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Water Availability Analysis

Maxville Lake Winery P17-00225-MOD & Conservation Regulations
Exception P18-00189
Planning Commission Hearing August 1, 2018

WATER AVAILABILITY ANALYSIS

FOR

MAXVILLE LAKE WINERY
4105 CHILES POPE VALLEY RD,
ST. HELENA, CA 94574
APN 025-020-023

SUMMIT

CIVIL STRUCTURAL WATER|WASTEWATER ELECTRICAL

SUMMIT ENGINEERING, INC.
463 Aviation Blvd., Suite 200
Santa Rosa, California 95403
707 527-0775

Project No. 2015052
November 04, 2016
Revised: August 31, 2017

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LIST OF ENCLOSURES

WATER AVAILABILITY ANALYSIS

MAXVILLE LAKE WINERY

St. Helena, Napa County, California

PROJECT SUMMARY

Maxville Lake Winery, located at 4105 Chiles Pope Valley Road, St. Helena, CA (APN 025-020-023), is applying for a Use Permit Modification for the existing winery facility to increase wine production from the currently permitted 59,000 average gallons over 3 consecutive years, with a peak of 65,000 gallons, to approximately 240,000 gallons per year, as well as increasing visitation. Summit has prepared the following Water Availability Analysis, which provides a comparison between the proposed water use and the available water capacity on the property.

Total annual water demand at Maxville Lake Winery, associated with the proposed increase in production capacity to 240,000 gallons of wine per year, is estimated to be 35% of the total water availability (Per Napa County Phase I water Availability Analysis method) for the parcel; therefore, the demand should be met with existing Well 01 in combination with two new Wells 03 and 04, operating for 8 hours per day at 21 gpm combined capacity.

SITE DESCRIPTION

The property is located adjacent to Chiles Pope Valley Rd, northeast of the town of St. Helena and south of the town of Pope Valley. The parcel has 247.45 acres, is long and narrow, and runs from northwest to southeast along the floor of Pope Valley. The parcel is relatively flat, aside from the southern edge which runs along the hillside of the valley.

The existing winery facility consists of one winery building on the south end of the parcel, vineyards on the north end of the parcel, Maxville Lake (previously known as Catacula Lake) in the center, and Maxwell Creek, which runs parallel to Chiles Pope Valley Rd across the middle of the parcel, from Maxville Lake to the north end of the parcel.

Water sources for the property consist of groundwater wells, a natural spring, and Maxville Lake. The natural spring is no longer used. The facility has an old well (Well 01) and four new wells that were drilled in 2015 (Wells 02, 03, 04 and 05). Based on the current capacity of the wells, only two of the new wells drilled in 2015 (Well 03 and Well 04) are proposed to be used for domestic and process water supply for the entire facility, in combination with existing Well 01. Maxville Lake is used for vineyard irrigation. The property has an existing pond for process wastewater treatment, an existing pond for fire protection, and an existing Evapotranspiration – Infiltration (ETI) bed for disposal of sanitary sewage.

WATER DEMAND

EXISTNG WATER USES

Current water use at the facility is based on the following needs:

- Process needs for the production capacity of 59,000 gallons per year (65,000 gallons peak year)
- Full Time Employees = 6 per day
- Part Time Employees = 4 per day
- Tasting Visitors = 10 average and 20 maximum per weekday, 30 average and 30 maximum per weekend
- Marketing Event Visitors = 75 maximum per event; 4 events per year
- Irrigation of 98 acres of vineyard
- Irrigation of 2 acres of landscape
- Frost protection

PROPOSED WATER USES

Water use at the facility will be based on the following needs:

- Process needs for the production capacity of 240,000 gallons per year
- Full Time Employees = 15 per day
- Part Time Employees = 9 per day
- Tasting Visitors = 20 average and 25 maximum per weekday, 60 average and 75 maximum per weekend day
- Marketing Event Visitors = 30 maximum per event and 8 events per month (96 events per year)
- Marketing Event Visitors = 95 maximum per event and 2 events per month (24 events per year)
- Marketing Event Visitors = 100 maximum per event (6 events per year)
- Wine Auction Events = 75 maximum per event (2 events per year)
- Commercial kitchen for event meal preparation
- Irrigation of 98 acres of vineyard
- Irrigation of 2 acres of landscape
- Frost protection

WINERY PROCESS WATER DEMAND

Water demand for wine production is expected to correlate to the process wastewater (PW) generated at the facility. Based on typical flow data from wineries of similar size and characteristics, the projected process wastewater generation for the current wine production is calculated as follows:

Current Annual production	=	65,000 gal wine/year
PW generation rate	=	6 gal PW/gal wine[a]
Annual PW Flow	=	65,000 gal wine x 6 gal PW/gal wine
	=	390,000 gal PW/year
Average PW Flow	=	(390,000 gal PW/year) / (365 days)
	=	1,100 gal PW/day
Peak PW Flow	=	(390,000 gal PW/year x 16.4[b] %)/(30 day)
	=	2,200 gal PW/day
Annual Production Water Demand	=	(390,000 gal water/yr.) / (325,851 gal/ac-ft.)
	=	1.20 ac-ft. water/year

[a] Generation rate based on industry standards and water data for similar wineries
[b] Percentage of flows accounted during harvest month of September, based on data for similar wineries

Based on typical flow data from wineries of similar size and characteristics, the projected process wastewater generation for wine production increase is calculated as follows:

Proposed Annual production	=	240,000 gal wine/year
PW generation rate	=	6 gal PW/gal wine[a]
Annual PW Flow	=	240,000 gal wine x 6 gal PW/gal wine
	=	1,440,000 gal PW/year
Average PW Flow	=	(1,440,000 gal PW/year) / (365 days)
	=	4,000 gal PW/day
Peak PW Flow	=	(1,440,000 gal PW/year x 16.4[b] %)/(30 day)
	=	7,900 gal PW/day
Annual Production Water Demand	=	(1,440,000 gal water/yr.) / (325,851 gal/ac-ft.)
	=	4.42 ac-ft. water/year

[a] Generation rate based on industry standards and water data for similar wineries
[b] Percentage of flows accounted during harvest month of September, based on data for similar wineries

The approximate annual water use associated with the existing production capacity is 390,000 gallons of water per year, or 1.2 ac-ft per year. The expected annual water use associated with the proposed production capacity is 1,440,000 gallons per year, or 4.42 ac-ft per year. Winery process water will be provided by Well 1 and the new Wells 3 and 4. See Enclosure B for detailed flows estimates and water demand calculation.

DOMESTIC WATER DEMAND

Domestic water use at the facility is determined based on the total number of employees, daily visitors and event guests. Sanitary Sewage generation is expected to be equivalent to the water demand for domestic uses. Using Napa County Planning, Building and Environmental Services (PBES) Environmental Health Division Table 4 from "Regulations for Design, Construction, and Installation of Alternative Sewage Treatment Systems", annual domestic water usage is estimated as follows:

Table 1. Existing Domestic Water Use at Maxville Lake Winery

Use Type	Maximum Quantity (persons/day)	Water Demand (gal/person)	Daily Demand (gal/day)	Number of Days (days/year)	Annual Water Use (gal/year)
FT Employee	6	15	90	365	32,850
PT Employee	4	15	60	365	21,900
Tasting Visitors (Weekday)	10	3	30	260	7,800
Tasting Visitors (Weekend)	30	3	90	105	9,450
Marketing Event Visitors	75	15	1,125	4	4,500
				Total Water Use	**76,500**
				Average Water use (gpd)[a]	**200**
				Peak Water Use (gpd)[b]	**1,400**
				Total Water Use (ac-ft. /yr.)	**0.23**

[a] Average water use is based on the average sanitary sewage generation which includes employees and average tasting visitor flows. See Enclosure B for calculations.

[b] Peak water use is based on the peak sanitary sewage generation which includes employees and highest marketing event visitors flows. See Enclosure B for calculations.

Table 2. Proposed Domestic Water Use at Maxville Lake Winery

Use Type	Maximum Quantity (persons/day)	Water Demand (gal/person)	Daily Demand (gal/day)	Number of Days (days/year)	Annual Water Use (gal/year)
FT Employee	15	15	225	365	82,125
PT Employee	9	15	135	365	49,275
Tasting Visitors (Weekday)	25	3	75	260	19,500
Tasting Visitors (Weekend)	75	3	225	105	23,625
Marketing Event Visitors	30	15	450	96	43,200
Marketing Event Visitors	95	15	1,425	24	34,200

Marketing Event Visitors	75	15	1,125	2	2,250
Marketing Event Visitors	100	15	1,500	6	9,000
				Total Water Use	**263,175**
				Average Water use (gpd)[a]	**500**
				Peak Water Use (gpd)[b]	**2,500**
				Total Water Use (ac-ft. /yr.)	**0.81**

[a] Average water use is based on the average sanitary sewage generation which includes employees and average tasting visitor flows. See Enclosure B for calculations.
[b] Peak water use is based on the peak sanitary sewage generation which includes employees and highest marketing event visitors flows. See Enclosure B for calculations.

The estimated existing annual domestic water use is 76,500 gallons per year, or 0.23 ac-ft per year. The expected annual domestic water use for the proposed marketing and visitation plan is 263,175 gallons per year, or 0.81 ac-ft. per year. Domestic water demand will be provided by Well 1 and the new groundwater Wells 3 and 4. See Enclosure B for flows estimates and water demand calculation.

IRRIGATION WATER DEMAND

- Vineyard Irrigation

  Water from Maxville Lake is used to irrigate 98 acres of vineyards. No change is proposed to the acreage of vineyard with the Use Permit modification. The estimated use for vineyard irrigation is 175,000 gallons of water per week. It is assumed that vineyard irrigation would not occur during the winter months (12 weeks out of the year)

  (175,000 gal/week) x (40 weeks/yr.) / (325,851 gal/ac-ft.) = 21.48 ac-ft. /yr.

  For comparison, annual vineyard irrigation demand was estimated using a rate of 0.3 ac-ft. per acre of vineyard. Napa County Phase I Water Use Guidelines for vineyard irrigation are 0.2 to 0.5 ac-ft./acre/year.

  98 acres x 0.3 ac-ft./acre/year = 29.4 ac-ft. /yr.

  The most conservative water demand, per Napa County Phase I guidelines will be assumed for vineyard irrigation (29.4 ac-ft. /yr.)

