FINAL REPORT

Hydrogeologic Report

Proposed California American Water Well, Geyserville, Sonoma County, California

Prepared for:

CALIFORNIA AMERICAN WATER

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Acronyms and Abbreviations

bgs	below ground surface
CAW	California American Water
CIA	Cumulative Impact Area
CUP	Conditional Use Permit
DWR	Department of Water Resources
ET	evapotranspiration
ft	foot / feet
GDE	Groundwater-dependent ecosystem
gpd	gallons per day
gpd/ft	gallons per day per foot
gpm	gallons per minute
GWWS	Geyserville Water Works System
LUST	Leaking Underground Storage Tank
MCL	maximum contaminant level
micrograms per liter	µg/L
MRLC	Multi-Resolution Land Characteristics
NHD	National Hydrography Database
PLSS	public land survey section
PTRA	Public Review Trust Area
USGS	United States Geologic Survey
WBD	watershed boundary dataset

1.0 Introduction

This Hydrogeological Report (Report) has been prepared for California American Water (CAW) to support the Conditional Use Permit (CUP) application prepared by Valentine Environmental Engineers (Valentine) and submitted to the County of Sonoma (County). The CUP application is for the development of a new well which will be added to the Geyserville Water Works System (GWWS). The Report will satisfy the requirements outlined in the Procedures for Groundwater Analysis and Hydrogeologic Reports (Policy and Procedure Number 8-1-14 [Sonoma County, 2017]). The objective of this Report is to demonstrate the impacts, if any, that the new well will have to neighboring wells and nearby interconnected surface waters.

This Report was prepared by Kipp Vilker, a licensed professional engineer in the State of California (CA No. 90011) and Ryan Alward, a licensed professional geologist in the State of California (CA No. 8927).

2.0 Background

2.1 Project Description

The proposed well site is a former residential property at 87 Crowell Street in Geyserville, an unincorporated area in Sonoma County, California. There are currently two wells (Well #1 and Well #3) that serve the GWWS. The locations of the existing CAW wells and proposed well (Well #4) are shown in **Figure 1,** along with the location of the storage tank. The Well #4 site (Site) parcel is approximately 51 feet (ft) by 94 ft. Well #4 is proposed to be screened in the alluvium formation. The well will be drilled to a depth that will maximize the use of the alluvial sediments, which is anticipated to be around 400 feet. The final well completion depth will be determined after a pilot borehole is drilled at the site to determine the depth of the alluvium. The proposed project (Project) will add a well, standby generator, electrical equipment, and a well discharge piping pad.

The existing wells have reported pumping rates of approximately 200 and 300 gallons per minute (gpm). Production data between 9/1/2023 and 9/30/2024 suggest that the average daily demand for Well 1 is 55,571 gallons per day (gpd), or 62.3 acre-feet per year (AFY) and for Well 3 is 59,314 gpd, or 66.4 AFY, for a total average daily system demand of about 115,000 gpd (128.7 AFY).

Well #4 is proposed as an additional well to the water system. Once Well #4 is active, Well #1 will be used only as a stand-by well and for emergency supply, to meet firefighting demands. The current GWWS annual volume of water produced and the post-Project annual volume of water produced are summarized in **Table 1.** The goal of the Project is to provide a new, redundant supply for the GWWS while keeping the annual volume of water produced the same. It is anticipated that Well #4 will have a pumping rate between 150 and 300 gpm.

Table 1 Water Demands

Well	Current Water Production (AFY)	Post-Project Water Production (AFY)
Well #1	62.3	-
Well #3	66.4	66.4
Well #4	-	62.3
Total:	**128.7**	**128.7**

Notes: AFY = acre-feet per year

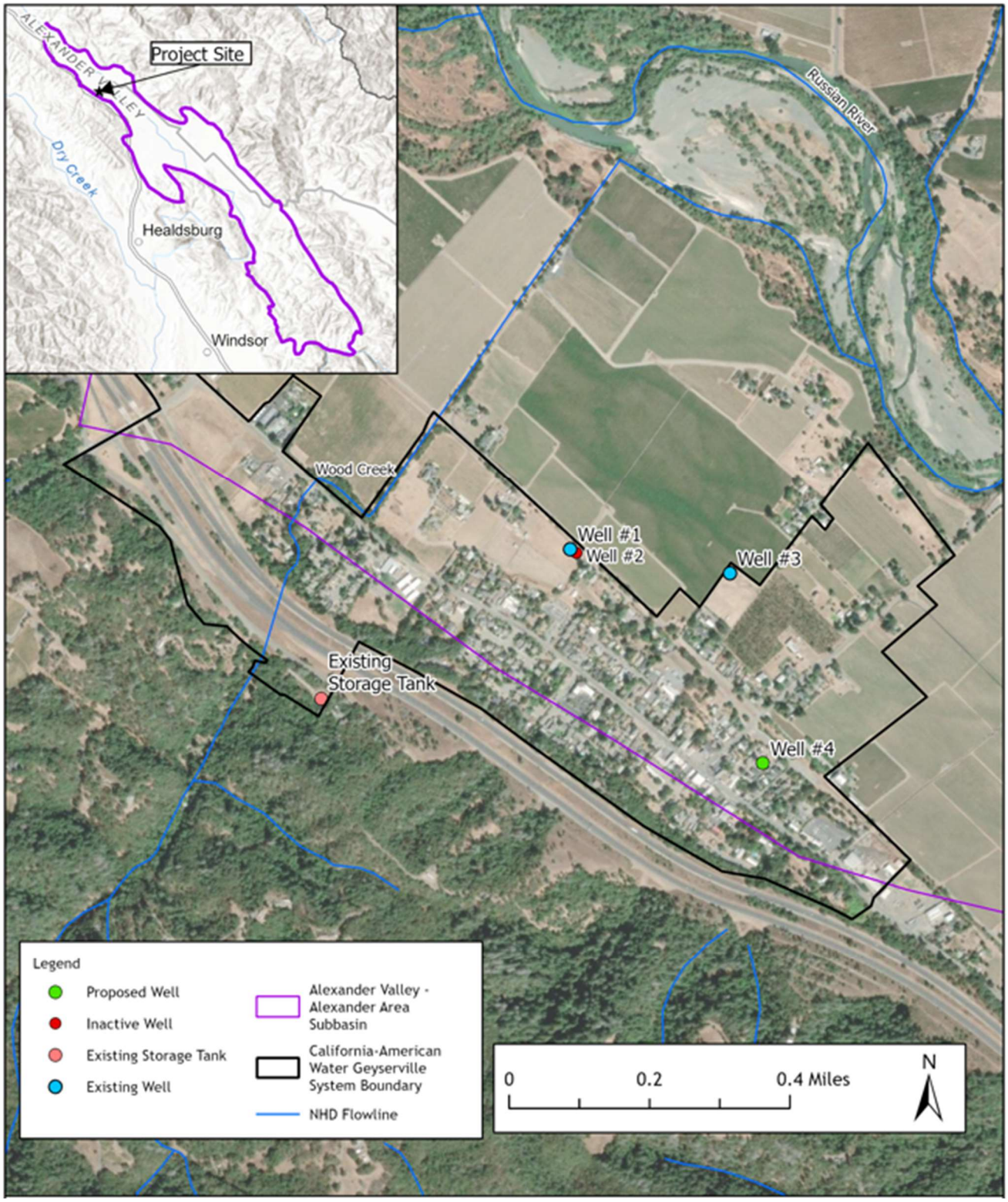

Figure 1 Site Location Map

2.2 Existing Wells

The existing Well #1 and Well #3 construction details and well yield information gathered from each well's Drinking Water Source Assessment developed in 2003 are summarized in **Table 2.** Well logs are provided in **Appendix A.** The existing wells discharge to a storage tank, and the tank level controls the operation. Both wells have pump to waste capabilities.

Table 2 Existing Well Construction Details and Well Yield Information

Well No.	Construction Date	Outside Well Diameter (inches)	Sanitary Seal (feet)	Completion Depth (feet bgs)	Screened Interval (feet bgs)	Static Water Level (feet bgs)	Well Yield (gpm)	Pump Type	Pump Size (hp)
Well #1	2/26/1976	16	none	66	4-56	17	500	Turbine	500 max (275 normally)
Well #3	6/22/2001	16	52	120	62-120	17	200	Unknown	Unknown

Notes: bgs = below ground surface
gpm = gallons per minute
hp = horsepower

Well pumping rate data and pumping water level data for Well #3 between March 2024 and September 2024 are shown in **Figure 2**. These data demonstrate that, while this well was pumping over a six-month period, the pumping water level remained stable. On September 30, 2024, it was reported that Well #3 had a pumping water level of 108 feet bgs and a static water level of 38 feet bgs (M. Nease, personal communication, September 30, 2024).

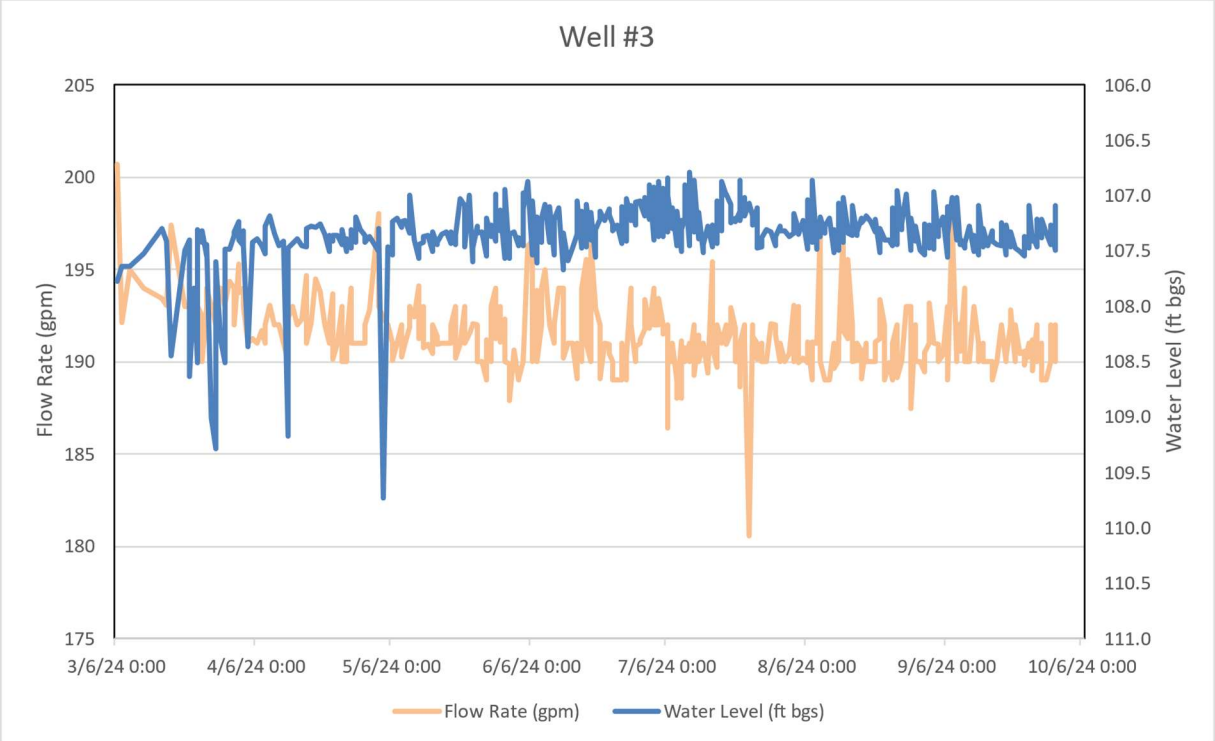

Figure 2 Well #3 Pumping Data

An 8-hour constant rate test for Well #1 was completed by Eaton Pumps in 2017 (**Appendix B**). The well was pumped at 200 gpm, and after 8 hours, the pumping water level was 22.17 feet, meaning there was 2.17 feet of drawdown. This indicates that there was a specific capacity (gallons per minute (gpm) divided by drawdown (ft) of 92 gpm/ft. A specific capacity of 92 gpm/ft indicates that the aquifer is highly transmissive and that the well is efficient. These data will be considered for the preliminary design of Well #4.

3.0 Cumulative Impact Area

Using information obtained from an 8-hour pump test performed on Well #1 by Eaton Pumps in 2017 (**Appendix B**) and the Theis equation (**Appendix C**), it was determined that after 48 hours of pumping Well #4 at 300 gpm, the estimated drawdown 500 feet away from the well would be 0.02 feet. This amount of time was selected because it is assumed that the well won't be pumped at 300 gpm for longer than 48 hours. Because this is a minimal drawdown, anywhere outside of the 500-foot buffer of Well #4 is assumed to be outside of the cumulative impact area (CIA). The CIA is 4.5 acres and is shown in **Figure 3.**

Inputs into this equation included the flow rate and drawdown obtained from the 2017 pump test to back into a transmissivity of 150,000 gallons per day per foot (gpd/ft). It was assumed that the aquifer was unconfined with a thickness of 52 feet, which is equal to the screened length of the well, and that the conditions observed in Well #1 would be similar as conditions that may be observed in the future Well #4. The Theis calibration equation using the Well #1 pump test and Theis drawdown calculation to estimate the future Well #4 characteristics can be found in **Appendix C**.

The Theis calculation was also performed using inputs from Well #3 pumping data since Well #3 is deeper than Well #1. Well #3 pumping data between 9/30/2024 at 0755 and 09/30/2024 at 1050 was used because it represents the well pumping for several hours and turning off. With the pump discharging at 193 gpm at 0755, the pumping water level was detected at 107.6 feet. The static water level was 37.9 feet, indicating a drawdown of 69.6 feet. The transmissivity calculated was 2,945 gpd/ft. It was assumed that the aquifer was unconfined with a thickness of 58 feet, which is equal to the screened length, and that the conditions observed in Well #3 may be similar to the future Well #4. This data when used in the Theis equation, presented in **Appendix C**, shows that after 48 hours of pumping in the planned Well #4 at 300 gpm, the estimated drawdown 500 feet away from the well would be 0.0 feet. We believe that the CIA determination is justified because no drawdown was calculated outside of the 500-foot buffer from Well #4.

4.0 Nearby Well Search

This section provides an overview of the wells nearby future Well #4.

4.1 Department of Water Resources

The California Department of Water Resources (DWR) has an interactive web-based mapping tool which provides well characteristics and well logs grouped into a public land survey section (PLSS) throughout California (DWR 2024a). The well locations may be accurate or may only be assigned to the centroid of a PLSS. The GWWS is in four PLSSs, and the types of wells and well characteristics within these PLSSs are shown in **Table 3.**

Table 3 Well Summary by Public Land Survey Section

Public Land Survey Section	Domestic Wells				Production Wells				Public Wells			
	Well Count	Avg. Well Depth	Min. Well Depth	Max. Well Depth	Well Count	Avg. Well Depth	Min. Well Depth	Max. Well Depth	Well Count	Avg. Well Depth	Min. Well Depth	Max. Well Depth
		(feet bgs)				(feet bgs)				(feet bgs)		
M10N09W18	23	129	30	422	34	132	26	712	3	97	66	120
M10N10W13	19	121	18	210	18	99	27	195	3	173	160	180
M10N10W24	13	258	143	410	1	300	300	300	1	300	300	300
M10N09W19	14	110	47	285	14	74	39	154	-	-	-	-

Note:
feet bgs = feet below ground surface
Min = minimum
Max = maximum

Wells within 1,000 feet of Wells #1, #3, and #4 were mapped and are shown on **Figure 3** and summarized in **Table 4.** The average yield of these wells is 70 gpm.

Table 4 Nearby Wells

Well Use	WCR Number	Record Type / Planned Use	Total Completed Depth	Top of Perforated Interval	Bottom of Perforated Interval	Casing Diameter	Static Water Level	Total Draw Down	Pump Test Length	Well Yield
			(feet bgs)	(feet bgs)	(feet bgs)	(inches)	(feet bgs)	(feet)	(hour)	(gpm)
Domestic/ Irrigation	WCR2012-000345	Water Supply Domestic	65	20	53	8	12	10	1	100
Domestic	WCR2014-000015	Water Supply Domestic	65	24	54	5	18	2	1	100
Domestic	WCR0328408	Water Supply Domestic	60	36	60	6	15	-	-	60
Domestic	WCR2015-00764	Water Supply Domestic	80	22	75	5	18	-	-	18
Unknown	WCR2013-003407	Destruction	0	0	0	0	0	-	-	0
Unknown	WCR2013-003410	Destruction	0	0	0	0	0	-	-	0
Unknown	WCR2013-003411	Destruction	0	0	0	0	0	-	-	0
Unknown	WCR2013-003413	Destruction	0	0	0	0	0	-	-	0
Unknown	WCR2013-003414	Destruction	0	0	0	0	0	-	-	0
Unknown	WCR2019-014300	Destruction	50	0	0	0	0	-	-	0
Unknown	WCR2019-014301	Destruction	50	0	0	0	0	-	-	0

Note:
feet bgs = feet below ground surface
gpm = gallons per minute
WCR = well completion report

Two domestic water supply (domestic well) wells are within 1,000 feet of Well #3, and one domestic well is just outside of the Well #3 1,000-foot buffer. One domestic well (WCR2014-000015) is within 1,000 feet of future Well #4 – this is the closest identified well and is 900 feet to the northeast. Of these four nearby wells, the average depth is 68 feet bgs and the average yield is 70 gpm. Additional non-supply wells, which are believed to be destroyed monitoring wells, are within 1,000 feet of the future Well #4 site. No wells were identified within 500 feet of the Well #4 site.

4.2 Additional Sources Review

There may be additional wells near Well #4 that may not have been identified using the DWR web-mapping tool. CAW provided a map of their service connections, and it is assumed that any parcel within the GWWS that is not shown as a connection on the GWWS is supplied by a private well. These parcels are identified below are shown in **Figure 3.**

- APN 140-130-002
- APN 140-130-003
- APN 140-130-061
- APN 140-130-081

None of the identified parcels are within 500 feet of Well #4.

