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Wastewater Feasibility Study

Cakebread Cellars P19-00074-MOD
Planning Commission Hearing Date November 4, 2020

BARTELT ENGINEERING

ONSITE WASTEWATER DISPERSAL FEASIBILITY STUDY FOR CAKEBREAD CELLARS WINERY 8300 ST. HELENA HIGHWAY, RUTHERFORD, CA APN 031-010-011

As required by Napa County Planning, Building and Environmental Services (PBES), this study outlines the feasibility of providing onsite wastewater dispersal for an existing winery and tasting room on the above referenced parcel located at 8300 St. Helena Highway, Rutherford, CA 94573.

PROJECT DESCRIPTION

It is our understanding that Cakebread Cellars Winery is proposing to increase the wine production limit from 500,000 gallons per year to 800,000 gallons per year and the number of employees from 77 to 120. This feasibility study evaluates the increase in process wastewater generated from the additional wine production and the increase in sanitary wastewater generated from the additional staff members and proposes improvements to the existing wastewater systems to accommodate the additional wastewater flows.

Table 1 summarizes the approved and proposed staffing plan:

TABLE 1: STAFFING PLAN SUMMARY

Description	Number of Employees	
	Approved	Proposed
Average Number of Employees per day	77	120

Table 2 summarizes the marketing plan:

TABLE 2: MARKETING PLAN SUMMARY

Description	Current		Permitted	
	Frequency	Number of Guests	Frequency	Number of Guests
Visitor Center Private Tours & Tastings	daily	400-450 per day	daily	450 per day
Food Service Events	13 events per week	18 per event	14 events per week	50 per event
Special Events	3 per year	195 per event	3 per year	195 per event
Open House	1 per year	700 per event	2 day event	832 per day

As part of our services, representatives from Bartelt Engineering have reviewed the operational methods for the winery with our Client, reviewed the parcel files at Napa County PBES, held conversations with Napa County PBES staff, performed a reconnaissance of the site to view existing conditions and conducted a site evaluation on November 12, 2015 to evaluate the feasibility of installing and/or expanding an onsite wastewater dispersal system.

This study and the associated Use Permit Modification Drawings prepared by Bartelt Engineering are provided to demonstrate that the proposed improvements to the existing process wastewater and sanitary wastewater systems can feasibly be developed and that all wastewater can be adequately treated and dispersed onsite.

WASTEWATER ANALYSIS

Process Wastewater Flow

The winery production process wastewater flow rates for the harvest and non-harvest seasons are based on historical water and wastewater data provided by Cakebread Cellars. Cakebread Cellars has been monitoring and collecting flow data on the amount of water and wastewater that is transferred throughout the winery facilities. The data collected and used for this study spans from 2015 through 2018. The data presented in the attached *Process Wastewater Flow Calculations Table 1-B Recorded Monthly Flow Distribution* is broken down into monthly flows for wastewater inflow to the wastewater ponds, for water extraction from the primary "Winery Well" (Evensen Well), and for water that is delivered to the winery buildings (Oakville and Rutherford Wineries) combined.

The data indicates that the peak monthly flows occur in August, September, and October with a second peak occurring between January and March. The data also infers Cakebread Cellars uses water and generates wastewater at a rate of (9) nine to (15) fifteen gallons of water or wastewater for every gallon of wine produced. It is our understanding that Cakebread Cellars is in the process of implementing water conservation practices. As noted in the accompanying water availability analysis, process wastewater is treated and reused onsite and the winery is well within its water use criteria.

Based on the historical wastewater data, the harvest season typically occurs from the middle/end of August through middle/end of October (60± days). During the harvest season, historical data shows that the peak monthly wastewater flow occurs during September where 17.3% of the total annual process wastewater flow occurs. The average daily process wastewater flow during the month of September is calculated by dividing the total monthly flow by the number of days per month. *Table I-A – Estimated Monthly Flow Distribution* in the attached Process Wastewater Flow Calculations shows a breakdown of each monthly flow and the calculated average day for each month. The calculated average daily flow during the peak month of September is calculated to be 44,288 gallons per day (gpd).

Based on the 2018 wine production of 609,093 gallons of wine, 5.8 million gallons of water was pumped from Evensen Well, 5.4 million gallons of water was delivered to the (2) two winery facilities, and 5.2 million gallons of wastewater was transferred to the wastewater treatment ponds. Based on the available data and averaging the annual amount of water pumped from the Evensen Well and the amount of water delivered to the (2) two winery facilities; the proposed increase in wine production to 800,000 gallons of wine per year will require approximately 9 million gallons of water per year and will generate

approximately 7.6 million gallons of wastewater. This equates to an approximate average daily flow of 21,000 gallons of water and wastewater.

Refer to the attached Process Wastewater Flow Calculations for a summary of the historical data and a breakdown of the monthly and daily process wastewater flows.