- Landscape Irrigation

  Water from Well 1 is used to irrigate 2 acres of landscape. No change is proposed to the acreage of vineyard with the Use Permit modification. The water demand for landscape irrigation was based on the California Department of Water Resources guidelines for Estimated Total Water Use (ETWU) per year:

$$ETWU = (ETo)(0.62)\left(\frac{PF \times HA}{IE} + SLA\right)$$

Where:

ETWU = Estimated Total Water Use per year (gallons)
ETo = Reference Evapotranspiration (inches)
PF = Plant Factor from WUCOLS (see Section 491)
HA = Hydrozone Area [high, medium, and low water use areas] (square feet)
SLA = Special Landscape Area (square feet)
0.62 = Conversion Factor
IE = Irrigation Efficiency (minimum 0.71)

Assumptions:

- Low water use plant types with a plant factor of 0.2 (native plants, shrubs, etc.)
- Napa reference evapotranspiration of 49.4 per CIMIS, 1999
- Irrigation efficiency of 90% for drip systems or similar

$$ETWU = (49.4 \text{ in/year})\ (0.62)\ \frac{(0.2^{*}\ 87{,}120 \text{ SF})}{0.9} = 593{,}000 \text{ gal/yr.} = 1.82 \text{ ac-ft. /yr.}$$

FROST PROTECTION WATER DEMAND

The facility estimated use for frost protection is 2 million gallons of water per year for the frost season. The frost protection season is assumed to last 60 days per year. Since there is no proposed change to vineyard acreage, frost protection water demand should remain constant.

(2,000,000 gal/yr.) / (325,851 gal/ac-ft.) = 6.14 ac-ft. /yr.

TOTAL WATER DEMAND

Table 3. Total Projected Annual Water Demand

Water Use	Average Gallons per day	Gallons per year	Acre-Feet per year
Wine Production	4,000	1,440,000	4.42
Domestic Use	500	263,175	0.81
Vineyard Irrigation	34,214[a]	9,580,018	29.4
Landscape Irrigation	2,120[a]	593,000	1.82
Frost Protection	33,400[b]	2,000,000	6.14
Total	74,234	13,876,193	42.6

[a] Estimated assuming no irrigation during winter months (280 days of irrigation)
[b] Estimated assuming 60 days of frost season

The total water demand at the facility associated with the proposed production increase is expected to be 42.6 ac-ft. per year, which is equivalent to approximately 13.9 million gallons per year.

Based on the proposed increase in production and employees there is an overall increase in projected water demand of about 3.80 ac-ft/year (see Table 4).

Table 4. Water Demand Comparison

Water Use	Existing (ac-ft)	Proposed (ac-ft)	Difference (ac-ft)
Wine Production	1.20	4.42	3.22
Domestic Use	0.23	0.81	0.58
Vineyard Irrigation	29.4	29.4	0.0
Landscape Irrigation	1.82	1.82	0.0
Frost Protection	6.14	6.14	0.0
Total	38.8	42.6	3.80

TIER I ANALYSIS: WATER USE CRITERIA

Tier I analysis is required for all parcels located within the "All Other Areas" in the WAA draft guidelines. Since Maxville Lake Winery is not located within the Napa Valley floor or MST areas, a Tier I analysis is required. This analysis is intended to estimate the annual recharge during average and dry years.

ESTIMATED RECHARGE

- Method

This analysis will include the estimated annual amount of infiltration from rainwater on the Maxville Lake Winery site. To determine the amount of infiltration onsite, the infiltration rates of the soils were established by the USDA Web Soil Survey (See Enclosure D). These infiltration rates account for soils that are on a steep slope. The mid-point of the infiltration rate range provided by the USDA of each soil was assumed for analysis. Impervious areas and water bodies (such as rivers or lakes) were assumed to have an infiltration rate of 0 in/hr.

The rainfall during average and dry years was determined from NOAA data (Enclosure E) for the number of days each year that have precipitation totals of more than 0.1"/day, 0.5"/day, and 1.0"/day.

If the daily infiltration (in/day) for the soil is greater than 1" per day, all rain that falls on it is assumed to be infiltrated. If the soil's infiltration rate is between 0.5"/day and 0.99"/day, then it was assumed that it will infiltrate its maximum rate during a 1" storm; in this case, the soil was assumed to only infiltrate 0.5" of the storm to be conservative. During a rain event of 0.1" to 0.49", this soil type would infiltrate all of the rain. The example calculation below is for the annual infiltration of "Haire Loam" (0.72 in/day infiltration rate) during an average rain year.

Infiltration During > 1" Event = 0.72 in/day x 12.5 days/year* = 9 inches of filtration

Infiltration During 0.5" to 0.99" Event = 0.5 in/day x 12.1 days/year* = 6.05 inches of filtration

Infiltration During 0.1" to 0.49" Event = 8.7 inches of filtration

Total Yearly Infiltration = ((9 in + 6.05 in + 8.7 in) x 14.4 acres of Haire Loam)/ (12 in/ft.) =28.5 ac-ft. /year

*Per NOAA
The full amount of yearly infiltration for each soil type can be found in Enclosure E, Tier 1 analysis, infiltration calculation tables.

- Results

Based on this analysis, it was estimated that the site will infiltrate approximately 734.6 ac-ft. /year during an average year and 399.9 ac-ft. /year during a 10-year drought from rain. These numbers do not account for the amount of water the vegetation will uptake (evapotranspiration). The amount of water use each year was conservatively estimated to be 42.6 ac-ft. /year. Even if the vegetation uptake is 85% of the infiltrated water during a drought year (a very conservative assumption), the site will still recharge more water (60 ac-ft. /year) to the aquifer than the water demand. This shows that the water use onsite should be less than what should be recharged to the aquifer from rain.

Additionally, treated process wastewater (4.42 ac-ft. /year) will be used for vineyard irrigation and will offset the amount of water demand out of the aquifer. The domestic water (0.81 ac-ft. /year) will be sent to a septic system, where the water used will be recharged through a subsurface drip system.

WATER AVAILABILITY

The total estimated water demand of 42.6 ac-ft. /year represents 11% of the water availability estimated for the facility during a 10 year drought period (399.9 ac-ft. /year).

- Well Water Supply

There are 5 wells on the parcel, as indicated on the attached Site Plan (Enclosure A). Based on the capacity of the new wells drilled, the facility has decided to use wells 01, 03 and 04 for all domestic and process water supply. For more information refer to the well logs and pump test results in Enclosure C.

Well 01 was drilled in 1972 to a depth of 216 feet, and has a 25 ft. annular seal. The well casing is 6 inch diameter steel with perforations from a depth of 60 feet to 216 feet. The estimated well yield in 1972 was 30 gpm for a 2 hour test. The well capacity has decreased over the years to approximately 7 gpm; therefore the facility decided to drill new wells to provide sufficient water supply.

Well 03, drilled in 2015, has a well casing diameter of 5 inch and a total depth of 440 ft and a 50 ft seal. An 8 hour pump test confirmed that well 03 has a sustainable yield of 15 gpm.

Well 04, drilled in 2015, has a well casing diameter of 5 inch and a total depth of 345 ft and a 50 ft seal. An 8 hour pump test confirmed that well 04 has a sustainable yield of 24 gpm.

The wells will be required to supply sufficient water to meet the potable demand. The estimated peak day potable water demand should account for 7,900 gal/day of process water and 2,100 gal/day of domestic water, for a total of 10,000 gal/day. Based on this potable water demand, the wells will need to supply 20.9 gallons per minute over 8 hours, or 13.9 gpm over 12 hours. This potable water demand will be met over an 8 hour period. See Enclosure B for flows estimates and water demand calculations.

TIER II ANALYSIS: WELL INTERFERENCE

A Tier II analysis is required for all parcels located within the "All Other Areas" in the WAA draft guidelines. The objective of the Tier 2 analysis is to determine if all wells within 500 ft. of the project's wells will be affected by the drawdown of the project's wells. Since information regarding the locations of the wells on adjacent parcels is not readily available, the analysis was performed for all onsite wells that are within 500 feet of the property line or each other.

- Method

Using the Theis equation as indicated in the Water Availability Analysis guidelines, the groundwater drawdown between property wells and from a well at the edge of the parcel was determined. The assumed closest distance that any neighboring well could be located is at the edge of the parcel. Due to the limited data on the aquifer, very conservative values were used.

Assumptions:

- Aquifer Thickness of 75 ft. based on value from Napa County Water Availability Analysis, that would yield a conservative drawdown estimate
- Hydraulic Conductivity of 10 ft./day, based on value from Napa County Water Availability Analysis, table F4, that would yield the most conservative drawdown estimate
- Specific Storage of 1.5×10^{-5} (1/ft.), based on most conservative value from Napa County Water Availability Analysis, table F3, for Loose to Dense Sandy Gravel

The Theis equation can be seen below along with an example calculation.

$$\text{Theis Equation: Drawdown} = \frac{\text{Flow}}{(4\pi \times \text{Transmissivity})} \times W(u)$$

$$W(u) = \int_u^{\infty} \frac{1}{\omega} e^{-\omega} d\omega$$

$$u = \frac{(\text{Distance}^2 \times \text{Specific Storage})}{(4 \times \text{Transmissivity} \times \text{Time})}$$

$$\text{Transmissivity} = \text{Hydraulic Conductivity} \times \text{Aquifer Thickness}$$

Example for effect of Well 04 on a well located at the property line:

$$u = \frac{(183\ \text{ft}^2 \times 1.50\ \text{X}\ 10^{-5})}{4 \times 10\frac{\text{ft}}{\text{day}} \times 75\ \text{ft} \times 1\text{day}} = 1.67 \times 10^{-4}$$

With this value of u, W(u) = 8.17

$$\text{Drawdown} = \frac{24\frac{\text{gal}}{\text{min}} \times\ 0.1337\frac{\text{cuft}}{\text{gal}} \times 1{,}440\frac{\text{min}}{\text{day}}}{4\pi\ \times 10\frac{\text{ft}}{\text{day}} \times 75\ \text{ft}} \times 8.17 = 4.00\ \text{ft}$$

The table below shows a summary of the estimated drawdown for either the existing wells on the property or an assumed well adjacent to the property line (whichever is closer). More detailed tables can be found in Enclosure F Tier II, well drawdown calculation tables.

Table 4. Well Drawdown Calculations

	Well Flow Rate (gpm)	Distance to Property Well or Property Line (whichever is closer) (ft.)	Estimated Drawdown (ft.)
Well 01	7	174	1.18
Well 03	15	436	1.96
Well 04	24	183	4.00

- Results

Based on using very conservative estimates for aquifer thickness, specific storage, and hydraulic conductivity, and values presented in the Water Availability Analysis guidelines adopted on March 2015, none of the wells should have a drawdown greater than 10 feet to any wells adjacent to the site or within the property.

- Spring Interference

A Tier II analysis requires that any project wells located within 1,500 ft. of a spring that are being used for domestic or agricultural water supply are analyzed to determine the potential connectivity between the spring and the aquifer system that supplies the well groundwater. Since the spring is not in use for domestic or agricultural water supply, no well to spring interference is required to be evaluated.

