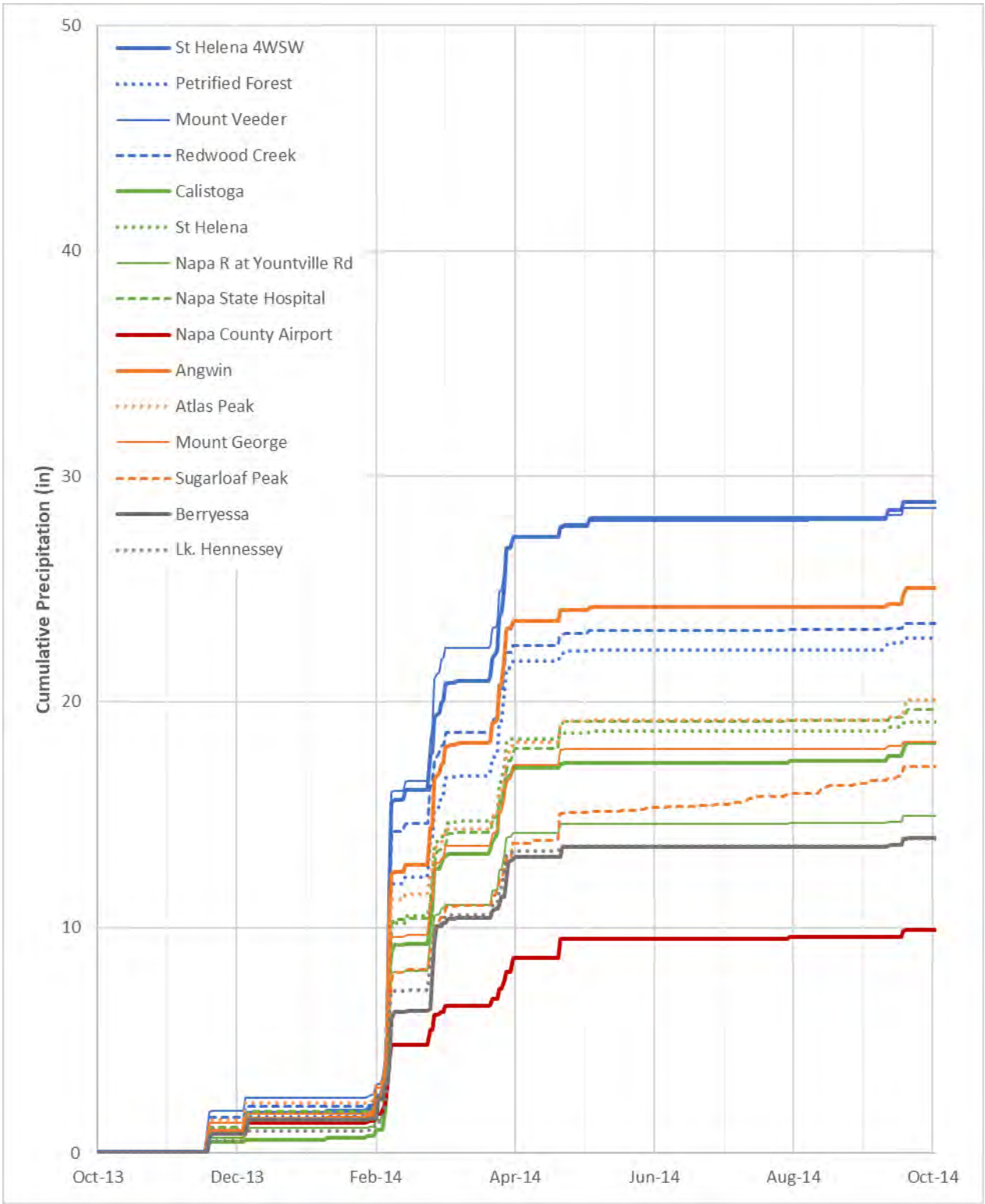


Figure 7b: Daily precipitation data used in the Napa County SWB model for WY 2014.

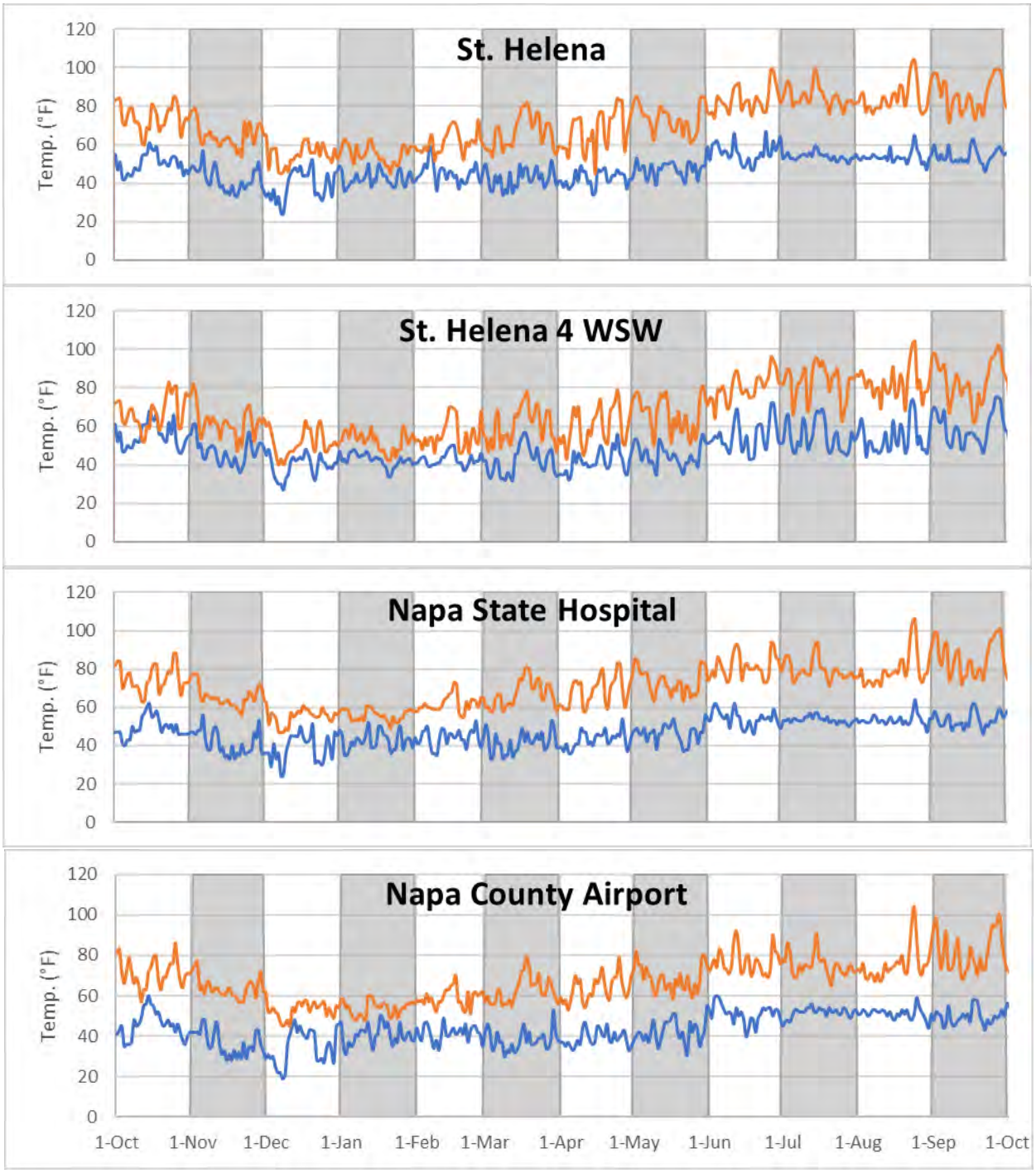


Figure 8: Daily minimum and maximum temperature data used in the Sonoma County SWB model for WY 2010.

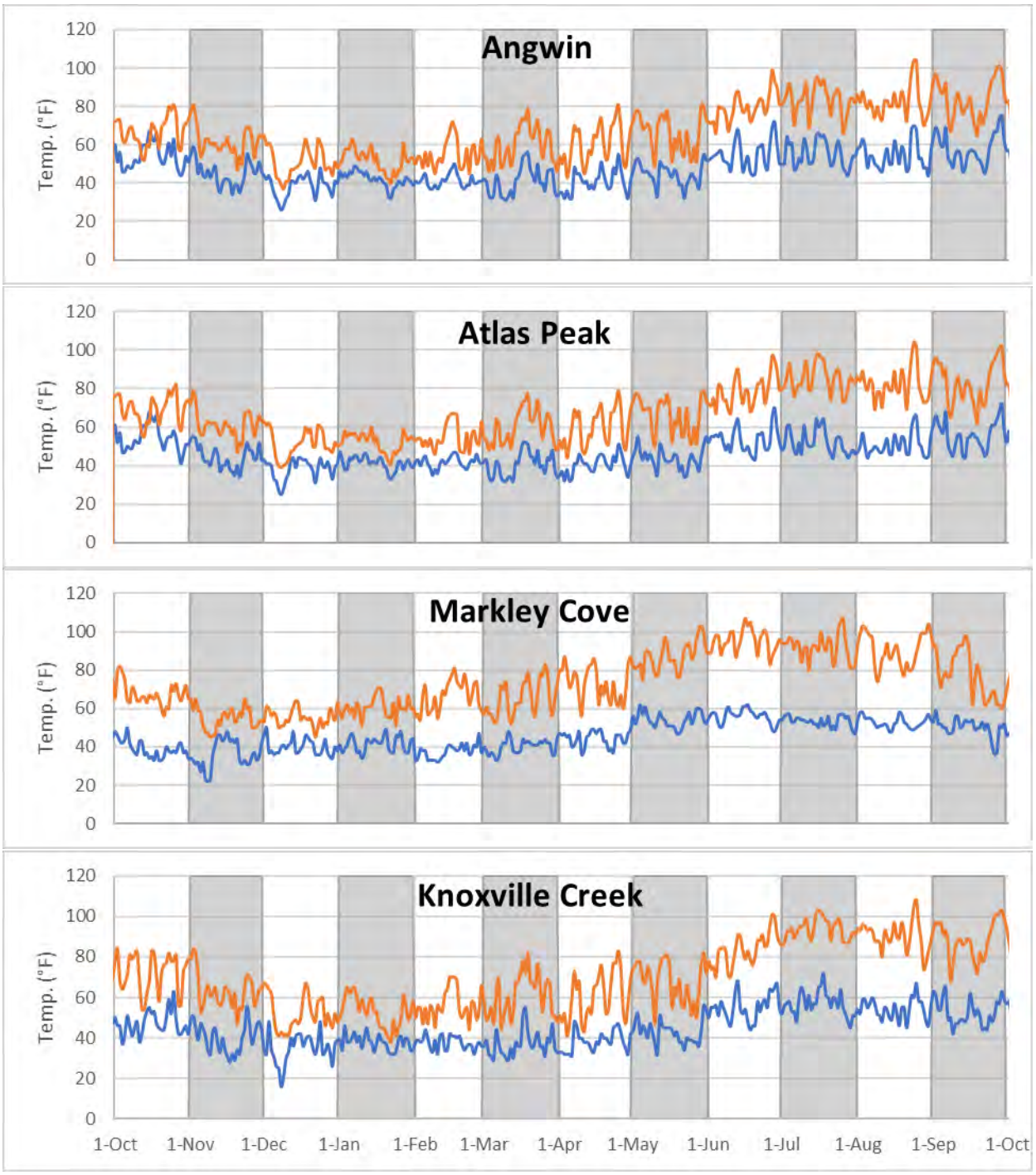


Figure 8 – cont.