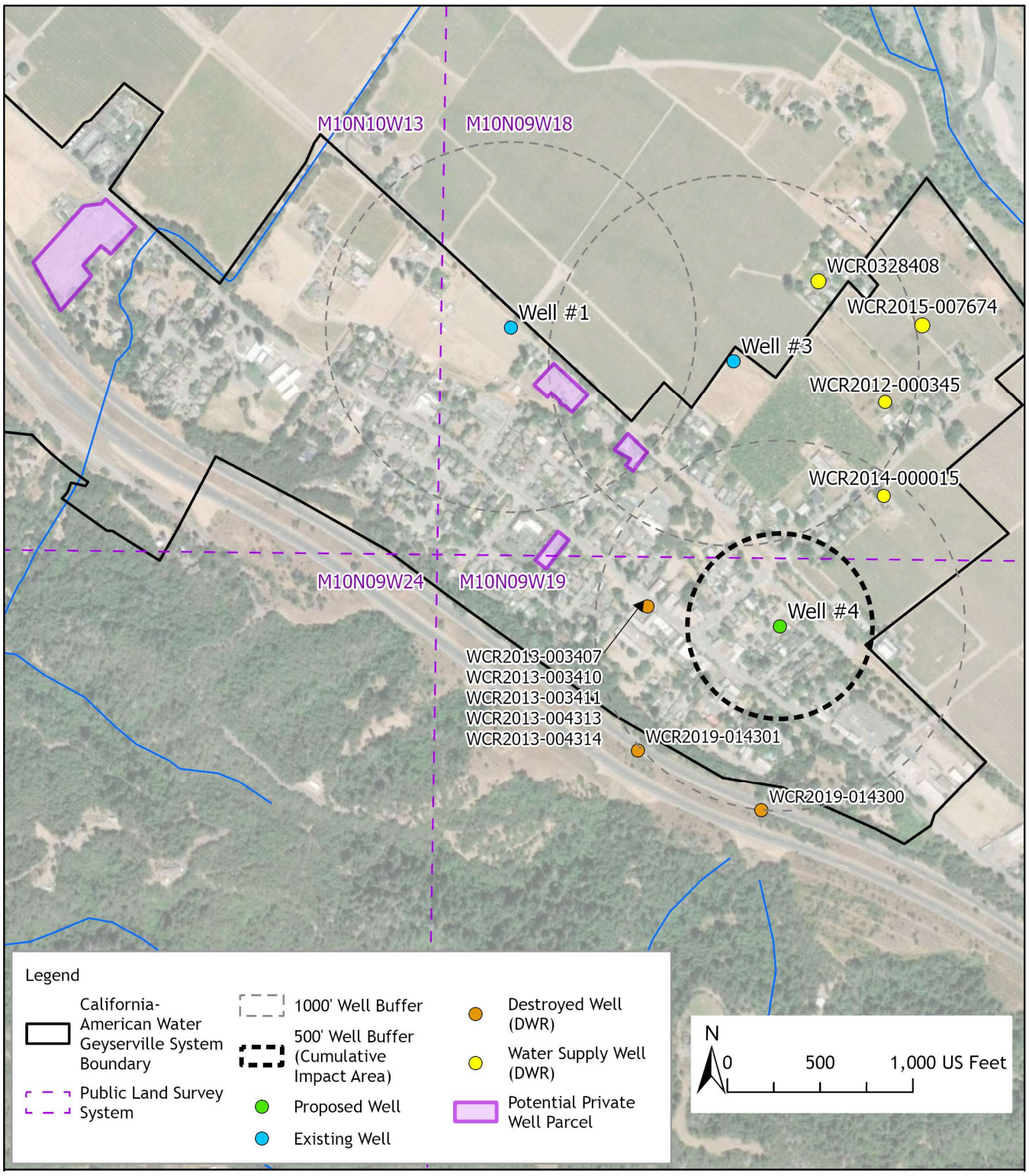

Figure 3 Wells Map

5.0 Environmental Setting

This section provides an overview of the regional and site-specific environmental setting.

5.1 Geology

According to the Geologic Map of the Santa Rosa Quadrangle, the CIA is underlain by Holocene-aged alluvium (Wagner and Bortugno, 1982). Late Quaternary faults are located approximately one mile to the north and south/southwest of the CIA. A Holocene-aged fault is approximately 2.5 miles northeast of the CIA in the Maacama Fault Zone (CDC, 2024). A geologic cross-section approximately 0.8 miles north of the CIA is shown in **Figure 4.**

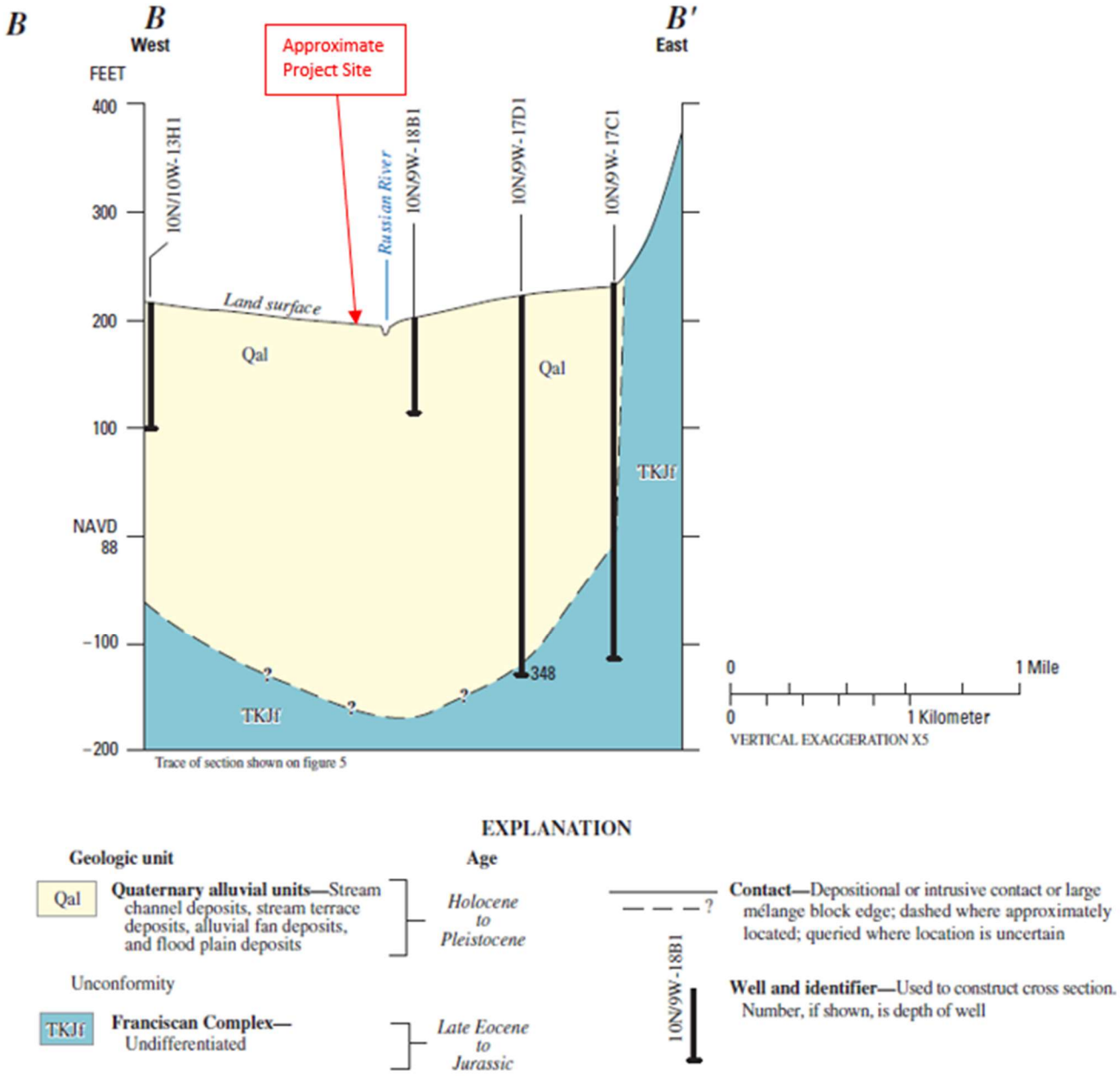

Figure 4 Geologic Cross-Section (USGS, 2006)

A soils report for the GWWS and surrounding area was obtained using the Web Soil Survey web application (USDA, 2024a; **Appendix D**). A map of soils within the GWWS and CIA can be found in **Figure 5** and is summarized in **Table 5**. Both existing wells are underlain by Yolo gravelly loam and the proposed well is underlain by Arbuckle gravelly loam (USDA 2024a).

Table 5 Soils

Map Unit Symbol	Map Unit Name
AkB	Arbuckle gravelly loam, 0 to 5 percent slopes
CrA	Cortina gravelly loam, 2 to 9 percent slopes
JoF	Josephine loam, 30 to 50 percent slopes
LmG	Los Gatos-Josephine complex, 30 to 75 percent slopes
StF	Suther loam, 30 to 50 percent slopes
YnA	Yolo loam, 0 to 10 percent slopes
YrB	Yolo gravelly loam, 0 to 8 percent slopes, MLRA 14

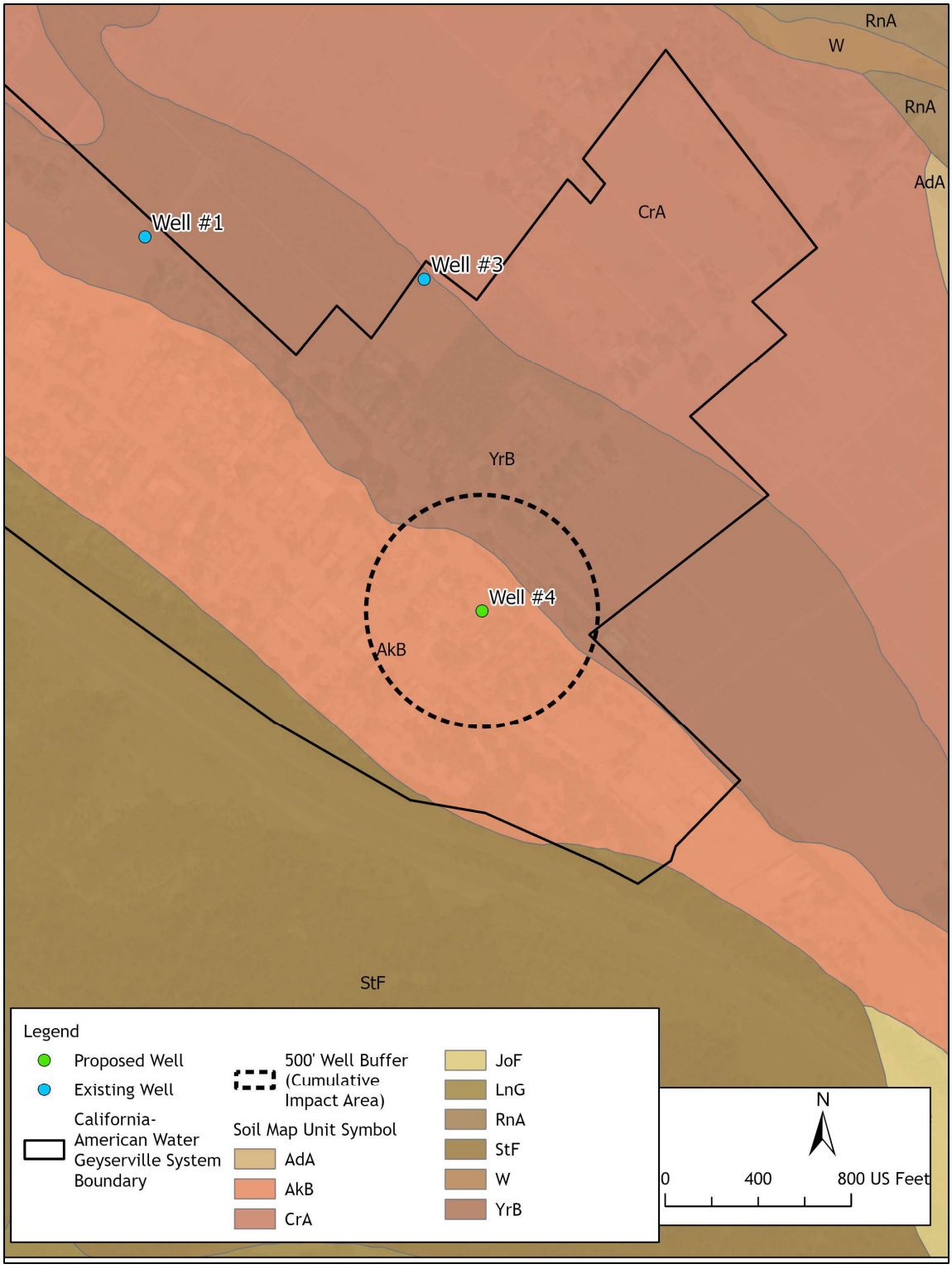

Figure 5 Soils Map

5.1.1 Hydrogeology

The Project area is in the Alexander Valley Groundwater Basin, Alexander Subbasin (Groundwater Basin Number 1-54.01, as identified by the Department of Water Resources Bulletin 118) and is part of the Russian River system at the northern boundary of Sonoma County. The Alexander Subbasin is classified as a Very Low Priority basin (DWR, 2024b) and therefore is not required to have a Groundwater Sustainability Plan under the Sustainable Groundwater Management Act. According to the Procedures for Groundwater Analysis and Hydrogeologic Reports, the Site is within a "Class 1 – Major Groundwater Basin Area" (Policy and Procedure Number 8-1-14 [Sonoma County, 2017]).

The Alexander Subbasin is comprised of volcanic rocks and continental sedimentary deposits from the Late Tertiary to Quaternary eras (DWR, 2004). The main water-bearing units in the Subbasin are (Metzger et al., 2006):

- Alluvium: Includes alluvial fan deposits, terraces, and stream-channel deposits from the Pleistocene and Holocene eras. These deposits are mainly found along the basin's margins, floodplains, and the channels of active streams. Where the alluvium is sufficiently thick, it comprises the best aquifer in the area. Thickness is up to 400 feet.
- Glen Ellen Formation: Consists of fluvial origin clay-rich stratified deposits of poorly sorted, loosely consolidated sand, silt, and gravel interbedded with minor beds of matrix-supported conglomerate (composed of basalt, andesite, obsidian clasts, and silicic tuffs).
- Sonoma Volcanics: Consist of a thick sequence of continental volcanic and volcaniclastic rocks, including basalt, andesite, and rhyolite lavas interbedded with tuffs, lahar deposits, debris avalanche deposits, mudflow units, reworked tuffs, sedimentary breccia deposits derived from volcanic rocks, and lacustrine deposits.

The existing wells are screened in the alluvium, which is the target formation for Well #4. The alluvial aquifer near Geyserville is unconfined and the aquifer consists of primarily coarse-grained material with a maximum thickness of about 400 feet.

5.1.1.1 Groundwater Levels

The standing water level in December 2024 was 13 feet bgs in Well #1 and 15 feet bgs in Well #3. The 2017 pump test noted the static water level in Well #1 was 20 feet bgs. Of the four domestic wells identified through well completion reports in the CIA, the water levels at the time of drilling ranged from 12 to 18 feet bgs, and the average water level was 16 feet bgs. Hydrographs from eight wells in the Alexander Subbasin between 1976 and 1999 indicate no long-term change in water levels (DWR, 2004). Water levels in the CIA appear to be stable.

5.1.1.2 Groundwater Quality

Water quality in the Alexander Subbasin is generally acceptable for potable use. Out of 11 wells sampled between 2002 and 2004, two wells contained one constituent with analytical results greater than the recommended standards for drinking water. A manganese concentration of 241 micrograms per liter (µg/L) exceeded the secondary maximum contaminant level (MCL) of 50 µg/L and a boron concentration of 1,350 µg/L exceeded the notification level of 1,000 µg/L (USGS 2024a).

Known Clean-Up Sites

Known environmental clean-up sites near Well #4 were mapped based on review of the GeoTracker web tool and are shown in **Table 6** and **Figure 6** (SWRCB 2025). Environmental clean-up sites identified on GeoTracker are classified as "Cleanup Program Sites[1]" or Leaking Underground Storage Tank (LUST) Sites[2]" and assigned a status of either "open" or "closed." A "closed" site means a formal closure decision document has been issued by the site. An "open" site may be in the assessment, remediation, monitoring, or management phase.

Table 6 Known Contaminated Sites

Site Name	Site Type	Potential COCs	Potential Media of Concern	Impacted Depth Below Surface (feet bgs)	Status	Address	Distance from Well #4 (feet)
Lampson Tractor & Equip.	LUST Cleanup Site	Gasoline, Waste / motor / hydraulic / lubricating oil	Groundwater	30*	Completed - Case Closed	20980 Geyserville Ave	193
Chevron (former)	LUST Cleanup Site	Gasoline, Waste / motor / hydraulic / lubricating oil	Groundwater	71.5*	Completed - Case Closed	21020 Geyserville Ave	463
Caltrans District 4	LUST Cleanup Site	Gasoline	Soil	5	Completed - Case Closed	21030 Geyserville Avenue (Caltrans Property)	555
Zumwalt Ford (former)	LUST Cleanup Site	Gasoline, Waste / motor / hydraulic / lubricating oil	Groundwater	50*	Completed - Case Closed	21085 Geyserville Ave	694
Zumwalt Union (former)	LUST Cleanup Site	Gasoline, Waste / motor / hydraulic / lubricating oil	Groundwater	21.5*	Completed - Case Closed	21091 Geyserville Ave	849
Draxton	LUST Cleanup Site	Diesel, Waste / motor / hydraulic / lubricating oil	Soil and Groundwater	Impacted groundwater depth to be determined. Soil depth impacted at a minimum of 17'.	Open - Site Assessment	20750 Geyserville Avenue	1,403

[1] Cleanup Program Sites includes all non-federally owned sites that are regulated under the SWRCB Site Cleanup Program and/or similar programs conducted by each of the nine Regional Water Quality Control Boards. These sites include but are not limited to pesticide and fertilizer facilities, rail yards, ports, equipment supply facilities, metals facilities, industrial manufacturing and maintenance sites, dry cleaners, bulk transfer facilities, refineries, mine sites, landfills RCRA/CERCLA cleanups, and some brownfields.
[2] LUST Cleanup Sites include all underground storage tank sites that have had an unauthorized release (i.e. leak or spill) of a hazardous substance, usually fuel hydrocarbons, and are being (or have been) cleaned up.