TIER III ANALYSIS: GROUNDWATER AND SURFACE WATER INTERACTION

Based on the screening criteria from the Water Availability Analysis guidelines adopted on March 2015, a Tier III analysis is not required for either the Napa Valley Floor, MST or all other areas, unless substantial evidence determines the need for such analysis. Due to the lack of substantial evidence, no analysis is needed for Tier III.

DROUGHT CONSERVATION

The facility plans to treat the process wastewater generated at the facility and reuse it for vineyard irrigation purposes, offsetting the water demand for irrigation uses. Domestic wastewater will be treated and disposed of in a subsurface system, recharging the groundwater table through infiltration.

CONCLUSION

Total annual water demand at Maxville Lake Winery, associated with the proposed increase in production capacity to 240,000 gallons of wine per year, and the associated marketing plan, is estimated to be 35% of the total water availability for the parcel (per Phase I of Napa County Water Availability Analysis); therefore, the potable demand should be met with existing Well 01 and two new wells 03 and 04, operating for a minimum of 8 hours per day at 20.9 gpm.

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SUMMIT

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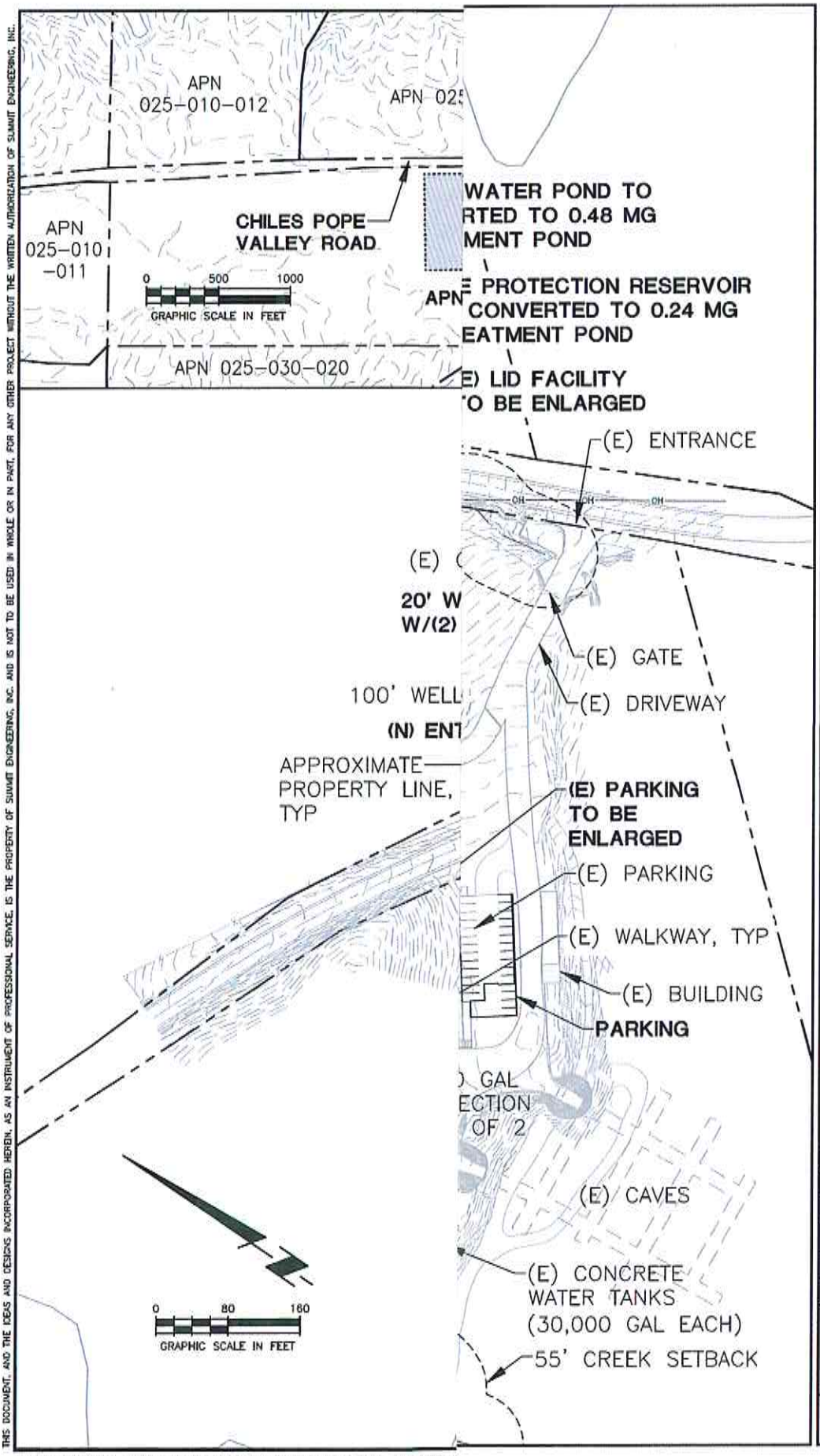
ENCLOSURE A

OVERALL SITE PLAN

SUMMIT



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MAXVILLE LAKE WINERY
4105 CHILES POPE VALLEY ROAD
ST. HELENA, CA
APN 025-020-023

MAXVILLE LAKE WINERY

WASTEWATER SITE PLAN

	2017-05-30 PERMIT SUBMITTAL
	2017-08-31 PERMIT SUBMITTAL

DATE:	2017-05-30
JOB NO:	2015052
SCALE:	AS SHOWN
DRAWN:	TAF
CHECKED:	CIP/CL
SHEET	UP7

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ENCLOSURE B

WASTEWATER GENERATION AND WATER DEMAND

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Maxville Lake Winery WASTEWATER FEASIBILITY STUDY Design Criteria	PROJECT NO. BY: CHK:	2015052 CL GG

DESIGN CRITERIA

FULL PRODUCTION			
Production Level	104,167	cases/year	
Annual Production	240,000	gal wine/year	
Crush Period	60	day	* per PBES criteria
Annual PW Flow	1,440,000	gal PW/year	
Average PW Flow	4,000	gal PW/day	
PW Generation Rate	6.0	gal PW/gal wine	
Peak Harvest Day	6,000	gal PW/day	* per PBES criteria
PW Flows accounted during September	16.4	%	
Average Day Peak Harvest Month	7,900	gal PW/day	

EXISTING POND VOLUME			**HRT**	(Based on peak harvest month flows)
Pond Cell # 1 Volume (aerated)	0.48	Mgal	61	days
Pond Cell # 2 Volume (aerated)	0.24	Mgal	30	days
Total Pond Volume	0.72	Mgal		
Total HRT	91	days		

EXISTING POND VOLUME			**HRT**	(Based on average day flows)
Pond Cell # 1 Volume (aerated)	0.48	Mgal	120	days
Pond Cell # 2 Volume (aerated)	0.24	Mgal	60	days
Total Pond Volume	0.72	Mgal		
Total HRT	180	days		

DESIGN PROCESS WASTEWATER FLOWS

Month	PW Monthly Percentage of Annual Flow[a] (%)	PW Monthly Flow[a] (Mgal)
August	10.5%	0.151
September	16.4%	0.236
October	12.9%	0.186
November	7.4%	0.107
December	6.4%	0.092
January	6.6%	0.095
February	7.2%	0.104
March	7.6%	0.109
April	6.8%	0.098
May	6.4%	0.092
June	5.6%	0.081
July	6.2%	0.089
Total	**100%**	**1.440**

[a] Assumption of monthly percentage of annual flow based on average of PW flow data for similar small wineries

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Maxville Lake Winery WASTEWATER FEASIBILITY STUDY Sanitary Sewage Flows	PROJECT NO. 2015052 BY: NM CHK: SW

PROPOSED SANITARY SEWAGE

WINERY

Average Tasting Day w/o Event -Non Harvest				
Employee (full-time)	15 x	15 gpcd	=	225 gal/day
Employee (part-time)	9 x	15 gpcd	=	135 gal/day
Tasting Visitors	20 x	3 gpcd	=	60 gal/day
Marketing Event Visitors	0 x	15 gpcd	=	0 gal/day
Total			=	420 gal/day
			=	***500 gal/day***
Average Tasting Day w/o Event - Harvest				
Employee (full-time)	15 x	15 gpcd	=	225 gal/day
Employee (part-time)	9 x	15 gpcd	=	135 gal/day
Tasting Visitors	60 x	3 gpcd	=	180 gal/day
Marketing Event Visitors	0 x	15 gpcd	=	0 gal/day
Total			=	540 gal/day
			=	***600 gal/day***
Peak Tasting Day w/ Event - Harvest				
Employee (full-time)	15 x	15 gpcd	=	225 gal/day
Employee (part-time)	9 x	15 gpcd	=	135 gal/day
Tasting Visitors	75 x	3 gpcd	=	225 gal/day
Marketing Event Visitors	100 x	15 gpcd	=	1,500 gal/day
Total			=	2,085 gal/day
			=	***2,100 gal/day***
Peak Day w/ Event - Harvest				
Employee (full-time)	15 x	15 gpcd	=	225 gal/day
Employee (part-time)	9 x	15 gpcd	=	135 gal/day
Tasting Visitors	0 x	3 gpcd	=	0 gal/day
Marketing Event Visitors	100 x	15 gpcd	=	1,500 gal/day
Total			=	1,860 gal/day
			=	***1,900 gal/day***
DESIGN FLOW			=	**2,100 gal/day**

ENCLOSURE C

WELL LOGS AND PUMP TESTS

SUMMIT

ALTH DEPT. USE ONLY
E: 11/12
TE: 11/12/11
PT NO: 23474

A.P. # 25-020-03

NAPA COUNTY HEALTH DEPARTMENT
DIVISION OF ENVIRONMENTAL HEALTH

WELL 1

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

NAME [redacted] ADDRESS [redacted] DATE 11/8/11
(Owner) (Job Location)
NAME [redacted] ADDRESS [redacted]
(Well Driller)

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

ROPOSED USE
DOMESTIC X IRRIGATION ____ INDUSTRIAL ____ MUNICIPAL ____
TEST WELL ____ OTHER ____

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

YPE OF QUIPMENT TO E USED
Rotary X Cable ____ Hand Dug ____ Other ____

TRUCTION ROPOSED
Diameter of casing 6" Material ____ Annular Space: Size ____
Sealed with: Concrete ____ Grout ____ Neat Cement ____ Puddled Clay ____ Other ____
Conductor Casing: Yes ____ No ____ Material ____
Chlorination By: Owner ____ Pump Co ____ Driller ____

[redacted] 11/8/11
(SIGNATURE OF APPLICANT) (DATE)

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

CASING

ONSTRUCTION
tal Depth 216 Ft.
rface seal to 22 Ft.
y Stratas sealed Yes ____ No X
f yes, depth of Stratas
rom ____ Ft. to ____ Ft.
rom ____ Ft. to ____ Ft.
rforations
rom 65 Ft. to 216 Ft.
rom ____ Ft. to ____ Ft.