Sanitary Wastewater Flow

In addition to the Commercial Design Flow Rate Standards, Cakebread Cellars has collected sanitary effluent dispersal data on the engineered pressure distribution dispersal field that was permitted in August 2016 (E16–00545) and install in October 2016.

During the period from August 8, 2019 to August 23, 2019, Cakebread Cellars recorded the daily winery activities including employee count, number of guests for tours and tastings, the number of guests for food and wine tastings, the number of guests attending the culinary events, and wastewater dispersal field meter readings. The collected data is summarized in the attached *Table V-A Employee & Guest Data* and *Table V-B Sanitary Flow Meter Data*.

During the monitoring period from August 8, 2019 to August 23, 2019, Cakebread Cellars recorded an average of 66 employees per day with a peak of 88 employees, an average of 178 tours and tasting guests with a peak of 335 along with a range of the number of guests for culinary/food and wine events from 3 to 85. Cakebread Cellars also recorded the average sanitary wastewater flows at 1,729 gpd with a peak of 2,394 gallons on August 22, 2019.

Using the recorded number of employees and guests that were at the winery between August 8, 2019 and August 23, 2019, this study assigned sanitary wastewater flow rates based on Commercial Design Flow Standards as a comparison to the recorded sanitary wastewater flow meter data and is summarized in the attached Table V-C, Estimated Sanitary Wastewater Flows.

In comparing the Sanitary Flow Data (Table V-B) and the Estimated Sanitary Wastewater Flows (Table V-C) the average recorded sanitary flow data is 3.9% higher than the average estimated sanitary wastewater flows.

Using the estimated average and maximum sanitary wastewater flows from Table V-C for guest, culinary events, and laundry; Table V-D incorporates the proposed increase in the number of employees to 120 per day. Table V-D estimates the average and maximum daily wastewater flows to be 2,470 gpd average and 3,197 gpd maximum. Adding in the additional 3.9% of higher wastewater flows based on recorded data, the projected wastewater flows should be 2,566 gpd on average and 3,321 gpd for peak.

It is our opinion that the data collected during the monitoring period does not completely reflect the annual operations and visitations that occur at Cakebread Cellars; therefore, this study will compare the recorded data with the calculated estimates based on the Commercial Design Flow Rate Standards.

Utilizing the Commercial Design Flow Rate Standards, the sanitary wastewater generated at the winery production facility, offices and tasting room including full-time employees, and guests and can be itemized as follows:

Employees:

- 120 Employees x 15.0 gpd per employee = 1,800 gpd

Guests[1,2]:

- Visitor Center Private Tours and Tasting:
  - (450 guests per day) x (3 gpd per guest) x (52% usage)* = 702 gpd
- Food Service Events:
  - (50 guests per event) x (9 gpd per guest) = 450 gpd per event
  - Laundry (1 load per event) x (20 gpd per load) = 20 gpd per event
- Special Events[3,4]:
  - Tasting (195 guests per event) x (3 gpd per guest) x (20% usage factor)* = 117 gpd per event
- Open House[3,4]:
  - Tasting (858 guests per event) x (3 gpd per guest) x (20% usage)* = 515 gpd per event

> ***Note:*** *This feasibility study assumes that portable toilets are utilized for Special and Open House events and that 20% of the event guests are assumed to use the winery restrooms during these events.*

Commercial Kitchen Sanitary Wastewater Flow

The sanitary wastewater generated by the commercial kitchen can be itemized as follows:

- Special Events[3,4]:
  - Food Preparation (195 guests per event) x (5 gpd per 10 guests) = 97.5 gpd per event
- Open House[5,6]:
  - Food Preparation (858 guests per event) x (5 gpd per 10 guests) = 429 gpd per event

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[1] Volume rate accounts for 3 gpd to 5 gpd from the commercial kitchen and 3 gpd from restroom use
[2] Represents a maximum as event may occur during harvest or non-harvest seasons
*Observed usage
[3] Portable toilets are provided for event and winery is closed to the general public during event
[4] Food is prepared as single serving appetizers, served using recyclable plates and utensils with minimal use of water
*Observed usage

[5] Portable toilets are provided for event and winery is closed to the general public during event
[6] Food is prepared as single serving appetizers, served using recyclable plates and utensils with minimal use of water
*Observed usage

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

The total estimated harvest season peak sanitary wastewater flow is the combination of the pond building, winery house, and winery building wastewater flows during the months of August through October/November (harvest). The total estimated non-harvest season peak sanitary wastewater flow is the combination of the pond building, winery house, and winery building sanitary wastewater flows during the months of November/December through July (non-harvest). For this design, it is assumed that three (3) Food Service Events can occur concurrently and in conjunction with Visitor Center Private Tours and Tastings. This design also assumes that Special Events may occur during or after normal operating hours, but not in conjunction with Visitor Center Private Tours and Tastings. In addition, Open House events may not occur on the same day as any other marketing events.