Site Name	Site Type	Potential COCs	Potential Media of Concern	Impacted Depth Below Surface (feet bgs)	Status	Address	Distance from Well #4 (feet)
Vino Farms	Cleanup Program Site		Soil	Not listed	Completed - Case Closed	21300 Railroad Avenue	2,072

Note:
* = deepest groundwater monitoring well depth at the site
gpm = gallons per minute
WCR = well completion report

A summary of contaminated sites within 2,500 feet of Well #4 is below:

- Caltrans District 4: A release of gasoline from an underground storage tank (UST) was investigated in 2013. The UST was removed in 2015 and based on the analytical results from the tank removal and field observations, no further investigation was deemed necessary because a release did not appear to occur from the tank. The case was closed on October 23, 2015.
- Chevron (former): A gas service station was taken out of service in the late 1970s. The station has remained dormant since then and all structures have been removed from the site. In 1998, five USTs were identified and inspected. The USTs were removed in 1998, and additional remediation activities took place including removal of free product, excavation of contaminated soil, removal of contaminated groundwater via a high vacuum dual phase extraction pilot test in 2013, and removal of contaminated groundwater via dual phase extraction in 2014-2015. An October 2016 No Further Action Letter from the Sonoma County Department of Health Services documented the completion of site investigation and remedial action at the site. The case was closed on October 14, 2016.
- Draxton: This case is open and in the site assessment phase as of July 11, 2024. A UST was discovered during site preparation of a new development. The UST, which was used to store heavy hydrocarbons in the diesel, motor oil, and fuel oil ranges, was removed in May 2024 under permit from the Sonoma County Fire Prevention and Hazardous Materials Division, and limited excavation was performed in June 2024. A work plan for additional investigation was prepared in September 2024. The work plan includes installing temporary soil vapor probes and collecting soil samples and grab groundwater samples. Groundwater is anticipated to be encountered between 20- and 30-feet bgs.
- Lampson Tractor & Equip.: A former commercial business had potential contaminants of concern in the soil and groundwater including gasoline, and waste/motor/hydraulic/lubricating oils related to a LUST. Remedial action involving soil excavation took place in 1987. A May 8, 2013 letter from the North Coast Water Quality Control Board determined that the shallow contaminated soils do not present a threat to waters of the state, human health, or the environment, and that no additional work will be required. The case was closed in 2001.
- Vino Farms: Gasoline releases to the soil were the concern at this cleanup program site. A leak was discovered and reported on June 13, 1994. Site assessment, remediation, verification monitoring, and case closure took place on January 8, 1996.
- Zumwalt Ford (former): Five USTs were removed from the site in 1998. A dual-phase extraction pilot test was completed in 2009 and cleaned up the site sufficiently by removing hydrocarbons.

The site was monitored until June 2012, when it was indicated that the site meets the low-risk site closure criteria and considered for closure. A May 9, 2013 No Further Action Letter from the Sonoma County Department of Health Services documented the completion of site investigation and remedial action at the site. The case was closed on May 9, 2013.

- Zumwalt Union (former): After leaking of a UST was discovered in 1992 and site assessment in 1993, potential contaminants of concern in the soil and groundwater were identified at the site including gasoline and waste/motor/hydraulic/lubricating oils. Remedial activities consisting of excavation in 2000 were deemed sufficient and on June 28, 2005 a No Further Action Letter from the Sonoma County Department of Health Services documented the completion of site investigation and remedial action at the site. The case was closed on June 28, 2005.

It has been well documented in literature and through experience at individual UST release sites that petroleum fuels naturally attenuate in the environment through adsorption, dispersion, dilution, volatilization, and biological degradation. This natural attenuation slows and limits the migration of dissolved petroleum plumes in groundwater. The biodegradation of petroleum, in particular, distinguishes petroleum products from other hazardous substances commonly found at commercial and industrial sites (SWRCB 2012).

The *Low-Threat Underground Storage Tank Case Closure Policy* was established because experience has shown that residual contaminant mass usually remains after the investment of reasonable effort, and that this mass is difficult to completely remove regardless of the level of additional effort and resources invested. The State Water Board believes it is in the best interest of the people of the state that unauthorized releases be prevented and cleaned up to the extent practicable in a manner that protects human health, safety, and the environment (SWRCB 2012).

According to the Sonoma County well ordinance, wells in a Class 1 Groundwater Availability Area shall be set back from known open contaminated sites by 2,500 feet and set back from known closed contaminated sites by 1,000 feet (Sonoma County 2025). A well closer than these minimum distances may be approved by the enforcing agency if the hydrogeologic report evaluates and concludes that a different setback and/or annular seal depth than those recommended in the well ordinance will be adequately protective.

Similarly to the analysis performed to assess the potential for Well #4 to impact surface water, we used the Theis equation to assess the amount of drawdown at different radii from the potential Well #4 site. The nearest closed site to Well #4 is about 193 feet. This distance and the aquifer characteristics used to calculate the CIA (see Section 3) were used for this analysis. The results indicated that pumping Well #4 at the assumed maximum flow rate of 300 gpm for 48 hours may only create 0.25 feet of drawdown 193 feet away. At a distance of 1,403 feet away from Well #4, which is the distance to the nearest open known cleanup site, we estimate that 0 feet of drawdown will be observed after pumping for 48 hours. These results indicate that pumping the proposed Well #4 for 48 hours will induce minimal drawdown at the closest closed site and will not produce a cone of depression that extends to the open site 1,403 feet away. These characteristics indicate a reduced potential for proposed Well #4 to mobilize any constituents of concern from the previously closed or open site.

The primary purpose of a well seal is to prevent degradation of water wells and groundwater by intrusion of poor water quality or mixing of aquifers with different water qualities. The annular space between the well casing and the wall of the drilled hole or between the conductor pipe and the wall of the drilled hole or the well casing shall be filled from the ground surface into an impervious formation, if possible, or at least to the minimum annular seal depth with approved neat cement, cement grout,

bentonite clay or other equivalent sealant material approved by the enforcing agency. The minimum annular seal depth for a public water well is 50 feet according to the Sonoma County well ordinance (Sonoma County 2025).

Five known closed cleanup sites are within 1,000 feet of Well #4 and one known open cleanup site (Draxton) is within 2,500 feet of Well #4. While these sites do not meet the recommended setback distances set forth in the Sonoma County well ordinance, INTERA believes that water quality at Well #4 will not be impacted by these sites if a minimum 50 foot well seal is installed which will be to the top of the gravel pack. The first impervious stratum is not expected until a depth of approximately 400 feet bgs, so it is not practical to extend the well seal to that depth. At a minimum, well seal requirements outlined in the California Water Well Standards – California Department of Water Resources (DWR) Bulletins 74-81 and 74-90 (DWR, 1981; DWR, 1991), American Water Works Association (AWWA) Standard A100-20 for Water Wells (AWWA, 2020), and Sonoma County well ordinances will be applied. Depending on the lithology, a well seal greater than 50 feet could be constructed. Well #4 drilling, construction, development, and testing will be completed in accordance with these standards. CAW will test water quality to confirm that all Title 22 Standards for drinking water are met and will provide the necessary treatment to meet those standards, if necessary.

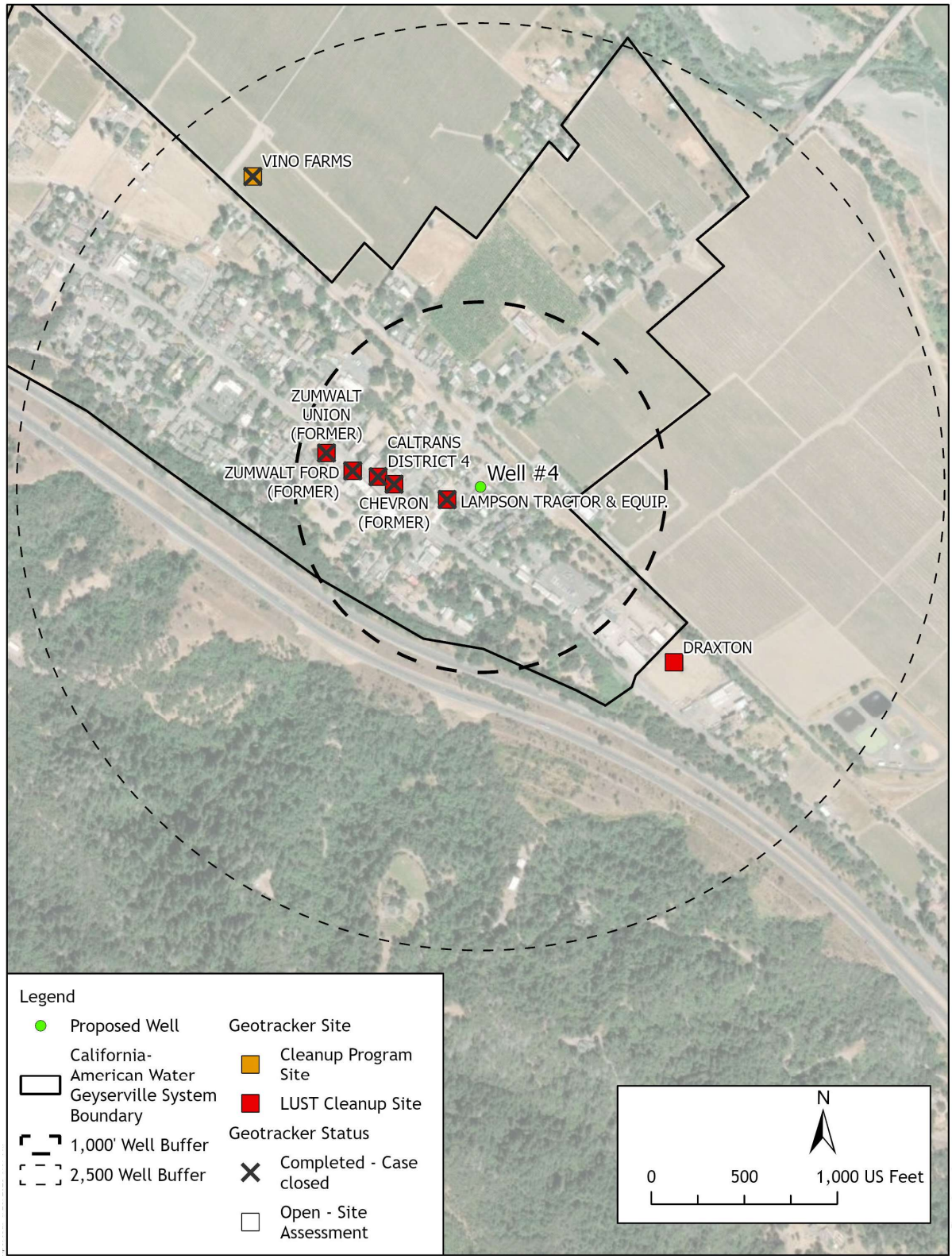

Figure 6 Environmental Clean-Up Sites

5.1.1.3 Groundwater Dependent Ecosystems

Groundwater-dependent ecosystems (GDEs) are ecosystems that are supported by groundwater. These places include springs and seeps, caves and karst systems, and deep-rooted plant communities. In many cases, rivers, wetlands, and lakes are also included (USDA 2024b). The Nature Conservancy uses machine learning and satellite imagery to map GDEs at 30-meter resolution. This mapping in the vicinity of the GWWS in relation to the CIA is shown in **Figure 7**. No GDEs are within the CIA.

Sonoma County developed an ordinance to modify how the County will evaluate applications for proposed groundwater wells. Public Trust Review Areas (PTRAs) are areas which have benefit for current and future generations, or uses including commerce, navigation, recreation, fishing, wildlife habitat, and preservation of trust lands in their natural state. A PTRA matrix was developed based on the results of resource sensitivity analysis and streamflow mapping. According to the Sonoma County Well Ordinance, the CIA is in an area with medium aquatic habitat value and a flow regulated reach area. Because flows within the main stem of the Russian River are controlled by releases from Lake Mendocino, the methodology used by Sonoma County to develop the relationship between groundwater pumping and streamflow depletion is not valid, and the CIA is classified as a low-risk area not included in the PTRA (Sonoma County, 2017).

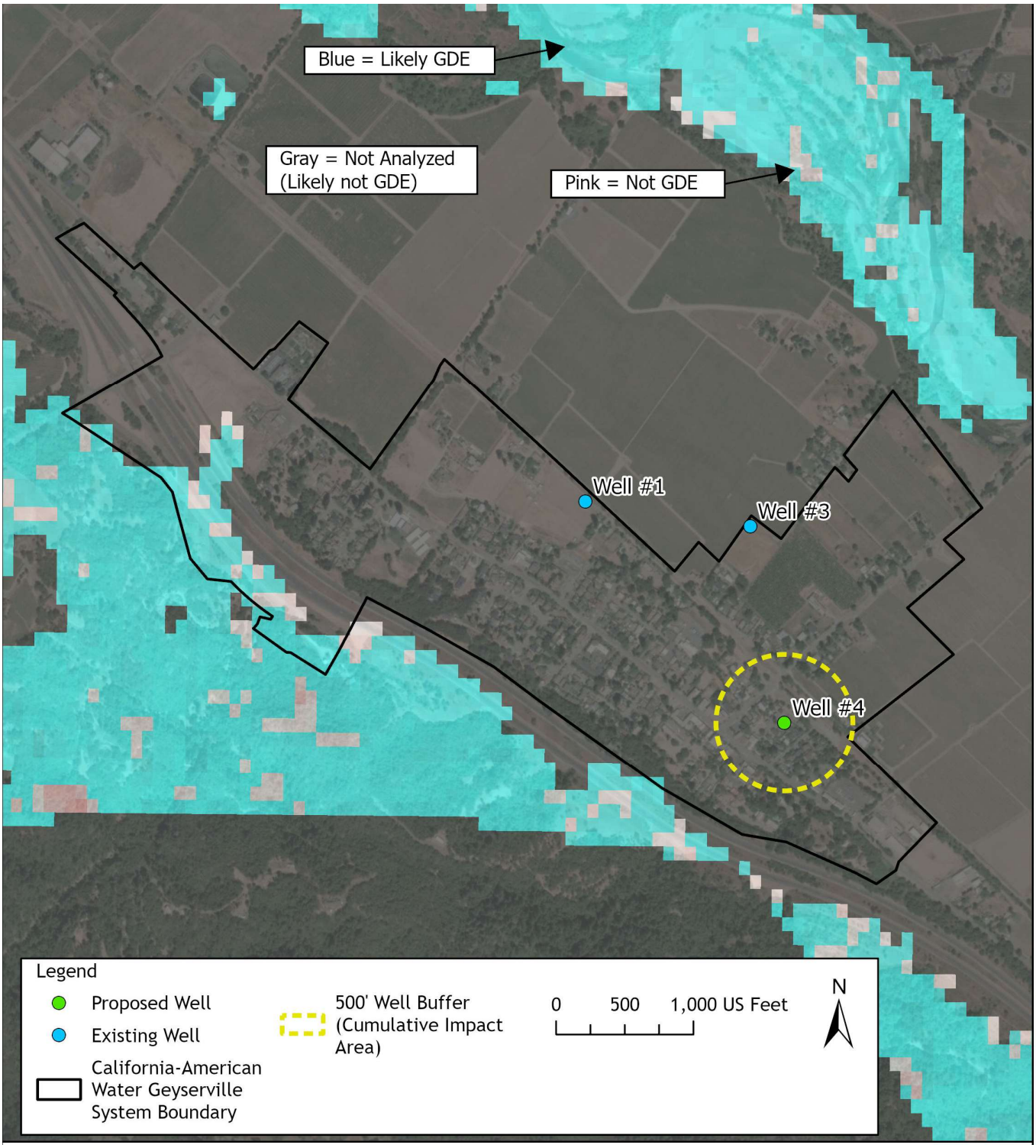

Figure 7 Groundwater-Dependent Ecosystems Map

5.1.1.4 Saltwater Intrusion

The CIA is located approximately 20 miles inland from the coast, and saltwater intrusion is not a concern. The Alexander Subbasin has no documented saline intrusion (DWR, 2024b).

5.1.1.5 Land Subsidence

The Alexander Subbasin has no documented groundwater-extraction-induced inelastic subsidence (DWR, 2024b).

5.2 Hydrology

The closest significant surface water feature to the Project site is the Russian River, which flows from northwest to southeast approximately 3,000 northeast of the proposed Well #4. According to the National Hydrography Database (NHD), Wood Creek originates in the higher elevation area south of the GWWS, where it flows in the northeast direction and crosses through the GWWS, ultimately flowing into the Russian River (USGS, 2024b). Wood Creek is approximately 4,000 feet northwest of the Well #4 site. Two unidentified drainages are mapped south of the CIA and south of the US-101 (**Figure 8**).

5.2.1 Watershed

The Watershed Boundary Dataset (WBD) is a national hydrologic unit dataset. Hydrologic units represent the area of the landscape that drains to a portion of the stream network. Hydrologic unit boundaries in the WBD are determined based on topographic, hydrologic, and other relevant landscape characteristics. The GWWS is in the western portion of the Hydrologic unit code 12 ((HUC-12 180101100602, USGS 2024c) Sausal Creek-Russian River watershed, which drains 29,646 acres into the Russian River (Figure 8).

