NORTH BAY | CIVIL CONSULTING **Attachment 5**

Technical Memorandum
For
Flying O Farm
Cultivation Operations

Project Name: Flying O Farm

Project Location: 11540 Bachelor Valley Road, Witter Springs, CA 95493

Risk Level: Tier 2 Low

Client: Alex Rashed

Prepared By: Matthew Klein, CA P.E. 79674, Senior Project Manager

Date: May 1, 2024

Contents

INTRODUCTION AND PURPOSE

The intent of this hydrology technical memorandum is to analyze the ground water supply for the above-named project in accordance with the Lake County Board of Supervisors Urgency Ordinance 3106 (Ordinance 3106). Requiring land use applicants to provide enhanced water analysis during a declared drought emergency. Ordinance 3106 requires that all projects that require a CEQA analysis of water use include the following items in a Hydrology Report prepared by a licensed professional experienced in water resources:

- Approximate amount of water available for the project's identified water source,
- Approximate recharge rate for the project's identified water source, and
- Cumulative impact of water use to surrounding areas due to the project.

The purpose of this Technical Memorandum (TM) is to provide the information required by Ordinance 3106 for UP 19-11, Flying O Farm. In addition to the Hydrology Report, Ordinance 3106 requires a Drought Management Plan (DMP) depicting how the applicant proposes to reduce water use during a declared drought emergency.

PROJECT LOCATION

The project is located at 11540 Bachelor Valley Road, Witter Springs, CA 95493 (APN: 002-024-22). The project site is located approximately 2.2-miles North of Tule Lake.

PROJECT OVERVIEW

Existing Conditions

The existing conditions of the project site includes one cabin, two main residences, one garage and five barns. The site is mainly undeveloped and is covered with native grass, pasture land, and a few trees. Per the Envirostor website and the State's GeoTracker database, there are no known historic sources of contamination at the site or within 10,000 feet of the project site. The aforementioned project's proposed cannabis cultivation water source will be a well located on the property just southeast of the cultivation area. The well has an estimated yield of 15 gpm per the well test conducted by Pollack Sons & Pump on April 11, 2022. The project site's sheet flow currently flows in a south-westerly direction towards Cooper Creek. Stormwater is conveyed through surface runoff and flows across natural vegetation creating a vegetative buffer between discharge area and watercourses. Stormwater discharge at all locations on the site are not considered direct discharges into the creek, as defined by the State Water Board. The property varies in slope, ranging from 0%-20%. The project parcel ranges in elevation from 1380-1470 feet above mean sea level (Information derived from Google Earth). The location where cannabis cultivation will occur slopes roughly at 0%-6%. Existing site vegetation, topography, drainage patterns, stormwater conveyance systems, and watercourses are shown on the Overall Site Plan submitted to the County of Lake.

The area that will be utilized for the proposed cannabis operation consists of Still loam, stratified substratum. The site is underlain by loam and clay loam. The Soil Analysis reference for the proposed cultivation area can be found in Appendix B.

Proposed Conditions

The project is proposing 1 acre of medium outdoor cannabis cultivation. This project proposes a number of site improvements to ensure that the cultivation site meets all local and state regulations and guidelines. The proposed improvements consist of a security fence, security system, employee parking, trash bins, storage sheds, portable toilets, etc. Plants are to be planted in above ground planter bags or raised planter beds. The limits of the canopy and cultivation area are shown on the Overall Site Plan that was submitted to the County of Lake.

PROJECT WATER DEMAND

The CalCannabis Environmental Impact Report (CDFA, 2017) uses a conservative estimate of 6.0 gpd per plant and assumes that there are approximately 500 plants per acre of canopy. The demand is 3,000 gpd (2.1 gallons per minute [gpm]) per acre of canopy; this use rate is more conservative with the Water Use Management Plan section (Section 12) of the project’s Property Management Plan. The total water demand for 1.0 acres of outdoor canopy is approximately as follows:

Water Demand Calculations:

- Daily – 3,000 gpd (2.09 gpm)
- Annually (Cultivation Season)
  i. 180-day cultivation season (1 acre) – 1.66 acre-feet (AF)
     - Typical for Outdoor plants.
- Total Demand for 1 acre of Outdoor – 1.66 acre-feet (AF)

WATER SOURCE AND SUPPLY

There is one (1) existing permitted groundwater well that will be used for all cultivation activities. The well is located approximately (Lat/Long, 39.19775°, -122.975215°). The well has a surface elevation of 1400-feet and is approximately 75 feet deep. A well test was performed by Pollack Sons & April 11, 2022, in which the static water level was at 26-feet below the ground surface prior to pumping, Appendix A. The well test that was performed, checked the static water level initially, after 2 hours, after 4 hours, and after 24 hours. Using USGS topography, the well has initial and static water level elevation of approximately 1374-feet.