Private Tours and Tastings can occur on the same day as Food Service Events during both harvest and non-harvest seasons; however, no other events can occur on the same day when an Open House Event is scheduled regardless of the season.

Table 4 uses the marketing schedule to calculate the sanitary wastewater flows generated by employees and guests during daily event sequences in harvest and non-harvest seasons. sanitary wastewater flows in the same column indicate the events may occur on the same day.

TABLE 4: HARVEST AND NON-HARVEST PROPOSED DAILY EVENT SCHEDULE

	Daily Occurrence					
	Harvest (gpd)			Non-Harvest (gpd)		
Employees	1,800	1,800	1,800	1,800	1,800	1,800
Visitor Center Private Tours & Tasting	702	624	-	702	624	-
Food Service Events	(3) x 470	-	-	(3) x 470	-	-
Special Events	-	214.5	-	-	214.5	-
Open House	-	-	944	-	-	944
Total	**3,912**	**2,638.5**	**2,744**	**3,912**	**2,638.5**	**2,744**

Table 4 shows that the greatest sanitary wastewater flow during the harvest and non-harvest seasons is generated during a Food Service Event hosted at the winery in conjunction with Visitor Center Private Tours and Tastings.

In comparison, the results in Table 4 are approximately 15% higher than the estimated future sanitary wastewater flows in Table V-D. The remainder of this study will utilize the calculated higher flow rates from Table 4.

Design Wastewater Flows

The greatest practical harvest and non-harvest season peak sanitary wastewater flow is summarized in the following table:

TABLE 5: HARVEST AND NON-HARVEST SEASON PEAK DAILY FLOW SUMMARY

Wastewater Source	Harvest (gpd)	Non-Harvest (gpd)
Process Wastewater	44,000	16,500
Sanitary Wastewater	3,912	3,912

WASTEWATER TREATMENT AND DISPERSAL METHODS

The proposed improvements to the existing process wastewater and recently installed sanitary wastewater systems are discussed further in the following sections as well as summarized in the attached Wastewater Treatment Diagrams. Refer to the associated Use Permit Modification Drawings for location of the primary and replacement dispersal areas.

Existing Process Wastewater System Evaluation

The existing process wastewater system includes a pair of duplex pumping lift stations that collect process wastewater from the winery buildings and transfer the wastewater through an existing rotating screen for removal of solids prior to entering the existing treatment ponds (Pond #1 and Pond #2). Ponds #1 and #2 are designed with a working storage capacity of 0.54 million gallons (Mgal) and 0.51 Mgal respectively. Ponds #1 and #2 are both equipped with aerators to promote a facultative pond environment that includes an aerobic environment on the top portion of the ponds and anaerobic digestion within the bottom portion of the ponds. The treated wastewater is then transferred from Ponds #1 and #2 to Reservoir (Pond) #3. Reservoir (Pond) #3 is designed with a working storage capacity of 2.6 Mgal and is also equipped with an aerator. Reservoir (Pond) #3 is primarily used for vineyard irrigation and fire protection storage.

Process Wastewater Surface Irrigation

A pond balance has been developed based on the proposed increase in wine production and accounts for rainfall, evaporation, and applied vineyard irrigation values. Based on the pond(s) water balance calculations there is sufficient pond storage capacity and sufficient available vineyard area to disperse all of the treated process wastewater onsite.

Future Process Wastewater Pretreatment

It is our understanding that Cakebread Cellars is considering installing a wastewater pretreatment system between Ponds #1 and #2 to complement the treatment that currently occurs in the wastewater treatment process. The pretreatment system is expected to have the capacity of treating 45,000 gpd which would be sufficient to accommodate the harvest peak flows of 44,000 gpd. Examples of a pretreatment system under consideration include, but are not limited to, BioFiltro, Cloacina or Lyve Systems.

Existing Sanitary Wastewater System Evaluation

The existing sanitary wastewater system that currently serves the winery and hospitality building is permitted under Permit E16-00545 and includes the following components:

- One (1) 1,500 gallon septic tank for Pond Building sanitary wastewater flows
- One (1) 1,500 gallon grease interceptor tank for Pond Building Kitchen flows
- One (1) 20,000 gallon septic tank for Winery Building sanitary wastewater flows
- One (1) 2,000 gallon grease interceptor tank for Winery House Kitchen flows
- Pressure distribution leachfield (2,610 lineal feet)
- One (1) 1,500 gallon septic tank for East Addition sanitary wastewater flows
- One (1) 2,000 gallon septic tank for North Addition sanitary wastewater flows

The 2,000 gallon grease interceptor for the winery house is sized based on a peak of 50 meals per hour with a wastewater flow rate of six (6) gallons per meal with a dishwashing machine and three (3) gallons per person for a bar/cocktail type facility. The grease interceptor sizing assumes a retention time of 2.5 days for use of multi-service utensils and a storage factor of 1.5 for a single service kitchen.

