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Revised Wastewater Feasibility Study

Benjamin Ranch Winery, Use Permit Application No. P13-00371-UP
Planning Commission Hearing, May 19, 2021

BARTELT
ENGINEERING

**ONSITE WASTEWATER DISPERSAL FEASIBILITY STUDY FOR
THE BENJAMIN RANCH WINERY
8895 CONN CREEK ROAD, NAPA COUNTY
APN 030-120-016**

As required by Napa County Planning, Building and Environmental Services (PBES), this study outlines the feasibility of providing onsite wastewater disposal for a potential winery and Visitors Center on the above referenced parcel located at 8895 Conn Creek Road, Napa County, CA.

Project Description

The project proposes the installation of a Visitors Center, commercial kitchen, and full crush winery on a 54.64± acre parcel with the intent of the facility having the capability of producing 475,000 gallons of wine per year. The parcel is currently developed with a vineyard manager's office, 47.5± acres of vineyard, miscellaneous structures associated with vineyard operations and access roads. The project also proposes a Lot Line Adjustment increasing the parcel size to 63.97± acres. Refer to the attached Use Permit drawings for the existing and proposed development.

Along with the proposed wine production at the site, the project proposes a moderate staffing and marketing plan which includes the following for the proposed winery: 30 year around full-time employees, 5 seasonal dayshift (harvest) employees and 5 seasonal swing shift (harvest) employees and the following for the proposed Visitors Center: 15 year around full-time employees and 5 part-time employees. 1 additional year around full-time employee is added to account for the onsite Vineyard Manager. The project proposes to offer private tours and tastings for a maximum number of 150 guests per day Monday through Wednesday and 300 guests per day Thursday through Sunday. The project also proposes to offer Large Events for a maximum of 150 guests that may occur Monday through Sunday up to an annual maximum of 8 events – no more than 2 large events may occur in a given month – no more than 1 large event may occur on any given day. The winery may also hold an event related to the Auction Napa Valley. In no case shall the daily combined tours and tastings and marketing event visitation exceed 300 guests. All marketing events will serve food provided by an offsite caterer.

Table 1 summarizes the proposed marketing plan:

Table 1: Marketing Plan Summary

Guest Experience Proposed	Frequency Proposed	Number of Guests Proposed
Large Events	8 per year	150 per event
Auction Napa Valley	annual	150 per event
Private Tours & Tastings	Daily (M, T, W)	up to 150 per day
Private Tours & Tastings	Daily (Th, F, Sa, Su)	up to 300 per day

As part of our work, representatives from Bartelt Engineering have reviewed the planned operational methods for the winery with our Client, reviewed the parcel files at Napa County Environmental Health, held conversations with Napa County Environmental Health staff, performed a reconnaissance of the site to view existing conditions and conducted a site evaluation on June 5, 2013 to evaluate the feasibility of installing an onsite wastewater dispersal system to serve the proposed winery and Visitors Center.

This study and the attached Use Permit Drawings will demonstrate that the proposed winery improvements and marketing plan can feasibly be developed and that the parcel can adequately dispose of all wastewater onsite.

WATER USE ANALYSIS

Bartelt Engineering has completed a Water Availability Analysis (WAA) for the proposed winery. According to the Water Availability Analysis, the proposed parcel configuration would be allotted 63.97± acre-feet of water per year. The Water Availability Analysis estimates that the proposed water uses for the entire parcel (vineyard and winery production of 475,000 gallons of wine per year) will be approximately 41.79± acre-feet of water per year (see the Water Availability Analysis prepared by Bartelt Engineering for more information on the proposed water use).

WASTEWATER ANALYSIS

Winery Production Process Wastewater Flow

The winery facility's production wastewater (PW) flow rates for harvest and non-harvest seasons can be calculated as follows:

Harvest Peak Winery Process Wastewater Flow=

$$\left(\frac{475{,}000\ \text{gallons of wine}}{\text{year}}\right)\times\left(\frac{1.5\ \text{gallons of water}}{1\ \text{gallon of wine}}\right)\times\left(\frac{1\ \text{year}}{61\ \text{days of crush}}\right)=$$

Harvest Peak Winery Process Wastewater Flow = 11,680 gallons per day (gpd)

Non-Harvest Peak Winery Process Wastewater Flow=

$$\left(\frac{475{,}000\ \text{gallons of wine}}{\text{year}}\right)\times\left(\frac{4.5\ \text{gallons water}}{1\ \text{gallon of wine}}\right)\times\left(\frac{1\ \text{year}}{304\ \text{days}}\right)=$$

Non-Harvest Peak Winery Process Wastewater Flow = 7,031 gpd

Sanitary Wastewater Flow

All plumbing fixtures in the winery production facility and Visitors Center will be water saving fixtures per the California Plumbing Code as adopted by the Napa County Building Division. The sanitary wastewater generated at the winery production facility and Visitors Center including full-time employees, seasonal (harvest) employees and guests and can be itemized as follows:

Winery Employees:

- 30 Year Around Full-Time Employees x 15 gpd per employee = 450 gpd
- 5 Seasonal Dayshift (Harvest) Employees x 15 gpd per employee = 75 gpd
- 5 Seasonal Swing Shift (Harvest) Employees x 15 gpd per employee = 75 gpd

Vineyard Manager:

- 1 Year Around Full-Time Employee x 15 gpd per employee = 15 gpd

Visitors Center Employees:

- 15 Year Around Full-Time Employees x 15 gpd per employee = 225 gpd
- 5 Part-Time Employees x 15 gpd per employee = 75 gpd

The sanitary wastewater generated by guests at the Visitors Center can be itemized as follows:

Guests:

- Large Events:
  - (150 guests per event) x (3 gpd per guest) x 75% usage rate = 338 gpd per event
  - (10 event staff) x (15 gpd per event staff) = 150 gpd per event
- Private Tours and Tasting (M, T, W):
  - (150 guests per day) x (3 gpd per guest) x 60% usage rate= 270 gpd
- Private Tours and Tasting (Th, F, Sa, Su):
  - (300 guests per day) x (3 gpd per guest) x 60% usage rate= 540 gpd

- ***Note:*** *This feasibility study assumes that portable toilets, offsite meal preparation and catering services are utilized during Large events regardless of the season and 75% of the event guests are assumed to use the Visitors Center restrooms during these events.*

Kitchen Sanitary Wastewater Flow

Meal preparations may occur for employees in the commercial kitchen within the Visitors Center. Kitchen waste consisting primarily of fats, oils and grease (FOG) as well as organic material would be generated during food preparation. Per PBES requirements, grease interceptors are required to be plumbed to a commercial kitchen with an onsite wastewater treatment system.

Wastewater generated for employee meal preparation is calculated per PBES requirement which includes a generation rate of 5 gpd per employee for kitchen waste from meal preparation/clean-up. The sanitary wastewater flow generated from kitchen waste is calculated below:

Kitchen Waste:

- (46 full-time employees) x (5 gpd per employee) = 230 gpd
- (15 part-time/harvest employees) x (5 gpd per employee) = 75 gpd

Total Harvest Season and Non-Harvest Season Peak Sanitary Wastewater Flow

The total proposed harvest season peak sanitary wastewater flow is the combination of the winery production facility, Visitors Center, and commercial kitchen sanitary wastewater flows during the months of August through November (harvest). The total proposed non-harvest season peak sanitary wastewater flow is the combination of the winery production facility, Visitors Center, and commercial kitchen sanitary wastewater flows during the months of December through July (non-harvest).

Table 2A below outlines the sanitary wastewater flows generated by employees and guests during a combination of events for a single day in harvest and non-harvest seasons.