The well was estimated to have a yield of 15 gpm (24.2 acre-feet per year). The potential daily demand of 2.09 gpm represents 14% of the maximum well yield and 6.8% production in acre-feet. Assuming the well will produce an average of 9 gpm consistently over the year, we anticipate that the well will be pumping for 8.5 hours a day. Leaving 15.5 hours per day for the well to recharge.

IRRIGATION AND WATER STORAGE

Irrigation for the cultivation operation will use water supplied by the existing well. The irrigation water would be pumped from the well via PVC piping to (8) 2,500-gallon water storage tanks, totaling 20,000 gallons of water storage and then delivered to a drip irrigation system. The drip lines will be sized to irrigate the cultivation areas at a rate slow enough to maximize absorption and prevent runoff.

GROUNDWATER BASIN INFORMATION AND HYDROGEOLOGY

The well site is located nearest to the Middle Creek groundwater basin (Basin #5-014). Middle Creek groundwater basin groundwater level information is not available resulting in an incomplete understanding of the ground water levels (CDM). Based on the hydraulic continuity and geology of Middle Creek groundwater basin, the California Department of Water Resource describes Middle Creek groundwater basin to likely be similar to the Upper Lake Groundwater Basin (DWR Bulletin 118). Therefore the Upper Lake groundwater basin (Basin #5-013) will be assumed.

The well is approximately 3 miles Northeast of the basin boundary (Appendix D). Thus, it is likely the well does not draw from the Upper Lake groundwater basin, but for this report it will be assumed that the well will depend on the Upper Lake groundwater basin for the site's irrigation. According to the California Department of Water Resources (DWR), the major source of recharge is from Middle Creek, Clover Creek and Alley Creek (DWR Bulletin 118).

The Upper Lake Basin is northwest of the northern end of Clear Lake. The Upper Lake Basin is composed of three valleys: Middle Creek Valley, Clover Valley, and Bachelor Valley. Middle Creek and Clover Valleys are in the Middle Creek Inventory Unit and are bordered to the east and north by the Franciscan Formation and to the west by Lower Cretaceous Marine rocks. Bachelor Valley is in the Scott's Creek Inventory Unit and is bounded primarily by the Franciscan Formation and by Middle Creek Valley to the east.

The Upper Lake Basin is composed primarily of Quaternary alluvial deposits and Pliestocene terrace, Pliestocene lake and floodplain deposits. The alluvium, lake and floodplain deposits fill the valleys and contain nearly all water yielded to wells. The Quantum alluvial deposits include channel alluvium, fan deposits, and older alluvium consisting of gravel, sand, and fines (ESA 1978). The active channels of Middle Creek, Alley Creek, and Clover Creek, and all other smaller creeks that drain the area around the Upper Lake Basin are underlain by uncemented gravel and sand, with silt and clay lenses. The Pliestocene terrace deposits border the west and northwest sides of Middle Creek Valley and exist as isolated remnants above the valley floor. The Pliestocene lake and floodplain deposits consist of fine-grained lacustrine sediments and coarser grained floodplain deposits that underlie the valley floors of Middle, Clover, and Alley creeks DWR Bulletin 118).

Evaluation of the groundwater levels in the Upper Lake Basin are swallow and have stayed constant from spring to spring. Water levels in the basin are within 10 feet below ground surface on average in the spring. The general direction of groundwater flow in Upper Lake Basin is southward toward Clear Lake. In Clover Valley, groundwater moves to the northwest, towards Middle Creek. The Department of Water Resources estimated 9000-acre feet of storage capacity and 5,000 acre feet of useable storage capacity in 1957. Average-year agricultural groundwater demand in the Upper Lake basin is roughly 4,000 AF per year.

The Upper Lake groundwater basin has not been identified by the California Department of Water Resources (SGMA 2019) as a critically overdrafted basin. DWR defines critically overdrafted as, “A basin subject to critical overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts." The California Statewide Groundwater Elevation Monitoring (CASGEM) program was developed by DWR to establish a permanent, locally managed system to monitor groundwater elevation in California’s alluvial groundwater basins and subbasins. A statewide ranking system, CASGEM Groundwater Basin Prioritization, was created to prioritize California ground water basins to help assess the need for additional groundwater level monitoring. The rankings for the Groundwater Basin Prioritization are classified into four categories high-priority, medium-priority, low-priority, or very low-priority. The Upper Lake groundwater basin is ranked as very low-priority basins by the California Department of Water Resources (SGMA 2019).