The 1,500 gallon grease interceptor for the pond building is sized based on a peak of 50 meals per hour with a wastewater flow rate of six (6) gallons per meal with a dishwashing machine and three (3) gallons per person for a bar/cocktail type facility. The grease interceptor sizing assumes a retention time of 1.5 days for use of single service utensils and a storage factor of 1.5 for a single service kitchen.

The following table summarizes the existing components of the sanitary wastewater treatment system and the estimated peak flow from the corresponding building:

TABLE 6: SEPTIC TANK SIZING

Septic Tank Wastewater Source	Peak Flow (GPD)	Minimum Recommended Retention Time (days)	Minimum Recommended Tank Capacity (gallons)	Existing Tank Capacity (gallons)
Sanitary Wastewater - Winery Building and Winery House	4,000	3	12,000	20,000
Sanitary Wastewater - Pond Building	500	3	1,500	1,500
Grease Interceptor - Pond Building	450	1.5	1,200	1,500
Grease Interceptor – Winery House	450	2.5	2,000	2,000
Sanitary Sump Manhole - Winery Building and Winery House	4,000	NA[7]	NA[7]	800
Dose Tank	4,500	NA[7]	NA[7]	1,500

[7] Utilizes duplex pumping system

As demonstrated in the above table, the recommended hydraulic retention time is achieved with the proposed increase in sanitary wastewater flows for the existing treatment tanks. Additional sanitary wastewater treatment tanks are not proposed at this time.

The existing pressure distribution leachfield includes 18 inch wide trenches with a total trench depth of 30 inches. The sidewall depth to the top of the distribution lateral is 18 inches. The total installed trench line length is 2,610 lf in Loam type soils with a corresponding hydraulic loading rate of 0.6 gal/sf/day. The installed trench section has a total sidewall area of 3.0 square feet. The total pressure distribution leachfield dispersal capacity is calculated below:

Existing Pressure Distribution Leachfield Capacity = (total lineal feet) x (sidewall area) x (hydraulic loading rate)

= 2,610 lf x 3.0 sf/lf x 0.6 gal/sf/day = 4,698 gpd

Proposed Peak sanitary wastewater Flow = 3,912 gpd

Since the existing capacity of the sanitary wastewater pressure distribution leachfield of 4,698 gpd is greater than the proposed increase of sanitary wastewater to 3,912 gpd an expansion of the system is not being proposed at this time.

Operation and Maintenance

Per Napa County PBES requirements, sanitary wastewater treatment and dispersal systems are classified as an Alternative Sewage Treatment Systems (ASTS) and therefore will continue to be maintained by a Service Provider.

Summary & Conclusions

Process wastewater and sanitary wastewater generated from the existing winery and administration/hospitality building is anticipated to increase as a result of the proposed changes to the wine production limit as well as an increase in employees. This study demonstrates that all wastewater generated from the proposed project can feasibly be treated and dispersed onsite per Napa County PBES requirements. Expansion of the existing process wastewater and sanitary wastewater systems are not being proposed at this time because existing infrastructure is adequately sized to treat and disperse the proposed wastewater flows.

Full design calculations and improvement plans will be completed as needed after approval of the Use Permit Modification under consideration for the process wastewater pretreatment system.