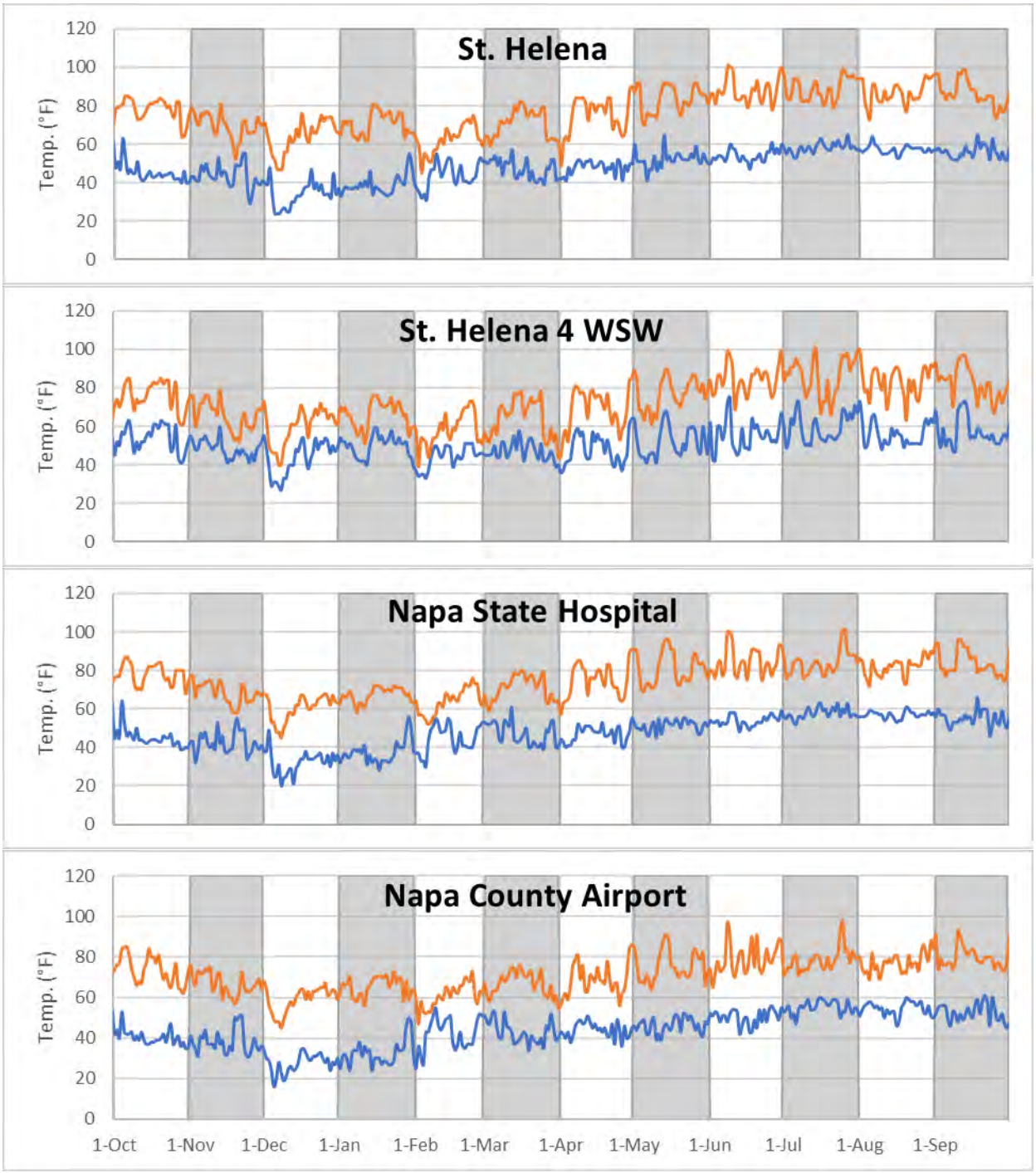


Figure 9: Daily minimum and maximum temperature data used in the Sonoma County SWB model for WY 2010.

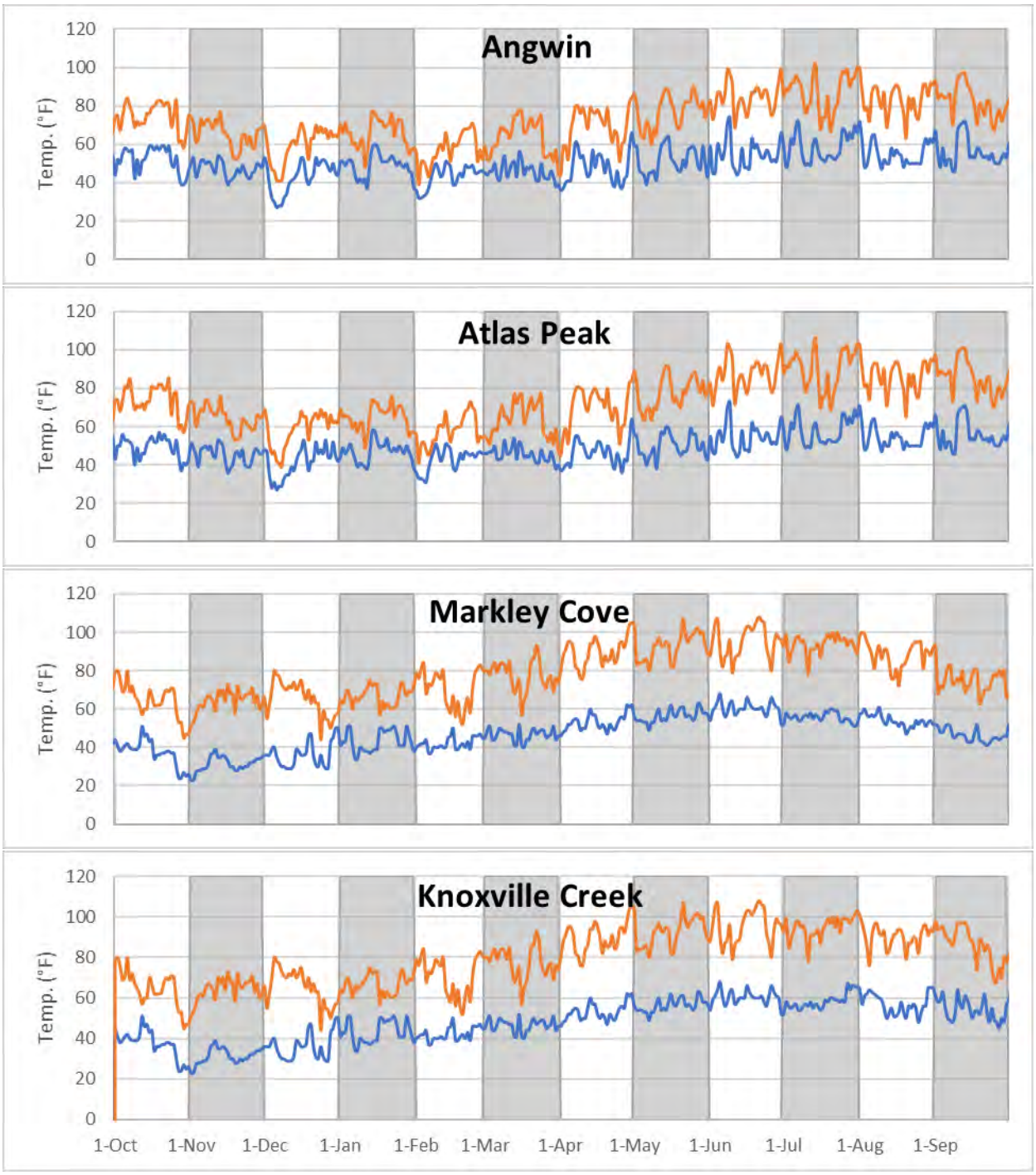


Figure 9 – cont.

Model Calibration

Available data are insufficient to calibrate the Water Year 2010 and 2014 SWB simulations; however, the land cover and soil properties used in the model were obtained from a previously prepared and calibrated SWB model of Sonoma County (OEI 2017). The Sonoma County model was calibrated against total monthly runoff volumes derived using baseflow separation of streamflow data for five watersheds within Sonoma County. Gages were selected because they represented relatively small watersheds (1.2 – 14.3 mi^2) without significant urbanization, diversions, groundwater abstraction, reservoir impoundments, or large alluvial bodies where significant exchanges between surface water and groundwater may be expected. These attributes are desirable because the hydrographs can more readily be separated into surface runoff and baseflow components and the surface runoff pattern is more directly comparable to the SWB simulated surface runoff which does not account for water use, reservoir operations, or surface water/groundwater exchange.

SWB utilizes a simplified routing scheme whereby surface runoff is routed to downslope cells or out of the model domain on the same day in which it originates as rainfall, thus it is not capable of accurately estimating streamflow over short time periods. The use of the total monthly surface runoff volumes provided a means of calibrating the Sonoma County SWB model to measured surface runoff data within the limitations of the model's approach to simulating surface runoff.

The SWB model of Sonoma County reproduced seasonal variations in surface runoff in all five calibration watersheds. Monthly Mean Errors (ME) ranged from -0.2 to 0.4 inches with a mean value of 0.1 inches. Annual surface runoff totals ranged from an under-prediction of approximately 10% at Franchini Creek to an over-prediction of approximately 19% at Buckeye Creek, with a mean over-prediction of approximately 6% across the five watersheds. These results indicate that the SWB model was able to reproduce monthly surface runoff volumes with a reasonable degree of accuracy and that the model tends to over-predict surface runoff somewhat, suggesting that the model may generate a low-range estimate of recharge.

Although the climate in Napa County is slightly drier than in Sonoma County, the vegetation, soils, and geology are similar and parameters calibrated using data from Sonoma County should be applicable to Napa County. Calibration of the Napa County SWB model was not performed due to a lack of publicly-available contemporary discharge records in suitable watersheds. Contemporary discharge records exist for USGS gaging stations located along the Napa River near St. Helena and Napa, but the watersheds above these gages are large and contain significant groundwater abstraction, reservoir impoundments, and alluvial bodies. USGS gages on smaller watersheds in Napa County have been inactive since 1983 or earlier. Discharge records exist through Napa One Rain for several streams gaged by the Napa County Resource Conservation District (RCD) but the RCD has cautioned against use of these discharge records for calibration purposes due to incomplete rating curve development.

Estimates of groundwater recharge are also available from an earlier model prepared by Luhdorff and Scalmanini Engineers and MBK Engineers (LSCE 2013). This report provided estimates of average annual recharge as a percentage of average annual precipitation for nine watersheds in Napa County. Averaged across the same nine watersheds, the SWB model predicts significantly higher rates of recharge than the model prepared by LSCE, which predicts slightly lower AET but significantly more runoff (Table 4). Differences in methodology between these two models complicate direct comparisons. The LSCE model calculated infiltration into the soil as the difference between monthly precipitation and discharge volumes within each watershed. Discharge volumes were calculated from USGS stream gages and included both direct runoff and baseflow from groundwater. Inclusion of baseflow with direct runoff in these calculations may inappropriately reduce the estimated volume of water infiltrated into the soil and available for recharge.

Table 4: Comparison of results from SWB model and Luhdorff and Scalmanini model.