WATER LEVELS
rst water at 10 Ft.
atic level at 3 Ft.

WELL TESTS
erformed 2000
eld 30 GPM with 140 ft.
awdown ____ ft. after 2 Hrs.

WELL LOG

(Formation; describe by color; size of material, structure)

Ft.	To	Ft.	
0	10		Brn C
10	40		Sand-gravel W/B
40	70		S G W/B
70	80		Clay B
80	216		Rock W/S

SIGNED: [redacted]

WELL 3

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

File Original with DWR

State of California
Well Completion Report

Refer to Instruction Pamphlet

No. e0277286

Page 1 of 1

Owner's Well Number Well # 5

Date Work Began 07/08/2015 Date Work Ended 7/15/2015

Local Permit Agency Planning, Building & Environmental

Permit Number E15-00548 Permit Date 7/9/15

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Air Drilling Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
0	60	soft soil and gravel had to put in temp seal
60	250	hard rock
250	330	hard rock with quarts and brown rock
330	350	soft shale

Total Depth of Boring 350 Feet

Total Depth of Completed Well 345 Feet

Well Owner

Name KOKO NOR Corp.

Mailing Address 4105 Chiles pope valley rd

City St Helena State CA Zip 94574

Well Location

Address 4105 Chiles pope valley rd

City St helena County Napa

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

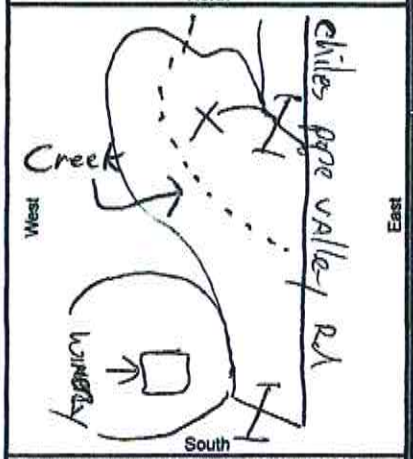
Datum ___ Decimal Lat. ___ Decimal Long. ___

APN Book 025 Page 020 Parcel 023

Township ___ Range ___ Section ___

Location Sketch

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



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

Activity

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

Planned Uses

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

Water Level and Yield of Completed Well

Depth to first water 5 (Feet below surface)

Depth to Static Water Level 5 (Feet) Date Measured 07/15/2015

Estimated Yield * 40 (GPM) Test Type Air Lift

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

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

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size If Any (Inches)
0	60	12	Blank	PVC Sch. 80		5		
60	80	8 3/4	Blank	PVC Sch. 80		5		
80	345	8 3/4	Staggered	PVC Sch. 80		5	Milled Slots	0.032

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	50	Bentonite	Seal
50	350	Filter Pack	

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other ___

Attach additional information, if it exists.

Certification Statement

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

Name D.BESS PUMP & WELL
Person, Firm or Corporation

1115 MT GEORGE AVE Address NAPA City CA State 94558 Zip

Signed [signature] C-57 Licensed Water Well Contractor Date Signed 8/3/15

487027 C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0277281

Page 1 of 1

Owner's Well Number Well # 4

Date Work Began 07/06/2015 Date Work Ended 7/8/2015

Local Permit Agency Planning, Building & Environmental

Permit Number E15-00546 Permit Date 7/9/15

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ◉ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Air Drilling Drilling Fluid

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
0	15	Top soil Brown rock
15	70	Brown rock and shale
70	130	Hard shale with mix of brown rock 5 gpm
130	450	Hard shale w/ brown rock white quarts 5-10gpm

Total Depth of Boring 450 Feet

Total Depth of Completed Well 440 Feet

Well Owner

Name KOKO NOR Corp.

Mailing Address 4105 Chiles pope valley rd

City St Helena State CA Zip 94574

Well Location

Address 4105 Chiles pope valley rd

City St helena County Napa

Latitude ___ ___ ___ N Longitude ___ ___ ___ W

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

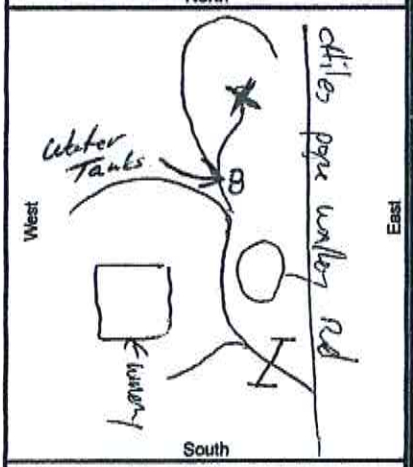
Datum ___ Decimal Lat. ___ Decimal Long. ___

APN Book 025 Page 020 Parcel 023

Township ___ Range ___ Section ___

Location Sketch

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



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

Activity

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

Planned Uses

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

Water Level and Yield of Completed Well

Depth to first water 130 (Feet below surface)

Depth to Static Water Level 13 (Feet) Date Measured 07/08/2015

Estimated Yield * 15 (GPM) Test Type Air Lift

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

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

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	50	12	Blank	PVC Sch. 80		5		
50	120	8 3/4	Blank	PVC Sch. 80		5		
120	440	8 3/4	Staggered	PVC Sch. 80		5	Milled Slots	0.032

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	50	Bentonite	Seal
50	450	Filter Pack	

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

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

Name D.BESS PUMP & WELL
Person, Firm or Corporation

1115 MT GEORGE AVE Address NAPA City CA State 94558 Zip

Signed [signature] C-57 Licensed Water Well Contractor 8/3/15 Date Signed 487027 C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

DAVE BESS PUMP & WELL
LIC.# C-57-C-10 487027

1115 MT GEORGE AVE.
NAPA, CALIF. 94558
707-226-2539 / 253-0574

WELL 3

WATER WELL TEST
REPORT # W-15-128

LOCATION (well address): 4105 Chilles Pope Valley Road, St. Helena, CA Well#4 Date 04Aug2015
TEST REQUESTOR: Greg Fitzgerald PH. # 707-387-8378

SURFACE INSPECTION

CASING DIA. 5 EST. AGE OF WELL 2015 DEPTH OF WELL 440'
PRESSURE TANK (N/A) SANITARY SEAL (Functional)
PIPING SYSTEM (N/A) ELECTRICAL SYSTEM (N/A)
WELL SIZE OF PUMP 2 (HP)
OPERATING VOLTS: 240 (3 Phase Motor) AMPS: 7.1/7.5/7.0

FLOW TEST DATA

METHOD OF TEST: 8 HOUR OPEN FLOW DISCHARGE TEST USING THE INSTALLED PUMP AND EXISTING EQUIPMENT. (TEST EQUIPMENT USED), 2" FLOW METER, 2" THROTTLING DISCHARGE VALVE, 0/200 PRESSURE GAGE AND A POWERS WELL DEPTH STATIC METER.

See Graph for flow Data

Pumping rate at the start was 18.5 gpm and slowly dropped to 14 gpm @ 146' for the last 4 Hours of the Test.

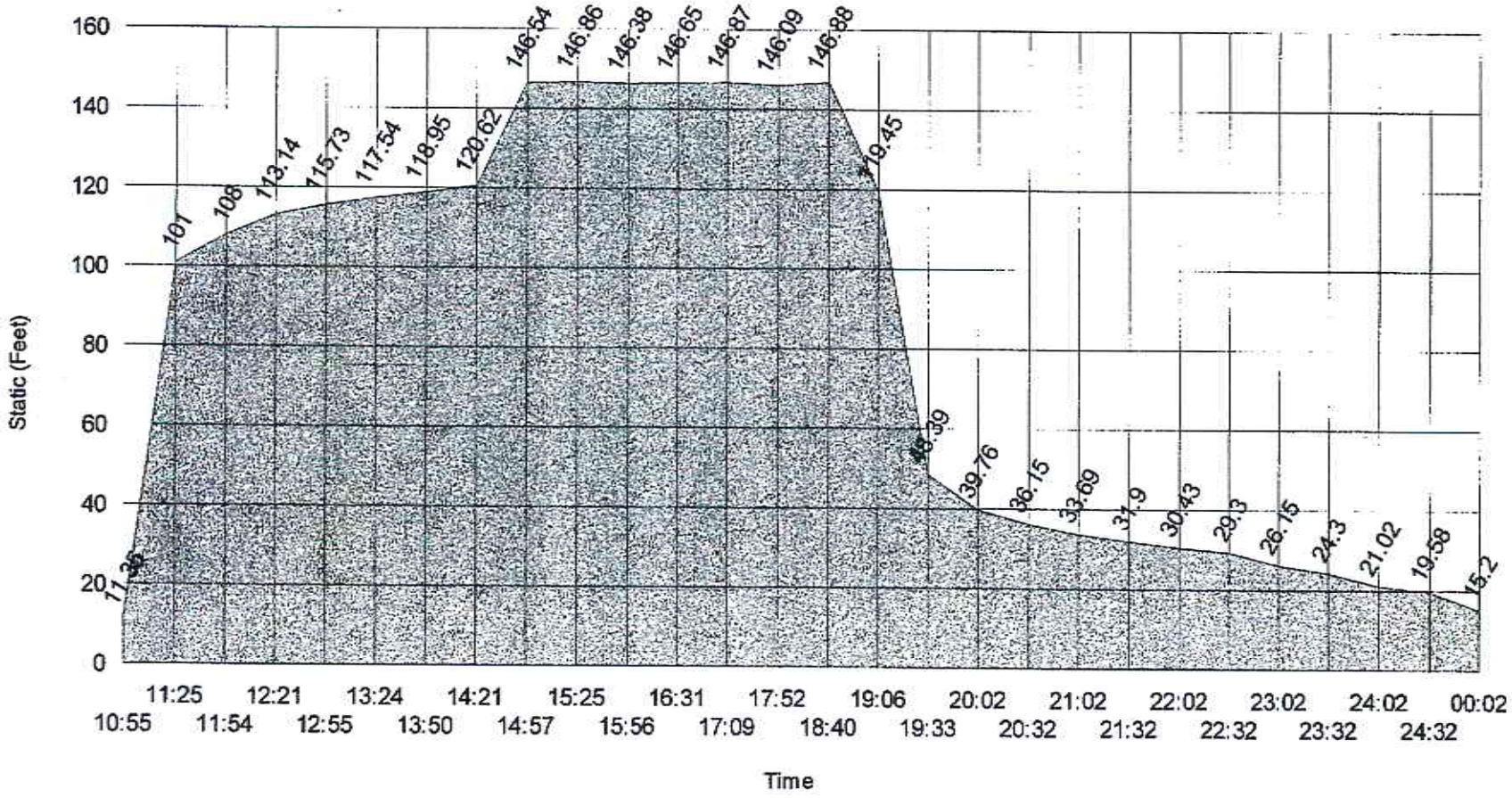
STATIC LEVEL PRIOR TO TEST 11 FT STATIC LEVEL @ END OF TEST 146
TOTAL DRAW DOWN DURING THIS TEST WAS 135 FT
(AVG.)GALLONS PER MIN. 15.31 FOR 8 HOURS OF TESTING.