ATTACHMENTS

Sanitary Wastewater Treatment Diagram

Process Wastewater Treatment Diagram

Table I-A – Process Wastewater Flow: Estimated Monthly Flow Distribution

Table I-B – Process Wastewater Flow: Recorded Monthly Flow Distribution

Table II-A – Process Wastewater Ponds #1 and #2 Layout

Table II-B – Process Wastewater Reservoir (Pond) #3 Layout

Table III – Climate Data Distribution

Table IV-A – Process Wastewater Ponds #1 and #2 Water Balance

Table IV-B – Process Wastewater Reservoir (Pond) #3 Water Balance

Table V-A – Employee and Guest Data

Table V-B – Sanitary Flow Meter Data

Table V-C – Estimated Sanitary Wastewater Flows

Table V-D – Estimated Future Sanitary Wastewater Flows

Site Evaluation Report

REFERENCES

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

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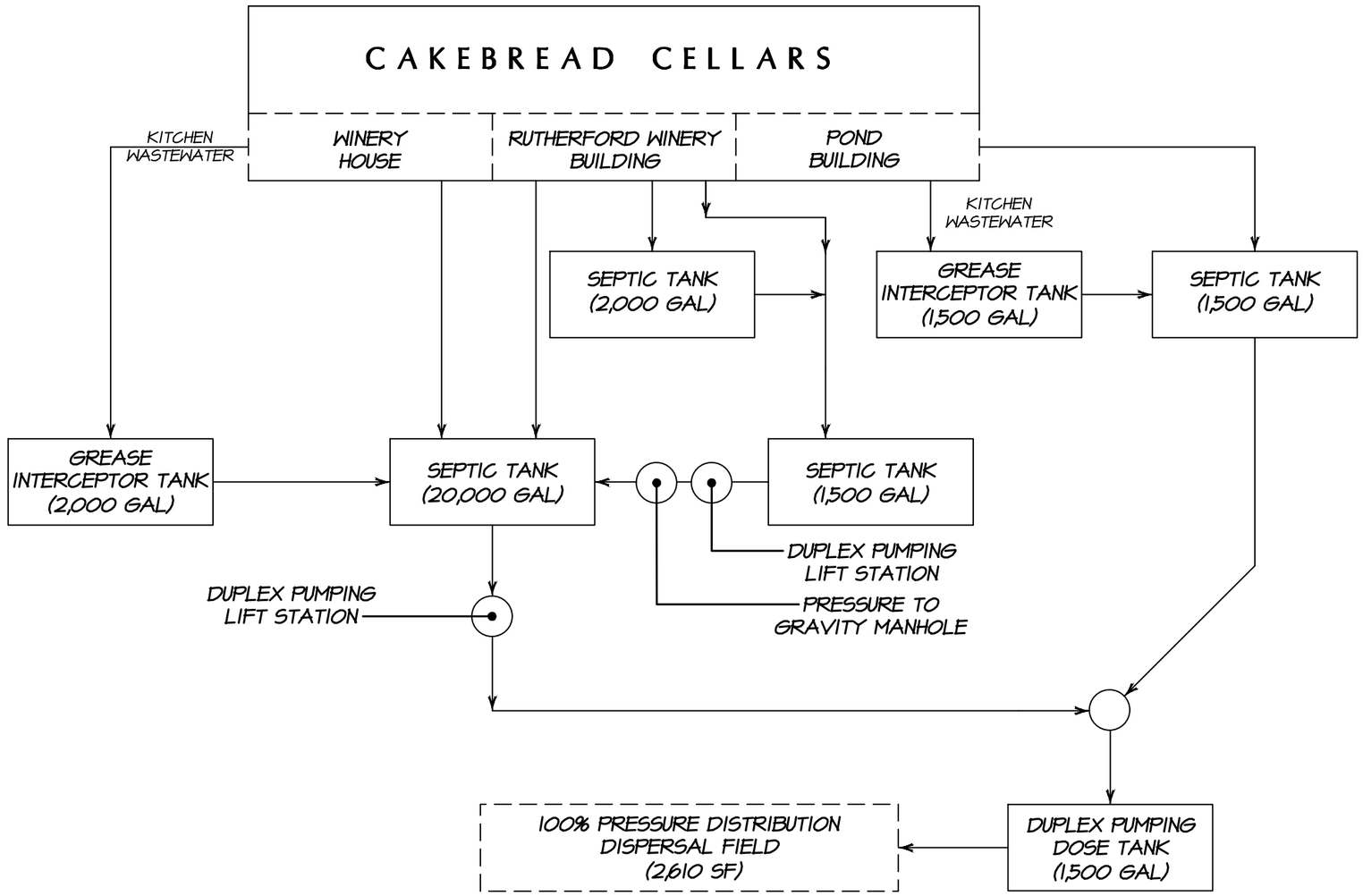