USGS Gage	HUC	Mean Precip, 2010 (in)	Mean AET, 2010 (% Precip)		Mean Runoff, 2010 (% Precip)		Mean Recharge, 2010 (% Precip)	
			SWB	LSCE	SWB	LSCE	SWB	LSCE
Conn Ck nr Oakville	11456500	34.8	59%	53%	21%	25%	21%	21%
Dry Ck nr Napa	11457000	41.5	56%	50%	18%	43%	25%	6%
Milliken Ck nr Napa	11458100	32.3	52%	41%	20%	51%	28%	8%
Napa Ck at Napa	11458300	36.6	61%	43%	16%	46%	23%	11%
Napa R nr Napa	11458000	39.5	56%	48%	20%	35%	24%	17%
Napa R nr St Helena	11456000	47.9	46%	45%	23%	42%	30%	14%
Redwood Ck nr Napa	11458200	39.6	53%	49%	26%	40%	22%	10%
Tulucay Ck nr Napa	11458300	27.0	64%	49%	16%	47%	20%	5%

Model Results

The principal elements of the annual water budget simulated with the Napa County SWB model for Water Years 2010 and 2014 are presented in map form in Figures 10 - 19 and in tabular form for 27 major watershed areas in Napa County (Tables 5 - 8). The watersheds are based on USGS HUC-12 watersheds and are named for the stream which comprises the largest proportion of the area; in many cases the areas consist of multiple tributary streams (Figure 20).

In Water Year 2010 (representing "average" hydrologic conditions) precipitation varied from 21.8 inches in the Ledgewood Creek watershed to 53.3 inches in the Saint Helena Creek watershed (Figure 10, Table 5). Actual evapotranspiration (AET) ranged from 13.4 inches in the Jackson Creek watershed to 25.2 inches in the Saint Helena Creek watershed (Figure 11). Surface runoff ranged from 3.4 inches in the Ledgewood Creek watershed to 13.5 inches in the Saint Helena Creek watershed (Figure 12). Recharge ranged from 3.3 inches in the Ledgewood Creek watershed to 14.4 inches in the Saint Helena watershed. (Figure 13). Small decreases in soil moisture storage (up to 1.8 inches) occurred in most watersheds, with changes in most

watersheds being less than an inch (Figure 14). Note that the San Pablo Bay estuaries have been excluded from these comparisons.

Expressed as a percentage of the annual precipitation, AET ranged from 77% in the Ledgewood Creek watershed to 45% in the Jackson Creek watershed (Table 6). Surface runoff ranged from 15% of precipitation in the Ledgewood Creek watershed to 42% in the Jackson Creek watershed. Recharge ranged from 10% of the precipitation in the Jackson Creek watershed to 27% in the Saint Helena watershed.

In Water Year 2014 (representing "dry" hydrologic conditions during the second year of an extreme three-year drought) precipitation varied from 10.1 inches in the American Canyon Creek watershed to 32.2 inches in the Saint Helena Creek watershed (Figure 15, Table 7). Actual evapotranspiration (AET) ranged from 10.3 inches in the Jackson Creek watershed to 17.8 inches in the Saint Helena Creek watershed (Figure 16). Surface runoff ranged from 0.7 inches in the American Canyon Creek watershed to 13.2 inches in the Saint Helena Creek watershed (Figure 17). Recharge ranged from 0.6 inches in the Wragg Canyon watershed to 4.1 inches in the Saint Helena watershed. (Figure 18). Large decreases in soil moisture storage of between 2.3 and 4.3 inches were also simulated (Figure 19).

Expressed as a percentage of the annual precipitation, AET ranged from 55% in the Saint Helena Creek watershed to 121% in the Jackson Creek watershed (Table 8). These very large AET rates caused significant decreases in soil moisture. Decreases in soil moisture ranged from 9% of precipitation in the Saint Helena watershed to 36% in the American Canyon Creek watershed. Surface runoff ranged from 7% of precipitation in the American Canyon Creek watershed to 41% in the Saint Helena Watershed. Recharge ranged from 18% in the Milliken Creek Watershed to 5% in the Jackson Creek and Wragg Canyon watersheds.

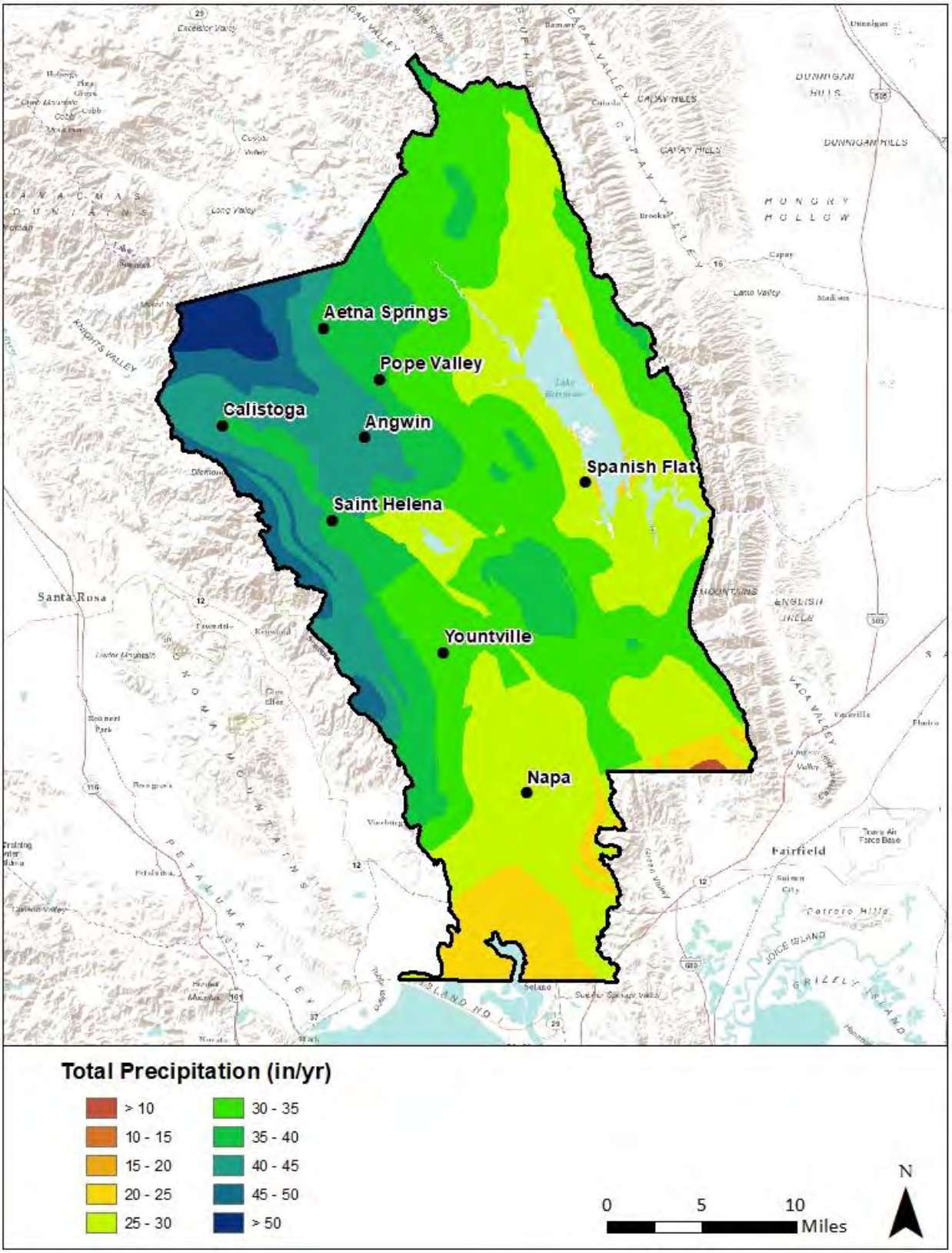


Figure 10: Water Year 2010 precipitation simulated with the Napa County SWB model.

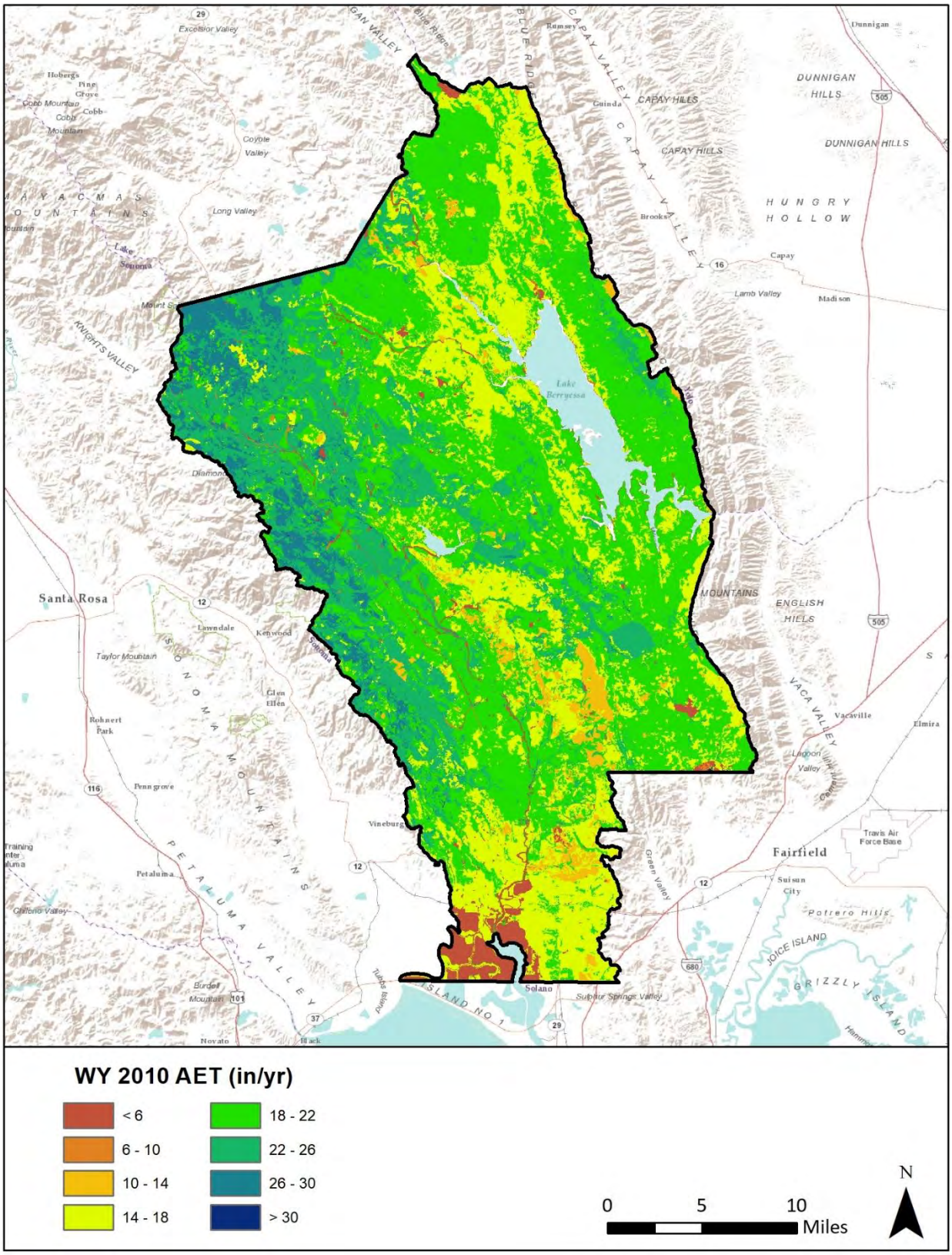


Figure 11: Water Year 2010 AET simulated with the Napa County SWB model.