Recharge Rate

The annual recharge rate can be estimated using a water balance equation, where recharge is equal to precipitation (P) minus runoff (Q) and abstractions that do not contribute to infiltration (e.g., evapotranspiration). The equation that can be used to estimate runoff and abstractions, that uses readily available data, is the Natural Resources Conservation Service (NRCS) Curve Number (CN) Method (NRCS, 1986). Determination of the CN depends on the watershed’s soil and cover conditions, cover type, treatment, and hydrologic condition.

The CN Method runoff equation is:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

Where:

- Q = runoff (inches)
- P = rainfall (inches)
- S = potential maximum retention after runoff begins (inches) and
- I_a = initial abstraction (inches)

The initial abstraction (I_a) represents all losses before runoff begins, including initial infiltration, surface depression storage, evapotranspiration, and other factors. The initial abstraction is estimated as

$I_a = 0.2 * S$, S is related to soil and cover conditions of the watershed through the CN, determined as $S = \frac{1000}{CN} - 10$. Using these relations, the runoff equation becomes:

$$Q = \frac{(P - 0.2 * S)^2}{(P + 0.8 * S)}$$

The CN is estimated based on hydrologic soil group (HSG), cover type, condition, and land use over the area of recharge. The area of recharge being an estimate of the area that Upper Lake Basin Watershed contributes to the well. The well has a depth of 75-feet and a static water level elevation 1374-feet, measured when the well was tested in April 2022.

The surface elevations of the Upper Lake Basin Watershed range between a maximum of 1,400-feet and a minimum of 1,100-feet at the outlet.

It will be assumed that the observed well is independent of the basin and accumulates its water from the recharge area located on the Watershed Area Map, Appendix D. Since the project is not in any known basin. It will be assumed that the project will affect the Upper Lake groundwater basin due to its proximity.

The recharge area soils are classified using the NRCS Web Soil Survey. The different classifications of the recharge soils are classified into four Hydrologic Soil Groups (HSGs) A, B, C, and D. The HSGs are used to determine the soil's ability to infiltrate water. HSG A has the highest infiltration potential and HSG D has the lowest infiltration potential. The project's site recharge area is considered to have both HSG C and HSG D. HSG C will be used to provide a more conservative value. The site is undeveloped with a cover type of brush and is in fair condition (50% to 75% ground cover) and has a CN of 79.

The PRISM Climate Group gathers climate observations from a wide range of monitoring networks and provides time series values of precipitation for individual locations (https://prism.oregonstate.edu/explorer/). Using the annual precipitation from 1895 to 2020, as predicted by PRISM, the annual average precipitation over this period is 38.82 inches and the minimum precipitation over this period is 10.38 inches (Appendix C).

Using the above information, and assuming that 50% of the initial abstraction infiltrates and the remainder is evapotranspiration (0.27 inches or 17.88 AF), the estimated annual recharge over the recharge area of 807 acres is 185 AF during an average year and 159 AF during a dry year (Table 1).

Table 1. Estimated annual recharge over the recharge area of the project's well.

	Recharge Area (acres)	**P (inches)**	**CN**	**S (inches)**	**I_a (inches)**	**Q (inches)**	**Recharge = *P - Q - 0.5*I_a* (inches)**	**Recharge (AF)**
Min	807	10.38	79	2.66	0.53	7.76	2.36	158.65
Avg	807	38.82	79	2.66	0.53	35.80	2.75	185.04

CUMULATIVE IMPACT TO SURROUNDING AREAS

The Upper Lake Basin groundwater is accumulated from the mouths and canyons around the periphery (DWR). Upper Lake Basin estimated storage capacity is 9,000 AF and has a usable storage capacity of 5,000 AF. Upper Lake Basin is not considered a critically overdrafted basin according to the California Department of Water Resources (SGMA 2019). The proposed Flying O Farm project's annual water demand could change depending on the length of the cultivation season. The demand is estimated to be 2.09 AF per year, or approximately 1.1% and 1.3% of the annual recharge during an average and dry year, respectively. Flying O Farm would need approximately 0.31 inches of rainfall to infiltrate into the recharge area shown in Appendix D, to satisfy its demand. Thus, there is sufficient recharge, on an annual basis, to meet the project's demand.