SANITARY WASTEWATER TREATMENT DIAGRAM

NO SCALE

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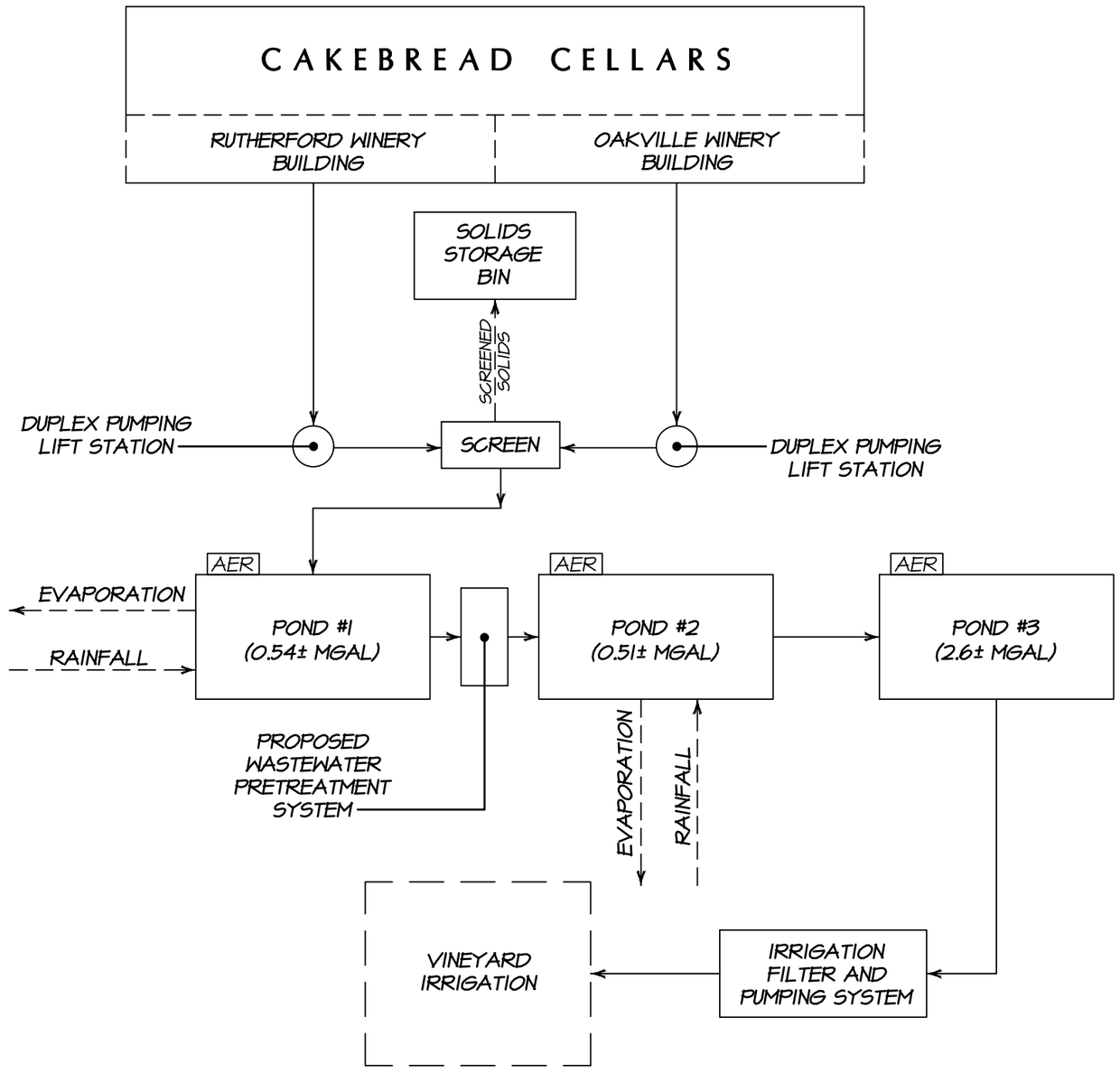

PROCESS WASTEWATER TREATMENT DIAGRAM

NO SCALE

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PROCESS WASTEWATER FLOW CALCULATIONS

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Annual Flows

Total annual wine production (gallons):	800,000
Annual water usage per gallon of wine (gallons)[1]:	9.6
Annual process wastewater flow (gallons):	7,680,000
Annual daily average process wastewater flow (gallons per day):	21,041

Harvest Flows

Harvest water usage per gallon of wine (gallons):	3.3
Length of Harvest (days):	60.0
Harvest process wastewater flow (gallons per day):	44,000

Non-Harvest Flows

Non-harvest water usage per gallon of wine (gallons):	6.3
Length of Non-Harvest (days):	305
Non-harvest process wastewater flow (gallons per day):	16,525

Monthly Flows

The estimated monthly and resulting daily flows are shown in the following table:

TABLE I-A - ESTIMATED MONTHLY FLOW DISTRIBUTION

Month	Percent[2] (%)	Wastewater Flow Monthly (gal/month)	Wastewater Flow Daily (gal/day)
September	17.3%	1,328,640	44,288
October (End of Harvest Season)	12.5%	960,000	30,968
November	6.6%	506,880	16,896
December	4.9%	376,320	12,139
January	10.1%	775,680	25,022
February	7.1%	545,280	19,474
March	7.2%	552,960	17,837
April	6.6%	506,880	16,896
May	6.6%	506,880	16,351
June	6.9%	529,920	17,664
July	4.8%	368,640	11,892
August (Start of Harvest Season)	9.4%	721,920	23,288
TOTALS	100.0%	7,680,000	

Peak Monthly Flow (during September) (gallons per month):	1,328,640
Peak Daily Flow (gallons per day):	**44,288**

Notes:

1) The annual water usage per gallon of wine is assumed to be 9.6 gallons
2) Wastewater monthly proportioning is based on data collected from Cakebread Cellars