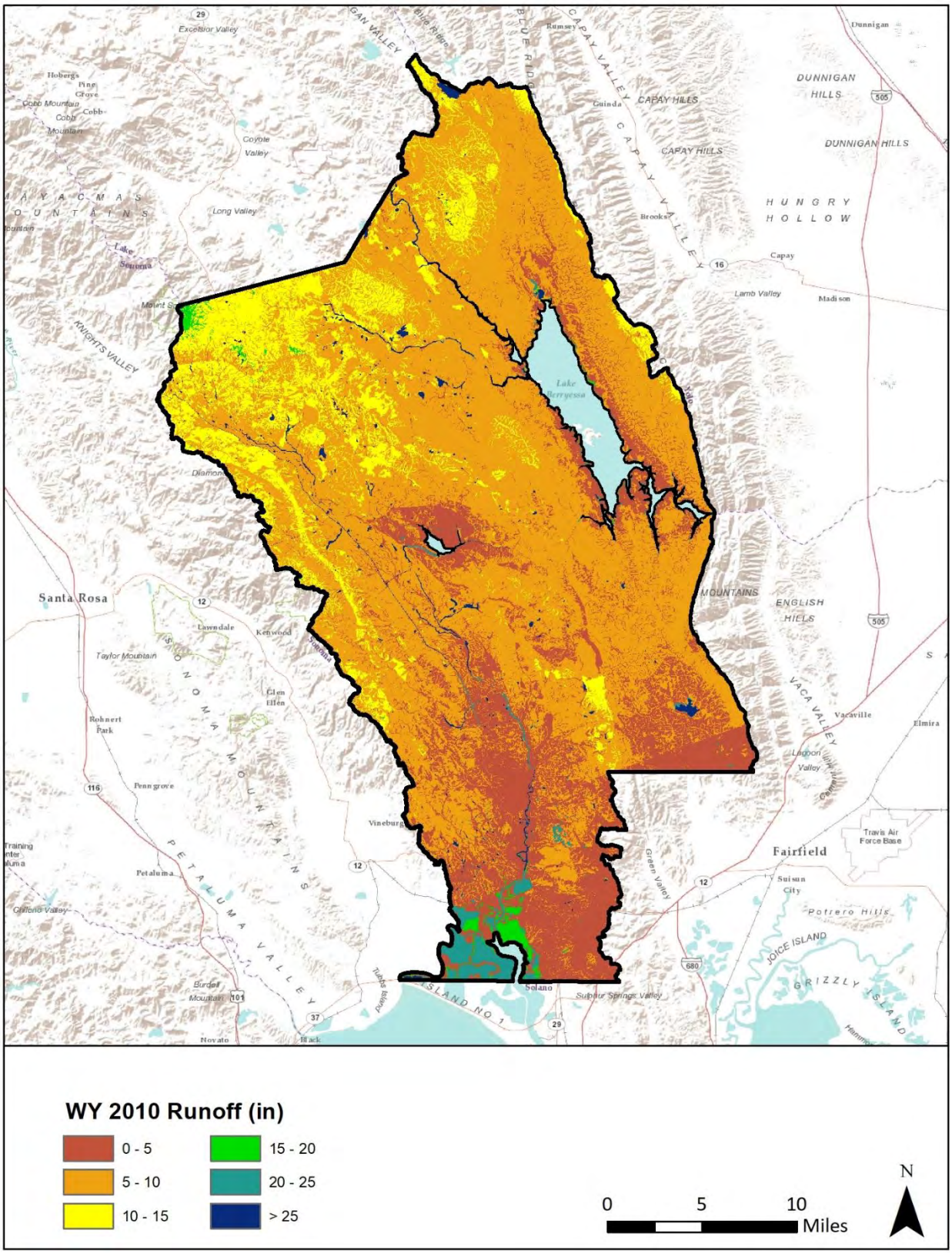


Figure 12: Water Year 2010 runoff simulated with the Napa County SWB model.

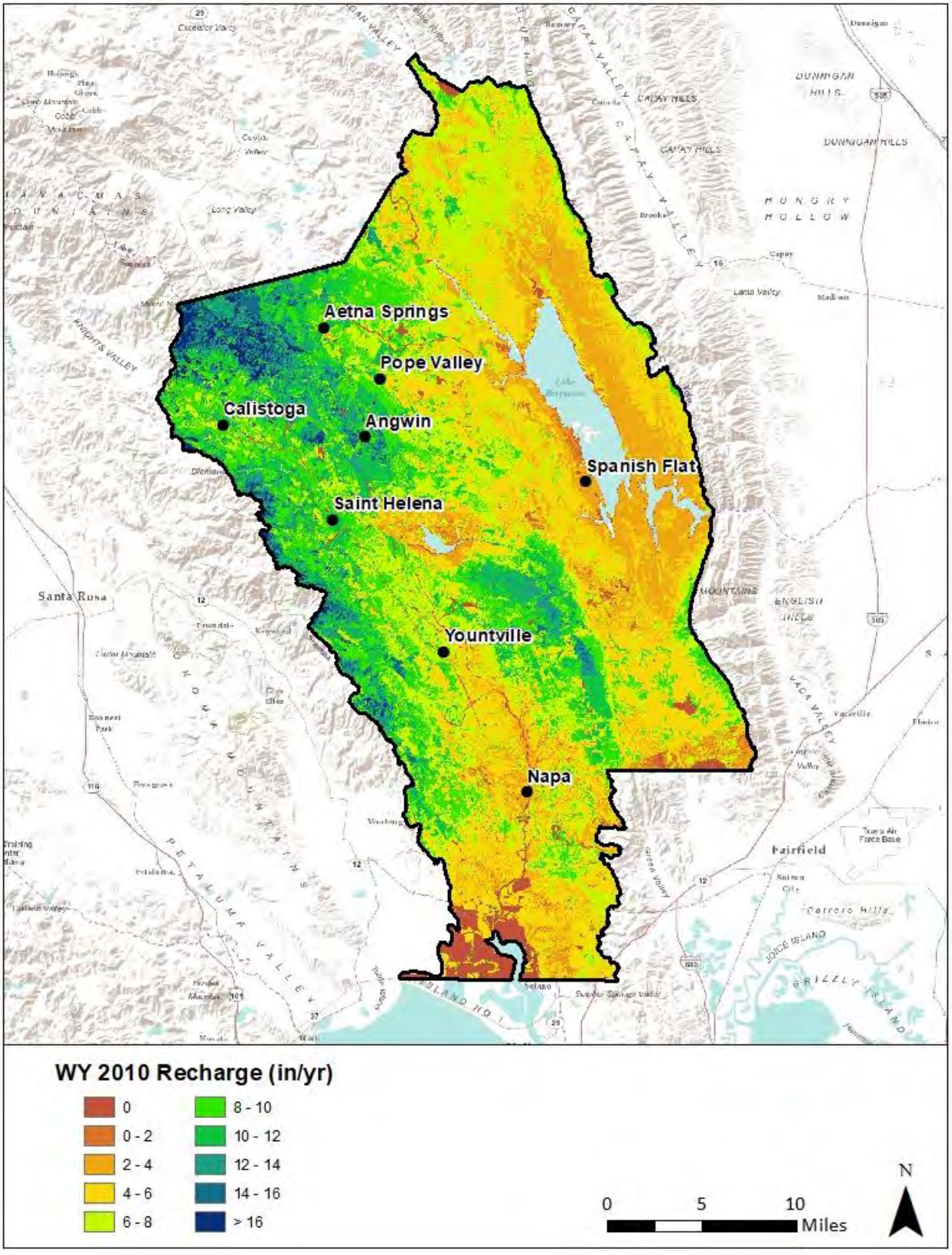


Figure 13: Water Year 2010 recharge simulated with the Napa County SWB model.

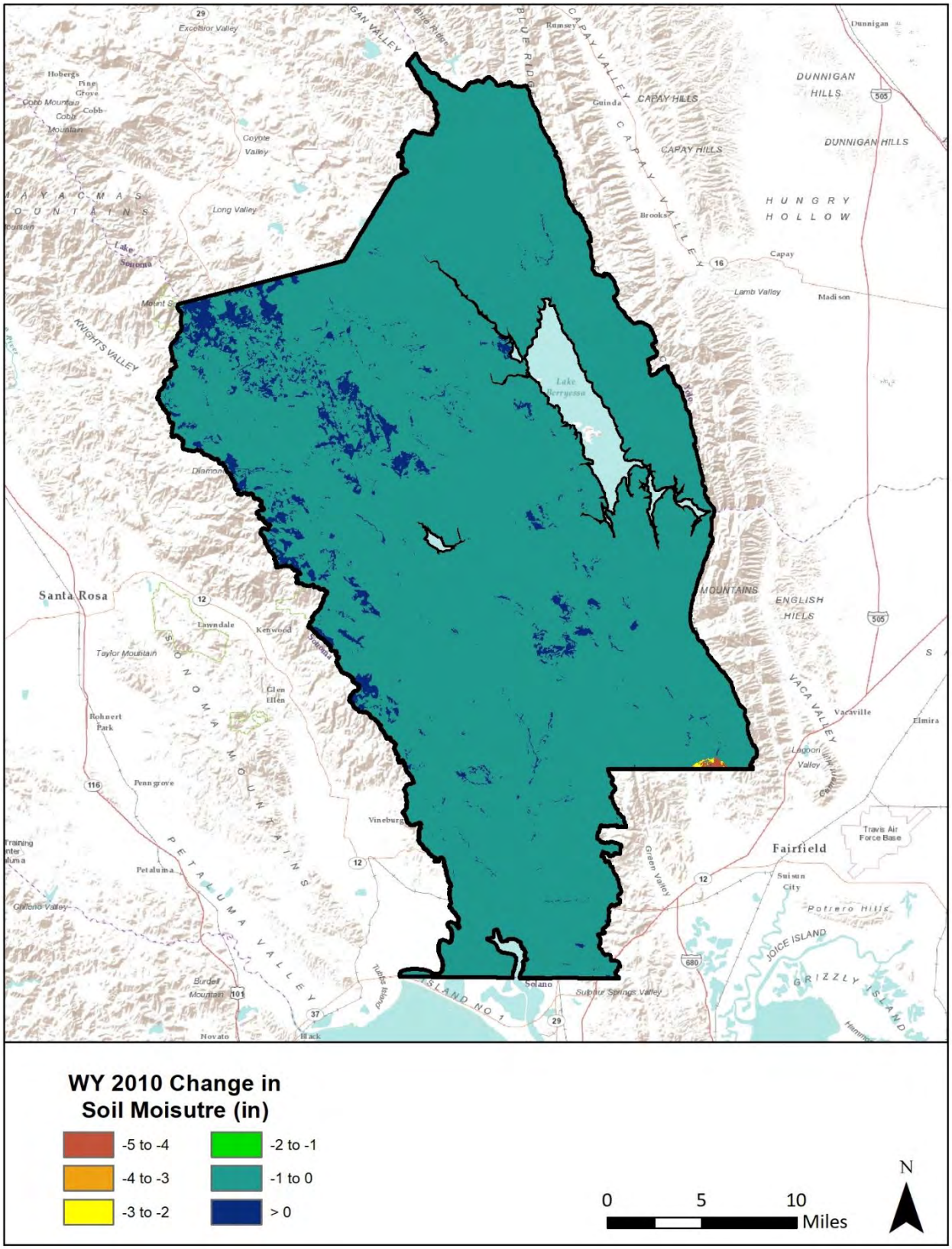


Figure 14: Water Year 2010 change in soil moisture content simulated with the Napa County SWB model.