GENERAL COMMENTS

Well and well equipment in working condition @ time of testing. Remaining life expectancy for well pump and equipment unknown @ this time.

TEST CONDUCTED BY: _____ DATE: 11Aug2015
Bacteria sampled Yes __ No x Chemical sampled: Yes x No __
Lab# Q080147

Maxville Winery 8 Hour Well Test (Well #4)



DAVE BESS PUMP & WELL
LIC.# C-57-C-10 487027

1115 MT GEORGE AVE.
NAPA, CALIF. 94558
707-226-2539 / 253-0574

WELL 4

WATER WELL TEST
REPORT # W-15-129

LOCATION (well address): 4105 Chilles Pope Valley Road, St. Helena, CA Well#5 Date 05Aug2015
TEST REQUESTOR: Greg Fitzgerald PH. # 707-387-8378

SURFACE INSPECTION

CASING DIA. 5 EST. AGE OF WELL 2015 DEPTH OF WELL 345'
PRESSURE TANK (N/A) SANITARY SEAL (Functional)
PIPING SYSTEM (N/A) ELECTRICAL SYSTEM (N/A)
WELL SIZE OF PUMP 2 (HP)
OPERATING VOLTS: 240 (3 Phase Motor) AMPS: 7.1/7.5/7.0

FLOW TEST DATA

METHOD OF TEST: 8 HOUR OPEN FLOW DISCHARGE TEST USING THE INSTALLED PUMP AND EXISTING EQUIPMENT. (TEST EQUIPMENT USED), 2" FLOW METER, 2" THROTTLING DISCHARGE VALVE, 0/200 PRESSURE GAGE AND A POWERS WELL DEPTH STATIC METER.

See Graph for flow Data

Pumping rate at the start was 41 gpm and slowly dropped to 22 gpm @ 146' for the last 4 Hours of the Test.
Well is an artisian at about 5.5 gpm. Still the same after the test.

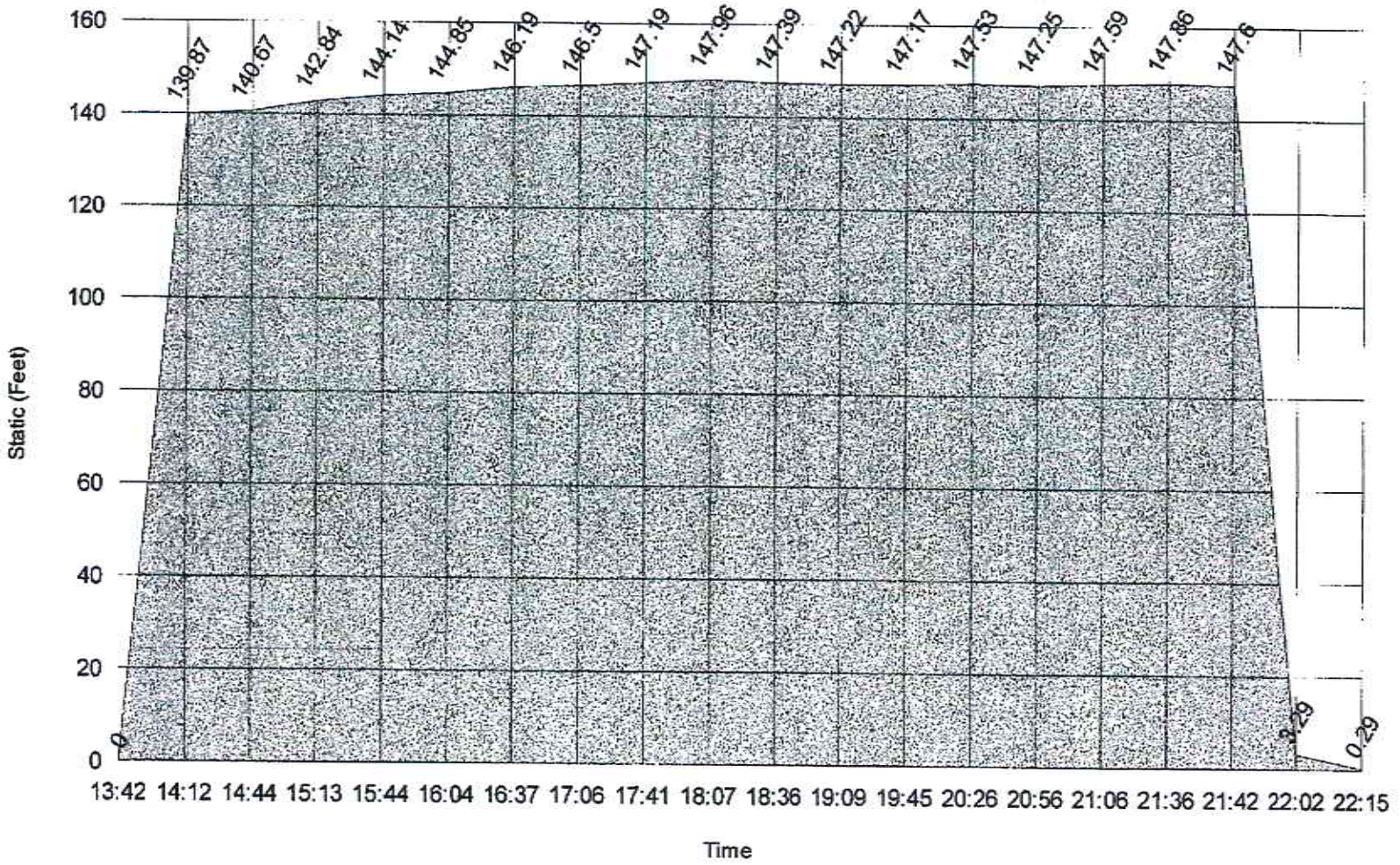
STATIC LEVEL PRIOR TO TEST 0 FT STATIC LEVEL @ END OF TEST 147
TOTAL DRAW DOWN DURING THIS TEST WAS 147 FT
(AVG.)GALLONS PER MIN. 24.10 FOR 8 HOURS OF TESTING.

GENERAL COMMENTS

Well and well equipment in working condition @ time of testing. Remaining life expectancy for well pump and equipment unknown @ this time.

TEST CONDUCTED BY: _____ DATE: 11Aug2015
Bacteria sampled Yes __ No x Chemical sampled: Yes x No __
Lab# Q080389

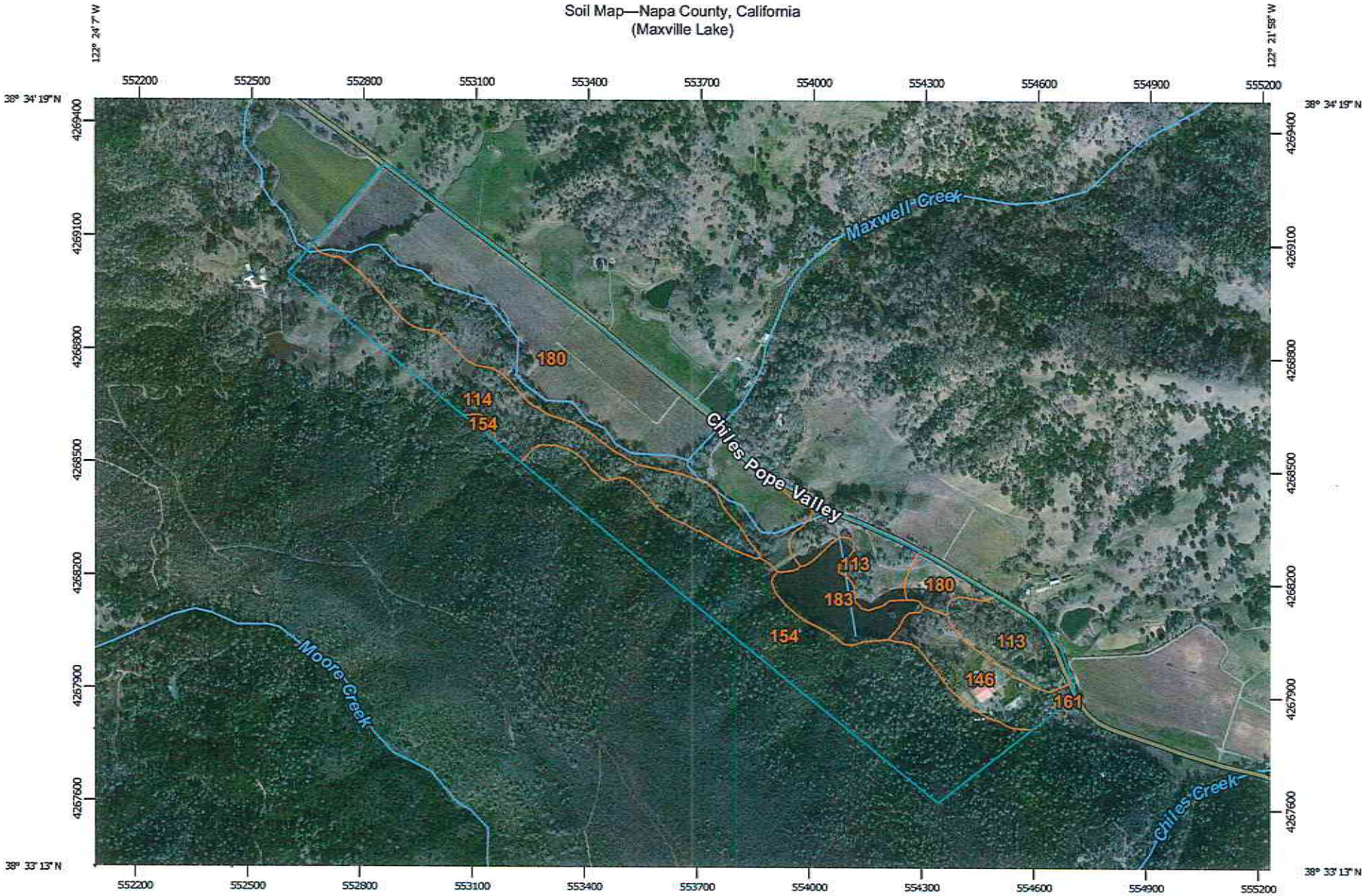
Maxville Winery 8 Hour Well Test (Well #5)