TABLE 2A: HARVEST AND NON-HARVEST SEASON DAILY SANITARY WASTEWATER FLOWS

	Daily Occurrence							
	Harvest				Non-Harvest			
Winery Employees	600	600	600	600	450	450	450	450
Vineyard Manager	15	15	15	15	15	15	15	15
Visitors Center Employees	300	300	300	300	300	300	300	300
Private Tours and Tastings (M, T, W)	270			270	270			270
Kitchen Waste	305	305	305	305	230	230	230	230
Large Event			488	488			488	488
Private Tours and Tastings (Th, F, Sa, Su)		540				540		
Total Flow (gpd)	1,490	1,760	1,708	1,978	1,265	1,535	1,483	1,753

Design Wastewater Flows

The greatest practical harvest and non-harvest season peak process and sanitary wastewater flows are summarized in the following Table 2B:

TABLE 2B: HARVEST AND NON-HARVEST SEASON PEAK WASTEWATER SUMMARY

Wastewater Source	Harvest		Non-Harvest
	(gpd)		(gpd)
Sanitary Wastewater	Winery	615	465
	Visitors Center	1,363	1,288
Process Wastewater	11,680		7,031

WASTEWATER EFFLUENT DISPERSAL METHODS

Bartelt Engineering proposes several options for the dispersal of wastewater generated by the winery production facility, Visitors Center, and commercial kitchen. A final treatment and dispersal option will be selected for installation following approval of the Use Permit Application. The proposed options are discussed further in the following sections. Refer to the associated Use Permit Drawings for location of the proposed treatment and dispersal methods.

Proposed Preferred Wastewater Option

Under the preferred option, separate wastewater conveyance, treatment, and dispersal systems are proposed. Process wastewater would be pretreated then surface applied as vineyard/landscape irrigation. Sanitary wastewater would also be pretreated then dispersed via a subsurface drip field.

Proposed Seasonal Surface Drip Irrigation Process Wastewater Dispersal System

The proposed process wastewater treatment system will consist of several steps. The floors of the proposed winery buildings will be sloped so that all process wastewater is collected in trench drains and floor drains. The winery process wastewater collected in the trench drains and floor drains will then gravity flow into septic tanks fitted with filters to remove finer solids. From the septic tanks, the process wastewater effluent will gravity flow into a sump vault before being pumped to 2 - 15,000± gallon equalization tanks.

The process wastewater effluent in the equalization tanks will then be treated by a pretreatment system. After the winery process wastewater effluent has been treated, the treated effluent will then be stored in a storage tank from which it will be distributed via seasonal surface irrigation on a designated portion of the existing vineyards on the parcel.

Surface Drip Irrigation Wastewater Flow Balance

A process wastewater flow balance was determined by estimating the monthly wastewater produced (see Table I), the potential/available volume of treated effluent that can be disposed of in the vineyard each month (see Table III), the average irrigation flow based on estimated vineyard irrigation practice (see Table IV) and sizing a storage tank to be able to store excess treated wastewater effluent until it can be properly disposed of in the vineyard (see Table V). Precipitation data for a 10-year return period was used for the irrigation analysis (see Table II). The estimates for a 10-year return period were taken from Oakville 1W Weather Station data derived from 1948-1981 Normals.

The treated wastewater effluent storage tank should have a minimum volume of 126,000 gallons (see attached Table V) to provide for some storage of the treated effluent through the winter months when surface drip land application is minimal and to equalize differences between the wastewater generation rate and the irrigation application rate. Reference evapotranspiration rates and crop coefficients were used to calculate the irrigation demand for the existing vineyard (see Table III). Reference evapotranspiration rates and crop coefficients were obtained from the California Irrigation Management Information System website (http://wwwcimis.water.ca.gov) for the Oakville #77 weather station (attached). It was assumed that available groundwater in the root zone is depleted by May and that irrigation is primarily applied to the vines for the months of May through

October. In the months where the irrigation demand exceeds the amount of treated effluent that is available for irrigation, it is assumed that the entire irrigation requirement for the vines is not met or that another water source (onsite wells) is used to supply additional irrigation water.

The winery effluent surface irrigation drip dispersal area design is based on the use of 45.7± acres or approximately 47,397 existing grape vines located adjacent to the winery. The dispersal area will need to be verified once all dispersal field setbacks are determined.

Furthermore, all dispersal field areas will need to be labeled with signage indicating the use of treated effluent for irrigation in accordance with Napa County Environmental Health standards.

Winery and Visitors Center Sanitary Wastewater Dispersal Systems

Due to the distance (380± feet) between the winery and the Visitors Center, the project's preferred option proposes 2 sanitary wastewater dispersal systems, 1 dedicated to the winery and 1 dedicated to the Visitors Center.

The winery and Visitors Center sanitary wastewater would gravity flow to a series of septic tanks fitted with filters for solids removal. Kitchen waste would flow into a grease interceptor prior to entering the septic tanks. From the septic tanks, sanitary wastewater effluent will gravity flow to a recirculation/blend tank where the effluent would be pretreated through an approved pretreatment system. Pretreated effluent is proposed to be dispersed through a subsurface drip field(s) by means of a timed-dose pumping system.

Sanitary Wastewater Effluent Subsurface Drip Dispersal Field and Replacement Area

Based on the site evaluation performed by Bartelt Engineering on June 5, 2013, test pits #1 through #6 showed similar results and are acceptable for a subsurface drip dispersal type septic system and 200% replacement area. The site evaluation determined that the soil in the area of these test pits is Clay Loam/Sandy Clay/Sandy Clay Loam. For the evaluated soil types, Napa County and GeoFlow Incorporated recommend a soil hydraulic loading rate[1,2] of 0.6 gal/sf/day. The maximum acceptable depth found during the site evaluation was approximately 40 inches. Napa County Standards require a minimum of 24 inches of useable soil below the drip lines. The maximum acceptable soil depth found at the site allows for 34 inches of useable soil beneath drip emitters buried 6 inches below the surface. The required dispersal field area can be calculated as follows:

Winery Dispersal Field

$$\text{Dispersal Field Area} = \left(\frac{615\ \text{gal}}{\text{day}}\right) \times \left(\frac{\text{day ft}^2}{0.6\ \text{gal}}\right) = 1{,}025 \text{ square feet; use } 1{,}040 \text{ square feet}$$

The dispersal field area is based on 2 foot lateral spacing between drip lines and 2 foot emitter spacing.

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[1]Hydraulic loading rate is based on *Table III-2 Soil Hydraulic Loading Rates* from Napa County Onsite Wastewater Treatment Systems (OWTS) Technical Standards, Final Draft.

[2] Referenced from *Table 1 Drip Loading Rates Considering Soils Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated.

The required number of emitters is calculated as follows:

$$\text{Required Number of Emitters} = 1{,}040 \text{ square feet} \times \frac{1 \text{ emitter}}{4 \text{ square feet}} = 260 \text{ emitters}$$

To make the best use of the available dispersal field area we recommend the system consist of 4 lines that are 130 feet long for a total of 520 lineal feet of drip line. This layout provides 260 emitters.

Visitors Center Dispersal Field

$$\text{Dispersal Field Area} = \left(\frac{1{,}363 \text{ gal}}{\text{day}}\right) \times \left(\frac{\text{day ft}^2}{0.6 \text{ gal}}\right) = 2{,}272 \text{ square feet; use } 2{,}300\pm \text{ square feet}$$

The dispersal field area is based on 2 foot lateral spacing between drip lines and 2 foot emitter spacing.

The required number of emitters is calculated as follows:

$$\text{Required Number of Emitters} = 2{,}300 \text{ square feet} \times \frac{1 \text{ emitter}}{4 \text{ square feet}} = 575 \text{ emitters}$$

To make the best use of the available dispersal field area we recommend the system consist of 10 lines that are 115 feet long for a total of 1,150 lineal feet of drip line. This layout provides 575 emitters.

A suitable dispersal and replacement area adjacent to the Visitors Center will need to be evaluated.

Tank Sizing

All septic and grease interceptor tanks should be sized to provide a minimum of 2 days retention time during peak wastewater flow. Based on discussions with the manufacturers of pretreatment systems, the equalization tank should be sized for a minimum of 1.5 days of peak flow capacity. The irrigation storage tank should be sized based on vineyard irrigation demands and flow balance calculations, see enclosed spreadsheets for preliminary calculations on treated wastewater flows and irrigation demands. All septic and grease interceptor tanks should have a Zabel A300 filter or approved equal installed at the outlet to aid in the screening of suspended solids and the reduction of BOD in the wastewater effluent stream.