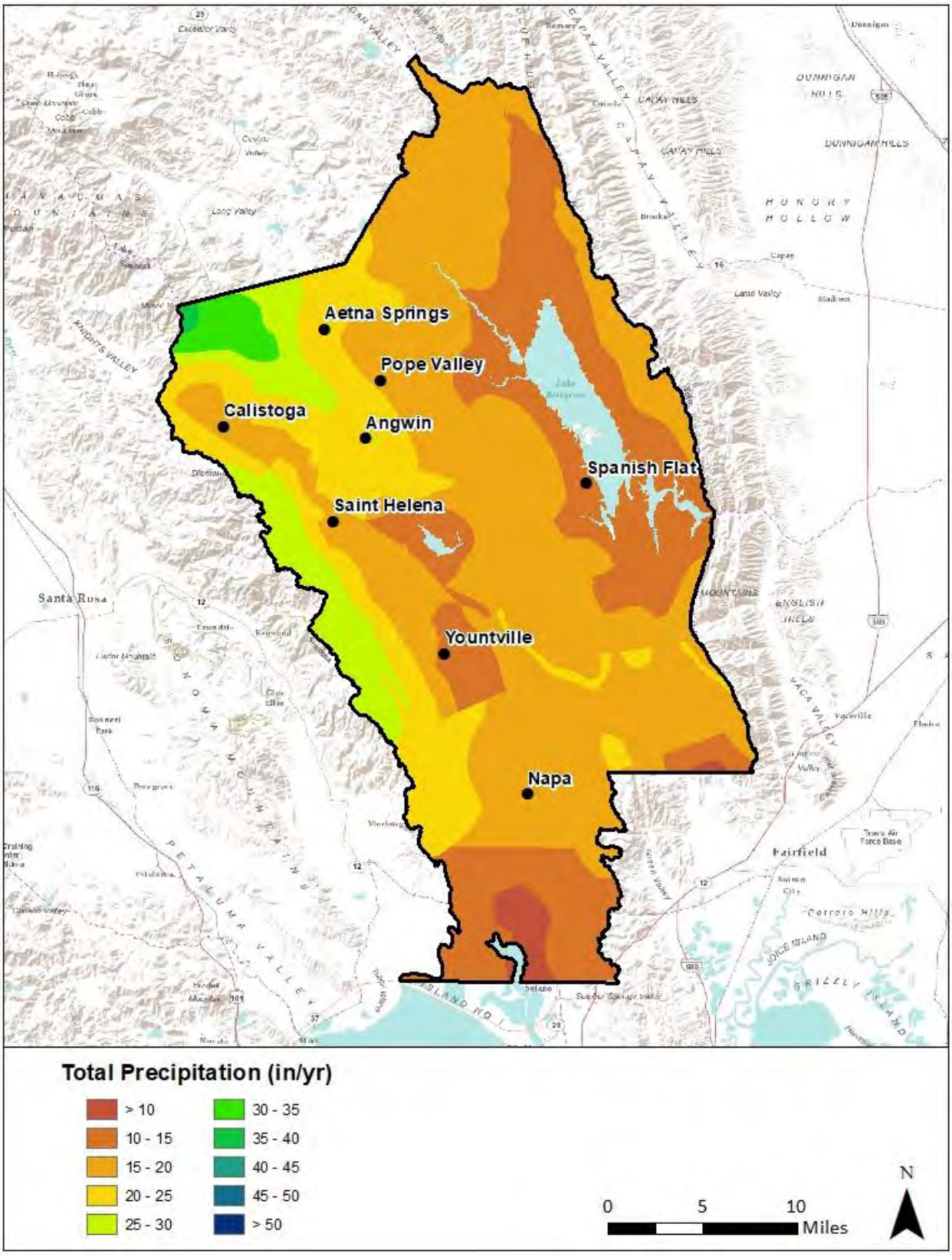


Figure 15: Water Year 2014 precipitation simulated with the Napa County SWB model.

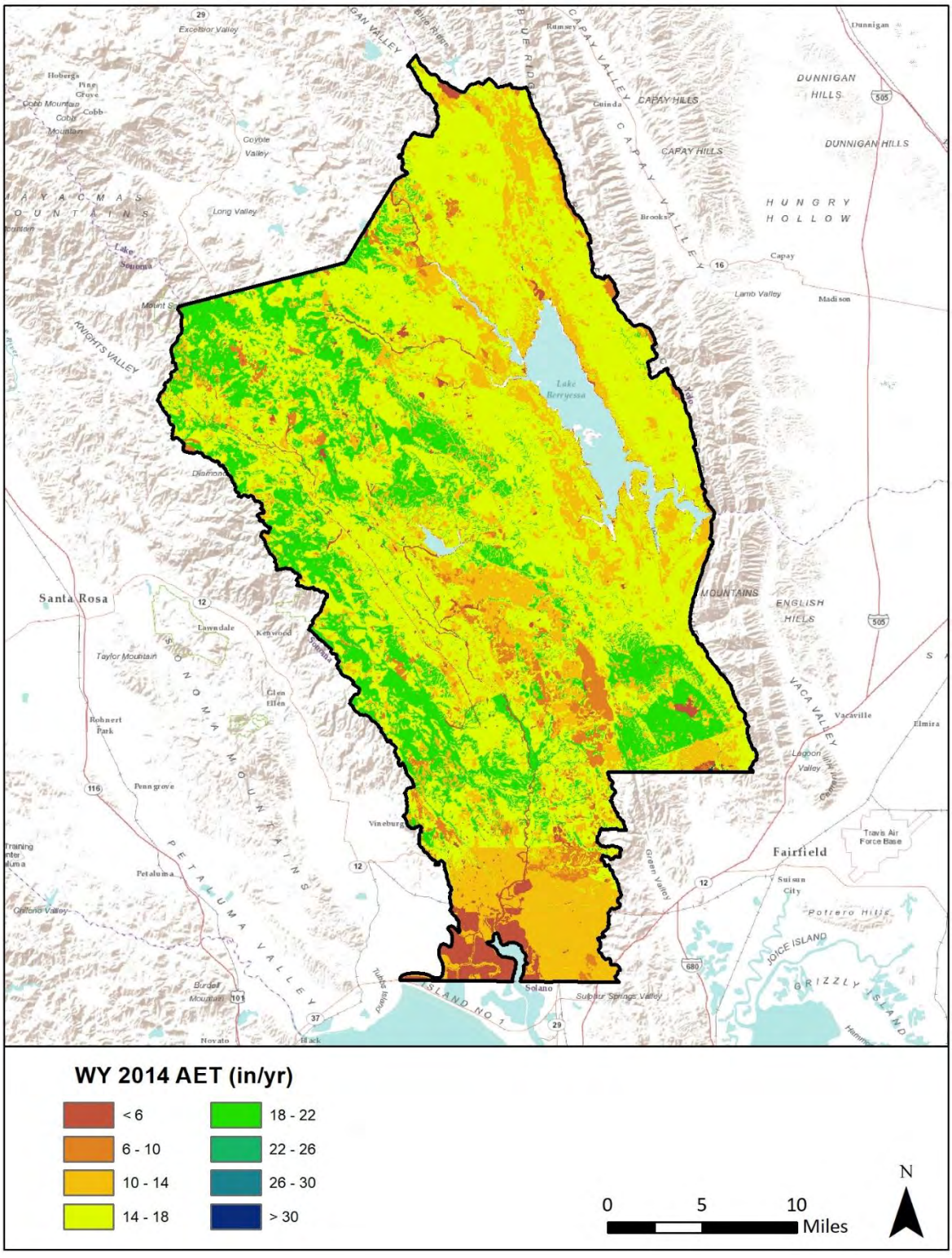


Figure 16: Water Year 2014 AET simulated with the Napa County SWB model.

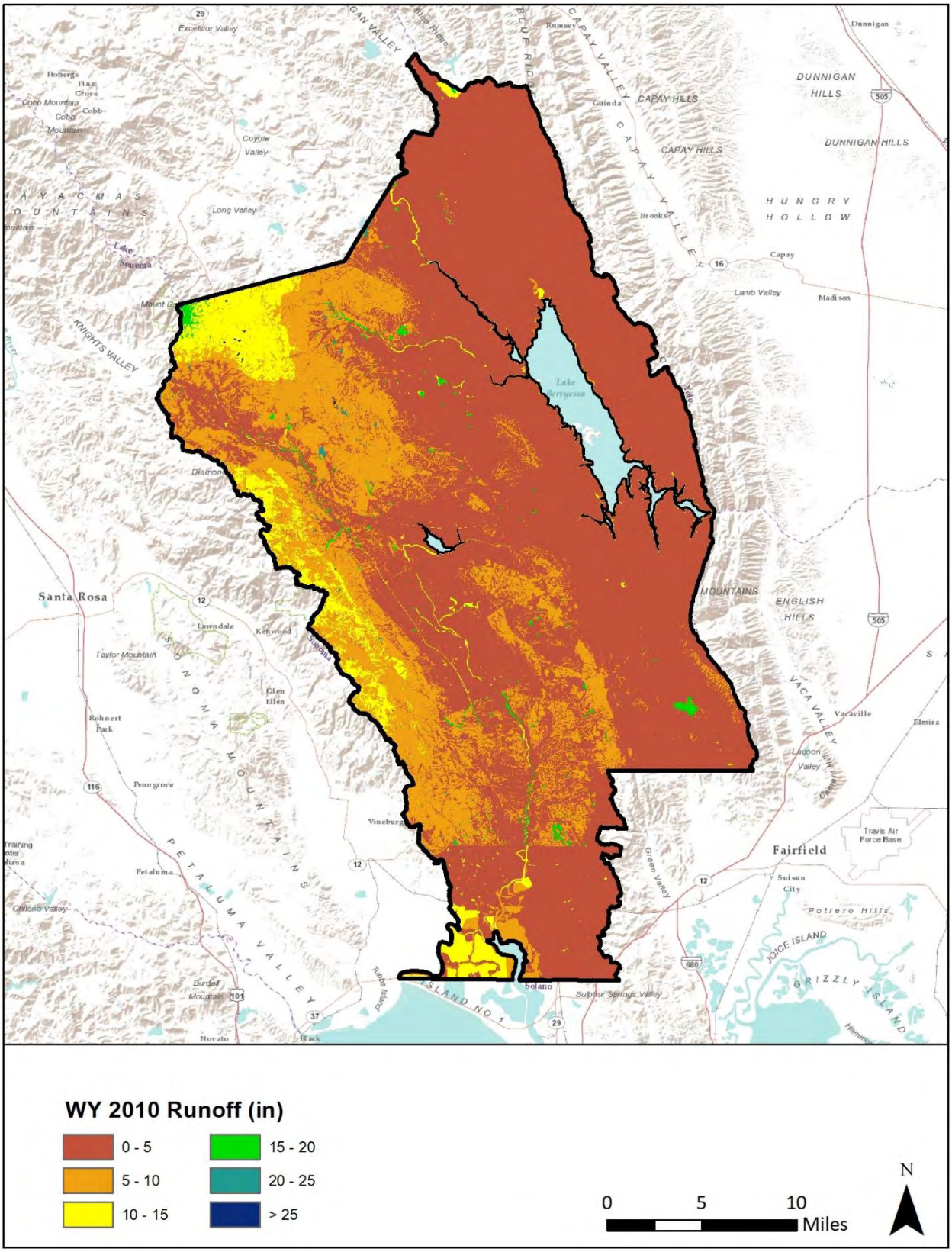


Figure 17: Water Year 2014 recharge simulated with the Napa County SWB model.