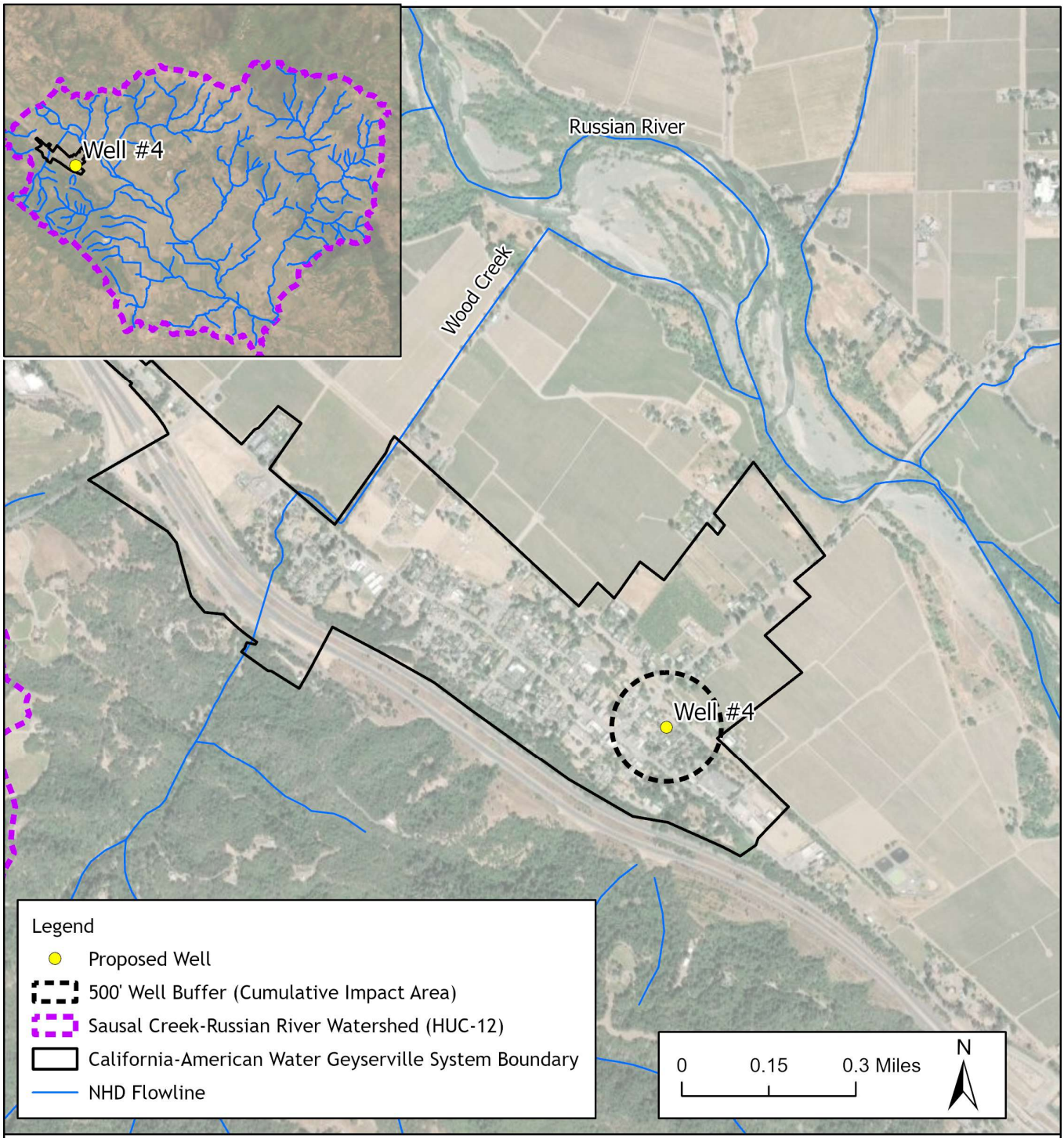

Figure 8 Watershed Map

5.2.2 Precipitation

According to the PRISM Climate Group dataset (PRISM, 2024), which presents average annual rainfall across the United States between 1999 and 2020, the average annual rainfall within the GWWS is 36 inches (**Figure 9**).

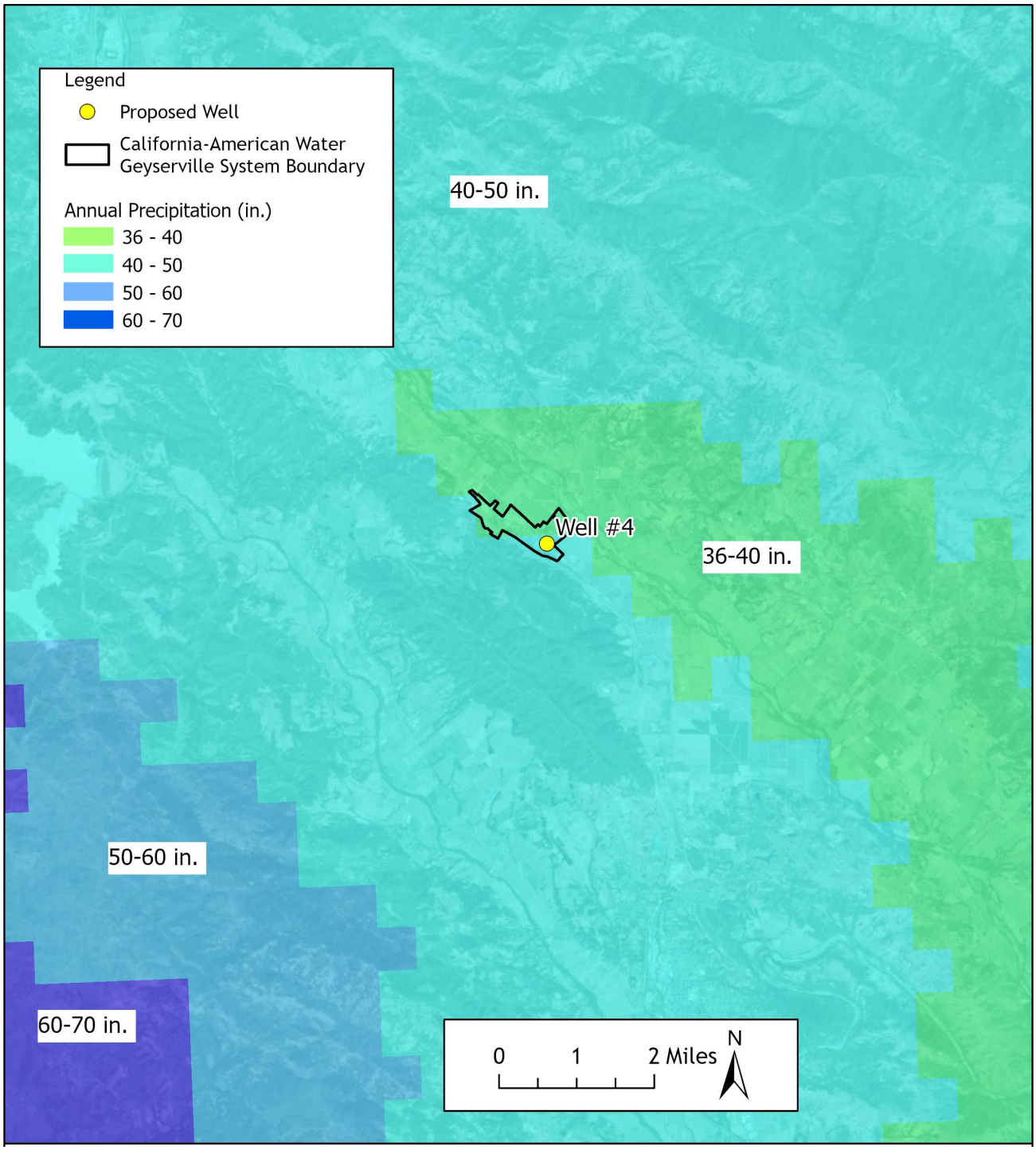

Figure 9 Precipitation Map

5.2.3 Evapotranspiration

The GWWS is within the "Inland San Francisco Bay Area" evapotranspiration (ET) zone, which totals 49.4 inches per year of ET (CIMIS, 2024).

5.3 Land Cover

The Multi-Resolution Land Characteristics (MRLC) consortium is a group of federal agencies who coordinate and generate consistent and relevant land cover information. The MRLC National Land Cover Database web tool was used to obtain land cover information for the GWWS and surrounding area, which can be seen in **Figure 10** (MRLC, 2024). Much of the CIA is classified as developed land.

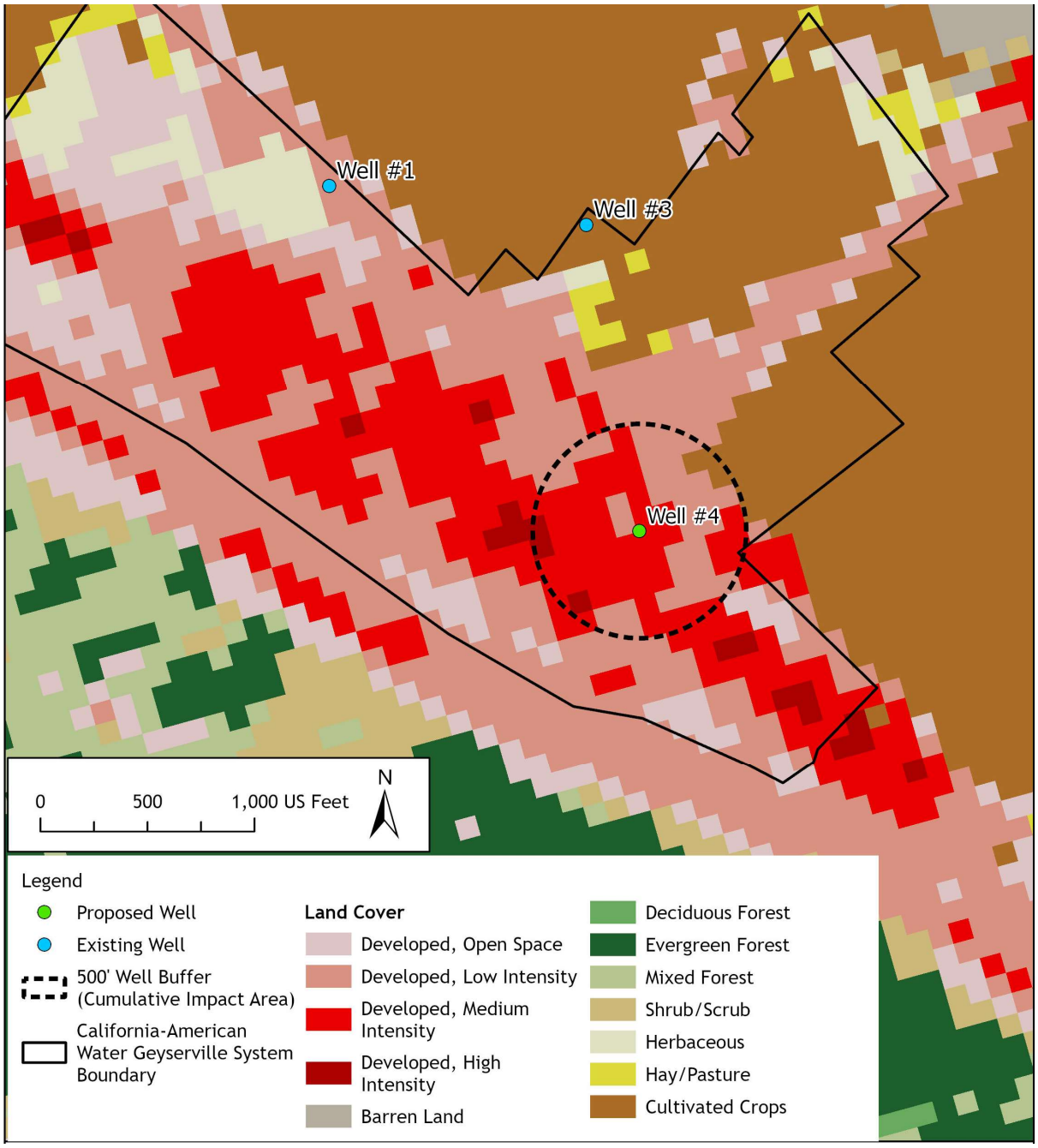

Figure 10 Land Cover Map

6.0 Discussion

6.1 Interconnected Surface Waters

Using Well #1 pump test data from 2017 and Well #3 pumping data from 2024 as two different calibration scenarios, the Thies equation was applied to calculate the hypothetical impacts at a distance from pumping well #4 at the assumed maximum pumping rate of 300 gpm. It was determined that no significant impacts to groundwater should be anticipated outside of a 500-foot radius from Well #4, which was designated as the CIA. As discussed in Section 5, no surface water or GDE's are within the CIA and no interconnected surface waters will be impacted due to the Project.

6.2 Water Balance

Because the pre-Project water demand and post-Project water demand are not changing, a water balance calculation is not required.

6.3 Conclusion

CAW is adding Well #4 as an additional well to the water system for supply redundancy. The well is anticipated to be up to 400-feet deep and have a capacity between 150- and 300-gpm. The Project is in the Alexander Valley Groundwater Basin and Alexander Subbasin, and the shallow alluvium is the target formation for installing Well #4. Once Well #4 is active, Well #1 will be used only as a stand-by well so the pre-Project and post-Project water demand and pumping demand of the GWWS will be unchanged. Therefore, the Project will not cause or exacerbate an overdraft condition in the groundwater basin.

The Theis equation was used to determine that the CIA would be a 500-foot buffer around the well. At this distance, drawdown is expected to be only 0.02 feet if Well #4 is pumping at 300 gpm. No production wells or interconnected surface waters were identified within the CIA and, therefore, will not be impacted by the Project.

There are known cleanup sites within the setback requirements set forth in the Sonoma County well ordinance. Therefore, INTERA recommends designing the well with a minimum sanitary seal depth of 60 feet bgs to minimize the migration of any constituents of concern into the productive aquifer. Well #4 shall be designed in accordance with DWR Bulletins 74-81 and 74-90, AWWA Standard A100-20 for Water Wells, and Sonoma County well ordinances.

7.0 References

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Appendix A

Existing Well Logs

TRIPLICATE
Retain this copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do Not
Nº 14
State Well No.
Other Well No.

(1) OWNER:
Name Clem Feldmeyer
Address P. O. Box 186
Geyserville, California

(2) LOCATION OF WELL:
County Sonoma Owner's number, if any
Township, Range, and Section Woods Lane
Distance from cities, roads, railroads, etc. Geyserville, Calif.

(3) TYPE OF WORK (check):
New Well ☐xx Deepening ☐ Reconditioning ☐ Destroying ☐
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐x Industrial ☐ Municipal ☐x
Irrigation ☐ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☐
Cable ☐
Other ☐

(6) CASING INSTALLED:
STEEL: x OTHER:
SINGLE ☐ DOUBLE ☐

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
1	60	xxxxxxxx				
		15"				

If gravel packed

Size of shoe or well ring: 15" Clors
Describe joint: weld
Size of gravel:

(7) PERFORATIONS OR SCREEN:
Type of perforation, or name of screen

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
2	56	4	4	

(8) CONSTRUCTION:
Was a surface sanitary seal provided? Yes ☐ No ☐ To what depth ft.
Were any strata sealed against pollution? Yes ☐ No ☐ If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing

(9) WATER LEVELS:
Depth at which water was first found, if known ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing 10 ft.

(10) WELL TESTS:
bail
Was pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: 150 gal./min. with ft. drawdown after hrs.
Temperature of water Was a chemical analysis made? Yes ☐ No ☐
Was electric log made of well? Yes ☐ No ☐ If yes, attach copy

(11) WELL LOG:
Total depth 66 ft. Depth of completed well
Formation: Describe by color, character, size of material, and structure

ft.	to	
1	4	top soil
4	12	gravel
12	35	loose gravel
35	50	gravel
50	66	cemented gravel

Work started 2/23 1976 Completed 2/25/76

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

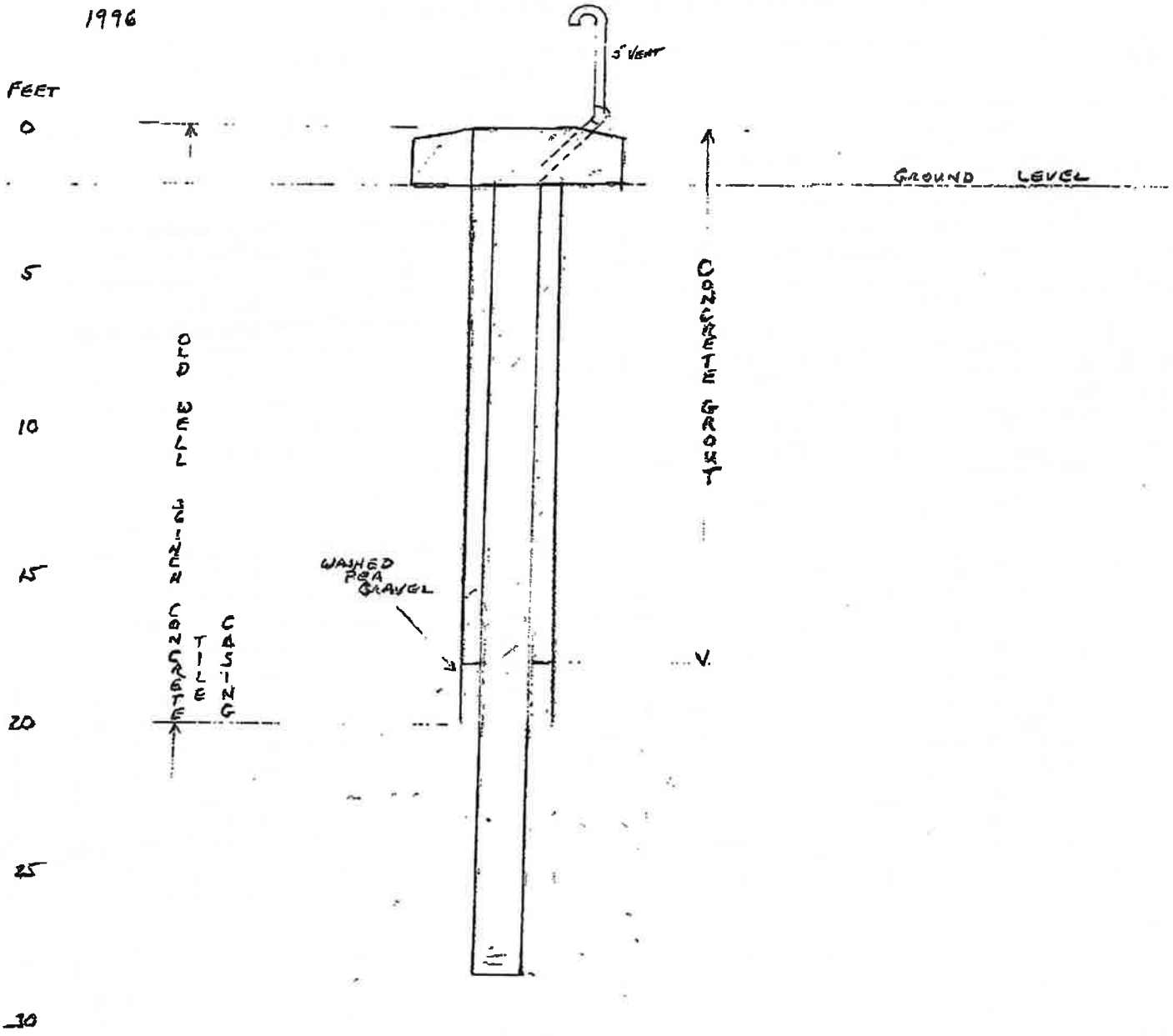
NAME Les Petersen Drilling & Pump, Inc.
(Person, firm, or corporation) (Typed or printed)
Address 5434 Old Redwood Highway
Santa Rosa, California
[SIGNED] Les Hansen
(Well Driller)
License No. 261004 Dated 2/25/76 19