PROCESS WASTEWATER FLOW CALCULATIONS

BARTELT ENGINEERING

Annual Flows	**2015**	**2016**	**2017**	**2018**	**2020+[4,5]**
Total annual wine production (gallons):	403,595	459,679	435,685	609,093	800,000
Annual water usage (gallons)[1]: water meter readings for both winerys combined	4,755,010	4,686,300	5,213,740	5,450,660	8,578,388
Annual water useage per gallon of wine (gallons):	11.8	10.2	12.0	8.9	10.7
Estimated annual daily average water use (gallons per day):	13,027	12,839	14,284	14,933	23,502
Annual water usage (gallons)[2]: water meter readings at winery well (Evensen Well)	3,793,413	6,302,898	6,656,536	5,829,619	9,591,977
Annual water useage per gallon of wine (gallons):	9.4	13.7	15.3	9.6	12.0
Estimated annual daily average water use (gallons per day):	10,393	17,268	18,237	15,972	26,279
Annual process wastewater flow (gallons)[3]:	430,798	407,795	4,584,650	5,280,960	7,677,223
Annual process wastewater per gallon of wine (gallons):	1.1	0.9	10.5	8.7	9.60
Estimated annual daily average process wastewater flow (gallons per day):	1,180	1,117	12,561	14,468	21,033

Monthly Flows

The recorded monthly and resulting daily flows are shown in the following table:

TABLE I-B - RECORDED MONTHLY FLOW DISTRIBUTION

Month	**Average Percent**	**Percent per Month (%) Year**				**Wastewater Meter Readings[3] (gal/month) Year**				**Daily Wastewater Flow (gpd) & Average (gpd) Year**				**2015 to 2018 Average (gpd)**
	(%)	**2015**	**2016**	**2017**	**2018**	**2015**	**2016**	**2017**	**2018**	**2015**	**2016**	**2017**	**2018**	
September	17.3%	14.5%	22.2%	18.4%	14.3%	62,320	90,444	841,980	753,110	2,077	3,015	28,066	25,104	**14,565**
October (End of Harvest Season)	12.5%	8.9%	14.0%	11.2%	16.2%	38,258	57,089	511,260	853,430	1,234	1,842	16,492	27,530	**11,774**
November	6.6%	3.0%	7.8%	7.1%	8.6%	13,115	31,858	325,420	454,610	437	1,062	10,847	15,154	**6,875**
December	4.9%	2.4%	7.1%	4.5%	5.5%	10,441	29,013	204,120	288,350	337	936	6,585	9,302	**4,290**
January	10.1%	19.1%	5.0%	10.8%	5.5%	82,347	20,301	493,160	290,680	2,656	655	15,908	9,377	**7,149**
February	7.1%	8.9%	6.0%	8.8%	4.7%	38,421	24,667	403,050	245,620	1,372	881	14,395	8,772	**6,355**
March	7.2%	5.6%	5.1%	6.9%	11.0%	24,257	20,910	315,530	583,240	782	675	10,178	18,814	**7,612**
April	6.6%	6.4%	7.1%	5.9%	7.2%	27,387	29,018	271,480	379,260	913	967	9,049	12,642	**5,893**
May	6.6%	6.0%	7.0%	5.7%	7.8%	25,703	28,489	263,350	412,970	829	919	8,495	13,322	**5,891**
June	6.9%	6.3%	5.6%	8.7%	7.0%	26,970	22,664	400,370	369,400	899	755	13,346	12,313	**6,828**
July	4.8%	6.6%	6.0%	3.8%	2.9%	28,321	24,599	176,410	153,260	914	794	5,691	4,944	**3,085**
August (Start of Harvest Season)	9.3%	12.4%	7.0%	8.3%	9.4%	53,258	28,743	378,520	497,030	1,718	927	12,210	16,033	**7,722**
TOTALS	100.0%	100.0%	100.0%	100.0%	100.0%	430,798	407,795	4,584,650	5,280,960	1,181	1,119	12,605	14,442	**7,337**

Month	**Water Meter Readings Both Wineries (gal/month) (Oakville & Rutherford)[1] Year**				**Water Meter Readings at Winery Well (gal/month) (Evensen Well)[2] Year**			
	2015	**2016**	**2017**	**2018**	**2015**	**2016**	**2017**	**2018**
September	867,890	1,080,620	1,108,920	784,070	723,768	1,468,945	1,379,176	806,526
October (End of Harvest Season)	532,670	712,430	655,660	915,430	496,433	907,031	821,480	636,708
November	175,220	270,650	324,200	435,130	269,161	361,562	409,267	317,673
December	116,410	234,900	256,350	201,660	159,976	256,056	356,278	212,930
January	362,400	274,300	239,470	237,090	313,021	350,820	297,927	278,382
February	236,930	173,600	225,330	252,590	171,912	177,982	271,144	313,611
March	215,910	117,500	244,250	317,290	88,961	143,167	330,684	374,648
April	333,820	317,910	299,100	271,560	180,526	588,959	392,683	330,259
May	374,230	293,490	400,650	520,680	280,830	468,045	527,266	644,416
June	385,630	287,030	629,550	456,590	237,485	456,974	813,604	581,029
July	466,130	419,600	288,440	410,500	417,745	591,943	357,893	532,933
August (Start of Harvest Season)	687,770	504,270	541,820	648,070	453,595	531,414	699,134	800,504
TOTALS	4,755,010	4,686,300	5,213,740	5,450,660	3,793,413	6,302,898	6,656,536	5,829,619