Conclusions

The parcel will be able to support the proposed 475,000 gallon winery and Visitors Center by utilizing a pretreatment system to treat the process wastewater effluent and dispose of treated effluent through surface drip irrigation to the vineyard and disposing of the sanitary sewer effluent through onsite subsurface drip dispersal fields utilizing an approved pretreatment system to pretreat the sanitary sewer effluent.

Full design calculations and construction plans will be completed after approval of the Use Permit currently under consideration.

ATTACHMENTS

Process Wastewater Flow Table I
Rainfall Rates Table II
Potential Vineyard Irrigation Demand Table III
Irrigation Flow Table IV
Treated Process Waste Irrigation Storage Tank Balance Table V
Reference World Climate Average Rainfall
Reference Evapotranspiration Rates and Crop Coefficients
Site Evaluation

REFERENCES

California Onsite Wastewater Association (COWA). "Pumping and Pressure Distribution Systems." May 1998.

Geoflow, Inc. *Wastewater Design, Installation and Maintenance Guidelines.* v1, 2007.

Napa County Department of Environmental Management. "Regulations for Design, Construction and Installation of Alternative Sewage Treatment Systems." http://www.countyofnapa.org/WorkArea/DownloadAsset.aspx?id=4294980363, October 28, 2013.

Telsco Industries. "Turf Irrigation Manual." By James A. Watkins. 1987.

U.S. Department of Health, Education and Welfare, Public Health Service Publication. *Manual of Septic-Tank Practice.* 1967.

U.S. Environmental Protection Agency. "Onsite Wastewater Treatment Systems Manual." February 2002.

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Benjamin Ranch Winery
Process Wastewater Flow
Table I

Total annual wine production (gallons):	**475,000**
Annual water usage per gallon of wine (gallons):	**6**
Annual process wastewater flow (gallons):	2,850,000
Average process wastewater flow (gpd):	7,808

MONTHLY WASTEWATER FLOW (gallons/month):

Month	Percent	Wastewater Flow
September	**12.5**	356,250
October	**12.5**	356,250
November	**7.5**	213,750
December	**7.5**	213,750
January	**5.5**	156,750
February	**5.5**	156,750
March	**5.5**	156,750
April	**7.5**	213,750
May	**7.5**	213,750
June	**7.5**	213,750
July	**8.5**	242,250
August	**12.5**	356,250
TOTALS	100.0	2,850,000

Notes:

> Wastewater monthly proportioning is based on information provided by property owner.

>The annual water usage per gallon of wine is assumed to be 6 gallons.

Benjamin Ranch Winery
Rainfall Rates
Table II

MONTHLY RAINFALL (inches/month):

Month	Site Rainfall	10-year Rainfall
September	**0.40**	0.56
October	**2.10**	2.94
November	**3.50**	4.90
December	**5.60**	7.84
January	**7.70**	10.78
February	**6.70**	9.38
March	**3.70**	5.18
April	**1.90**	2.66
May	**0.50**	0.70
June	**0.10**	0.14
July	**0.10**	0.14
August	**0.10**	0.14
TOTALS	**32.40**	**45.36**

Notes:

> Site rainfall = Napa, CA (Oakville 1W Weather Station 1948 - 1981).
See www.worldclimate.com

> 10 year rainfall = Site rainfall x 1.4

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Benjamin Ranch Winery
Potential Vineyard Irrigation Demand
Table III

Vineyard Irrigation
Drip Field Area (acres): 45.70

Month	Days	[a]Reference Evapotranspiration ET_o (in/mo)	[b]Grapevine Crop Coefficient K_c	[c]Grapevine Evapotranspiration ET_c (in/mo)	[d]Precipitation 10-year (in/mo)	[e]Irrigation Demand (in/mo)	[f]Total Irrigation Demand (gallons/mo)
September	30	4.98	0.729	3.6	0.56	3.1	3,807,587
October	31	3.46	0.729	2.5	2.94	0.0	0
November	30	1.63	0.729	1.2	4.90	0.0	0
December	31	1.15	0.729	0.8	7.84	0.0	0
January	31	1.61	0.729	1.2	10.78	0.0	0
February	28	2.57	0.729	1.9	9.38	0.0	0
March	31	3.51	0.729	2.6	5.18	0.0	0
April	30	4.53	0.729	3.3	2.66	0.6	794,739
May	31	6.89	0.729	5.0	0.70	4.3	5,360,723
June	30	7.33	0.729	5.3	0.14	5.2	6,453,468
July	31	7.05	0.729	5.1	0.14	5.0	6,200,314
August	31	6.35	0.729	4.6	0.14	4.5	5,567,430
TOTALS	**365**	**51.06**	**8.74**	**37.2**	**45.36**	**22.7**	**28,184,262**

(a) Average monthly reference evapotranspiration. Station #77, Oakville, for the period from April 2012 to March 2013. See www.cimis.water.ca.gov

(b) K_c coefficients for grapevines

(c) $ET_c = ET_o \times K_c$

(d) 10-year precipitation = Average precipitation x 1.4. See Rainfall Rates, Table II

(e) Irrigation Demand = ET_c - 10-year precipitation

(f) Total irrigation demand (gallons/month) = (No. of acres) x irrigation demand (inches/month) / 12 (inches/foot) x 325851 (gallons/acre-feet)

Grapevine Crop Coefficient (Kc) is calculated based on the following vineyard information:

A = Row Width = **7** feet
B = Vine Spacing = **6** feet
C = Area per Vine = 42 sq-ft
D = Average Width of Measured Shaded Area Between Two Vines **3** feet
E = Shaded Area per Vine = 'B' x 'D' = 18 sq-ft
PSA (percent shaded area) = 'E' / 'C'= 0.429 or 43%

The Grapevine Crop Coefficient (Kc) is calculated with the following equation where 0.017 is the slope of the equation describing the relationship between the percent shaded area and the crop coefficient of Thompson Seedless vines

Kc = PSA x 0.017 = 0.729

References:

> Irrigation of winegrapes in California, By Larry E. Williams, Department of Viticulture & Enology University of California-Davis, and Kearney Agricultural Center

> Irrigation Scheduling of grapevines with Evapotranspiration Data, by Ed Hellman, viticulture Extension Specialist, AgriLIFE Extension, Texas A&M system

> California Irrigation Management Information System (CIMIS)

Benjamin Ranch Winery
Irrigation Flow
Table IV

Vineyard area (acres):	**45.70**
Row spacing (feet):	**7**
Vine spacing (feet):	**6**
Total number of irrigated vines:	47,397

Seasonal irrigation (May - October):
Seasonal irrigation per vine (gallons/season): **100**

Non-Seasonal irrigation (November - March):*
Depth of irrigation (inches/month):

November	**0.25**
December	**0.25**
January	**0.25**
February	**0.25**
March	**0.25**

Frost protection irrigation (April):*
Depth of irrigation (inches/month): **0.40**

MONTHLY IRRIGATION FLOW (gallons/month):

Month	Seasonal Percent	Seasonal Irrigation per Vine	Total Irrigation
September	**6.0**	**6.0**	284,385
October	**20.0**	**20.0**	947,949
November*			310,216
December*			310,216
January*			310,216
February*			310,216
March*			310,216
April			496,346
May	**20.0**	**20.0**	947,949
June	**20.0**	**20.0**	947,949
July	**20.0**	**20.0**	947,949
August	**14.0**	**14.0**	663,564
TOTALS	**100.0**	**100.0**	**6,787,170**

** Total non-seasonal irrigation =*
(vineyard area)(43,560 sq.-ft./acre)*(depth of irrigation/12 in./ft.)**
(7.48 gal./cu.-ft.)