SKETCH LOCATION OF WELL ON REVERSE SIDE

WR 188 (REV. 3-66)

WELL # 2 GEYSERVILLE WATER WORKS

1996



16 INCH PVC
WELL CASING
LOWER 13 FEET
PERFED

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

WELL DATA

System Name: Geyserville Water Works No. 4910024
Source of Information: Harry Bosworth, System Owner
Collected By: D. Lambeth Date: 9/25/91

Number or Name	Well No. 1	Well No. 2
Date Drilled	1974	Old Hand-Dug Well
Neighborhood	Agricultural	Agricultural
Lot size	20 ft x 30 ft	20 ft x 30 ft
Distance to: Sewer	75 ft	75 ft
Sewage disposal	N/A	N/A
Abandoned well	N/A	N/A
Property line	10 ft	10 ft
Plot plan on file?	Yes	Yes

Housing: Type	Corrugated Aluminum	Corrugated Aluminum
Pit depth	N/A	N/A
Floor material	Concrete	Concrete
Drainage	OK	OK

Well Depth	65 ft	Approx. 30 ft
Casing:Depth(s)	65 ft	30 ft
Diameter(s)	16 inch	4 ft
Type	Steel	Concrete Pipe
Height above floor	2.5 ft	2 ft
Dist. to perforations	Unknown	Open Bottom
Surface sealed?	5x6 ft Concrete Slab	8x10 ft Concrete Slab
Gravel packed?	No	N/A
Conductor casing depth	N/A	N/A
Conductor casing dia.	N/A	N/A
Annular seal depth	20 ft	None
Impervious strata:		
Thickness		
Depth to		
Well log on file?	Yes	No

Water levels:		
Static	14 ft (4/81)	
Pumping	15 ft (4/81)	
Pump: Make	Berkeley	Fairbanks - Morris
Type	Turbine	Centrifugal
Capacity (gpm)	350 gpm	200 gpm (approx)
Lubrication	Water	Water
Power	Electric	Electric
Auxiliary power	None	None
Control	Automatic	Manual
Frequency of use	Daily	Emergency Use Only
Discharge to	Distribution System	
Flood Hazard	Minimal	
Remarks and defects		Well is disconnected
		from water system.

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

WELL DATA

(1) System Name: GEYSERVILLE WATER WORKS System Number: 4910014

(2) Source of Information: _____

Collected by: MK Date: 7-31-98

(3) Number or Name	WELL #2	
Date drilled	OLD HAND DUG / DEEPENED 1997	
(4) Location: Neighborhood	AGRICULTURAL	
Distance to: Sewer	100 FT	
Sewage disposal	NONE	
Abandoned well	NONE	
Nearest property line	10 FT	
Plot plan on file?		
(5) Housing: Type	WOOD FRAME	
Condition	GOOD	
Pit depth (if any)	NONE	
Floor (material)	CONCRETE & TILE	
Drainage	GOOD	
(6) Well Depth	28 FT	
(7) Casing: Depth	28 FT	
Diameter	16 INCH	
Type	PVC	
Height above floor	2 FT	
Distance to highest perforations	18 FT	
Sanitary sealed (yes or no)	YES 18 FT	
Sanitary surface seal(yes or no)		
Gravel pack (yes or no)	YES 10 FT	
Second casing depth	20 FT	
Second casing diameter	36 INCH	
Annular seal (depth)	18 FT	
(8) Impervious Strata: Thickness	/	
Depth to	/	
(9) Water Levels: Static	17	
When pumping	19	
(10) Pump: Make	GOULD	
Type	D W T	
Capacity, g.p.m.	100 - 250	
Lubrication	WATER	
Power	ELECTRIC	
Auxiliary power	NONE	
Controlled by	AUTOMATIC	
Discharge to	SYSTEM	
(11) Frequency of Use	DAILY	
(12) Flood Hazard	IN RUSSIAN RIVER SOME: FLOOD PLAIN	
(13) Well log on file?	NO	
(14) Remarks and Defects (Use other side if necessary)		

WELL DATA SHEET (Page 1 of 2)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.

** Indicates items required for Source Water Assessment*

*** Indicates additional items required for assessments and Ground Water Rule*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name: GEYSERVILLE WATER WORKS		from DHS database
System Number: 4910029		from DHS database
Source of Information *(well log, DHS/County files, system, etc)*		
Organization Collecting Information *(DHS, County, System, other)*	[illegible]	
Date Information Collected/Updated	8-2 [illegible]	
WELL IDENTIFICATION		
* Well Number or Name	WELL # 3	from DHS database
* DHS Source Identification Number (FRDS ID No.)		
DWR Well Log on File? ("YES" or "NO")	NO	
State Well Number (from DWR)		
Well Status (Active, Standby, Inactive)	ACT	from DHS database
WELL LOCATION		
Latitude: 3[illegible]° 42.[illegible] N		from DHS database
Longitude: [illegible]° 54.21 W		from DHS database
Ground Surface Elevation (ft above Mean Sea Level)	206.59	
Street Address	21148	
Nearest Cross Street	RAILROAD AVE	
City	GEYSERVILLE	
County	SONOMA	
* Neighborhood/Surrounding Area *(see Note 1)*	[illegible]	
Site plan on file? ("YES" or "NO")	[illegible]	
DWR Ground Water Basin		to come from DWR
DWR Ground Water Sub-basin		to come from DWR
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)	400 ft	
Distance to Active Wells (ft)	1000 ft	
Distance to Abandoned Wells (ft)	500 ft	
Distance to Surface Water (ft)	13 ft	
** Size of controlled area around well (square feet)	7100 ft²	
* Type of access control to well site *(fencing, building, etc)*	BUILDING	
* Surface Seal? (Concrete slab)("YES", "NO" or "UNKNOWN")	YES	
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	5ft x 5ft x 6IN	
* Within 100 year flood plain? ("YES", "NO" or "UNKNOWN")	YES	
* Drainage away from well? ("YES" or "NO")	YES	
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*	BUILDING	
Floor material	CONCRETE	
Located in Pit? ("YES" or "NO")	NO	
Pit depth (feet) (if applicable)		
WELL CONSTRUCTION		
Date drilled	JUNE - OCT 2001	
Drilling Method	CABLE TOOL	
Depth of Bore Hole (feet below ground surface)	120 ft	
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning Depth/Ending Depth; 3rd Casing, etc.	[illegible]	
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	[illegible]	
Casing Material; 2nd Casing Material; 3rd Casing, etc.	STEEL	

WELL DATA SHEET (Page 2 of 2)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.		
* Indicates items required for Source Water Assessment		
** Indicates additional items required for assessments and Ground Water Rule		
	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
WELL CONSTRUCTION (continued)		
Conductor casing used? ("YES", "NO" or "UNKNOWN") *(See Note 2)*	YES	
Conductor casing removed? ("YES", "NO" or "UNKNOWN")	YES	
* Depth to highest perforations/screens (ft below surface) (or "UNKNOWN")	52 FT	
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	52 FT - 120 FT	
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)* (or "UNKNOWN")	68 FT	
* Annular Seal?("YES", "NO" or "UNKNOWN") *(See Note 3)*	YES	
* Depth of Annular Seal (ft)	52 FT	
Material of Annular Seal *(cement grout, bentonite, etc.)*	CEMENT	
Gravel pack, Depth to top (ft below ground surface)		
Total length of gravel pack (ft)		
AQUIFER		
* Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*	SAND, SILT, CLAY GRAVEL	
* Effective porosity (decimal percent) *(default = 0.2)* (or "UNKNOWN")		
* Confining layer (Impervious Strata) above aquifer? ("YES", "NO" or "UNKNOWN")	UNKNOWN	
Thickness of confining layer, if known (ft)		
Depth to confining layer, if known (ft below ground)		
* Static water level (ft below ground surface)	13 FT - 18 FT	
Static water level measurement: Date/Method		
Pumping water level (ft below ground surface)	65 FT	
Pumping water level measurement: Date/Method		
WELL PRODUCTION		
Well Yield (gpm)	200 GPM	
Well Yield Based On (i.e., pump test, etc.)	PUMP TEST	
Date measured		
Is the well metered? ("YES" or "NO")	YES	
Production (gallons per year)		
Frequency of Use (hours/year)		
Typical pumping duration (hours/day)		
PUMP		
Make		
Type		
Size (hp)		
* Capacity (gpm)		
Depth to suction intake (ft below ground surface)		
Lubrication Type		
Type of Power: *(i.e., electric, diesel, etc.)*	ELECTRIC	
Auxiliary power available? ("YES" or "NO")		
Operation controlled by: *(i.e., level in tank, pressure, etc.)*		
Pump to Waste capability? ("YES" or "NO")		
Discharges to: *(i.e., distribution system, storage, etc.)*		
REMARKS AND DEFECTS (use additional sheets as necessary)		

STATE
Owner's Copy
Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 749233

Owner's Well No. 1
Date Work Began 6-22-01 Ended 10-23-01
Local Permit Agency County of Sonoma Public Health Dept
Permit No. 01-0341 Permit Date 6-19-01

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

GEOLOGIC LOG

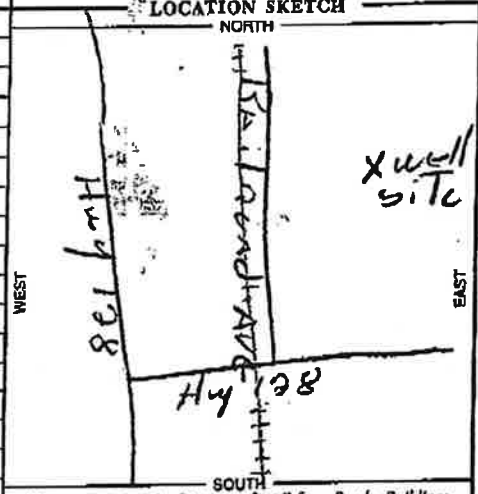
ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Cable FLUID ___

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	3	Top soil
3	10	Brn clay + Gravel
10	111	Gravel & cobblestones
111	112	Brn clay
112	—	Cement Gravel

TOTAL DEPTH OF BORING 120 (Feet)
TOTAL DEPTH OF COMPLETED WELL 120 (Feet)

WELL OWNER
Name Geyserville Water Work
Mailing Address P.O. Box 65
City Geyserville State CA Zip 95441

WELL LOCATION
Address 21148 Railroad Ave
City Geyserville
County Sonoma
APN Book 140 Page 330 Parcel 34
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 17 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (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	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	52	20	✓				Steel 42.05	15½	.250	
52	62	16	✓				Steel 42.05	15½	.250	.032
62	122	16		✓			Steel 42.05	15½	.250	.031

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	52	✓			

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 Erwin Well Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS 3801 Biscardi Ln CITY Fulton STATE CA ZIP 95439
Signed [signature] (WELL DRILLER/AUTHORIZED REPRESENTATIVE) DATE SIGNED 10-28-01 C-57 LICENSE NUMBER 458647

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

WELL DATA SHEET (Page 1 of 2)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.		
** Indicates items required for Source Water Assessment*		
*** Indicates additional items required for assessments and Ground Water Rule*		
	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name GEYSERVILLE WATER WORKS		*from DHS database*
System Number 4910024		*from DHS database*
Source of Information *(well log, DHS/County files, system, etc)*		
Organization Collecting Information *(DHS, County, System, other)*	SYSTEM	
Date Information Collected/Updated		
WELL IDENTIFICATION		
* Well Number or Name	WELL #3	*from DHS database*
* DHS Source Identification Number (FRDS ID No.)		
DWR Well Log on File? ("YES" or "NO")		
State Well Number (from DWR)		
Well Status (Active, Standby, Inactive)		*from DHS database*
WELL LOCATION		
Latitude 38° 42.64 N		*from DHS database*
Longitude 122° 54.21 W		*from DHS database*
Ground Surface Elevation (ft above Mean Sea Level)	206.59	
Street Address	21148 R.R. AVE.	
Nearest Cross Street	HWY 128	
City	GEYSERVILLE	
County	SONOMA	
* Neighborhood/Surrounding Area *(see Note 1)*	AG / GRAPES	
Site plan on file? ("YES" or "NO")	YES	
DWR Ground Water Basin RUSSIAN RIVER		*to come from DWR*
DWR Ground Water Sub-basin		*to come from DWR*
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)	400 FT	
Distance to Active Wells (ft)	1000	
Distance to Abandoned Wells (ft)	500	
Distance to Surface Water (ft)	13	
** Size of controlled area around well (square feet)	7100	
* Type of access control to well site *(fencing, building, etc)*	BUILDING	
* Surface Seal? (Concrete slab)("YES", "NO" or "UNKNOWN")	YES	
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	5 X 5 X 6	
* Within 100 year flood plain? ("YES", "NO" or "UNKNOWN")	YES	
* Drainage away from well? ("YES" or "NO")	YES	
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*	BUILDING	
Floor material	CONCRETE	
Located in Pit? ("YES" or "NO")	NO	
Pit depth (feet) (if applicable)		
WELL CONSTRUCTION		
Date drilled	JUNE - OCT 2001	
Drilling Method	CABLE TOOL	
Depth of Bore Hole (feet below ground surface)	120	
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning Depth/Ending Depth; 3rd Casing, etc.	0 / 52 0 / 120	
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	20 ; 16	
Casing Material; 2nd Casing Material; 3rd Casing, etc.	STEEL	

WELL DATA SHEET (Page 2 of 2)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.		
** Indicates items required for Source Water Assessment*		
*** Indicates additional items required for assessments and Ground Water Rule*		
	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
WELL CONSTRUCTION (continued)		
Conductor casing used? ("YES", "NO" or "UNKNOWN") *(See Note 2)*	YES	
Conductor casing removed? ("YES", "NO" or "UNKNOWN")	YES	
* Depth to highest perforations/screens (ft below surface) (or "UNKNOWN")	52	
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	52 / 120	
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)* (or "UNKNOWN")	68	
* Annular Seal?("YES", "NO" or "UNKNOWN") *(See Note 3)*	YES	
* Depth of Annular Seal (ft)	52	
Material of Annular Seal *(cement grout, bentonite, etc.)*	CEMENT	
Gravel pack, Depth to top (ft below ground surface)		
Total length of gravel pack (ft)		
AQUIFER		
* Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*	SAND, SILT, CLAY GRAVEL	
* Effective porosity (decimal percent) *(default = 0.2)* (or "UNKNOWN")		
* Confining layer (Impervious Strata) above aquifer? ("YES", "NO" or "UNKNOWN")		
Thickness of confining layer, if known (ft)		
Depth to confining layer, if known (ft below ground)		
* Static water level (ft below ground surface)	13	
Static water level measurement: Date/Method	8-02 RESISTANCE	
Pumping water level (ft below ground surface)	65	
Pumping water level measurement: Date/Method	8-02 RESISTANCE	
WELL PRODUCTION		
Well Yield (gpm)	200	
Well Yield Based On (i.e., pump test, etc.)	PUMP TEST	
Date measured	8-02	
Is the well metered? ("YES" or "NO")	YES	
Production (gallons per year) 20M EST.		
Frequency of Use (hours/year) 1825 EST.		
Typical pumping duration (hours/day) 5 EST.		
PUMP		
Make	GOULDS	
Type	SUBMERSIBLE	
Size (hp)	20	
* Capacity (gpm)	200	
Depth to suction intake (ft below ground surface)	100	
Lubrication Type	SEALED	
Type of Power: *(i.e., electric, diesel, etc.)*	ELECTRIC	
Auxiliary power available? ("YES" or "NO")	YES	
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	SCADA	
Pump to Waste capability? ("YES" or "NO")	YES	
Discharges to: *(i.e., distribution system, storage, etc.)*	DISTR. SYSTEM	
REMARKS AND DEFECTS (use additional sheets as necessary)		

BARTLEY PUMP
SANTA ROSA, CA

REF. NO. _____

WELL TEST RECORD

ite 1-29-02
wner Greyserville Water Works
ocation of Well Greyserville / Railroad Ave.
ell Age New
eported Depth 112'
ther information

W. O. NO. 21443
Well Diameter 16"
Measured Depth 116'

Date	Time	W/L Feet	Cap GPM	Inclination ↕ ↔	Remarks
1-29-02	0905	13'			Start-UP
" "	0920	60'	350		Muddy-
" "	1020	60'	350	↔	Muddy / Clearing-up
" "	1120	93'	~~300~~ 350	200 ↓	Brownish- Sanged
" "	1200	94'	~~400~~ 350	200 ↓	Brown - Sanged
" "	1230	94'	~~350~~ 350	200 ↔	Brownish/Sanged
" "	1300	94'	~~350~~ 350	200 ↔	Brownish/Sanged
" "	1330	94'	~~350~~ 350	200 ↔	Brownish / Clearing-up/Sanged
" "	1400	94'	~~350~~ 350	200 ↔	Clearing - Sanged - Brownish
" "	1430	94'	~~350~~ 350	200 ↔	Clearing - Sanged - Brownish
" "	1500	94'	~~350~~ 350	200 ↔	Sanged - Brownish
" "	1530	74'	Approx 150-200	↑	Lowered RPMs to bring up level for night.
	Engine	was	ran all	night.	
1-30-02	0830	93'	200	↔	Clearing
" "	0930	93'	200	↔	Clear
	1030	Changed out tube to flow meter			
" "	1100	74'	200		Brownish
" "	1130	74'	200	↔	Sanged - Brown/Clear
" "	1200	74'	200	↔	Clearing
" "	1230	74'	200	↔	Clear

t Pump Type Engine driven turbine
t Pump Setting 96'
hod of Measurement Well tester

certify that the above information is correct to the best of our knowledge belief.