ENCLOSURE D

USDA WEB SOIL SURVEY

Soil Map—Napa County, California
(Maxville Lake)



Map Scale: 1:14,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

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.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

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

Date(s) aerial images were photographed: Feb 4, 2012—Feb 17, 2012

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

Napa County, California (CA055)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
113	Bressa-Dibble complex, 15 to 30 percent slopes	23.5	9.5%
114	Bressa-Dibble complex, 30 to 50 percent slopes	36.3	14.7%
146	Haire loam, 2 to 9 percent slopes	14.4	5.8%
154	Henneke gravelly loam, 30 to 75 percent slopes	67.8	27.5%
161	Maxwell clay, 2 to 9 percent slopes	0.0	0.0%
180	Tehama silt loam, 0 to 5 percent slopes	92.7	37.5%
183	Water	12.3	5.0%
Totals for Area of Interest		**247.0**	**100.0%**

Napa County, California

113—Bressa-Dibble complex, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: hdkf
Elevation: 100 to 2,000 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 63 to 64 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Bressa and similar soils: 70 percent
Dibble and similar soils: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bressa

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 33 inches: silty clay loam
H3 - 33 to 60 inches: weathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 30 to 40 inches to paralithic bedrock
Natural 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
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Fine loamy (R015XD024CA)

Description of Dibble

Setting

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

Typical profile

H1 - 0 to 9 inches: silty clay loam
H2 - 9 to 34 inches: silty clay
H3 - 34 to 60 inches: weathered bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural 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
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Fine loamy (R015XD024CA)

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

Napa County, California

114—Bressa-Dibble complex, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hdkg
Elevation: 100 to 2,000 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 63 to 64 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Bressa and similar soils: 70 percent
Dibble and similar soils: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bressa

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 and shale

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 33 inches: silty clay loam
H3 - 33 to 60 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 30 to 40 inches to paralithic bedrock
Natural 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
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: Fine loamy (R015XD024CA)

Description of Dibble

Setting

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

Typical profile

H1 - 0 to 9 inches: silty clay loam
H2 - 9 to 34 inches: silty clay
H3 - 34 to 60 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 30 to 40 inches to paralithic bedrock
Natural 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
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Fine loamy (R015XD024CA)

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

Napa County, California

161—Maxwell clay, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hdlz
Elevation: 200 to 1,500 feet
Mean annual precipitation: 30 to 35 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Maxwell and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Maxwell

Setting

Landform: Rims, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from serpentinite

Typical profile

H1 - 0 to 62 inches: clay

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly 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
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Ecological site: Serpentine (R015XD123CA)

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

Napa County, California

180—Tehama silt loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hdml
Elevation: 50 to 1,000 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 250 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Tehama and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tehama

Setting

Landform: Terraces, alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural 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
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

Napa County, California

154—Henneke gravelly loam, 30 to 75 percent slopes

Map Unit Setting

National map unit symbol: hdlr
Elevation: 500 to 4,000 feet
Mean annual precipitation: 25 to 45 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Henneke and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Henneke

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 serpentinite

Typical profile

H1 - 0 to 7 inches: gravelly loam
H2 - 7 to 15 inches: very gravelly clay loam
H3 - 15 to 25 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Excessively 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
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D

Ecological site: Rocky serpentine (R015XD128CA)

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

Napa County, California

146—Haire loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hdlh
Elevation: 20 to 2,400 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Haire and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haire

Setting

Landform: Alluvial fans, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 22 inches: loam
H2 - 22 to 27 inches: sandy clay loam
H3 - 27 to 45 inches: clay
H4 - 45 to 60 inches: sandy clay

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately 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
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: Claypan (R014XD089CA)

Minor Components

Clear lake

Percent of map unit: 5 percent
Landform: Alluvial fans

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

ENCLOSURE E

NOAA RAINFALL DATA

SUMMIT

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data,
and Information Service

Climatography of the United States No. 20 1971-2000

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801
www.ncdc.noaa.gov

Station: ANGWIN PAC UNION COL, CA **COOP ID: 040212**

Climate Division: CA 1 **NWS Call Sign:** **Elevation: 1,715 Feet** **Lat: 38°34N** **Lon: 122°26W**

Temperature (°F)

	Mean (1)			Extremes										Degree Days (1) Base Temp 65		Mean Number of Days (3)					
Month	Daily Max	Daily Min	Mean	Highest Daily(2)	Year	Day	Highest Month(1) Mean	Year	Lowest Daily(2)	Year	Day	Lowest Month(1) Mean	Year	Heating	Cooling	Max >= 100	Max >= 90	Max >= 50	Max <= 32	Min <= 32	Min <= 0
Jan	53.2	39.3	46.3	75+	1962	8	50.1	1984	19+	1969	29	42.1	1987	582	0	.0	.0	21.3	@	5.8	.0
Feb	56.0	39.9	48.0	78+	1977	15	54.2	1991	20+	1989	6	43.3	1989	478	0	.0	.0	22.2	.1	4.2	.0
Mar	59.1	40.6	49.9	83	1996	17	55.3	1988	23	1971	5	45.0	1985	470	0	.0	.0	27.5	.0	3.9	.0
Apr	65.8	42.9	54.4	91	1989	8	60.0	1987	25+	1971	21	49.0	1975	326	7	.0	.1	29.1	.0	1.8	.0
May	72.9	46.8	59.9	101	1984	27	64.9	1992	27	1964	6	52.9	1998	203	43	@	1.1	31.0	.0	.3	.0
Jun	80.4	51.3	65.9	106	1961	15	72.8	1981	33	1952	12	59.2	1980	73	99	.4	6.0	30.0	.0	.0	.0
Jul	85.6	55.0	70.3	110	1972	15	74.7	1988	32	1975	4	65.3	1987	13	177	1.0	10.6	31.0	.0	@	.0
Aug	85.0	54.3	69.7	107+	1971	11	74.3	1998	37	1978	2	66.0	1985	16	160	1.0	10.2	31.0	.0	.0	.0
Sep	80.8	53.4	67.1	108+	1955	2	71.9	1974	32	1971	30	59.9	1985	55	119	.2	5.0	30.0	.0	@	.0
Oct	72.3	49.6	61.0	99	1980	3	66.2	1991	27	1971	29	55.0	1984	173	48	@	1.3	31.0	.0	.2	.0
Nov	59.1	42.0	50.6	86+	1967	2	58.4	1976	24	1977	19	43.8	1994	438	6	.0	.0	26.9	.0	2.4	.0
Dec	53.0	38.3	45.7	75+	1958	11	50.1	1989	14	1972	9	38.8	1971	599	0	.0	.0	21.4	.1	6.6	.0
Ann	68.6	46.1	57.4	110	Jul 1972	15	74.7	Jul 1988	14	Dec 1972	9	38.8	Dec 1971	3426	659	2.6	34.3	332.4	.2	25.2	.0

\+ Also occurred on an earlier date(s)

@ Denotes mean number of days greater than 0 but less than .05

Complete documentation available from: www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

Issue Date: February 2004

(1) From the 1971-2000 Monthly Normals

(2) Derived from station's available digital record: 1948-2001

(3) Derived from 1971-2000 serially complete daily data

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
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Climatography of the United States No. 20 1971-2000

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801
www.ncdc.noaa.gov

Station: ANGWIN PAC UNION COL, CA

COOP ID: 040212

Climate Division: CA 1 **NWS Call Sign:**

Elevation: 1,715 Feet **Lat: 38°34N** **Lon: 122°26W**

Precipitation (inches)

Precipitation Totals

Month	Means/ Medians(1) Mean	Means/ Medians(1) Median	Extremes Highest Daily(2)	Year	Day	Highest Monthly(1)	Year	Lowest Monthly(1)	Year
Jan	8.47	8.36	5.85	1967	21	28.29	1995	.48	1976
Feb	7.75	6.15	7.40	1986	17	28.49	1986	.29	1971
Mar	6.21	4.47	6.14	1995	9	19.12	1983	.05	1988
Apr	2.27	2.08	3.08	1982	11	7.43	1982	.15	1977
May	1.14	.44	2.14	1957	18	5.09	1998	.00+	1992
Jun	.26	.07	1.42	1967	2	1.66	1993	.00+	1998
Jul	.05	.00	1.11	1974	9	1.12	1974	.00+	2000
Aug	.10	.00	.78	1965	12	1.42	1976	.00+	2000
Sep	.62	.22	3.94	1959	18	3.08	1982	.00+	1995
Oct	2.17	1.54	6.80	1962	12	5.94	1979	.00+	1995
Nov	5.48	4.21	4.98	1977	21	17.33	1973	.24+	1995
Dec	6.15	5.02	6.42	1955	19	17.95	1996	.00	1989
Ann	40.67	38.49	7.40	Feb 1986	17	28.49	Feb 1986	.00+	Aug 2000

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	12.8	9.5	4.8	2.6
Feb	11.8	8.8	4.9	2.8
Mar	12.0	8.9	3.9	1.9
Apr	7.1	4.7	1.4	.4
May	4.1	2.3	.8	.2
Jun	1.4	.7	.1	.1
Jul	.3	.1	@	@
Aug	.7	.3	.0	.0
Sep	2.4	1.3	.4	.1
Oct	5.2	3.1	1.4	.8
Nov	9.9	6.7	3.4	1.7
Dec	11.2	7.6	3.5	1.9
Ann	78.9	54.0	24.6	12.5

Precipitation Probabilities (1)

Probability that the monthly/annual precipitation will be equal to or less than the indicated amount

Monthly/Annual Precipitation vs Probability Levels
These values were determined from the incomplete gamma distribution

Month	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
Jan	.70	1.28	2.39	3.57	4.86	6.33	8.09	10.30	13.36	18.48	23.52
Feb	.52	1.00	1.98	3.04	4.23	5.61	7.28	9.40	12.36	17.35	22.30
Mar	.45	.85	1.65	2.50	3.45	4.55	5.86	7.53	9.85	13.76	17.62
Apr	.20	.36	.66	.98	1.32	1.72	2.18	2.77	3.58	4.92	6.25
May	.00	.00	.03	.14	.31	.53	.84	1.28	1.93	3.11	4.34
Jun	.00	.00	.00	.00	.03	.09	.17	.29	.47	.77	1.09
Jul	.00	.00	.00	.00	.00	.00	.00	.00	.00	.09	.32
Aug	.00	.00	.00	.00	.00	.00	.00	.01	.09	.33	.62
Sep	.00	.00	.00	.00	.10	.25	.45	.71	1.09	1.77	2.45
Oct	.00	.16	.51	.85	1.21	1.61	2.10	2.69	3.51	4.88	6.22
Nov	.27	.55	1.19	1.92	2.76	3.76	4.99	6.58	8.83	12.67	16.53
Dec	.37	.97	1.93	2.83	3.79	4.84	6.07	7.59	9.64	13.01	16.28
Ann	17.20	20.89	26.06	30.30	34.28	38.30	42.63	47.61	53.90	63.49	72.19