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Benjamin Ranch Winery
Treated Process Wastewater Irrigation Storage Tank Balance
Table V

WASTEWATER TANK BALANCE (GALLONS):

Month	Beginning Balance	Wastewater Flow	Actual Irrigation	Tank Balance
September	0	356,250	284,385	71,865
October	71,865	356,250	947,949	0
November	0	213,750	310,216	0
December	0	213,750	310,216	0
January	0	156,750	310,216	0
February	0	156,750	310,216	0
March	0	156,750	310,216	0
April	0	213,750	496,346	0
May	0	213,750	947,949	0
June	0	213,750	947,949	0
July	0	242,250	947,949	0
August	0	356,250	663,564	0
	TOTALS	**2,850,000**	**6,787,170**	
	Average	**237,500**	**565,597**	

Recommended Tank Capacity (gallons): 126,000
Recommended Tank Capacity (acre-feet): 0.39

Notes:
Water balance calculations assume storage tank is empty at the beginning of November.
In months when the irrigation demand exceeds the beginning balance plus the wastewater flow it is assumed that the full irrigation demand is not met or that the additional irrigation water is supplied from an alternate source.

OAKVILLE 1 W, NAPA COUNTY, CALIFORNIA USA

Weather station **OAKVILLE 1 W, NAPA COUNTY** is at about 38.45°N 122.41°W. Height about 49m / 160 feet above sea level.

Average Rainfall

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
mm	195.5	170.6	95.2	47.2	11.8	3.4	2.1	1.9	10.1	54.6	89.2	143.1	825.5
inches	7.7	6.7	3.7	1.9	0.5	0.1	0.1	0.1	0.4	2.1	3.5	5.6	32.5

Source: OAKVILLE 1 W, NAPA COUNTY data derived from NCDC Cooperative Stations. 23 complete years between 1948 and 1981

Map of the area around OAKVILLE 1 W, NAPA COUNTY from tiger.census.gov.
Locations outside the continental US are not mapped.

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Monthly Report

Rendered in ENGLISH Units.
April 1, 2012 - March 31, 2013
Printed on April 29, 2013
See the bottom of this report for a legend for all flag values.

North Coast Valleys - Oakville - #77

Month Year	Tot ETo (in)	Tot Precip (in)	Avg Sol Rad (Ly/Day)	Avg Vap Pres (mBars)	Avg Max Air Tmp (F)	Avg Min Air Tmp (F)	Avg Air Tmp (F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (F)	Avg Wind Speed (mph)	Avg Soil Temp (F)
Apr 2012	4.53 K	0.92 K	497	10.8 K	70.9 K	43.5 K	56.3 K	93 K	41 K	68 K	45.6 K	4.1	59.6 K
May 2012	6.89	0.00 K	641	10.8 K	79.6	44.7	61.7 K	89 K	35 K	58 K	46.0 K	4.2 K	64.4 K
Jun 2012	7.33	0.00	685	11.9 K	81.9 K	46.7 K	65.2	89	35	57 K	48.6 K	4.5 K	67.4
Jul 2012	7.05	0.00	637	14.3	83.3 K	49.7 K	65.3	92	43	68	54.1	4.2 K	69.4
Aug 2012	6.35	0.00	573	14.1	85.6	49.1 K	65.6	92	39	66	53.7	3.7	70.0
Sep 2012	4.98	0.00	488	12.5	84.1	44.4 K	61.8	94	36	67	50.4	3.1	65.8
Oct 2012	3.46	0.90 K	339	11.9	77.1 K	45.0	59.5	93	42	70	48.7	3.0	62.5
Nov 2012	1.63 K	10.55 K	212 K	11.6 K	66.7 K	41.8 K	53.3 K	97 K	54 K	82	47.9	2.8 K	57.3 K
Dec 2012	1.15	11.39 K	160	9.4 K	57.2 K	37.5 K	46.7	96	62	84 K	42.0 K	3.3	51.3 K
Jan 2013	1.61	0.95 K	219	7.3	60.0 K	31.7 K	44.0	93	44	73	35.5	2.8	46.6
Feb 2013	2.57	0.36	329 K	7.6	64.9	33.8	48.1	92	37	67	36.9	3.5	49.7
Mar 2013	3.51	1.98 K	385 K	10.1 K	68.8	39.5	53.7	94	45	71 K	44.3 K	3.6 K	55.2
Totals/Avgs	51.06	27.05	430	11.0	73.3	42.3	56.8	93	43	69	46.2	3.6	59.9

San Francisco Bay - Carneros - #109

Month Year	Tot ETo (in)	Tot Precip (in)	Avg Sol Rad (Ly/Day)	Avg Vap Pres (mBars)	Avg Max Air Tmp (F)	Avg Min Air Tmp (F)	Avg Air Tmp (F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (F)	Avg Wind Speed (mph)	Avg Soil Temp (F)
Apr 2012	4.14 K	1.63 K	487	11.3 K	68.0 K	42.0 K	55.0 K	95 K	52 K	74 K	47.0 K	4.0 K	55.4
May 2012	5.95	0.06	594 K	11.3	74.2 K	42.6 K	58.2	94	45	69	47.7	4.1 K	61.9
Jun 2012	6.40	0.02	607	12.3 K	77.8	45.7 K	62.1 K	92 K	42 K	65 K	49.6 K	4.7 K	64.7
Jul 2012	6.05	0.15	576 K	14.1	77.5 K	49.1 K	62.2	94	50	74	53.7	4.8	66.5
Aug 2012	5.51	0.00	530 K	13.7 K	79.3	47.6 K	61.9	94	47	73 K	52.9 K	4.2	68.2
Sep 2012	4.38	0.03	455 K	12.4	78.6	43.2 K	59.1	95	44	73	50.3	3.4	64.2 K
Oct 2012	3.09 K	1.75 K	304 K	12.5 K	74.9 K	45.0 K	59.4 K	94 K	47 K	73	50.2	2.8 K	61.7 K
Nov 2012	1.66	3.19 K	218	11.5	65.8 K	40.6 K	52.6	96	59	83	47.6	3.1 K	56.1
Dec 2012	1.07	6.80 K	155	9.4 K	56.8 K	36.8 K	46.4	96	65	85 K	42.2 K	3.0	50.7 K
Jan 2013	1.63	0.64	236 K	7.3 K	57.6	30.7 K	42.7	95	52	77 K	35.8 K	2.6	43.9 K
Feb 2013	2.37	0.27	326	7.9	63.4 K	32.8	46.5	95	46	74	38.3	2.7	46.4 K
Mar 2013	3.30	0.66	380	10.3	67.1 K	38.6	52.1	96	52	77	44.9	3.2	51.8
Totals/Avgs	45.55	15.20	406	11.2	70.1	41.2	54.8	95	50	75	46.7	3.6	57.6

M - All Daily Values Missing
K - One or More Daily Values Flagged
J - One or More Daily Values Missing
L - Missing and Flagged Daily Values

W/sq.m = Ly/day/2.065	inches * 25.4 = mm	C = 5/9 * (F - 32)

m/s = mph * 0.447	kPa = mBars * 0.1

Napa County Department of Environmental Management

SITE EVALUATION REPORT

Permit #: E13-00257	
APN: 030-120-016	
(County Use Only) Reviewed by:	Date:

Please attach an 8.5" x 11" plot map showing the locations of all test pits triangulated from permanent landmarks or known property corners. The map must be drawn to scale and include a North arrow, surrounding geographic and topographic features, direction and % slope, distance to drainages, water bodies, potential areas for flooding, unstable landforms, existing or proposed roads, structures, utilities, domestic water supplies, wells, ponds, existing wastewater treatment systems and facilities.