FOR BARTLEY PUMP, INC.

BARTLEY PUMP
SANTA ROSA, CA

REF. NO. _____

WELL TEST RECORD

ite 1-30-02 W. O. NO. 21443
wner Geyserville Water Works
ocation of Well Rail Road Ave., Geyserville
ell Age New Well Diameter 16"
eported Depth 112 Measured Depth 116'
ther information

Date	Time	W/L Feet	Cap GPM	Inclination ↔ ↕	Remarks
1-30-02	1300	74'	700	↔	Clean- Accelerate RPMS to ma 250 gpm. Drawdown to 94' then loose GPM to 200.
" "	1330	74'	200	↔	
" "	1400	74'	200	↔	Put 25 PSI backpressure to make 250 gpm. Would not hold, Had to go back to 74' with 200 gpm, w/ 0 backpressure.
" "	1430	74'	200	↔	
	1445	Shut-Down			

t Pump Type _____
t Pump Setting _____
hod of Measurement _____

ertify that the above information is correct to the best of our knowledge belief.

_____
FOR BARTLEY PUMP, INC.

BARTLEY PUMP
SANTA ROSA, CA

REF. NO. _____

WELL TEST RECORD

ate 2-14-02 W. O. NO. 21443
wner GEYSERVILLE WATER CO
ocation of Well RAILROAD AVE, GEYSERVILLE
all Age NEW Well Diameter 16"
eported Depth 116 FT Measured Depth 116 FT
ther information

Date	Time	W/L Feet	Cap GPM	Inclination ↑ ↓ ← →	Remarks
2-14-02	12:30	16 FT	300	↓	MUDDY
	12:40	95 FT	225	↓	MUDDY - BREAKING SUCTION
	12:50	75 FT	200	↑	CLEARING -
	12:55	—	—	—	SURGE WELL
	1:00	16 FT	250	↓	MUDDY
	1:15	75	215	↓	CLEARING
	1:40	75	215	→	CLOUDY
	2:15	75	215	→	CLOUDY
	2:30	—	—	—	SURGE WELL
	2:40	16 FT	250	↓	CLOUDY
	3:00	75 FT	215	↓	CLOUDY
	3:05	75 FT	215	→	CLOUDY
	3:08	—	—	—	SURGE WELL
	3:15	16 FT	250	↓	CLOUDY
	3:20	75 FT	215	→	CLOUDY
	3:25	75 FT	216	→	CLOUDY
	3:30	END	TEST		

t Pump Type ENGINE DRIVEN TURBINE
t Pump Setting 96 FT
ıod of Measurement FLOW METER

ertify that the above information is correct to the best of our knowledge belief.

Kurt Kehrlein
FOR BARTLEY PUMP, INC.

BARTLEY PUMP
SANTA ROSA, CA

REF. NO. _____

WELL TEST RECORD

ite 2-15-02 W. O. NO. 21443
ner GEYSERVILLE WATER CO
cation of Well RAILROAD AVE, GEYSERVILLE
ll Age NEW Well Diameter 16"
ported Depth 116 FT Measured Depth 116 FT
her information

Date	Time	W/L Feet	Cap GPM	Inclination ↑ ← → ↓	Remarks
2-15-02	11:30	16 FT	—	→	START TEST
	11:35	75 FT	210	↓	CLOUDY
	11:50	75 FT	200	→	CLOUDY
	12:20	60 FT	190	↑	CLOUDY
	12:40	70 FT	200	↓	CLOUDY
	1:10	75 FT	210	↓	CLOUDY → CLEAR
	1:15	SURGE WELL		→	MUDDY
	1:30	65 FT	210	↓	MUDDY
	2:00	70 FT	210	↓	MUDDY
	2:30	70 FT	210	→	MUDDY - CLEARING -
	3:00	70 FT	200	→	CLOUDY
	3:10	70 FT	200	→	CLOUDY - CLEARING -
	3:20	70 FT	200	→	CLEARING
	3:25		END	TEST	

t Pump Type ENGINE DRIVEN TURBINE
t Pump Setting 96 FT
hod of Measurement FLOW METER

certify that the above information is correct to the best of our knowledge belief.

FOR BARTLEY PUMP, INC.

Appendix B

Well #1 Constant Rate Test

EATON PUMPS
SALES & SERVICE

CONTRACTOR'S LICENSE #133783 C57 A C61/D21
10 W. KENTUCKY AVE. • WOODLAND, CA 95695
(530) 661-6737 • FAX (530) 661-6747

July 24, 2017

TNT Industrial
3600 51st. Ave
Sacramento, CA 95823

RE: California American Water
Geyserville, CA Well Test

Dear Dave,

Eaton Pump has completed the 8 hour constant rate test for the Well #01 located in Geyserville California as per request. The data was collected as directed taking water level readings every 15 minutes for 8 hours and recovery water levels for 8 hours.

The following data is for your review;

SWL: 20 Feet
PWL @ 8 Hours 22.17 Feet
GPM: 200 GPM
YEILD: 92.2 gpf.
SAND: .01 ppm

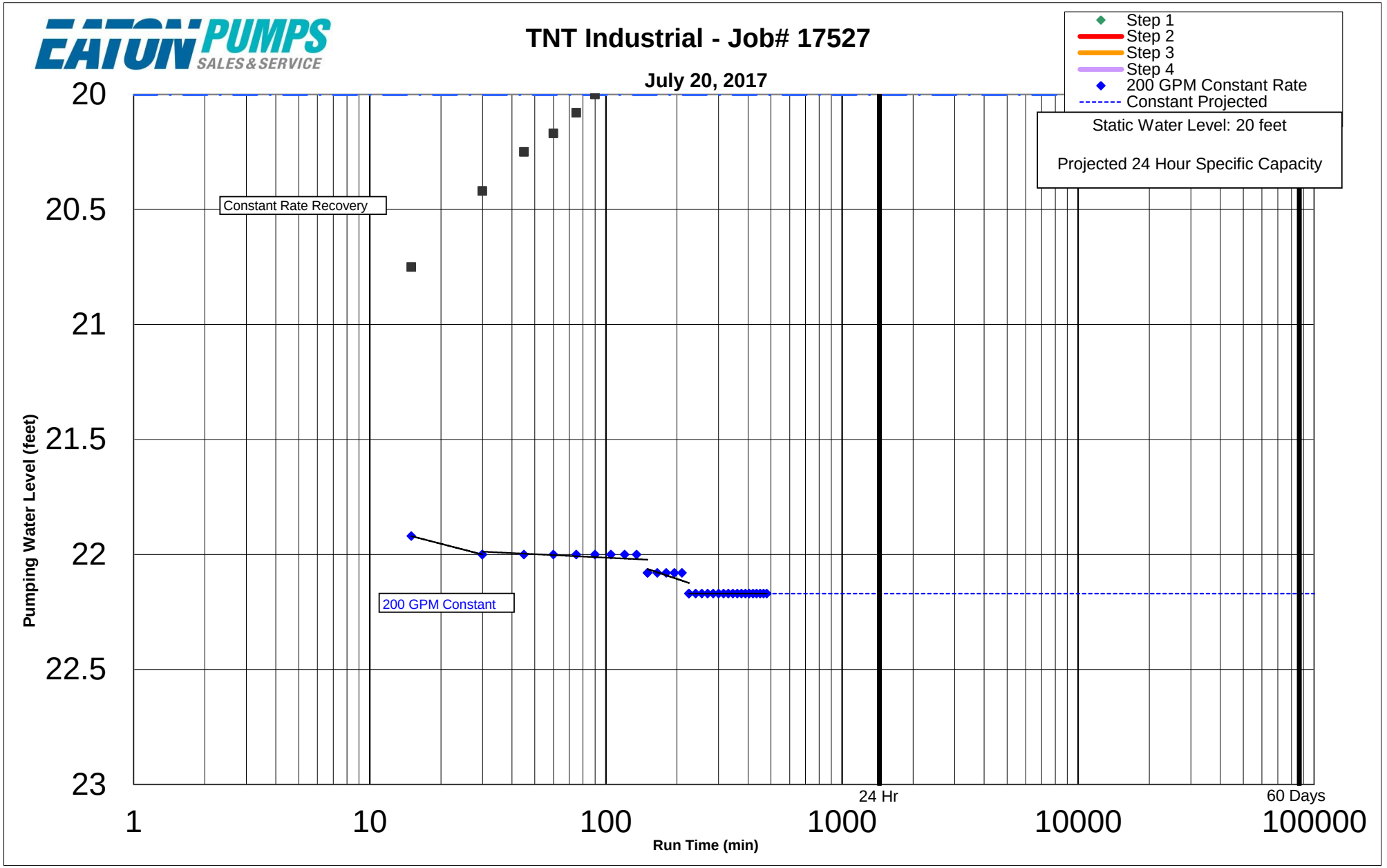
I have attached a drawdown graph and data sheet for your examination.

If you have any further questions or concerns please give me a call. My office number (530) 661-6737 Mobile (530) 908-1266.

Thank you,

E. N. Vincent

Eric N. Vincent
Attachments


EATON PUMPS
SALES & SERVICE
TNT Industrial - Job# 17527
July 20, 2017
Step 1
Step 2
Step 3
Step 4
200 GPM Constant Rate
Constant Projected
Static Water Level: 20 feet
Projected 24 Hour Specific Capacity
Constant Rate Recovery
200 GPM Constant
Pumping Water Level (feet)
20
20.5
21
21.5
22
22.5
23
1
10
100
1000
10000
100000
24 Hr
60 Days
Run Time (min)

EATON PUMPS
SALES & SERVICE

Job Name:	TNT Industrial
Job Number:	17527
Well Number:	0
Testing Dates:	July 20, 2017 - July 20, 2017

Static Water Level: 20 Feet

Step Test Results

GPM	PWL	Yield	24 Hr *Projected* PWL	24 Hr *Projected* Yield	$/kW H: HP Motor	$0.15 $/Acre Ft	Sand	Notes

Constant Rate Test Results

200	22.17	92.2	22.17	92.2	2	$ 6.08	0.0 ppm	

Step Test Results

Static Water Level : 20

	GPM		GPM		GPM		GPM
1		1		1		1	
2		2		2		2	
3		3		3		3	
4		4		4		4	
5		5		5		5	
6		6		6		6	
7		7		7		7	
8		8		8		8	
9		9		9		9	
10		10		10		10	
11		11		11		11	
12		12		12		12	
14		14		14		14	
16		16		16		16	
18		18		18		18	
20		20		20		20	
25		25		25		25	
30		30		30		30	
35		35		35		35	
40		40		40		40	
45		45		45		45	
50		50		50		50	
60		60		60		60	
70		70		70		70	
80		80		80		80	
90		90		90		90	
100		100		100		100	
120		120		120		120	

Constant Rate

SWL: 20

200	GPM
15	21.92
30	22
45	22
60	22
75	22
90	22
105	22
120	22
135	22
150	22.08
165	22.08
180	22.08
195	22.08
210	22.08
225	22.17
240	22.17
255	22.17
270	22.17
285	22.17
300	22.17
315	22.17
330	22.17
345	22.17
360	22.17
375	22.17
390	22.17
405	22.17
420	22.17
435	22.17
450	22.17
465	22.17
480	22.17

***Projected* 24 Hour Specific Capacity**

200 Constant Rate	92.2	gpm/ft dd
Step		gpm/ft dd
Step		gpm/ft dd
Step		gpm/ft dd
Step		gpm/ft dd

Recovery Results

Step		Constant Rate	
RWL:		RWL:	
1		15	20.75
2		30	20.42
3		45	20.25
4		60	20.17
5		75	20.08
10		90	20
15			
20			
30			
40			
50			
60			

Appendix C

Theis Calculation

THEIS EQUATION ANALYSIS

Well #1 Pump Test Calibration

INTERA

By: **K. Vilker**

Date: **4/10/2025**

Answer :

Static Water Level (bgs) =	20	feet
Drawdown =	**2.17**	feet
Pumping Water Level =	22.2	feet

u = 3.74E-07

Thickness (b)	**52**	ft
Flow (Q)	**200**	gpm
Flow (Q)	288000	gpd
Transmissivity (T)	**150,000**	gpd/ft
Transmissivity (T)	20053.476	ft^2/day
Radius	**0.1**	feet
Storativity	**1.0.E+00**	unitless
Time	**0.3333333**	days
Hydraulic Conductivity	385.64377	ft/day

CALCULATIONS

u = *3.74E-07*

IF u <= 1 THEN W(u) = *14.22181*

IF u > 1 THEN W(u) = *180889.16*

u = *14.22181*

DRAWDOWN IN OB. WELL = *2.1730926* *2.174034713*

TOTAL VOLUME PUMPED = *107.52* *ac-ft/yr*

0.0011202 *conversion gal to ft & day to yr.*

THEIS EQUATION ANALYSIS

Well #4 Hypothetical Impacts at Distance

INTERA

By: **K. Vilker**

Date: **4/10/2025**

Answer :

Static Water Level =	20	feet
Drawdown =	**0.02**	feet
Pumping Water Level =	20.02	feet

u = 1.5583333

Thickness (b)	**52**	ft
Flow (Q)	**300**	gpm
Flow (Q)	432000	gpd
Transmissivity (T)	**150,000**	gpd/ft
Transmissivity (T)	20053.476	ft^2/day
Radius	**500**	feet
Storativity	**1.0.E+00**	unitless
Time	**2**	days
Hydraulic Conductivity	385.64377	ft/day

CALCULATIONS

u = *1.5583333*

IF u <= 1 THEN W(u) = *0.0916237*

IF u > 1 THEN W(u) = *0.0917483*

u = *0.0917483*

DRAWDOWN IN OB. WELL = *0.0210287* *0.021037837*

TOTAL VOLUME PUMPED = *967.68* *ac-ft/yr*

0.0011202 *conversion gal to ft & day to yr.*

THEIS EQUATION ANALYSIS

Well #3 Pumping Data Calibration

INTERA

By: **K. Vilker**

Date: **4/10/2025**

Answer :

Static Water Level (bgs) =	37.9	feet
Drawdown =	**69.62**	feet
Pumping Water Level =	107.5	feet

u = 5.291E-05

Thickness (b)	**58**	ft
Flow (Q)	**193**	gpm
Flow (Q)	277920	gpd
Transmissivity (T)	**2,945**	gpd/ft
Transmissivity (T)	393.71658	ft^2/day
Radius	**0.1**	feet
Storativity	**1.0.E+00**	unitless
Time	**0.12**	days
Hydraulic Conductivity	6.7882169	ft/day

CALCULATIONS

u =	*5.291E-05*		
IF u <= 1 THEN W(u) =	*9.2696852*		
IF u > 1 THEN W(u) =	*1280.2648*		
u =	*9.2696852*		
DRAWDOWN IN OB. WELL =	*69.618012*		*69.64819241*
TOTAL VOLUME PUMPED =	*37.352448*	*ac-ft/yr*	
	0.0011202	*conversion gal to ft & day to yr.*	

THEIS EQUATION ANALYSIS

Well #4 Hypothetical Impacts at Distance

INTERA

By: **K. Vilker**

Date: **4/10/2025**

Answer :

Static Water Level =	37.9	feet
Drawdown =	**0.00**	feet
Pumping Water Level =	37.90	feet

u = 79.371817

Thickness (b)	**58**	ft
Flow (Q)	**300**	gpm
Flow (Q)	432000	gpd
Transmissivity (T)	**2,945**	gpd/ft
Transmissivity (T)	393.71658	ft^2/day
Radius	**500**	feet
Storativity	**1.0.E+00**	unitless
Time	**2**	days
Hydraulic Conductivity	6.7882169	ft/day

CALCULATIONS

u =	*79.371817*		
IF u <= 1 THEN W(u) =	*3102321.4*		
IF u > 1 THEN W(u) =	*4.209E-37*		
u =	*4.209E-37*		
DRAWDOWN IN OB. WELL =	*4.914E-36*		*4.91619E-36*
TOTAL VOLUME PUMPED =	*967.68*	*ac-ft/yr*	
	0.0011202	*conversion gal to ft & day to yr.*	

Appendix D

Site-Specific Soils Report

United States Department of Agriculture

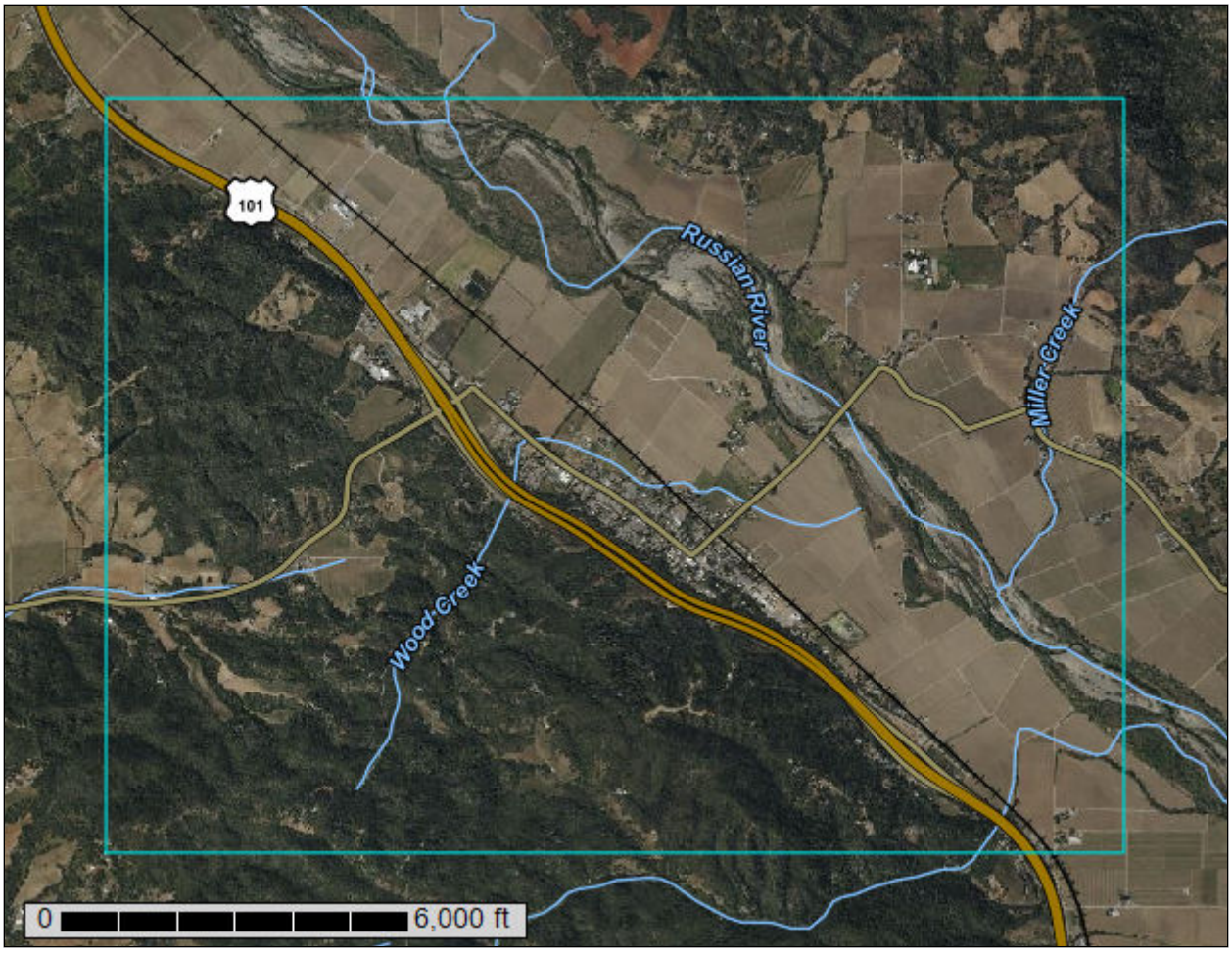
NRCS

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 Sonoma County, California

Geyserville



November 26, 2024

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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Contents

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.