· Also occurred on an earlier date(s)
Denotes amounts of a trace
@ Denotes mean number of days greater than 0 but less than .05
* Statistics not computed because less than six years out of thirty had measurable precipitation

(1) From the 1971-2000 Monthly Normals
(2) Derived from station's available digital record: 1948-2001
(3) Derived from 1971-2000 serially complete daily data

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

U.S. Department of Commerce
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Climatography of the United States No. 20 1971-2000

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801
www.ncdc.noaa.gov

Station: ANGWIN PAC UNION COL, CA **COOP ID: 040212**

Climate Division: CA 1 **NWS Call Sign:** **Elevation: 1,715 Feet** **Lat: 38°34N** **Lon: 122°26W**

Snow (inches)

Snow Totals

Means/Medians (1)

Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median
Jan	1.0	.0	#	0
Feb	.1	.0	#	0
Mar	.4	.0	#	0
Apr	#	.0	0	0
May	#	.0	0	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	.0	.0	0	0
Oct	#	.0	0	0
Nov	#	.0	0	0
Dec	.3	.0	#	0
Ann	1.8	.0	N/A	N/A

Extremes (2)

Month	Highest Daily Snow Fall	Year	Day	Highest Monthly Snow Fall	Year	Highest Daily Snow Depth	Year	Day	Highest Monthly Mean Snow Depth	Year
Jan	7.5	1979	30	8.0	1973	24	1974	4	4	1974
Feb	1.0	1976	5	1.0	1976	#	1971	27	#	1971
Mar	10.2	1976	2	10.2	1976	4	1982	17	#+	1985
Apr	#	1980	21	#	1980	0	0	0	0	0
May	#	1980	24	#+	1980	0	0	0	0	0
Jun	.0	0	0	.0	0	0	0	0	0	0
Jul	.0	0	0	.0	0	0	0	0	0	0
Aug	.0	0	0	.0	0	0	0	0	0	0
Sep	.0	0	0	.0	0	0	0	0	0	0
Oct	#	1971	16	#	1971	0	0	0	0	0
Nov	#	1977	21	#	1977	0	0	0	0	0
Dec	2.0	1971	27	3.0	1971	2	1971	27	#+	1984
Ann	10.2	Mar 1976	2	10.2	Mar 1976	24	Jan 1974	4	4	Jan 1974

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	.2	.2	.1	.1	.0
Feb	@	@	.0	.0	.0
Mar	@	@	@	@	@
Apr	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	.0	.0	.0	.0	.0
Oct	.0	.0	.0	.0	.0
Nov	.0	.0	.0	.0	.0
Dec	.3	.2	.0	.0	.0
Ann	.5	.4	.1	.1	@

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	.1	.1	@	.0
Feb	.0	.0	.0	.0
Mar	.0	.0	.0	.0
Apr	.0	.0	.0	.0
May	.0	.0	.0	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.0	.0	.0	.0
Oct	.0	.0	.0	.0
Nov	.0	.0	.0	.0
Dec	.2	.0	.0	.0
Ann	.3	.1	@	.0

+ Also occurred on an earlier date(s) #Denotes trace amounts

@ Denotes mean number of days greater than 0 but less than .05

-9/-9.9 represents missing values
Annual statistics for Mean/Median snow depths are not appropriate

(1) Derived from Snow Climatology and 1971-2000 daily data

(2) Derived from 1971-2000 daily data

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

National Oceanic & Atmospheric Administration
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Climatography of the United States No. 20 1971-2000

Federal Building
151 Patton Avenue
Asheville, North Carolina 288
www.ncdc.noaa.gov

Station: ANGWIN PAC UNION COL, CA **COOP ID: 04021**

Climate Division: CA 1 **NWS Call Sign:** **Elevation: 1,715 Feet** **Lat: 38°34N** **Lon: 122°26W**

Freeze Data

Spring Freeze Dates (Month/Day)

Temp (F)	Probability of later date in spring (thru Jul 31) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	6/06	5/27	5/21	5/15	5/09	5/04	4/28	4/21	4/12
32	5/28	5/13	5/02	4/23	4/15	4/06	3/28	3/17	3/02
28	4/06	3/19	3/06	2/22	2/11	1/31	1/17	12/30	0/00
24	2/06	1/14	12/23	11/20	0/00	0/00	0/00	0/00	0/00
20	0/00	0/00	0/00	0/00	0/00	0/00	0/00	0/00	0/00
16	0/00	0/00	0/00	0/00	0/00	0/00	0/00	0/00	0/00

Fall Freeze Dates (Month/Day)

Temp (F)	Probability of earlier date in fall (beginning Aug 1) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	10/21	10/28	11/01	11/06	11/10	11/14	11/18	11/23	11/30
32	10/28	11/08	11/17	11/23	11/30	12/06	12/13	12/21	1/02
28	11/08	11/25	12/07	12/17	12/27	1/07	1/19	2/04	0/00
24	12/08	12/23	1/07	0/00	0/00	0/00	0/00	0/00	0/00
20	0/00	0/00	0/00	0/00	0/00	0/00	0/00	0/00	0/00
16	0/00	0/00	0/00	0/00	0/00	0/00	0/00	0/00	0/00

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	217	206	197	190	184	177	170	162	151
32	288	267	253	240	229	217	204	190	169
28	>365	>365	>365	350	322	303	285	267	244
24	>365	>365	>365	>365	>365	>365	>365	>365	307
20	>365	>365	>365	>365	>365	>365	>365	>365	>365
16	>365	>365	>365	>365	>365	>365	>365	>365	>365

* Probability of observing a temperature as cold, or colder, later in the spring or earlier in the fall than the indicated date.

0/00 Indicates that the probability of occurrence of threshold temperature is less than the indicated probability.

Derived from 1971-2000 serially complete daily data

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

National Oceanic & Atmospheric Administration
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No. 20
1971-2000

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Station: ANGWIN PAC UNION COL, CA

COOP ID: 040212

Climate Division: CA 1 **NWS Call Sign:** **Elevation: 1,715 Feet** **Lat: 38°34N** **Lon: 122°26W**

Degree Days to Selected Base Temperatures (°F)

Heating Degree Days (1)

Base Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	582	478	470	326	203	73	13	16	55	173	438	599	3426
60	427	339	326	197	110	23	1	1	15	86	303	445	2273
57	335	260	245	136	68	10	0	0	6	51	232	356	1699
55	277	210	198	102	46	5	0	0	2	34	189	299	1362
50	146	107	106	38	15	0	0	0	0	9	105	171	697
32	0	0	0	0	0	0	0	0	0	0	0	0	0

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	441	446	554	671	863	1016	1187	1167	1054	898	558	424	9279
55	5	12	39	84	196	331	474	454	366	219	57	10	2247
57	1	7	24	57	156	276	412	392	310	174	39	5	1853
60	0	1	11	28	106	199	320	300	229	117	21	1	1333
65	0	0	0	7	43	99	177	160	119	48	6	0	659
70	0	0	0	0	14	34	73	62	46	14	0	0	243

Growing Degree Units (2)

Base	Growing Degree Units (Monthly)												Growing Degree Units (Accumulated Monthly)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
40	196	225	302	432	623	787	953	933	827	657	320	186	196	421	723	1155	1778	2565	3518	4451	5278	5935	6255	6441
45	85	111	169	289	468	637	798	778	677	503	187	76	85	196	365	654	1122	1759	2557	3335	4012	4515	4702	4778
50	27	45	74	166	317	487	643	623	527	351	87	24	27	72	146	312	629	1116	1759	2382	2909	3260	3347	3371
55	1	13	24	80	189	341	489	468	377	216	33	1	1	14	38	118	307	648	1137	1605	1982	2198	2231	2232
60	0	0	2	32	100	211	335	313	235	113	7	0	0	0	2	34	134	345	680	993	1228	1341	1348	1348
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	71	99	151	251	385	499	605	590	521	387	150	76	71	170	321	572	957	1456	2061	2651	3172	3559	3709	3785

(1) Derived from the 1971-2000 Monthly Normals
(2) Derived from 1971-2000 serially complete daily data
Note: For corn, temperatures below 50 are set to 50, and temperatures above 86 are set to 86

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

Notes

a. The monthly means are simple arithmetic averages computed by summing the monthly values for the period 1971-2000 and dividing by thirty. Prior to averaging, the data are adjusted if necessary to compensate for data quality issues, station moves or changes in station reporting practices. Missing months are replaced by estimates based on neighboring stations.

b. The median is defined as the middle value in an ordered set of values. The median is being provided for the snow and precipitation elements because the mean can be a misleading value for precipitation normals.

c. Only observed validated values were used to select the extreme daily values.

d. Extreme monthly temperature/precipitation means were selected from the monthly normals data.
Monthly snow extremes were calculated from daily values quality controlled to be consistent with the Snow Climatology.

e. Degree Days were derived using the same techniques as the 1971-2000 normals.
Compete documentation for the 1971-2000 Normals is available on the internet from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

f. Mean "number of days statistics" for temperature and precipitation were calculated from a serially complete daily data set .
Documentation of the serially complete data set is available from the link below:

g. Snowfall and snow depth statistics were derived from the Snow Climatology.
Documentation for the Snow Climatology project is available from the link under references.