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner Frank Family Vineyards, LLC, c/o Richard Frank	☐ New Construction ☐ Addition ☐ Remodel ☐ Relocation ☒ Other: Winery
Property Owner Mailing Address 1091 Larkmead Lane	☐ Residential - # of Bedrooms: Design Flow : gpd
City: Calistoga State: CA Zip: 94515	☒ Commercial – Type: Sanitary Waste: 580 gpd Process Waste: gpd
Site Address/Location 8895 Conn Creek Road, St. Helena, CA	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name Bartelt Engineering	Evaluator's Name Paul N. Bartelt, P.E.	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
Mailing Address: 1303 Jefferson Street, 200 B		Telephone Number (707) 258-1301
City: Napa	State: CA Zip: 94559	Date Evaluation Conducted June 5, 2013

Primary Area See below	Expansion Area See below
Acceptable Soil Depth: 42 in. Test pits #: 3 & 4 Soil Application Rate (gal. /sq. ft. /day): PTE 0.6	Acceptable Soil Depth: 42 in. Test pits #: 1, 2, 5 & 6 Soil Application Rate (gal. /sq. ft. /day): PTE 0.6
System Type(s) Recommended: Subsurface Drip	System Type(s) Recommended: Subsurface Drip
Slope: 0% to 2%. Distance to nearest water source: 100+ feet	Slope: 0% to 2%. Distance to nearest water source: 100+ feet
Hydrometer test performed? No ☒ Yes ☐ (attach results)	Hydrometer test performed? No ☐ Yes ☒ (attach results)
Bulk Density test performed? No ☒ Yes ☐ (attach results)	Bulk Density test performed? No ☒ Yes ☐ (attach results)
Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)	Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)

Site constraints/Recommendations:

A site evaluation was conducted on June 5, 2013 by Paul Bartelt and Rich Paxton of Bartelt Engineering. Test pits were excavated by Harold Smith & Son, Inc. Peter Ex of Napa County Environmental Health visited the site to inspect soil conditions. Test pits #1 thru #7 showed suitable soil for the installation of a subsurface drip type dispersal field within the area tested.

Test Pit # 1

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-42		0-15	CL	SSB	VH	FRB/F	S	MVF/MF/ FM	MVF/CF/F M	None
42-64	G	0-15	SCL	SSB	H	FRB	VS	MVF/MF/ CM	FVF/FF	FFFt

Slope = 0% to 2%. Acceptable soil depth observed: 42 inches.
Assigned soil application rate = STE Insufficient Soil Depth for a Conventional – Standard System
STE Insufficient Soil Depth for ASTS (Alternative Sewage Treatment System)
PTE Insufficient Soil Depth for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 64 inches deep.
No groundwater observed.

Test Pit # 2

* Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-44*		0-15	CL	SSB	VH	FRB/F	S	MVF/MF/ FM	MVF/CF/ FM/FC	None
44-64*	G	0-15	SCL	SSB	H	FRB	VS	MVF/MF/ CM	FVF/FF	FFFt

Slope = 0% to 2%. Acceptable soil depth observed: 44 inches.
Assigned soil application rate = STE Insufficient Soil Depth for a Conventional – Standard System
STE Insufficient Soil Depth for ASTS
PTE Insufficient Soil Depth for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 64 inches deep.
No Groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated June 11, 2013.

Test Pit # 3

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-42		0-15	CL	SSB	VH	FRB/F	S	MVF/MF/ FM	MVF/CF/ FM/FC	None
42-64	G	0-15	SCL	SSB	H	FRB	VS	MVF/MF/ CM	FVF/FF	FFFt

Slope = 0% to 2%. Acceptable soil depth observed: 42 inches.
Assigned soil application rate = STE Insufficient Soil Depth for a Conventional – Standard System
STE Insufficient Soil Depth for ASTS
PTE Insufficient Soil Depth for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 64 inches deep.
No ground water observed.

Test Pit # 4

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-42		0-15	CL	SSB	VH	FRB/F	S	MVF/MF/ FM	MVF/CF/ FM/FC	None
42-46	C	15-30	CL	SSB	H	FRB/F	S	MVF/MF/ FM	MVF/CF/ FM	FFFt
46-64	G	0-15	SCL	SSB	H	FRB	VS	MVF/MF/ CM	FVF/FF	FFFt

Slope = 0% to 2%. Acceptable soil depth observed: 42 inches.
Assigned soil application rate = STE Insufficient Soil Depth for a Conventional – Standard System
STE Insufficient Soil Depth for ASTS
PTE Insufficient Soil Depth for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 64 inches deep.
No groundwater observed.

Test Pit # 5

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-42		0-15	CL	SSB	VH	FRB/F	S	MVF/MF/ FM	MVF/CF/ FM	None
42-64	G	0-15	SCL	SSB	H	FRB	VS	MVF/MF/ CM	FVF/FF	FFFt

Slope = 0% to 2%. Acceptable soil depth observed: 42 inches.
Assigned soil application rate = STE Insufficient Soil Depth for a Conventional – Standard System
STE Insufficient Soil Depth for ASTS
PTE Insufficient Soil Depth for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 64 inches deep.
No groundwater observed.

Test Pit # 6

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-44		0-15	CL	SSB	VH	FRB/F	S	MVF/MF/ FM	MVF/CF/ FM	None
44-66	G	0-15	SCL	SSB	H	FRB	VS	MVF/MF/ CM	FVF/FF	FFFt

Slope = 0% to 2%. Acceptable soil depth observed: 44 inches.
Assigned soil application rate = STE Insufficient Soil Depth for a Conventional – Standard System
STE Insufficient Soil Depth for ASTS
PTE Insufficient Soil Depth for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 66 inches deep.
No groundwater observed.

Test Pit # 7

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36		0-15	CL	SSB	VH	FRB/F	S	MVF/MF/ FM	MVF/CF/ FM	None
36-65	G	0-15	SCL	SSB	H	FRB	VS	MVF/MF/ CM	FVF	FFFt
Slope = 0% to 2%. Acceptable soil depth observed: 36 inches. Assigned soil application rate = STE Insufficient Soil Depth – Standard System STE Insufficient Soil Depth for ASTS PTE Insufficient Soil Depth for ASTS Subsurface Drip = 0.6 gal/sf/day										
No refusal at 65 inches deep. No groundwater observed.										

Table of Abbreviations

Boundary	Texture	Structure	Consistence			Pores	Roots	Mottling
			Side Wall	Ped	Wet			
A=Abrupt <1" **C**=Clear 1"-2.5" **G**=Gradual 2.5"-5" **D**=Difuse >5"	**S**=Sand **LS**=Loamy Sand **SL**=Sandy Loam **SCL**=Sandy Clay Loam **SC**=Sandy Clay **CL**=Clay Loam **L**=Loam **C**=Clay **SiC**=Silty Clay **SiCL**=Silty Clay Loam **SiL**=Silt Loam Si=Silt	**W**=Weak **M**=Moderate **S**=Strong --- **G**=Granular **PL**=Platy **Pr**=Prismatic **C**=Columnar **AB**=Angular Blocky **SB**=Subangular Blocky --- **M**=Massive **C**=Cemented	**L**=Loose **S**=Soft **SH**=Slighty Hard **H**=Hard **VH**=Very Hard **ExH**=Extremely Hard	**L**=Loose **VFRB**=Very Friable **FRB**=Friable **F**=Firm **VF**=Very Firm **ExF**=Extremely Firm	**NS**=NonSticky **SS**=Slightly Sticky **S**=Sticky **VS**=Very Sticky --- **NP**=NonPlastic **SP**=Slightly Plastic **P**=Plastic **VP**=Very Plastic	**Quantity:** **F**=Few **C**=Common **M**=Many **Size:** **VF**=Very Fine **F**=Fine **M**=Medium **C**=Coarse	**Quantity:** **F**=Few **C**=Common **M**=Many **Size:** **VF**=Very Fine **F**=Fine **M**=Medium **C**=Coarse **VC**=Very Course	**Quantity:** **F**=Few **C**=Common **M**=Many **Size:** **F**=Fine **M**=Medium **C**=Coarse **VC**=Very Course **ExC**=Extremely Coarse **Contrast:** **Ft**=Faint **D**=Distinct **P**=Prominent

Attach additional sheets as needed

Alternative Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2/day)	
	Shape	Grade	STE[1]	PTE[1,2]
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	1.0	1.2
Fine Sand, Loamy Fine Sand	Single grain	Structureless	0.6	1.0
Sandy Loam, Loamy Sand	Massive	Structureless	0.35	0.5
	Platy	Weak	0.35	0.5
	Prismatic, blocky, granular	Weak	0.5	0.75
		Moderate, Strong	0.8	1.0
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.5	0.75
		Strong	0.8	1.0
Sandy Clay, Silty Clay Loam, Clay Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.35	0.5
		Strong	0.6	0.75
Clay, Silty Clay	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak		
		Moderate, strong	0.2	0.25

1. See Table 1 in the Design, Construction and Installation of Alternative Sewage Treatment Systems.
2. A higher application rate for pretreated effluent may only be used when pretreatment is not used for one foot of vertical separation credit.