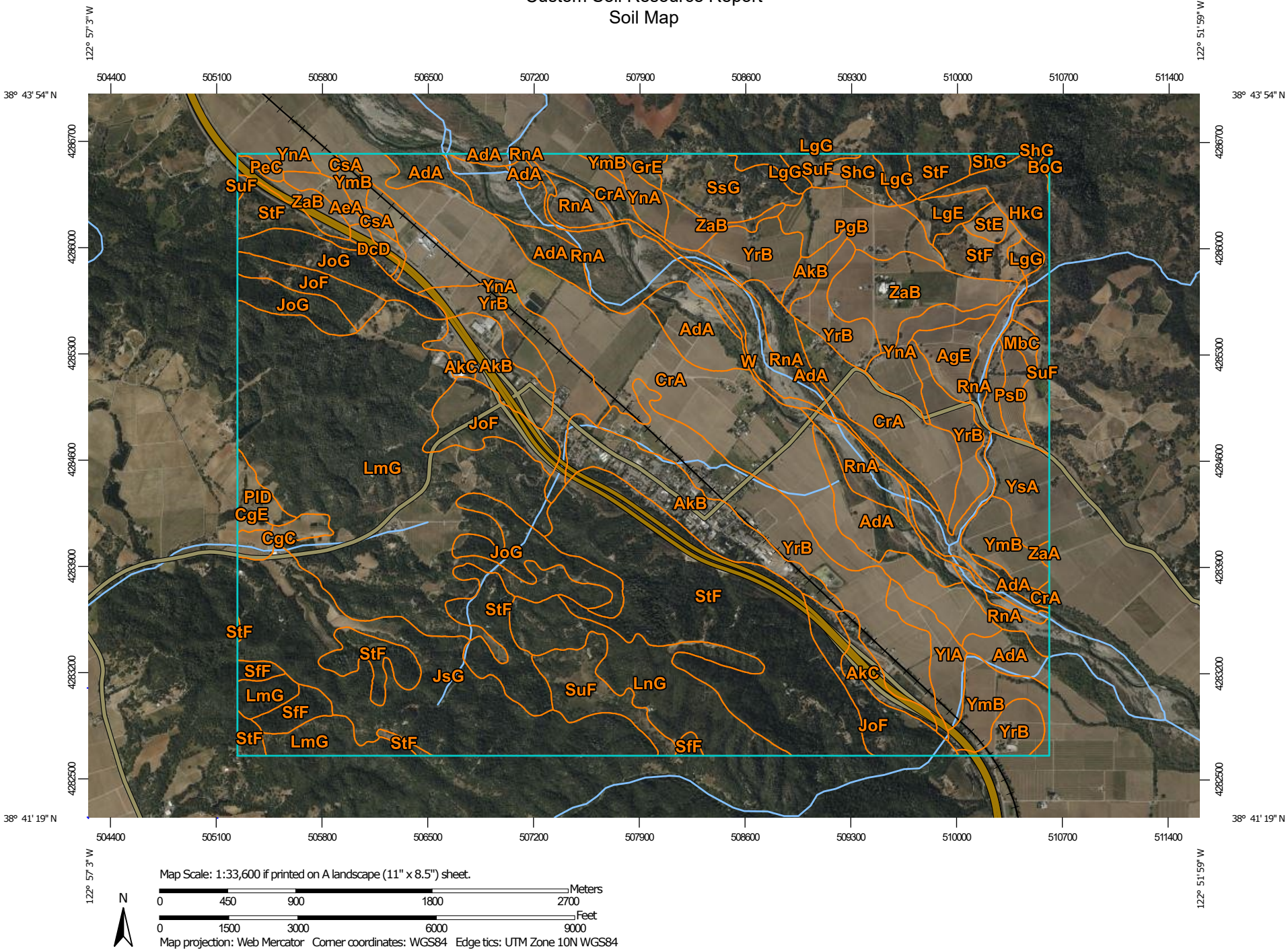
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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 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 1:20,000.

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: Sonoma County, California
Survey Area Data: Version 18, Sep 8, 2024

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

Date(s) aerial images were photographed: Mar 26, 2022—Apr 25, 2022

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
AdA	Alluvial land, sandy	262.4	5.0%
AeA	Alluvial land, clayey	24.5	0.5%
AgE	Arbuckle gravelly sandy loam, 15 to 30 percent slopes	39.9	0.8%
AkB	Arbuckle gravelly loam, 0 to 5 percent slopes	200.7	3.8%
AkC	Arbuckle gravelly loam, 5 to 9 percent slopes	34.0	0.6%
BoG	Boomer loam, 50 to 75 percent slopes	2.1	0.0%
CgC	Clough gravelly loam, 2 to 9 percent slopes	23.1	0.4%
CgE	Clough gravelly loam, 15 to 30 percent slopes	5.5	0.1%
CrA	Cortina very gravelly sandy loam, 0 to 2 percent slopes	563.2	10.7%
CsA	Cortina very gravelly loam, 0 to 2 percent slopes	12.1	0.2%
DcD	Dibble clay loam, deep, 5 to 26 percent slopes, MLRA 15	10.0	0.2%
GrE	Guenoc gravelly silt loam, 5 to 30 percent slopes	9.2	0.2%
HkG	Hugo very gravelly loam, 50 to 75 percent slopes	61.0	1.2%
JoF	Josephine loam, 30 to 50 percent slopes	170.4	3.2%
JoG	Josephine loam,50 to 75 percent slopes	162.0	3.1%
JsG	Josephine-Sites loams, 30 to 75 percent slopes	341.7	6.5%
LgE	Laughlin loam, 2 to 30 percent slopes	26.4	0.5%
LgG	Laughlin loam, 50 to 75 percent slopes	35.3	0.7%
LmG	Los Gatos gravelly loam, 30 to 75 percent slopes	770.0	14.6%
LnG	Los Gatos-Josephine complex, 30 to 75 percent slopes	161.4	3.1%
MbC	Manzanita gravelly silt loam, 0 to 9 percent slopes	11.2	0.2%
PeC	Pleasanton loam, 2 to 9 percent slopes, MLRA 14	5.8	0.1%
PgB	Pleasanton gravelly loam, 2 to 5 percent slopes	78.1	1.5%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
PlD	Pleasanton-Haire complex, 9 to 15 percent slopes	20.1	0.4%
PsD	Positas gravelly loam, 9 to 15 percent slopes	22.3	0.4%
RnA	Riverwash	311.3	5.9%
SfF	Sites loam, 30 to 50 percent slopes	35.3	0.7%
ShG	Sobrante loam, 50 to 75 percent slopes	28.9	0.5%
SsG	Supan silt loam, 30 to 75 percent slopes	73.9	1.4%
StE	Suther loam, 15 to 30 percent slopes	12.3	0.2%
StF	Suther loam, 30 to 50 percent slopes	631.6	11.9%
SuF	Suther-Laughlin loams, 15 to 50 percent slopes	115.0	2.2%
W	Water	51.0	1.0%
YlA	Yolo sandy loam, 0 to 2 percent slopes	44.5	0.8%
YmB	Yolo sandy loam, overwash, 0 to 5 percent slopes	113.0	2.1%
YnA	Yolo loam, 0 to 10 percent slopes, moist, MLRA 14	186.0	3.5%
YrB	Yolo gravelly loam, 0 to 8 percent slopes, MLRA 14	409.0	7.7%
YsA	Yolo silt loam, 0 to 5 percent slopes, MLRA 14	55.1	1.0%
ZaA	Zamora silty clay loam, moist, 0 to 2 percent slopes, MLRA 14	17.7	0.3%
ZaB	Zamora silty clay loam, moist, 0 to 8 percent slopes, MLRA 14	149.9	2.8%
Totals for Area of Interest		**5,287.1**	**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.

Sonoma County, California

AdA—Alluvial land, sandy

Map Unit Setting

National map unit symbol: hf9s
Elevation: 200 to 800 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 59 to 61 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Alluvial land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Alluvial Land

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 10 inches: gravelly sand
H2 - 10 to 60 inches: stratified very gravelly coarse sand to sand

Properties and qualities

Slope: 0 to 5 percent
Drainage class: Somewhat excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Frequency of flooding: Occasional
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydric soil rating: Yes

Minor Components

Unnamed

Percent of map unit: 15 percent
Hydric soil rating: No

AeA—Alluvial land, clayey

Map Unit Setting

National map unit symbol: hf9t
Elevation: 200 to 800 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 59 to 61 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Alluvial land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Alluvial Land

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 10 inches: clay loam
H2 - 10 to 30 inches: stratified clay loam to clay
H3 - 30 to 60 inches: stratified very gravelly sand to sand

Properties and qualities

Slope: 0 to 2 percent
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Frequency of flooding: Occasional
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydric soil rating: Yes

Minor Components

Unnamed

Percent of map unit: 15 percent
Hydric soil rating: No

AgE—Arbuckle gravelly sandy loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: hf9x
Elevation: 100 to 1,600 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Arbuckle

Setting

Landform: Terraces, hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 6 inches: gravelly sandy loam
H2 - 6 to 27 inches: loam
H3 - 27 to 72 inches: gravelly clay loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R014XG924CA - Loamy Upland
Hydric soil rating: No

Minor Components

Haire

Percent of map unit: 8 percent
Hydric soil rating: No

Clough

Percent of map unit: 7 percent
Hydric soil rating: No

AkB—Arbuckle gravelly loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hf9y
Elevation: 100 to 1,600 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Arbuckle

Setting

Landform: Terraces, hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 6 inches: gravelly loam
H2 - 6 to 27 inches: loam
H3 - 27 to 72 inches: gravelly clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R014XG924CA - Loamy Upland
Hydric soil rating: No

Minor Components

Haire

Percent of map unit: 7 percent
Hydric soil rating: No

Pleasanton

Percent of map unit: 7 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

AkC—Arbuckle gravelly loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: hf9z
Elevation: 100 to 1,600 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Arbuckle

Setting

Landform: Terraces, hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 6 inches: gravelly loam
H2 - 6 to 27 inches: loam

H3 - 27 to 72 inches: gravelly clay loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R014XG924CA - Loamy Upland
Hydric soil rating: No

Minor Components

Haire

Percent of map unit: 8 percent
Hydric soil rating: No

Pleasanton

Percent of map unit: 7 percent
Hydric soil rating: No

BoG—Boomer loam, 50 to 75 percent slopes

Map Unit Setting

National map unit symbol: hfbc
Elevation: 600 to 5,500 feet
Mean annual precipitation: 30 to 60 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 120 to 260 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: Hills, mountains
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from metavolcanics

Typical profile

H1 - 0 to 19 inches: loam
H2 - 19 to 37 inches: clay loam
H3 - 37 to 55 inches: gravelly clay loam
H4 - 55 to 65 inches: weathered bedrock

Properties and qualities

Slope: 50 to 75 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): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F004BK103CA - Upper slopes and higher elevation mountains
Hydric soil rating: No

Minor Components

Josephine

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

Hugo

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

Red hill

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

CgC—Clough gravelly loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hfbn
Elevation: 200 to 1,000 feet
Mean annual precipitation: 35 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 200 to 250 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Clough

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Gravelly alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: gravelly loam
H2 - 10 to 23 inches: very gravelly clay
H3 - 23 to 38 inches: indurated
H4 - 38 to 60 inches: stratified very gravelly loam to very cobbly loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches; 20 to 40 inches to duripan
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: R015XD129CA - SHALLOW LOAMY UPLANDS
Hydric soil rating: No

Minor Components

Positas

Percent of map unit: 8 percent
Hydric soil rating: No

Manzanita

Percent of map unit: 7 percent
Hydric soil rating: No

CgE—Clough gravelly loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: hfbq
Elevation: 200 to 1,000 feet
Mean annual precipitation: 35 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Clough

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Gravelly alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: gravelly loam
H2 - 10 to 23 inches: very gravelly clay
H3 - 23 to 38 inches: indurated
H4 - 38 to 60 inches: stratified very gravelly loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches; 20 to 40 inches to duripan
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R015XD129CA - SHALLOW LOAMY UPLANDS
Hydric soil rating: No

Minor Components

Positas

Percent of map unit: 8 percent
Hydric soil rating: No

Haire

Percent of map unit: 7 percent
Hydric soil rating: No

CrA—Cortina very gravelly sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hfc1
Elevation: 30 to 2,400 feet
Mean annual precipitation: 8 to 40 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 250 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Cortina

Setting

Landform: Flood plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 7 inches: very gravelly sandy loam
H2 - 7 to 60 inches: stratified very gravelly loamy sand to very gravelly loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: R014XG907CA - Loamy Bottom
Hydric soil rating: No

Minor Components

Yolo

Percent of map unit: 7 percent
Hydric soil rating: No

Cole

Percent of map unit: 7 percent
Hydric soil rating: No

Riverwash

Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

CsA—Cortina very gravelly loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hfc2
Elevation: 30 to 2,400 feet
Mean annual precipitation: 8 to 40 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 250 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Cortina

Setting

Landform: Flood plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 7 inches: very gravelly loam
H2 - 7 to 60 inches: stratified very gravelly loamy sand to very gravelly loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: R014XG907CA - Loamy Bottom
Hydric soil rating: No

Minor Components

Yolo

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

Cole

Percent of map unit: 4 percent
Hydric soil rating: No

Riverwash

Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: Yes

Zamora

Percent of map unit: 3 percent
Hydric soil rating: No

DcD—Dibble clay loam, deep, 5 to 26 percent slopes, MLRA 15

Map Unit Setting

National map unit symbol: 2xc9r
Elevation: 240 to 750 feet
Mean annual precipitation: 38 to 47 inches
Mean annual air temperature: 58 to 59 degrees F
Frost-free period: 292 to 313 days
Farmland classification: Not prime farmland

Map Unit Composition

Dibble, deep, and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dibble, Deep

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 sedimentary rock

Typical profile

A1 - 0 to 6 inches: clay loam
A2 - 6 to 12 inches: clay loam
Bt1 - 12 to 22 inches: clay
Bt2 - 22 to 50 inches: clay
Bt3 - 50 to 56 inches: clay loam
Cr - 56 to 66 inches: bedrock

Properties and qualities

Slope: 5 to 26 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 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)
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R015XD126CA - LOAMY UPLAND
Hydric soil rating: No

Minor Components

Spreckels

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

Laughlin

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

Montara

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

GrE—Guenoc gravelly silt loam, 5 to 30 percent slopes

Map Unit Setting

National map unit symbol: hfdj
Elevation: 400 to 3,000 feet
Mean annual precipitation: 25 to 50 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 260 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Guenoc

Setting

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

Typical profile

H1 - 0 to 17 inches: gravelly silt loam
H2 - 17 to 38 inches: gravelly clay
H3 - 38 to 44 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 30 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R015XD126CA - LOAMY UPLAND
Hydric soil rating: No

Minor Components

Supan
Percent of map unit: 4 percent
Hydric soil rating: No

Rock outcrop
Percent of map unit: 4 percent
Hydric soil rating: No

Boomer
Percent of map unit: 4 percent
Hydric soil rating: No

Spreckels
Percent of map unit: 3 percent
Hydric soil rating: No

HkG—Hugo very gravelly loam, 50 to 75 percent slopes

Map Unit Setting
National map unit symbol: hff4
Elevation: 800 to 3,000 feet
Mean annual precipitation: 60 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

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

Description of Hugo

Setting
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sedimentary rock

Typical profile
H1 - 0 to 8 inches: very gravelly loam
H2 - 8 to 31 inches: gravelly sandy clay loam
H3 - 31 to 48 inches: gravelly clay loam
H4 - 48 to 59 inches: weathered bedrock