The Lake County Groundwater Management Plan (Table 3-1), states that there are 243 domestic wells, 99 irrigation wells, 6 municipal wells, 22 monitoring wells, and 68 others wells in in the Upper Lake Basin. The groundwater demand from agriculture in an average year is 8,257 AF (Table 2-5). The demand from additional proposed cannabis cultivation projects in the Upper Lake Basin is not included in the Lake County Groundwater Management Plan, so the total additional proposed cannabis cultivation is unknown. It will be assumed that new cannabis cultivation could add an additional 15 to 25 acres to the Upper Lake Basin. This additional agricultural demand of the groundwater could increase by 42 AF. With the addition of these new cultivations and the proposed Flying O Farm project, the annual groundwater demand could increase up to 44 AF of the leftover usable storage capacity of the Upper Lake Basin. Therefore, the proposed project water use would have little to no cumulative impact on the agricultural groundwater demand.

QUALIFICATIONS OF AUTHOR

I am a registered Professional Engineer with the State of California with 5-years of experience practicing Water Resources Engineering.

LIMITATIONS

North Bay Civil Consulting is not responsible for the independent conclusions, recommendations, or opinions made by other individuals or agencies based on the well test, research data, topographic mapping, site visit, and interpretations presented in this report.

Hydrogeologic interpretations are based on the drillers' reports which are made available to us through the California department of water resources (DWR), existing geological maps, hydrogeologic findings and professional assessment. This analysis is based on limited hydrogeologic data and therefore relies extensively on individual interpretation of data.

In addition, the passage of time may result in environmental changes, impacting the characteristics at this site and surrounding properties. This report does not guard against future operations or conditions, nor does this allow for operations or conditions present of a type or at a location not investigated.

This report is for the exclusive use of Flying O Farm, their affiliates, designates and assignees. No other party shall have any right to rely on any service provided by North Bay Civil Consulting without prior written consent.

REFERENCES

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APPENDIX A: Well Report & Test

POLLACK & SONS PUMP

707.987.0917
19280 Deer Hill
Hidden Valley Lake
CA., 95467

"Your one stop water shop 24 hours"
Iron and Chlorine Removal
Softeners • Filters • Pumps • Tanks

Name Alex Rasnav (707) Phone
Address Bachelor Vly Rd City Upper Lake 4-11-22
State Calif Zip Date 4-12-22

WATER ANALYSIS

Hardness (lime) gpg. ~~..........~~ Iron (rust) ~~ppm~~
Manganese ppm. ~~..........~~ PH ~~(acid)~~
Gal Per Min. 15 GPM
Well Depth. 75' Casing Size 12" STEEL
Static Level. 26'
Before Pumping. 26'
After Pumping 2 HRS. 55' 4 HRS. 60' 24 HRS. 26'
Water Supply Garden ☒ Private Well ☐ 100' Recovery

EXISTING EQUIPMENT

4-3000 gal TANKS
10 GPM Solar pu
25 GPM " " IN TANK

COMMENTS/RECOMMENDATIONS

100% Recvy IN 24 Hr

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APPENDIX B: NRCS Soil Survey Results

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

Lake County, California

March 18, 2022

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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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.

Soil Map

122° 58' 41" W
122° 58' 7" W
39° 11' 57" N
39° 11' 41" N
501930
502010
502090
502170
502250
502330
502410
502490
502570
502650
4338890
4338810
4338730
4338650
4338570
4338490
4338410
214
233
Bachelor Valley Rd
Soil Map may not be valid at this scale.
N
Map Scale: 1:3,630 if printed on A landscape (11" x 8.5") sheet.
0
50
100
200
300
Meters
0
150
300
600
900
Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Lake County, California
Survey Area Data: Version 18, Sep 6, 2021

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

Date(s) aerial images were photographed: May 8, 2019—May 10, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
214	Sleeper variant-Sleeper loams, 15 to 30 percent slopes	7.0	15.1%
233	Still loam, stratified substratum	39.5	84.9%
Totals for Area of Interest		**46.5**	**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.