MINIMUM SURFACE AREA GUIDELINES TO DISPOSE OF 100 GPD OF SECONDARY TREATED EFFLUENT FOR SUBSURFACE DRIP DISPERSAL SYSTEMS

		Soil Absorption Rates		Design Application Rate (Gal/ft^2/day)	Total Area Required Sq. ft./100 gallons per day
Soil Class	Soil Type	Est. Soil Perc. Rate minutes/inch	Hydraulic Conductivity inches/hour		
I	Coarse sand	1 – 5	>2	1.400	71.5
I	Fine sand	5 – 10	1.5 – 2	1.200	83.3
II	Sandy loam	10 – 20	1.0 – 1.5	1.000	100.0
II	Loam	20 – 30	0.75 – 1.0	0.700	143.0
III	Clay loam	30 – 45	0.5 – 0.75	0.600	167.0
III	Silt - clay loam	45 – 60	0.3 – 0.5	0.400	250.0
IV	Clay non-swell	60 – 90	0.2 – 0.3	0.200	500.0
IV	Clay - swell	90 – 120	0.1 – 0.2	0.100	1000.0

1. For design purpose, the "Soil Type" category to be used in the above table shall be based on the most restrictive soil type encountered within two feet below the bottom of the drip line.
2. Dispersal field area calculation: Total square feet area of dispersal field = Design flow divided by loading rate.

Conventional Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2 /day)
	Shape	Grade	STE
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	Prohibited
Sandy Loam, Loamy Sand	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.33
		Moderate, strong	0.5
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.25
		Moderate, Strong	0.33
Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	0.25
		Strong	0.33
Sandy Clay, Silty Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	Prohibited
		Strong	0.25
Clay, Silty Clay	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak	Prohibited
		Moderate, strong	Prohibited

CONVENTIONAL SEWAGE TREATMENT SYSTEM SOIL APPLICATION RATES BASED ON PERCOLATION RATES	
Percolation Rate (mpi)	Application Rate (STE)
< 5 MPI	Prohibited
5 to 10 MPI	0.5
10-20 MPI	0.33
20-60 MPI	0.25
> 60 MPI	Prohibited

TABLE 1

DRIP LOADING RATES CONSIDERING SOIL STRUCTURE.

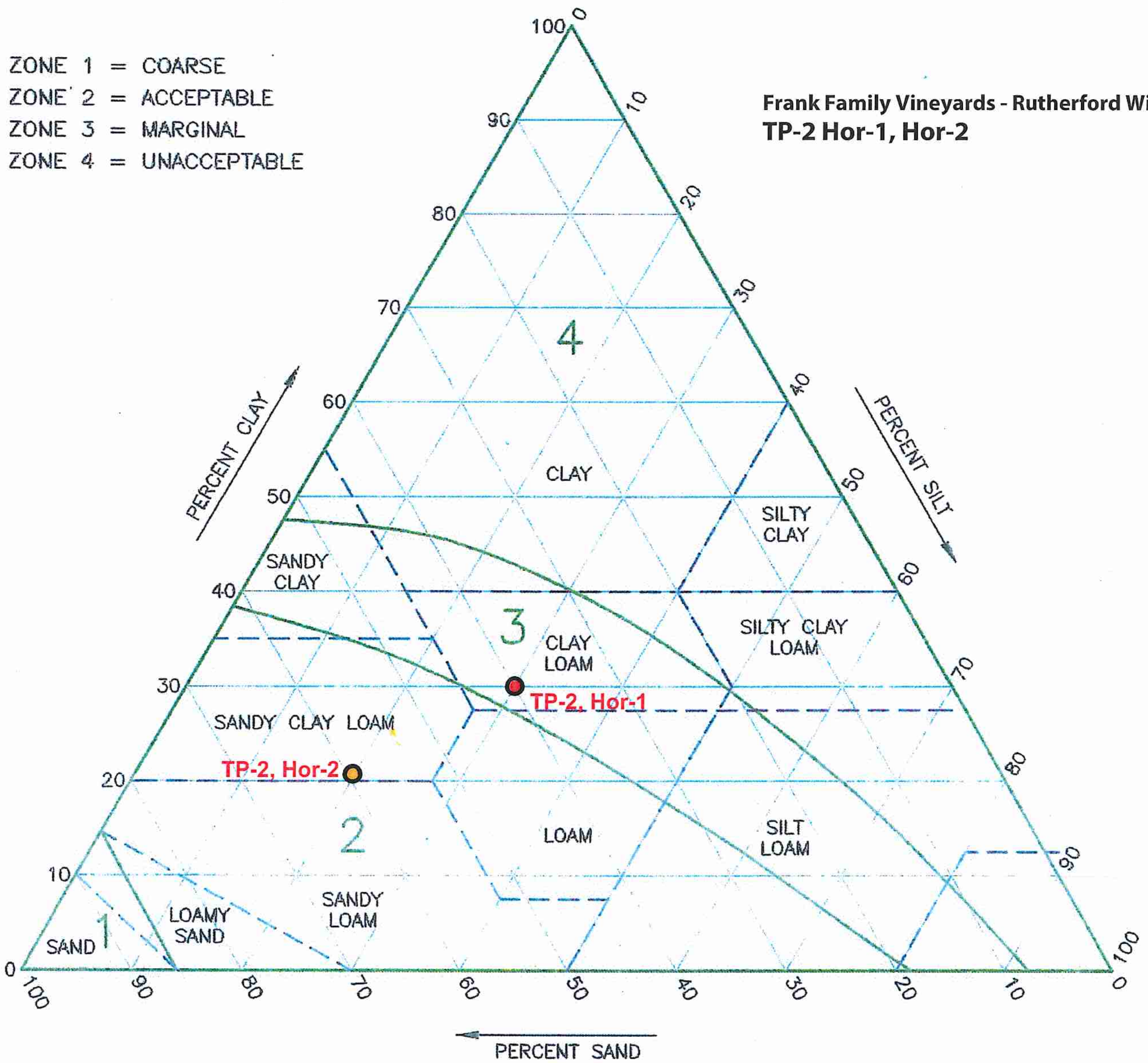
Table 1 is taken from the State of Wisconsin code and was prepared by Jerry Tyler.
Provided for guidelines and budgeting purposes. Refer to your local regulations and qualified soil scientists to determine best loading rates.