Properties and qualities
Slope: 50 to 75 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 high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F004BK102CA - Fog-influenced, low elevation mountain slopes
Hydric soil rating: No

Minor Components

Josephine

Percent of map unit: 4 percent
Hydric soil rating: No

Laughlin

Percent of map unit: 4 percent
Hydric soil rating: No

Maymen

Percent of map unit: 4 percent
Hydric soil rating: No

Atwell

Percent of map unit: 3 percent
Hydric soil rating: No

JoF—Josephine loam, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hfft
Elevation: 1,200 to 5,000 feet
Mean annual precipitation: 50 inches
Mean annual air temperature: 55 degrees F
Frost-free period: 125 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Josephine

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 13 inches: gravelly loam
H2 - 13 to 35 inches: gravelly clay loam
H3 - 35 to 45 inches: gravelly fine sandy loam
H4 - 45 to 59 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 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 high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R014XG924CA - Loamy Upland
Hydric soil rating: No

Minor Components

Boomer

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

Hugo

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

Laughlin

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

JoG—Josephine loam,50 to 75 percent slopes

Map Unit Setting

National map unit symbol: hffw
Elevation: 1,200 to 5,000 feet
Mean annual precipitation: 50 inches
Mean annual air temperature: 55 degrees F
Frost-free period: 125 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Josephine

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 13 inches: gravelly loam
H2 - 13 to 25 inches: gravelly clay loam
H3 - 25 to 36 inches: gravelly fine sandy loam
H4 - 36 to 59 inches: weathered bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F004BK103CA - Upper slopes and higher elevation mountains
Hydric soil rating: No

Minor Components

Boomer
Percent of map unit: 4 percent
Hydric soil rating: No

Laughlin
Percent of map unit: 4 percent
Hydric soil rating: No

Hugo
Percent of map unit: 4 percent
Hydric soil rating: No

Mendocino
Percent of map unit: 3 percent
Hydric soil rating: No

JsG—Josephine-Sites loams, 30 to 75 percent slopes

Map Unit Setting
National map unit symbol: hffx
Elevation: 600 to 5,000 feet
Mean annual precipitation: 30 to 85 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 125 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition
Josephine and similar soils: 50 percent
Sites and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Josephine

Setting
Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sedimentary rock

Typical profile
H1 - 0 to 13 inches: gravelly loam
H2 - 13 to 25 inches: gravelly clay loam
H3 - 25 to 36 inches: gravelly fine sandy loam
H4 - 36 to 59 inches: weathered bedrock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F004BK103CA - Upper slopes and higher elevation mountains
Hydric soil rating: No

Description of Sites

Setting

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

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 9 inches: clay loam
H3 - 9 to 44 inches: clay
H4 - 44 to 55 inches: clay loam
H5 - 55 to 59 inches: weathered bedrock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 55 to 59 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F004BK103CA - Upper slopes and higher elevation mountains
Hydric soil rating: No

Minor Components

Hugo

Percent of map unit: 10 percent
Hydric soil rating: No

LgE—Laughlin loam, 2 to 30 percent slopes

Map Unit Setting

National map unit symbol: hfgl
Elevation: 800 to 3,500 feet
Mean annual precipitation: 35 to 70 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 240 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Laughlin

Setting

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

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 25 inches: sandy clay loam
H3 - 25 to 35 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 30 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R004BY065CA - SHALLOW LOAMY UPLANDS
Hydric soil rating: No

Minor Components

Hugo

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

Yorkville

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

Suther

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

LgG—Laughlin loam, 50 to 75 percent slopes

Map Unit Setting

National map unit symbol: hfgn
Elevation: 800 to 3,500 feet
Mean annual precipitation: 35 to 70 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 240 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Laughlin

Setting

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

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 22 inches: sandy clay loam
H3 - 22 to 32 inches: unweathered bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R004BY067CA - STEEP SHALLOW LOAMY UPLANDS
Hydric soil rating: No

Minor Components

Hugo

Percent of map unit: 4 percent
Hydric soil rating: No

Suther

Percent of map unit: 4 percent
Hydric soil rating: No

Maymen

Percent of map unit: 4 percent
Hydric soil rating: No

Yorkville

Percent of map unit: 3 percent
Hydric soil rating: No

LmG—Los Gatos gravelly loam, 30 to 75 percent slopes

Map Unit Setting

National map unit symbol: hfgs
Elevation: 600 to 4,000 feet
Mean annual precipitation: 25 to 70 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Los Gatos

Setting

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

Typical profile

H1 - 0 to 7 inches: gravelly loam
H2 - 7 to 25 inches: gravelly clay loam
H3 - 25 to 35 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R015XD131CA - VERY SHALLOW
Hydric soil rating: No

Minor Components

Hugo

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

Maymen

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

Boomer

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

LnG—Los Gatos-Josephine complex, 30 to 75 percent slopes

Map Unit Setting

National map unit symbol: hfgt
Elevation: 600 to 5,000 feet
Mean annual precipitation: 25 to 70 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 125 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Los gatos and similar soils: 70 percent
Josephine and similar soils: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Los Gatos

Setting

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

Typical profile

H1 - 0 to 7 inches: gravelly loam
H2 - 7 to 25 inches: gravelly clay loam
H3 - 25 to 35 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R015XD131CA - VERY SHALLOW
Hydric soil rating: No

Description of Josephine

Setting

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

Typical profile

H1 - 0 to 13 inches: gravelly loam
H2 - 13 to 25 inches: gravelly clay loam
H3 - 25 to 36 inches: gravelly fine sandy loam
H4 - 36 to 59 inches: weathered bedrock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R004BY068CA - VERY SHALLOW
Hydric soil rating: No

Minor Components

Unnamed

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

MbC—Manzanita gravelly silt loam, 0 to 9 percent slopes

Map Unit Setting

National map unit symbol: hfh5
Elevation: 1,000 to 1,600 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 230 to 250 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Manzanita

Setting

Landform: Terraces, alluvial fans
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Alluvium derived from basic igneous rock

Typical profile

H1 - 0 to 4 inches: gravelly silt loam
H2 - 4 to 29 inches: clay loam
H3 - 29 to 47 inches: gravelly clay loam
H4 - 47 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R014XG918CA - Loamy Fan
Hydric soil rating: No

Minor Components

Yolo

Percent of map unit: 4 percent
Hydric soil rating: No

Haire

Percent of map unit: 4 percent
Hydric soil rating: No

Zamora

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

PeC—Pleasanton loam, 2 to 9 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2x52v
Elevation: 120 to 3,440 feet
Mean annual precipitation: 19 to 44 inches
Mean annual air temperature: 58 to 60 degrees F
Frost-free period: 240 to 340 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Pleasanton

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 21 inches: loam
Bt1 - 21 to 33 inches: clay loam
Bt2 - 33 to 45 inches: very gravelly clay loam
C - 45 to 55 inches: clay loam
2C - 55 to 79 inches: stratified very gravelly clay

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R014XG918CA - Loamy Fan
Hydric soil rating: No

Minor Components

Zamora

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Arbuckle

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Yolo

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

PgB—Pleasanton gravelly loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: hfhp
Elevation: 2,400 feet
Mean annual precipitation: 25 inches
Mean annual air temperature: 59 degrees F
Frost-free period: 260 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Pleasanton

Setting

Landform: Alluvial fans, terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 27 inches: gravelly loam
H2 - 27 to 72 inches: gravelly clay loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R014XG912CA - Loamy Terrace
Hydric soil rating: No

Minor Components

Yolo

Percent of map unit: 4 percent
Hydric soil rating: No

Arbuckle

Percent of map unit: 4 percent
Hydric soil rating: No

Zamora

Percent of map unit: 4 percent
Hydric soil rating: No

Cortina

Percent of map unit: 3 percent
Hydric soil rating: No

PID—Pleasanton-Haire complex, 9 to 15 percent slopes

Map Unit Setting

National map unit symbol: hfht
Elevation: 20 to 2,400 feet
Mean annual precipitation: 20 to 45 inches
Mean annual air temperature: 54 to 59 degrees F
Frost-free period: 260 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Pleasanton and similar soils: 60 percent
Haire and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pleasanton

Setting

Landform: Alluvial fans, terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 27 inches: gravelly loam
H2 - 27 to 72 inches: gravelly clay loam

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R014XG912CA - Loamy Terrace
Hydric soil rating: No

Description of Haire

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 12 inches: gravelly loam
H2 - 12 to 36 inches: clay
H3 - 36 to 60 inches: very gravelly clay loam

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R014XG912CA - Loamy Terrace
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 10 percent
Hydric soil rating: No

PsD—Positas gravelly loam, 9 to 15 percent slopes

Map Unit Setting

National map unit symbol: hfhw
Elevation: 30 to 1,500 feet
Mean annual precipitation: 18 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 260 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Positas

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous and sedimentary rock

Typical profile

H1 - 0 to 12 inches: gravelly loam
H2 - 12 to 24 inches: clay loam

H3 - 24 to 52 inches: gravelly clay
H4 - 52 to 60 inches: gravelly clay

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R014XG911CA - Dry Loamy Terrace
Hydric soil rating: No

Minor Components

Pleasanton

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

Clough

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

Haire

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

RnA—Riverwash

Map Unit Setting

National map unit symbol: hfj7
Elevation: 700 to 2,900 feet
Mean annual precipitation: 8 to 15 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Riverwash

Setting

Landform: Flood plains
Parent material: Sandy and gravelly alluvium

Typical profile

H1 - 0 to 6 inches: very gravelly sand
H2 - 6 to 60 inches: stratified very gravelly coarse sand to very gravelly sand

Properties and qualities

Slope: 0 to 2 percent
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

Minor Components

Unnamed

Percent of map unit: 15 percent
Hydric soil rating: No

SfF—Sites loam, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hfjk
Elevation: 600 to 5,000 feet
Mean annual precipitation: 25 to 70 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 260 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Sites

Setting

Landform: Hills
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from metasedimentary rock

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 9 inches: clay loam
H3 - 9 to 30 inches: clay
H4 - 30 to 40 inches: clay loam
H5 - 40 to 59 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F004BK103CA - Upper slopes and higher elevation mountains
Hydric soil rating: No

Minor Components

Hugo

Percent of map unit: 4 percent
Hydric soil rating: No

Boomer

Percent of map unit: 4 percent
Hydric soil rating: No

Josephine

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

ShG—Sobrante loam, 50 to 75 percent slopes

Map Unit Setting

National map unit symbol: hfjn
Elevation: 120 to 3,500 feet
Mean annual precipitation: 15 to 50 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Sobrante

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from igneous and metamorphic rock

Typical profile

H1 - 0 to 7 inches: loam
H2 - 7 to 20 inches: clay loam
H3 - 20 to 26 inches: weathered bedrock
H4 - 26 to 36 inches: unweathered bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R015XD130CA - STEEP SHALLOW LOAMY UPLANDS
Hydric soil rating: No

Minor Components

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

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

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

SsG—Supan silt loam, 30 to 75 percent slopes

Map Unit Setting
National map unit symbol: hfk5
Elevation: 120 to 3,500 feet
Mean annual precipitation: 15 to 50 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 270 days
Farmland classification: Not prime farmland

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

Description of Supan

Setting
Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from basic igneous rock

Typical profile
H1 - 0 to 8 inches: silt loam
H2 - 8 to 39 inches: clay loam
H3 - 39 to 49 inches: unweathered bedrock

Properties and qualities
Slope: 30 to 75 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R015XD116CA - STEEP LOAMY
Hydric soil rating: No

Minor Components

Sobrante

Percent of map unit: 3 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 3 percent
Hydric soil rating: No

Guenoc

Percent of map unit: 3 percent
Hydric soil rating: No

Boomer

Percent of map unit: 3 percent
Hydric soil rating: No

Toomes

Percent of map unit: 3 percent
Hydric soil rating: No

StE—Suther loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: hfk6
Elevation: 300 to 3,000 feet
Mean annual precipitation: 40 inches
Mean annual air temperature: 55 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Suther

Setting

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

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 14 inches: clay loam
H3 - 14 to 36 inches: gravelly clay
H4 - 36 to 59 inches: weathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R015XD115CA - CLAYPAN
Hydric soil rating: No

Minor Components

Laughlin

Percent of map unit: 4 percent
Hydric soil rating: No

Josephine

Percent of map unit: 4 percent
Hydric soil rating: No

Hugo

Percent of map unit: 4 percent
Hydric soil rating: No

Yorkville

Percent of map unit: 3 percent
Hydric soil rating: No

StF—Suther loam, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hfk8
Elevation: 300 to 3,000 feet
Mean annual precipitation: 40 inches
Mean annual air temperature: 55 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Suther

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 14 inches: clay loam
H3 - 14 to 36 inches: gravelly clay
H4 - 36 to 59 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R015XD134CA - STEEP CLAYPAN
Hydric soil rating: No

Minor Components

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

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

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

SuF—Suther-Laughlin loams, 15 to 50 percent slopes

Map Unit Setting
National map unit symbol: hfk9
Elevation: 300 to 3,500 feet
Mean annual precipitation: 35 to 70 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition
Suther and similar soils: 60 percent
Laughlin and similar soils: 35 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Suther

Setting
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile
H1 - 0 to 3 inches: loam
H2 - 3 to 14 inches: clay loam
H3 - 14 to 36 inches: gravelly clay
H4 - 36 to 59 inches: weathered bedrock

Properties and qualities
Slope: 15 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R015XD134CA - STEEP CLAYPAN
Hydric soil rating: No

Description of Laughlin

Setting

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

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 22 inches: sandy clay loam
H3 - 22 to 32 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R004BY067CA - STEEP SHALLOW LOAMY UPLANDS
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

YlA—Yolo sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hfkq
Elevation: 30 to 400 feet
Mean annual precipitation: 16 to 22 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 240 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Yolo

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 15 inches: sandy loam
H2 - 15 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well 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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R014XG917CA - Dry Loamy Fan
Hydric soil rating: No

Minor Components

Cortina

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

Zamora

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

Pajaro

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

YmB—Yolo sandy loam, overwash, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hfkr
Elevation: 0 to 3,500 feet
Mean annual precipitation: 12 to 30 inches
Mean annual air temperature: 59 degrees F
Frost-free period: 200 to 350 days
Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

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

Description of Yolo

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile
H1 - 0 to 8 inches: sandy loam
H2 - 8 to 60 inches: loam

Properties and qualities
Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups
Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Ecological site: R014XG918CA - Loamy Fan
Hydric soil rating: No

Minor Components

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

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

Pleasanton
Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

YnA—Yolo loam, 0 to 10 percent slopes, moist, MLRA 14

Map Unit Setting
National map unit symbol: 2w89n

Elevation: 10 to 850 feet
Mean annual precipitation: 25 to 57 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Yolo, Moist

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

Ap - 0 to 6 inches: loam
A - 6 to 24 inches: silt loam
C1 - 24 to 45 inches: silt loam
C2 - 45 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.3 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 12.4 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R014XG907CA - Loamy Bottom
Hydric soil rating: No

Minor Components

Cortina

Percent of map unit: 5 percent

Cole

Percent of map unit: 5 percent

Bale

Percent of map unit: 5 percent

YrB—Yolo gravelly loam, 0 to 8 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2w89g
Elevation: 90 to 510 feet
Mean annual precipitation: 31 to 52 inches
Mean annual air temperature: 58 to 60 degrees F
Frost-free period: 240 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Yolo

Setting

Landform: Alluvial fans, flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

Ap - 0 to 8 inches: gravelly loam
C - 8 to 60 inches: loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.3 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R014XG918CA - Loamy Fan
Hydric soil rating: No

Minor Components

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

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

Zamora
Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

YsA—Yolo silt loam, 0 to 5 percent slopes, MLRA 14

Map Unit Setting
National map unit symbol: 2w8b0
Elevation: 30 to 790 feet
Mean annual precipitation: 31 to 54 inches
Mean annual air temperature: 56 to 60 degrees F
Frost-free period: 240 to 260 days
Farmland classification: Prime farmland if irrigated

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

Description of Yolo

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from volcanic and sedimentary rock

Typical profile
Ap - 0 to 8 inches: silt loam
C - 8 to 60 inches: loam

Properties and qualities
Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline (0.3 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R014XG918CA - Loamy Fan
Hydric soil rating: No

Minor Components

Pajaro

Percent of map unit: 5 percent

Cortina

Percent of map unit: 5 percent

Pleasanton

Percent of map unit: 5 percent

ZaA—Zamora silty clay loam, moist, 0 to 2 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2xcbw
Elevation: 20 to 260 feet
Mean annual precipitation: 27 to 43 inches
Mean annual air temperature: 58 to 59 degrees F
Frost-free period: 288 to 325 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Zamora

Setting

Landform: Alluvial fans, stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Alluvium derived from volcanic and sedimentary rock

Typical profile

A1 - 0 to 5 inches: silty clay loam
A2 - 5 to 17 inches: clay loam
A3 - 17 to 29 inches: clay loam
Bt1 - 29 to 41 inches: clay loam
Bt2 - 41 to 55 inches: sandy clay loam
Bt3 - 55 to 60 inches: gravelly clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.2 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Cole

Percent of map unit: 4 percent
Hydric soil rating: No

Yolo

Percent of map unit: 4 percent
Hydric soil rating: No

Pajaro

Percent of map unit: 3 percent
Hydric soil rating: No

Cortina

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

ZaB—Zamora silty clay loam, moist, 0 to 8 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2xcc1
Elevation: 20 to 350 feet
Mean annual precipitation: 29 to 44 inches
Mean annual air temperature: 58 to 60 degrees F
Frost-free period: 280 to 323 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Zamora

Setting

Landform: Alluvial fans, stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Convex, concave
Parent material: Alluvium derived from volcanic and sedimentary rock

Typical profile

A1 - 0 to 5 inches: silty clay loam
A2 - 5 to 17 inches: clay loam
A3 - 17 to 29 inches: clay loam
Bt1 - 29 to 41 inches: clay loam
Bt2 - 41 to 55 inches: sandy clay loam
Bt3 - 55 to 60 inches: gravelly clay

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 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)
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Yolo

Percent of map unit: 6 percent
Hydric soil rating: No

Cortina

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

Pajaro

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

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