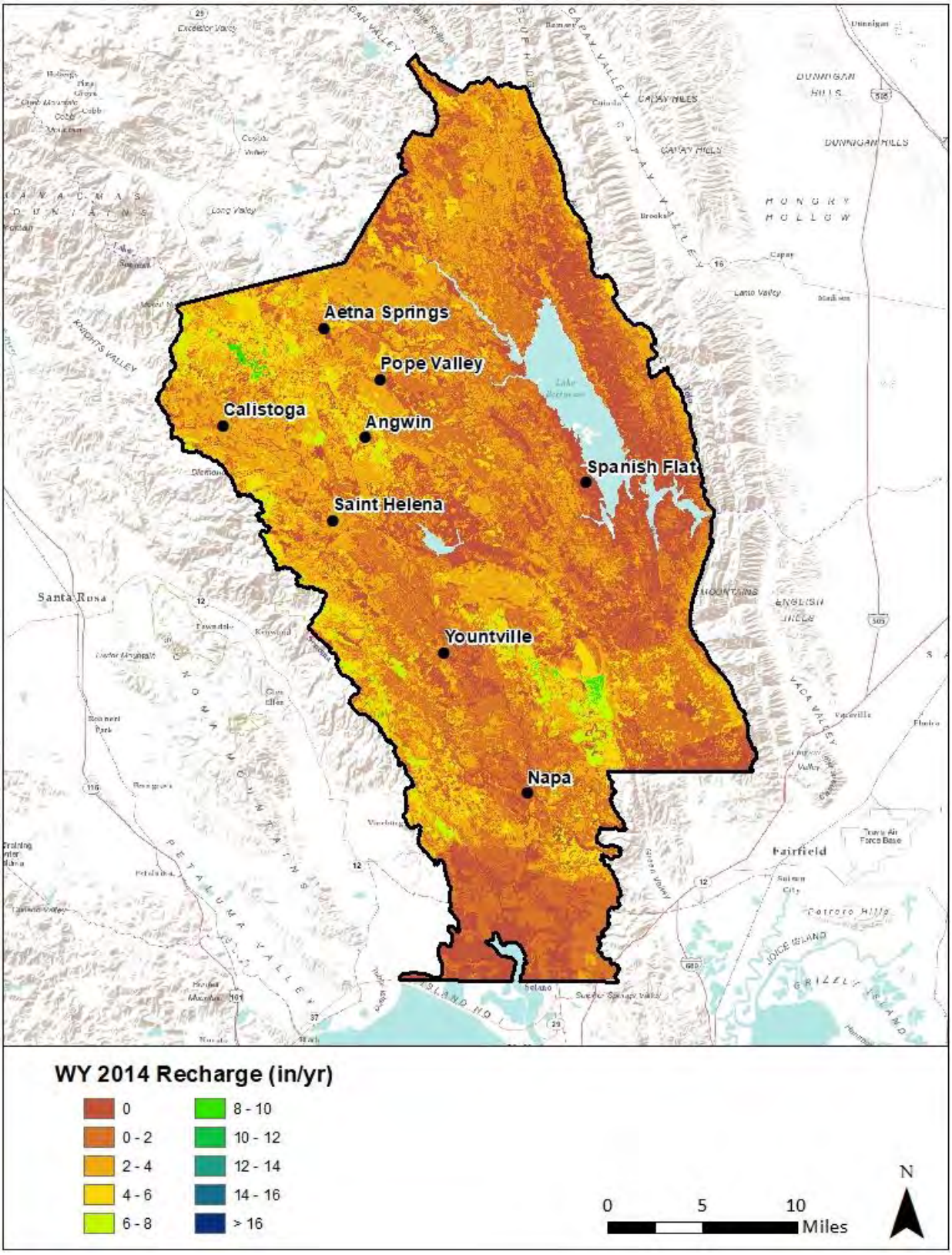


Figure 18: Water Year 2014 recharge simulated with the Napa County SWB model.

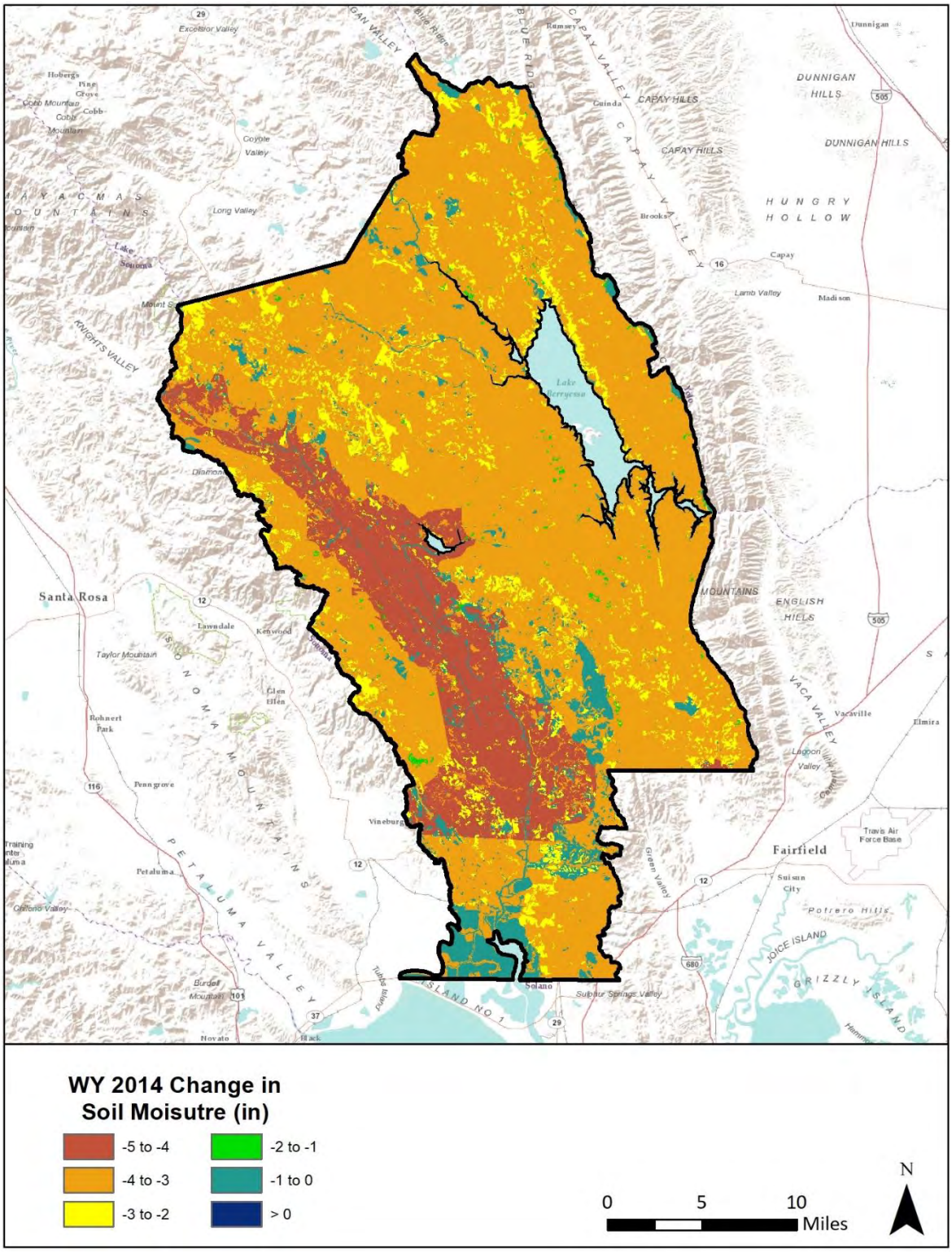


Figure 19: Water Year 2014 change in soil moisture content simulated with the Napa County SWB model.

Table 5: Simulated precipitation and recharge values averaged across HUC-12 watersheds in Napa County for Water Year 2010 expressed as depths. See Figure 20 for watershed locations.

Name	Drainage Area (mi^2)	Precipitation (in)	AET (in)	Surface Runoff (in)	Recharge (in)	Soil Moisture Change (in)
American Canyon Creek	10.8	24.1	16.3	3.7	4.7	-0.6
Bucksnort Creek	1.9	47.9	24.5	12.1	11.1	0.1
Butts Creek-Putah Creek	49.9	33.0	17.4	9.7	6.2	-0.7
Capell Creek	43.0	31.1	19.1	7.4	5.0	-0.6
Carneros Creek	29.7	28.0	18.6	5.2	5.5	-0.6
Chiles Creek	32.0	34.6	21.1	7.1	6.8	-0.5
Dry Creek	28.8	37.0	22.2	7.2	8.4	-0.5
Hunting Creek	12.0	33.7	19.0	9.7	5.7	-0.8
Jackson Creek-Putah Creek	54.5	29.9	13.4	12.6	3.0	-0.5
Lake Curry-Suisun Creek	16.4	30.7	18.9	6.5	5.9	-0.6
Lake Hennessey-Conn Creek	20.0	35.1	19.6	8.5	7.3	-0.4
Ledgewood Creek	6.4	21.8	16.9	3.4	3.3	-1.8
Lower Eticuera Creek	44.0	30.0	17.7	8.1	4.7	-0.7
Lower Napa River	45.0	31.7	19.9	5.6	6.7	-0.6
Lower Pope Creek	31.8	33.9	18.0	9.7	6.5	-0.6
Maxwell Creek	35.1	34.7	19.6	8.7	6.9	-0.6
Middle Napa River	60.3	39.9	22.8	8.5	9.2	-0.5
Milliken Creek	29.7	30.9	16.9	6.6	7.9	-0.6
Rector Creek-Conn Creek	22.3	32.8	18.0	7.1	8.2	-0.7
Saint Helena Creek	7.7	53.3	25.2	13.5	14.4	0.1
San Pablo Bay Estuaries	19.5	23.9	8.1	13.8	2.3	-0.3
Tulucay Creek	34.2	26.1	16.7	4.6	5.4	-0.7
Upper Eticuera Creek	25.6	31.2	17.2	8.6	6.1	-0.8
Upper Napa River	44.6	44.7	23.6	10.6	10.8	-0.4
Upper Pope Creek	21.7	44.5	22.7	10.5	11.5	-0.3
Wooden Valley & Suisun Creeks	23.3	29.0	19.0	5.1	5.5	-0.6
Wragg Canyon-Putah Creek	34.2	28.3	16.3	8.6	3.3	-0.6

Table 6: Simulated precipitation and recharge values averaged across HUC-12 watersheds in Napa County for Water Year 2010 expressed as a percentage of precipitation. See Figure 20 for watershed locations.