Lake County, California

214—Sleeper variant-Sleeper loams, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: hf8c
Elevation: 1,250 to 2,500 feet
Mean annual precipitation: 25 to 40 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 150 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Sleeper, variant, and similar soils: 50 percent
Sleeper and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sleeper, Variant

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 12 inches: loam
H2 - 12 to 37 inches: clay loam
H3 - 37 to 56 inches: clay
H4 - 56 to 75 inches: clay loam
H5 - 75 to 79 inches: bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 75 to 79 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 to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R015XY009CA - Hills 20-40"ppt
Hydric soil rating: No

Description of Sleeper

Setting

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

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 45 inches: clay
H3 - 45 to 55 inches: bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 45 to 49 inches to lithic 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
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R015XY009CA - Hills 20-40"ppt
Hydric soil rating: No

Minor Components

Unnamed

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

Rock outcrop

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

Millsholm

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

233—Still loam, stratified substratum

Map Unit Setting

National map unit symbol: hf8z
Elevation: 600 to 2,000 feet
Mean annual precipitation: 25 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 150 to 205 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Still

Setting

Landform: Alluvial flats
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 52 inches: stratified loam to clay loam
H3 - 52 to 70 inches: stratified extremely gravelly loamy coarse sand to very gravelly sandy 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 (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C
Ecological site: R014XG907CA - Loamy Bottom

Hydric soil rating: No

Minor Components

Cole, variant

Percent of map unit: 2 percent
Hydric soil rating: No

Talmage

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 2 percent
Hydric soil rating: No

Cole

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Kelsey

Percent of map unit: 2 percent
Hydric soil rating: No

Lupoyoma

Percent of map unit: 2 percent
Hydric soil rating: No

Xerofluvents

Percent of map unit: 1 percent
Hydric soil rating: No

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APPENDIX C: Prism Climate Precipitation

PRISM Time Series Data
Location: Lat: 39.2013 Lon: -122.9714 Elev: 2024ft
Climate variable: ppt
Spatial resolution: 4km
Period: 1895 - 2020
Dataset: AN81m
PRISM day definition: 24 hours ending at 1200 UTC on the day shown
Grid Cell Interpolation: Off
Time series generated: 2022-Mar-18
Details: http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf

Date	ppt (inches)
1895	44.46
1896	52.17
1897	37.73
1898	19.93
1899	45.47
1900	30.82
1901	31.26
1902	44.2
1903	33.7
1904	56.02
1905	27.69
1906	46.54
1907	43.1
1908	23.71
1909	57.11
1910	22.27
1911	39.46
1912	32.86
1913	38.26
1914	44.99
1915	52.03
1916	41.33
1917	26.76
1918	30.14
1919	36.74
1920	44.93
1921	33.27
1922	39.97
1923	21.32
1924	29.42
1925	36.52
1926	43.3
1927	43.61
1928	33.5
1929	25.46
1930	23.02

	ppt (inches)
Minimum:	10.38
Average:	38.82
Maximum:	83.15

1931	35.41
1932	19.25
1933	34.16
1934	28.75
1935	34.5
1936	37.85
1937	54.24
1938	45.92
1939	20.05
1940	63.89
1941	61.62
1942	47.1
1943	29.52
1944	38.14
1945	44.14
1946	21.51
1947	25.63
1948	36.37
1949	23.15
1950	46.65
1951	43.6
1952	44.35
1953	35.39
1954	41.02
1955	37.85
1956	32.95
1957	46.17
1958	49.1
1959	27.92
1960	42.58
1961	31.81
1962	38.49
1963	41.99
1964	44.76
1965	36.39
1966	37.01
1967	40
1968	43.43
1969	48.6
1970	56.18
1971	31.66
1972	31.64
1973	55.59
1974	38.36
1975	40.89
1976	15.66
1977	30.33

1978	44.24
1979	48.37
1980	36.43
1981	50.08
1982	54.92
1983	83.15
1984	31.97
1985	24.5
1986	45.77
1987	36.9
1988	27.8
1989	27.34
1990	23.5
1991	29.69
1992	41.01
1993	44.01
1994	29.47
1995	68.41
1996	57.71
1997	38.72
1998	65.91
1999	36.56
2000	35.8
2001	43.07
2002	39.05
2003	46.68
2004	37.51
2005	54.07
2006	46.54
2007	23.83
2008	27.54
2009	25.46
2010	56.85
2011	32.61
2012	47.47
2013	10.38
2014	43.66
2015	25.15
2016	49.81
2017	49.89
2018	32.88
2019	56.34
2020	15.16

APPENDIX D: Maps

0 1 2mi

N S E W

Datum: WGS 1984
Projection: Mercator Auxiliary
Zone:
Units: Mile
Source:

Groundwater Basin Map

Project Location:
11540 Bachelor Valley Road
Witter Springs, CA 95493

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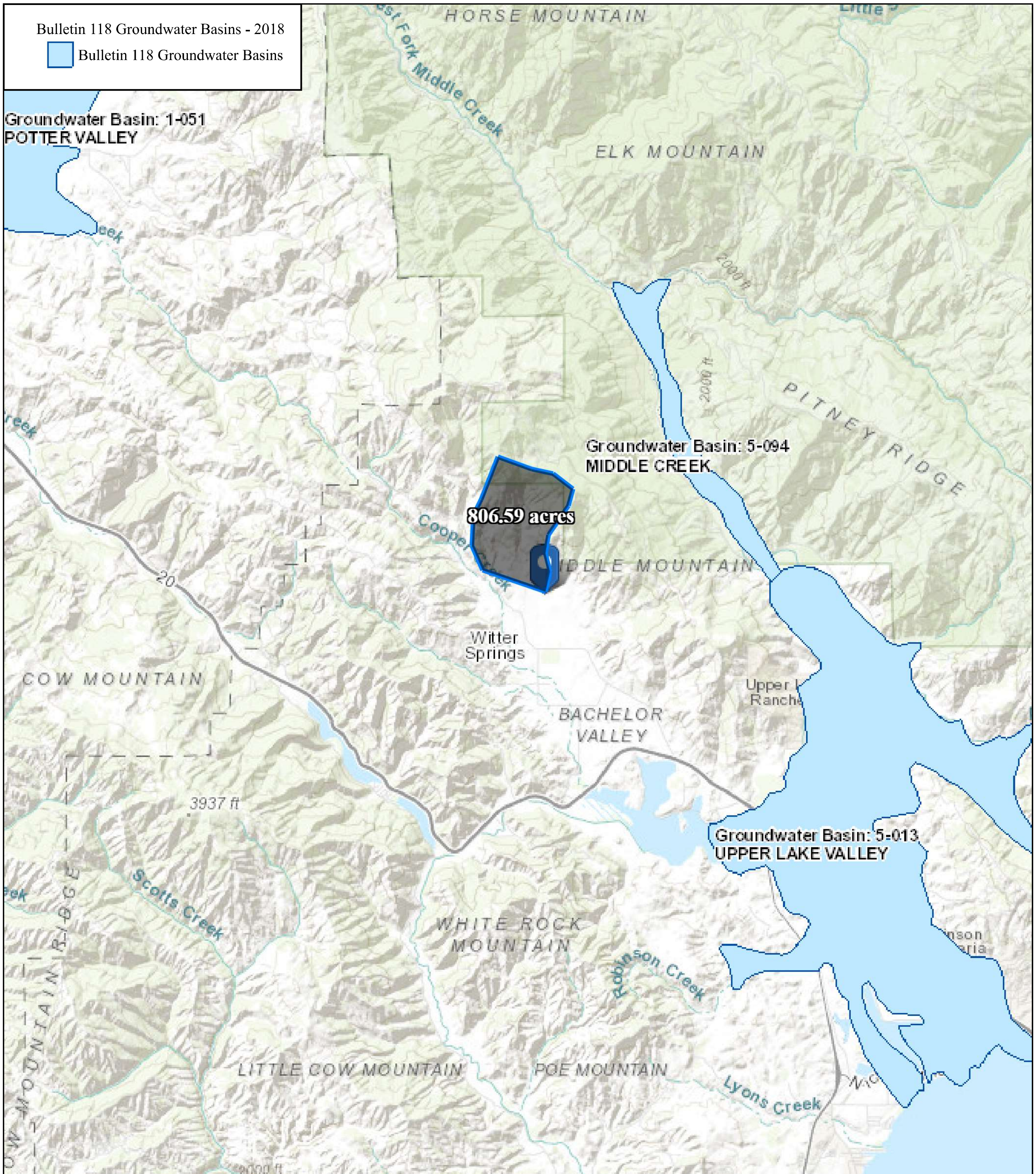
Prepared MK	Figure: 001
Job No.: 20-010	Date: 03/18/2022
File:	



0 1 2mi

N
W E
S

Datum: WGS 1984
Projection: Mercator Auxiliary
Zone:
Units: Mile
Source:

Watershed Area

Project Location:
11540 Bachelor Valley Road
Witter Springs, CA 95493

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Prepared	MK	Figure:	002
Job No.:	20-010	Date:	03/18/2022
File:			