Data Sources for Tables

Several different data sources were used to create the Clim20 climate summaries. In some cases the daily extremes appear inconsistent with the monthly extremes and or the mean number of days statistics. For example, a high daily extreme value may not be reflected in the highest monthly value or the mean number of days threshold that is less than and equal to the extreme value. Some of these difference are caused by different periods of record. Daily extremes are derived from the station's entire period of record while the serial data and normals data were are for the 1971-2000 period. Therefore extremes observed before 1971 would not be included in the 1971-2000 normals or the 1971-2000 serial daily data set. Inconsistencies can also occur when monthly values are adjusted to reflect the current observing conditions or were replaced during the 1971-2000 Monthly Normals processing and are not reconciled with the Summary of the Day data.

a. Temperature/ Precipitation Tables
   1. 1971-2000 Monthly Normals
   2. Cooperative Summary of the Day
   3. National Weather Service station records
   4. 1971-2000 serially complete daily data

b. Degree Day Table
   1. Monthly and Annual Heating and Cooling Degree Days Normals to Selected Bases derived from 1971-2000 Monthly Normals
   2. Daily Normal Growing Degree Units to Selected Base Temperatures derived from 1971-2000 serially complete daily data

c. Snow Tables
   1. Snow Climatology
   2. Cooperative Summary of the Day

d. Freeze Data Table
   1971-2000 serially complete daily data

References

U.S. Climate Normals 1971-2000, www.ncdc.noaa.gov/normals.html
U.S. Climate Normals 1971-2000-Products Clim20, www.ncdc.noaa.gov/oa/climate/normals/usnormalsprods.html
Snow Climatology Project Description, www.ncdc.noaa.gov/oa/climate/monitoring/snowclim/mainpage.html
Eischeid, J. K., P. Pasteris, H. F. Diaz, M. Plantico, and N. Lott, 2000: Creating a serially complete, national daily time series of temperature and precipitation for the Western United States. J. Appl. Meteorol., 39, 1580-1591,
www1.ncdc.noaa.gov/pub/data/special/ serialcomplete_jam_0900.pdf

ENCLOSURE E

TIER I ANALYSIS: INFILTRATION CALCULATION TABLES

SUMMIT ENGINEERING, INC.	MAXVILLE LAKE WINERY Water Availability Tier I: Infiltration Calculation	PROJECT NO. 2015052 BY: CL CHK: GG

Average Year Rain Events

Daily Rainfall	Rainfall (Days/Year)	Annual Rainfall (in)
1" or More	12.5	20.8
0.5" to 0.99"	12.1	9.0
0.1" to 0.49"	29.4	8.7
Total	54	38.5

Annual Rain Volume (ac-ft/year) **793.4**

Soil Type	Slope	Infiltration Rate (in/hr)	Infiltration Rate (in/day)	Area (Acres)	Annual Infiltration Volume (ac-ft/year)
Impervious	N/A		0	0.5	0.0
Bressa-Dibble Complex	15-30%	0.39	9.24	23.5	75.3
Bressa-Dibble Complex	30-50%	0.39	9.24	36.3	116.3
Haire Loam	2-9%	0.03	0.72	14.4	28.5
Henneke Gravelly Loam	30-75%	0.29	6.96	67.8	217.3
Maxwell Clay	2-9%	0.03	0.72	0.0	0.0
Tehama Silt Loam	0-5%	0.13	3.12	92.7	297.1
Water	N/A		0	12.3	0.0
TOTAL				**247.5**	**734.6**

Notes:

1. Total Annual Rainfall should represent the annual median precipitation for the site
2. Annual Rainfall for the respective daily rainfall (in) bracket, is estimated based on the days of rainfall and the average inches of rain for those days
3. Impervious area is based on currently built structures
4. Annual Rain Volume is estimated based on the total acres of the parcel and total annual rainfall
5. Soil Infiltration Rates are obtained from the USDA soil data for the respective soil type for the parcel
6. Annual Infiltration Volume for each soil type is based on the infiltration capacity of the soil and a conservative estimate of the inches of rain that could infiltrate the soil during a rain event

SUMMIT ENGINEERING, INC.	MAXVILLE LAKE WINERY Water Availability Tier I: Infiltration Calculation	PROJECT NO. 2015052 BY: CL CHK: GG

10-Year Drought Rain Events

Daily Rainfall	Rainfall (Days/Year)	Annual Rainfall (in)
1" or More	6.8	11.3
0.5" to 0.99"	6.6	4.9
0.1" to 0.49"	16.0	4.7
Total	29.5	20.9

Annual Rain Volume (ac-ft/year) **431.9**

Soil Type	Slope	Infiltration Rate (in/hr)	Infiltration Rate (in/day)	Area (Acres)	Annual Infiltration Volume (ac-ft/year)
Impervious	N/A		0.00	0.5	0.0
Bressa-Dibble Complex	15-30%	0.39	9.24	23.5	41.0
Bressa-Dibble Complex	30-50%	0.39	9.24	36.3	63.3
Haire Loam	2-9%	0.03	0.72	14.4	15.5
Henneke Gravelly Loam	30-75%	0.29	6.96	67.8	118.3
Maxwell Clay	2-9%	0.03	0.72	0.0	0.0
Tehama Silt Loam	0-5%	0.13	3.12	92.7	161.8
Water	N/A		0.00	12.3	0.0
TOTAL				**247.5**	**399.9**

Notes:

1. Total Annual Rainfall should represent the annual 0.1 precipitation probability level
2. Annual Rainfall for the respective daily rainfall (in) bracket, is estimated based on the days of rainfall and the average inches of rain for those days
3. Impervious area is based on currently built structures
4. Annual Rain Volume is estimated based on the total acres of the parcel and total annual rainfall
5. Soil Infiltration Rates are obtained from the USDA soil data for the respective soil type for the parcel
6. Annual Infiltration Volume for each soil type is based on the infiltration capacity of the soil and a conservative estimate of the inches of rain that could infiltrate the soil during a rain event

ENCLOSURE F

TIER II ANALYSIS: WELL DRAWDOWN CALCULATION TABLES

SUMMIT ENGINEERING, INC.	MAXVILLE LAKE WINERY Water Availability Tier II: Well Drawdown Analysis	PROJECT NO. 2015052 BY: CL CHK: GG

Well 01 - 02 Drawdown	Well Flow (gpm)	Radius (ft)	Specific Storage (1/ft)	Transmissivity (ft2/day)	Time (days)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)
Data	7	174	1.50E-05	750	1	75	10
Theis Eq =	0.0061475	u =	1.51E-04	W (u) =	8.28	Drawdown (ft) =	1.18

Theis Function	X	Y
a	1.00E-04	8.633
b	2.00E-04	7.94

Well 01 (7 gpm) Calculated Drawdown

Aquifer Thickness Assumed = 75 ft
Time = 1 day

Specific Storage (1/ft)	Hydraulic Conductivity (ft/day)	Minimum Distance To Neighboring Well (ft)	Drawdown (ft)
3.10E-04	10	174	0.74
1.50E-05	10	174	1.18
3.10E-04	140	174	0.08
1.50E-05	140	174	0.11

Well 02 - 01 Drawdown	Well Flow (gpm)	Radius (ft)	Specific Storage (1/ft)	Transmissivity (ft2/day)	Time (days)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)
Data	3.5	174	1.50E-05	750	1	75	10
Theis Eq =	0.1804438	u =	1.51E-04	W (u) =	8.28	Drawdown (ft) =	0.59

Theis Function	X	Y
a	1.00E-04	8.633
b	2.00E-04	7.94

Well 02 (3.5 gpm) Calculated Drawdown

Aquifer Thickness Assumed = 75 ft
Time = 1 day

Specific Storage (1/ft)	Hydraulic Conductivity (ft/day)	Minimum Distance To Neighboring Well (ft)	Drawdown (ft)
3.10E-04	10	174	0.37
1.50E-05	10	174	0.59
3.10E-04	140	174	0.04
1.50E-05	140	174	0.06

Well 03-04 Drawdown	Well Flow (gpm)	Radius (ft)	Specific Storage (1/ft)	Transmissivity (ft2/day)	Time (days)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)
Data	15	492	1.50E-05	750	1	75	10
Theis Eq =	0.5779935	u =	1.21E-03	W (u) =	6.19	Drawdown (ft) =	1.90

Theis Function	X	Y
a	1.00E-03	6.332
b	2.00E-03	5.639

Well 03 (15 gpm) Calculated Drawdown

Aquifer Thickness Assumed = 75 ft
Time = 1 day

Specific Storage (1/ft)	Hydraulic Conductivity (ft/day)	Minimum Distance To Neighboring Well (ft)	Drawdown (ft)
3.10E-04	10	492	0.97
1.50E-05	10	492	1.9
3.10E-04	140	492	0.13
1.50E-05	140	492	0.19

SUMMIT ENGINEERING, INC.	MAXVILLE LAKE WINERY Water Availability Tier II: Well Drawdown Analysis	PROJECT NO. 2015052 BY: CL CHK: GG

Well 04-03 Drawdown	Well Flow (gpm)	Radius (ft)	Specific Storage (1/ft)	Transmissivity (ft2/day)	Time (days)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)
Data	24	492	1.50E-05	750	1	75	10
Theis Eq =	0.9247896	u =	1.21E-03	W (u) =	6.19	Drawdown (ft) =	3.03

Theis Function	X	Y
a	1.00E-03	6.332
b	2.00E-03	5.639

Well 04 (24 gpm) Calculated Drawdown

Aquifer Thickness Assumed = 75 ft
Time = 1 day

Specific Storage (1/ft)	Hydraulic Conductivity (ft/day)	Minimum Distance To Neighboring Well (ft)	Drawdown (ft)
3.10E-04	10	492	1.55
1.50E-05	10	492	3.03
3.10E-04	140	492	0.20
1.50E-05	140	492	0.31

Well 03 - Other property well Drawdown	Well Flow (gpm)	Radius (ft)	Specific Storage (1/ft)	Transmissivity (ft2/day)	Time (days)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)
Data	15	436	1.50E-05	750	1	75	10
Theis Eq =	0.5964695	u =	9.50E-04	W (u) =	6.38	Drawdown (ft) =	1.96

Theis Function	X	Y
a	9.00E-04	6.437
b	1.00E-03	6.332

Well 03 (15 gpm) Calculated Drawdown

Aquifer Thickness Assumed = 75 ft
Time = 1 day

Specific Storage (1/ft)	Hydraulic Conductivity (ft/day)	Minimum Distance To Neighboring Well (ft)	Drawdown (ft)
3.10E-04	10	436	1.04
1.50E-05	10	436	1.96
3.10E-04	140	436	0.13
1.50E-05	140	436	0.20

Well 04 - Other property well Drawdown	Well Flow (gpm)	Radius (ft)	Specific Storage (1/ft)	Transmissivity (ft2/day)	Time (days)	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/day)
Data	24	183	1.50E-05	750	1	75	10
Theis Eq =	1.2206862	u =	1.67E-04	W (u) =	8.17	Drawdown (ft) =	4.00

Theis Function	X	Y
a	1.00E-04	8.633
b	2.00E-04	7.94

Well 04 (24 gpm) Calculated Drawdown

Aquifer Thickness Assumed = 75 ft
Time = 1 day

Specific Storage (1/ft)	Hydraulic Conductivity (ft/day)	Minimum Distance To Neighboring Well (ft)	Drawdown (ft)
3.10E-04	10	183	2.5
1.50E-05	10	183	4.0
3.10E-04	140	183	0.27
1.50E-05	140	183	0.38