Name	Drainage Area (mi^2)	Precipitation (in)	AET (%)	Surface Runoff (%)	Recharge (%)	Soil Moisture Change (%)
American Canyon Creek	10.8	24.1	67%	15%	19%	-3%
Bucksnort Creek	1.9	47.9	51%	25%	23%	0%
Butts Creek-Putah Creek	49.9	33.0	53%	29%	19%	-2%
Capell Creek	43.0	31.2	61%	24%	16%	-2%
Carneros Creek	29.7	29.7	66%	19%	20%	-2%
Chiles Creek	32.0	34.6	61%	21%	20%	-1%
Dry Creek	28.8	37.8	60%	20%	23%	-1%
Hunting Creek	12.0	33.7	56%	29%	17%	-2%
Jackson Creek-Putah Creek	54.5	29.7	45%	42%	10%	-2%
Lake Curry-Suisun Creek	16.4	30.7	61%	21%	19%	-2%
Lake Hennessey-Conn Creek	20.0	36.0	56%	24%	21%	-1%
Ledgewood Creek	6.4	21.8	77%	15%	15%	-8%
Lower Eticuera Creek	44.0	30.0	59%	27%	16%	-2%
Lower Napa River	45.0	31.7	63%	18%	21%	-2%
Lower Pope Creek	31.8	33.9	53%	29%	19%	-2%
Maxwell Creek	35.1	34.7	56%	25%	20%	-2%
Middle Napa River	60.3	40.4	57%	21%	23%	-1%
Milliken Creek	29.7	30.9	55%	21%	26%	-2%
Rector Creek-Conn Creek	22.3	32.8	55%	22%	25%	-2%
Saint Helena Creek	7.7	53.3	47%	25%	27%	0%
San Pablo Bay Estuaries	19.5	23.9	34%	58%	10%	-1%
Tulucay Creek	34.2	26.1	64%	18%	21%	-3%
Upper Eticuera Creek	25.6	31.2	55%	28%	19%	-3%
Upper Napa River	44.6	44.7	53%	24%	24%	-1%
Upper Pope Creek	21.7	44.5	51%	23%	26%	-1%
Wooden Valley & Suisun Creeks	23.3	29.0	65%	18%	19%	-2%
Wragg Canyon-Putah Creek	34.2	28.3	58%	31%	12%	-2%

Table 7: Simulated precipitation and recharge values averaged across HUC-12 watersheds in Napa County for Water Year 2014 expressed as depths. See Figure 20 for watershed locations.

Name	Drainage Area (mi^2)	Precipitation (in)	AET (in)	Surface Runoff (in)	Recharge (in)	Soil Moisture Change (in)
American Canyon Creek	10.8	10.1	12.3	0.7	0.7	-3.6
Bucksnort Creek	1.9	28.8	17.6	11.5	2.6	-3.0
Butts Creek-Putah Creek	49.9	16.9	14.2	3.9	1.9	-3.2
Capell Creek	43.0	15.8	14.8	3.1	1.1	-3.1
Carneros Creek	29.7	15.0	14.7	4.6	2.0	-3.7
Chiles Creek	32.0	18.3	16.5	3.7	1.5	-3.3
Dry Creek	28.8	21.5	16.5	6.8	2.5	-3.7
Hunting Creek	12.0	16.7	15.4	3.1	1.6	-3.4
Jackson Creek-Putah Creek	54.5	14.9	10.3	6.1	0.7	-2.3
Lake Curry-Suisun Creek	16.4	18.4	16.1	3.7	1.9	-3.4
Lake Hennessey-Conn Creek	20.0	19.1	14.8	5.7	2.2	-3.2
Ledgewood Creek	6.4	12.2	13.9	1.7	0.8	-4.3
Lower Eticuera Creek	44.0	14.9	14.0	2.6	1.3	-3.1
Lower Napa River	45.0	19.4	15.9	5.0	2.2	-3.6
Lower Pope Creek	31.8	17.8	14.5	4.5	2.0	-3.2
Maxwell Creek	35.1	18.3	15.9	3.8	2.0	-3.3
Middle Napa River	60.3	21.3	16.5	6.6	2.5	-3.7
Milliken Creek	29.7	18.7	13.7	4.5	3.4	-2.9
Rector Creek-Conn Creek	22.3	16.5	13.6	4.0	2.3	-3.4
Saint Helena Creek	7.7	32.2	17.8	13.2	4.1	-3.0
San Pablo Bay Estuaries	19.5	10.4	6.0	5.6	0.5	-1.6
Tulucay Creek	34.2	14.6	13.5	2.6	1.7	-3.3
Upper Eticuera Creek	25.6	15.5	14.1	2.5	2.1	-3.2
Upper Napa River	44.6	22.9	16.2	6.9	3.3	-3.5
Upper Pope Creek	21.7	25.6	16.8	8.5	3.5	-3.2
Wooden Valley & Suisun Creeks	23.3	17.9	16.4	3.1	2.0	-3.5
Wragg Canyon-Putah Creek	34.2	14.1	12.6	3.6	0.6	-2.8

Table 8: Simulated precipitation and recharge values averaged across HUC-12 watersheds in Napa County for Water Year 2014 expressed as a percentage of precipitation. See Figure 20 for watershed locations.

Name	Drainage Area (mi^2)	Precipitation (in)	AET (%)	Surface Runoff (%)	Recharge (%)	Soil Moisture Change (%)
American Canyon Creek	10.8	10.1	121%	7%	7%	-36%
Bucksnort Creek	1.9	28.8	61%	40%	9%	-10%
Butts Creek-Putah Creek	49.9	16.8	84%	23%	11%	-19%
Capell Creek	43.0	15.8	94%	20%	7%	-20%
Carneros Creek	29.7	17.6	98%	30%	13%	-25%
Chiles Creek	32.0	18.4	90%	20%	8%	-18%
Dry Creek	28.8	22.1	77%	32%	12%	-17%
Hunting Creek	12.0	16.7	92%	18%	10%	-20%
Jackson Creek-Putah Creek	54.5	14.7	69%	41%	5%	-16%
Lake Curry-Suisun Creek	16.4	18.4	88%	20%	10%	-19%
Lake Hennessey-Conn Creek	20.0	19.6	78%	30%	12%	-17%
Ledgewood Creek	6.4	12.2	114%	14%	7%	-35%
Lower Eticuera Creek	44.0	14.9	94%	18%	9%	-21%
Lower Napa River	45.0	19.4	82%	26%	11%	-19%
Lower Pope Creek	31.8	17.8	81%	25%	11%	-18%
Maxwell Creek	35.1	18.3	87%	21%	11%	-18%
Middle Napa River	60.3	21.8	77%	31%	12%	-18%
Milliken Creek	29.7	18.7	74%	24%	18%	-16%
Rector Creek-Conn Creek	22.3	16.5	83%	24%	14%	-21%
Saint Helena Creek	7.7	32.2	55%	41%	13%	-9%
San Pablo Bay Estuaries	19.5	10.4	58%	53%	4%	-16%
Tulucay Creek	34.2	14.6	93%	18%	12%	-23%
Upper Eticuera Creek	25.6	15.5	91%	16%	14%	-21%
Upper Napa River	44.6	22.9	71%	30%	14%	-15%
Upper Pope Creek	21.7	25.6	66%	33%	14%	-12%
Wooden Valley & Suisun Creeks	23.3	17.9	91%	17%	11%	-20%
Wragg Canyon-Putah Creek	34.2	14.1	90%	26%	5%	-20%

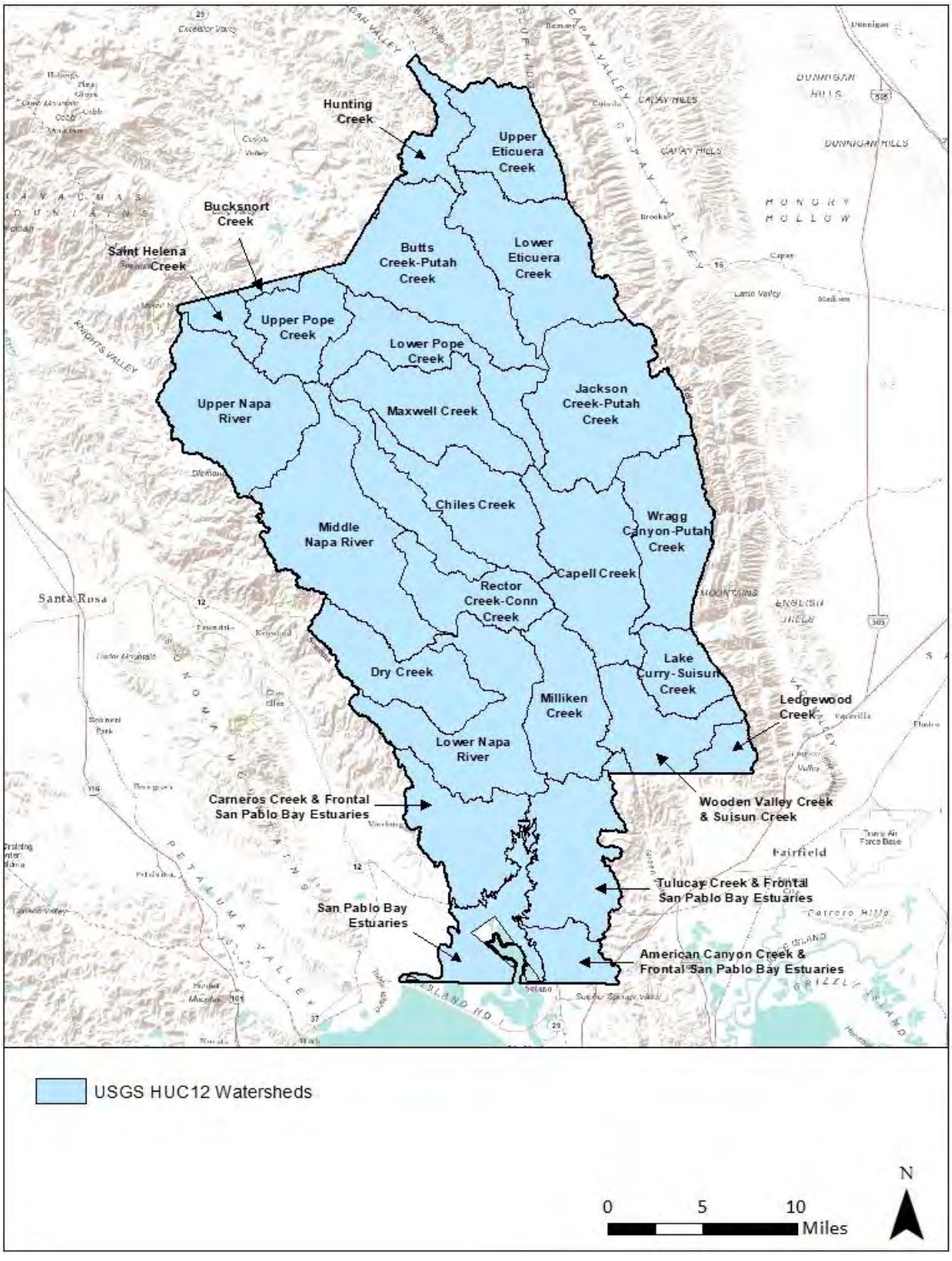


Figure 20: Major watersheds areas used to summarize water budget information in Tables 5 - 8.

Discussion and Conclusion

Numerous previous modeling studies have estimated water budget components in several larger watershed areas in Sonoma and Napa Counties including the Santa Rosa Plain, the Green Valley and Dutch Bill Creek watersheds, and the Sonoma Valley (Farrar et. al., 2006; Kobor and O'Connor, 2016; Woolfenden and Hevesi, 2014). Comparisons to these water budgets are useful for evaluating the SWB results, but one would not expect precise agreement owing to significant variations in climate, land cover, soil types, underlying hydrogeologic conditions, and different spatial scales of modeling studies. These regional analyses estimate that average annual recharge varies from 7% to 19% of the annual precipitation. The equivalent county-wide value from this study is slightly higher at 20%.