Soil Textures	**Soil Structure**	Maximum Monthly Average **BOD_5<30mg/L TSS<30mg/L** (gallons/ft²/day)	Maximum Monthly Average **BOD_5>30mg/L TSS>30mg/L** (gallons/ft²/day)
Course sand or coarser	N/A	1.6	0.4
Loamy coarse sand	N/A	1.4	0.3
Sand	N/A	1.2	0.3
Loamy sand	Weak to strong	1.2	0.3
Loamy sand	Massive	0.7	0.2
Fine sand	Moderate to strong	0.9	0.3
Fine sand	Massive or weak	0.6	0.2
Loamy fine sand	Moderate to strong	0.9	0.3
Loamy fine sand	Massive or weak	0.6	0.2
Very fine sand	N/A	0.6	0.2
Loamy very fine sand	N/A	0.6	0.2
Sandy loam	Moderate to strong	0.9	0.2
Sandy loam	Weak, weak platy	0.6	0.2
Sandy loam	Massive	0.5	0.1
Loam	Moderate to strong	0.8	0.2
Loam	Weak, weak platy	0.6	0.2
Loam	Massive	0.5	0.1
Silt loam	Moderate to strong	0.8	0.2
Silt loam	Weak, weak platy	0.3	0.1
Silt loam	Massive	0.2	0.0
Sandy clay loam	Moderate to strong	0.6	0.2
Sandy clay loam	Weak, weak platy	0.3	0.1
Sandy clay loam	Massive	0.0	0.0
Clay loam	Moderate to strong	0.6	0.2
Clay loam	Weak, weak platy	0.3	0.1
Clay loam	Massive	0.0	0.0
Silty clay loam	Moderate to strong	0.6	0.2
Silty clay loam	Weak, weak platy	0.3	0.1
Silty clay loam	Massive	0.0	0.0
Sandy clay	Moderate to strong	0.3	0.1
Sandy clay	Massive to weak	0.0	0.0
Clay	Moderate to strong	0.3	0.1
Clay	Massive to weak	0.0	0.0
Silty clay	Moderate to strong	0.3	0.1
Silty clay	Massive to weak	0.0	0.0

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

Frank Family Vineyards - Rutherford Winery
TP-2 Hor-1, Hor-2



Instructions:

1. Plot texture on triangle based on percent sand, silt, and clay as determined by hydrometer analysis.
2. Adjust for coarse fragments by moving the plotted point in the sand direction an additional 2% for each 10% (by volume) of fragments greater than 2mm in diameter.
3. Adjust for compactness of soil by moving the plotted point in the clay direction an additional 15% for soils having a bulk-density greater than 1.7 gm/cc.

Note:

For soils falling in sand, loamy sand or sandy loam classification bulk density analysis will generally not affect suitability and analysis not neccesary.

RGH CONSULTANTS

Experience is the difference

June 10, 2013
File: 9147.36

Bartelt Engineering
1303 Jefferson Street, Ste. 200B
Napa, CA 94559

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
Frank Family Vineyards, Rutherford Winery
JOB# 12-17

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

Size/Density	TP-2 HORIZON-1
+ #10 Sieve	14.9 %
Sand	38.2 %
Clay	30.4 %
Silt	31.4 %
Db g/cc	--

We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager

RGH CONSULTANTS

Experience is the difference

June 10, 2013
File: 9147.36

Bartelt Engineering
1303 Jefferson Street, Ste. 200B
Napa, CA 94559

Subject: Laboratory Test Results
Soil Texture Analysis by
Bouyoucos Hydrometry Method
Frank Family Vineyards, Rutherford Winery
JOB# 12-17

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

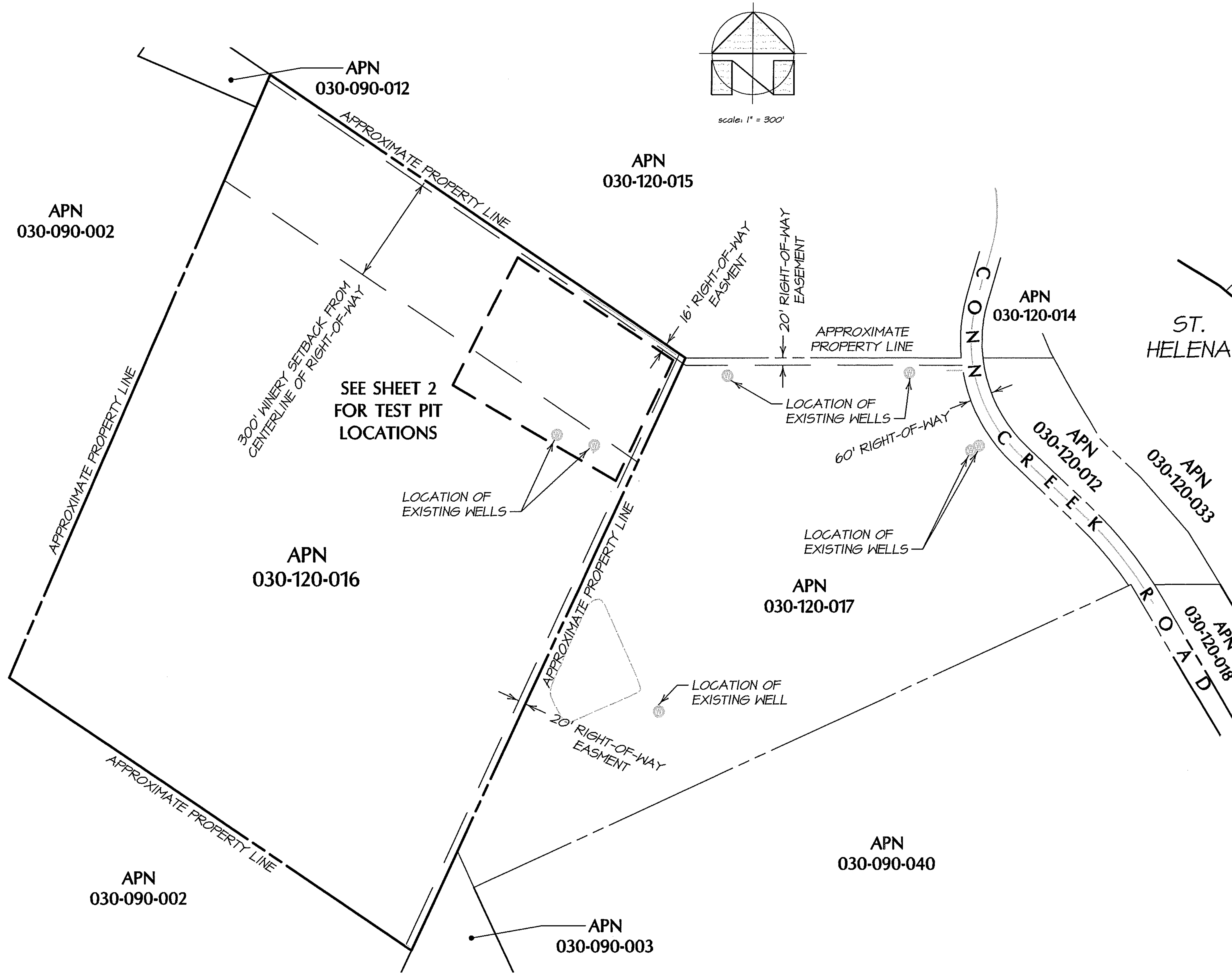
Size/Density	TP-2 HORIZON-2
+ #10 Sieve	29.5 %
Sand	53.2 %
Clay	21.4 %
Silt	25.4 %
Db g/cc	--