Water budgets for the Napa River and selected sub-basins were also estimated in a previous study by Luhdorff and Scalmanini Engineers and MBK Engineers (LSCE 2013). The LSCE study estimated that, as a percentage of annual precipitation, AET comprised slightly less, runoff significantly more, and recharge substantially less of the typical annual water budget. LSCE (2013) calculated infiltration of precipitation based on the difference between total monthly streamflow at selected gaging stations and total monthly precipitation for the gages' drainage area. Streamflow volumes include both direct runoff (overland flow and interflow) and baseflow from groundwater. Inclusion of baseflow with direct runoff in these calculations may inappropriately reduce the estimated volume of water infiltrated into the soil and available for recharge; the LSCE approach therefore tends to underestimate groundwater recharge. Additionally, many of the gauging stations used for the analysis are located in reaches that may be significantly influenced by upstream reservoir releases, surface water diversions, groundwater abstraction, and/or surface water groundwater exchanges, further complicating the interpretation of the LSCE (2013) runoff rates and the interrelated calculations of AET and recharge rates. In contrast, the SWB model presented here is based on calibrated parameter values developed for a similar model in Sonoma County which was calibrated to gauges specifically selected to minimize the effects of reservoir releases, water use, or significant surface water/groundwater interaction, and after separating and removing the baseflow component of streamflow.

The recharge estimates presented here arguably represent the best available county-wide estimates produced at a fine spatial resolution using a consistent and objective data-driven approach. This analysis focused on two Water Years, 2010 and 2014, which represent average and drought conditions respectively. Input parameters were determined based on literature values and values calibrated through prior modeling experience in Sonoma County.

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APPENDIX D

SUMMARY OF SELECTED WELL DATA AND GEOLOGIC LOGS FOR CONSIDERATION OF POTENTIAL INTERACTION BETWEEN SURFACE WATER AND GROUND WATER

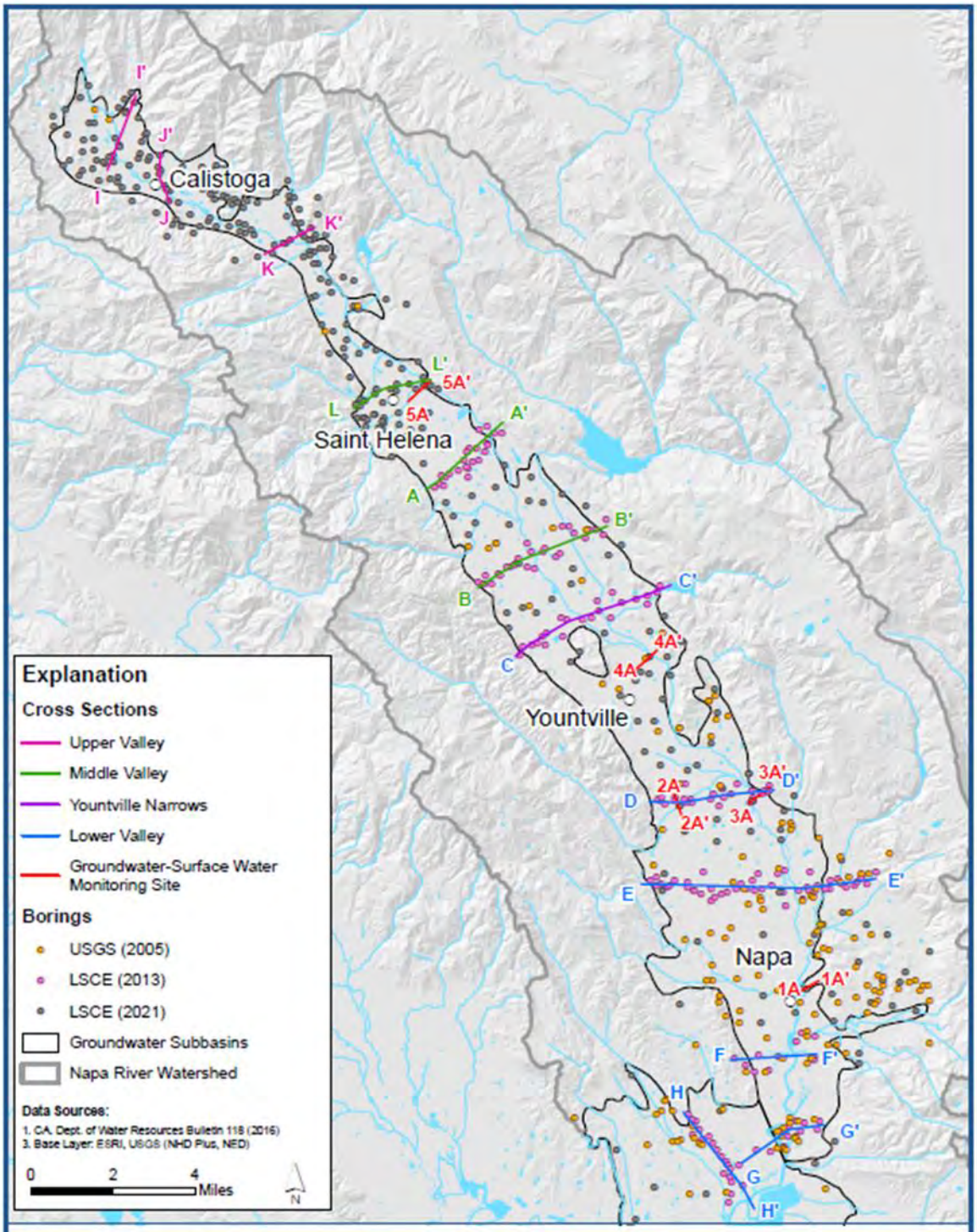
Note: Well Numbers Cross Reference to Well Completion Reports in Appendix B

Well No.	Stratum Top Elev. (ft bgs)	Stratum Base Elev. (ft bgs)	Stratum Top Elev. (ft bgs)	Stratum Base Elev. (ft bgs)	Groundwater Elev. (ft amsl)	Top of Well Screen (ft amsl)	Geologic Material
	GSE: 290						
1	0	5	290	285			Topsoil
Year	5	85	285	205	230		volcanic ash
2021	85	86	205	204			rock & ash
	86	210	204	80		170	hard cemented conglomerate
	210	304	80	-14		90	hard black rock
	304	345	-14	-55			black & white rock
	345	375	-55	-85			hard black rock
	375	420	-85	-130			red cinder
Well No.	GSE: 370						
2	0	20	370	350			soft brown top soil
Year	20	25	350	345			solid boulder
2016	25	60	345	310			brown rock and ash
	60	80	310	290	310		brown rock and white ash 2gpm
	80	130	290	240		270	solid white ash
	130	200	240	170		150	gray ash and rock
	200	240	170	130			rock in gray ash 2gpm
Well No.	GSE: 370						
3	0	2	370	368			topsoil
Year	2	25	368	345			red& brown rock soft
1987	25	75	345	295			red brown rock stringers gray & red
	75	100	295	270			red & light green & gray rock stringers
	100	125	270	245	285		soft black rock stringers white ash
	125	150	245	220			black rock soft
	150	175	220	195			black & green rock soft
	175	220	195	150		155	black green red rock fractured
Well No.	GSE: 292						
4	0	20	292	272			topsoil brown clay
Year	20	60	272	232	239	252	multicolor rock brown clay
2013	60	80	232	212			white brown gray black rock
Well No.							
19	GSE: 282						
Year	0	3	282	279			brown clay
2014	3	20	279	262			sand & gravel
	20	45	262	237			sandy brown clay
	45	70	237	212			coarse sand
	70	75	212	207			tan clay
	75	220	207	62	190	204	coarse sand
Well No.							
20	GSE: 281						
Year	0	0.5	281	280.5			topsoil
2013	0.5	18	280.5	263			brown clay and embedded gravels
	18	70	263	211			clayey brown volcanics
	70	82	211	199	202		brown clayey ash
	82	145	199	136			clayey brown volcanics
	145	210	136	71			blue gray clayey volcanics
	210	219	71	62			brown clayey ash, some volcanics
	219	255	62	26			ble gray clayey ash
	255	322	26	-41			white clayey ash and volcanics
	322	340	-41	-59			blue clayey volcanics
	340	375	-59	-94			blacy & red volcanics streak, clayey ash
	375	390	-94	-109		-104	clayey ash
Well No.							
33	GSE: 282						
Year	0	2	282	280			topsoil
1997	2	12	280	270			clay/sand
	12	85	270	197	222	219	clay sand/gravel

APPENDIX E

Hydrogeologic Section K-K’

NVGB GSP Chapter 4

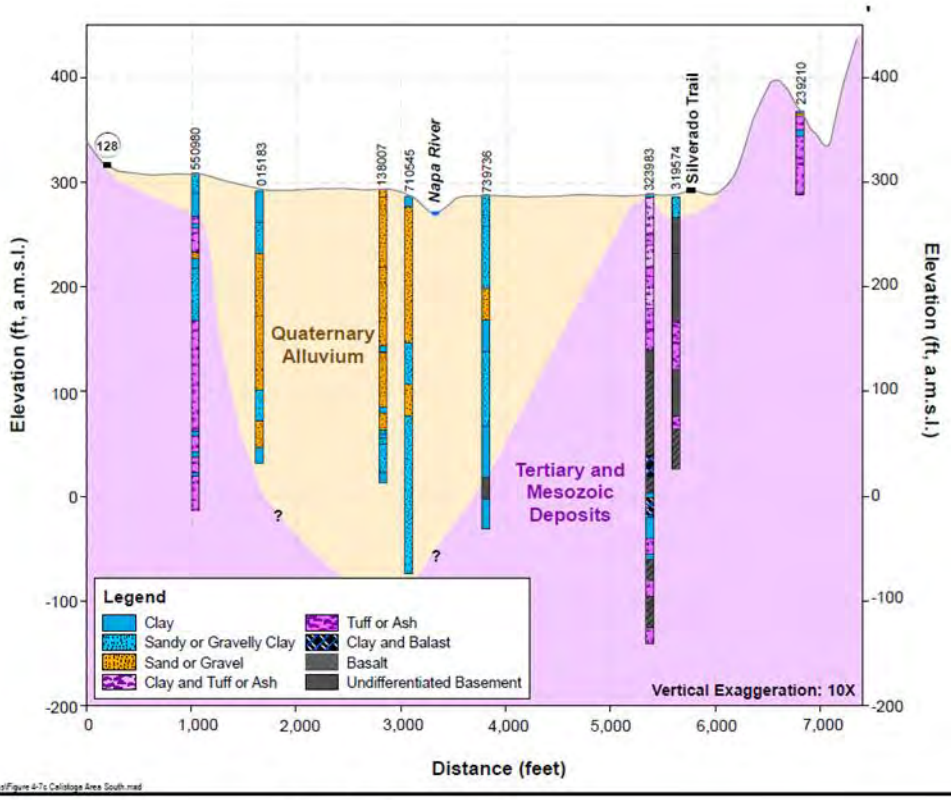


Luhdorff & Scalmanini Consulting Engineers

Geologic Cross Section Location Map

Figure 4-6

Napa Valley Subbasin Groundwater Sustainability Plan
Napa County, California



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Luhdorff & Scalmanini Consulting Engineers

Cross Section - 2021 :
Southern Calistoga Subarea

Figure 4-11

Napa Valley Subbasin Groundwater Sustainability Plan:
Napa County, CA