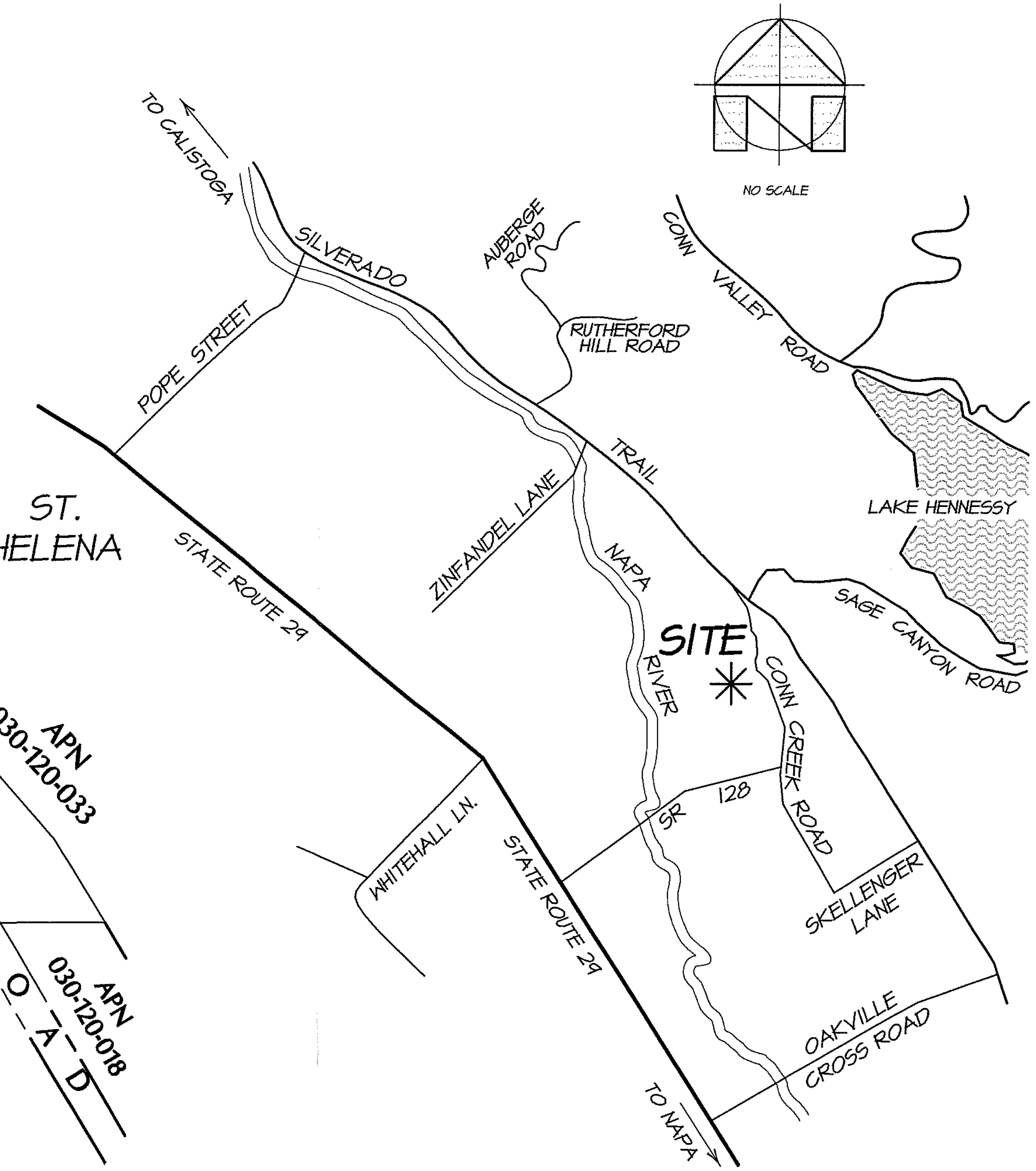
We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager





LOCATION MAP

NO SCALE

BARTELT ENGINEERING

CIVIL ENGINEERING · LAND PLANNING

1303 Jefferson Street, 200 B, Napa, CA 94559

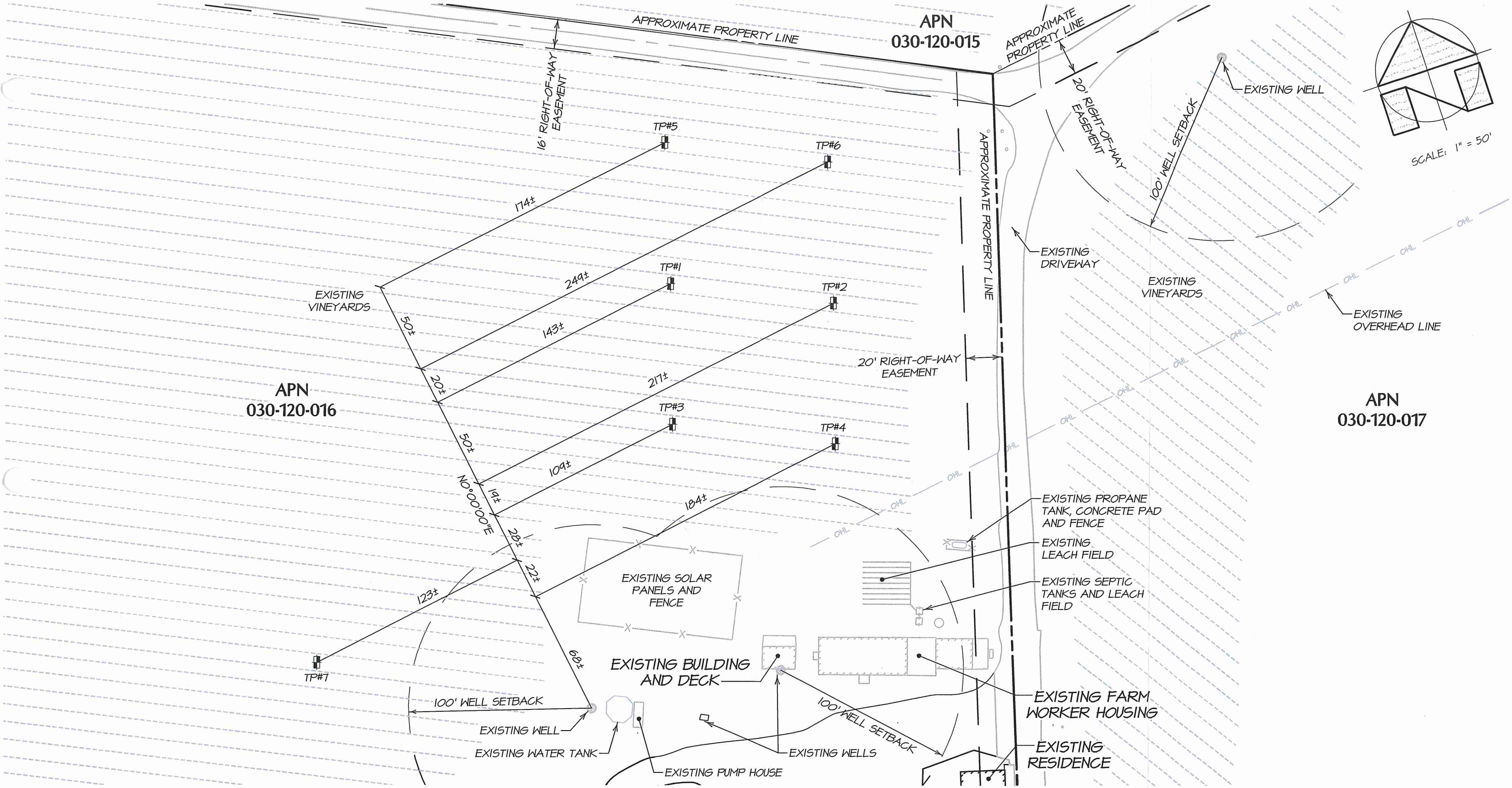
Tel: 707-258-1301 · Fax: 707-258-2926

· www.barteltengineering.com ·

TEST PIT LOCATION OVERALL SITE MAP

SCALE: 1" = 300'

Frank Family Vineyards -
Rutherford Winery
8895 Conn Creek Road
St. Helena, CA
APN 030-120-016
Job No. 12-17
June 2013
Sheet 1 of 2



BARTELT ENGINEERING

CIVIL ENGINEERING · LAND PLANNING

1303 Jefferson Street, 200 B, Napa, CA 94559

Tel: 707-258-1301 · Fax: 707-258-2926

· www.barteltengineering.com ·

TEST PIT LOCATION MAP

SCALE: 1" = 50'

TEST PIT EXPLORATION NOTES:

TEST PITS WERE EXCAVATED BY HAROLD SMITH AND SON, INC. ON JUNE 5, 2013 AND WITNESSED BY A REPRESENTATIVE FROM BARTELT ENGINEERING AND NAPA COUNTY ENVIRONMENTAL HEALTH.

Frank Family Vineyards - Rutherford Winery
8895 Conn Creek Road
St. Helena, CA
APN 030-120-016
Job No. 12-17
June 2013
Sheet 2 of 2