Notes:

1) Meter readings are taken from the main meters that monitor the water to each winery
2) Meter readings are taken from the main meter located at the wellhead
3) Meter readings are taken from the inflow meter to the wastewater ponds
4) 2020+ annual water use values are based on the average gallon of water used per gallon of wine from 2015 thru 2018
5) 2020+ annual wastewater flows are based on the average gallon of process wastewater per gallon of wine for 2017 and 2018

PROCESS WASTEWATER
EXISTING POND LAYOUT

BARTELT ENGINEERING

TABLE II-A - PONDS #1 & #2 LAYOUT INFORMATION

Depth[1,2] (feet)	Surface Area Pond #1[3] (ft^2)	Surface Area Pond #2[3] (ft^2)	Total Surface Area (ft^2)	Volume Change[3] (gal)	Total Pond Volume (Pond #1 & #2) (gal)	(Mgal)
0	3,027	2,681	5,708	0	0	0
1	3,695	3,316	7,011	47,572	47,572	0.048
2	4,428	4,014	8,442	57,798	105,370	0.105
3	5,224	4,777	10,001	68,982	174,352	0.174
4	6,085	5,604	11,689	81,126	255,478	0.255
5	7,011	6,495	13,506	94,236	349,714	0.350
6	8,000	7,450	15,450	108,303	458,017	0.458
7	9,054	8,470	17,524	123,331	581,348	0.581
8	10,172	9,555	19,727	139,328	720,676	0.721
9	11,355	10,703	22,058	156,287	876,963	0.877
10	12,601	11,916	24,517	174,203	1,051,166	1.051
11	13,912	13,193	27,105	193,080	1,244,246	1.244
12	15,351	14,598	29,949	213,397	1,457,643	1.458

Notes:

1) Minimum depth of pond is limited to four (4) feet for adequate operation of the surface aerators

2) Maximum depth of pond is limited to ten (10) feet to maintain two (2) feet of freeboard

3) Pond surface area and volume are sourced from the Design Report for Cakebread Cellars Process Wastewater Management System prepared by Summit Engineering dated March 18, 1991

TABLE II-B - RESERVOIR (POND) #3 LAYOUT INFORMATION

Depth[1,2] (feet)	Surface Area Pond #3[3] (ft^2)	Volume Change[3] (gal)	Total Volume Pond #3 (gal)	(Mgal)
0	16,814	0	0	0
1	18,683	132,768	132,768	0.133
2	20,650	147,116	279,884	0.280
3	22,715	162,196	442,080	0.442
4	24,878	178,010	620,090	0.620
5	27,139	194,557	814,647	0.815
6	29,498	211,837	1,026,484	1.026
7	31,955	229,850	1,256,334	1.256
8	34,510	248,596	1,504,930	1.505
9	37,163	268,076	1,773,006	1.773
10	39,914	288,288	2,061,294	2.061
11	39,914	298,577	2,359,871	2.360
12	39,914	298,577	2,658,448	2.658
13	39,914	298,577	2,957,025	2.957
14	39,914	298,577	3,255,602	3.256

Notes:

1) Initial depth is maintained at six (6) feet for adequate storage for fire protection

2) Maximum depth of pond is limited to twelve (12) feet to maintain two (2) feet of freeboard

3) Pond surface area and volume are sourced from the Design Report for Cakebread Cellars Process Wastewater Management System prepared by Summit Engineering dated March 18, 1991

PROCESS WASTEWATER FLOW CALCULATIONS

BARTELT ENGINEERING

Pan Coefficient (K_{PAN})[1]: 0.80

TABLE III - POND CLIMATE MONTHLY DISTRIBUTION

Month	Days/ Month	Rainfall, R[2] (inches)	10-year Rainfall[3] (inches)	Reference Evapotranspiration, ETo[4] (inches)	Pan Evaporation, E_{PAN}[5] (inches)	Lake Evaporation[6] (inches)
September	30	0.23	0.32	4.9	8.67	6.94
October	31	1.67	2.34	3.5	5.72	4.58
November	30	3.75	5.25	1.6	2.48	1.98
December	31	6.67	9.34	1.2	1.66	1.33
January	31	6.79	9.51	1.0	1.53	1.22
February	28	6.99	9.79	1.5	2.15	1.72
March	31	4.82	6.75	2.9	3.79	3.03
April	30	2.01	2.81	4.7	5.82	4.66
May	31	0.91	1.27	5.8	8.90	7.12
June	30	0.20	0.28	6.9	11.00	8.80
July	31	0.01	0.01	7.2	13.22	10.58
August	31	0.08	0.11	6.4	12.06	9.65
TOTALS	365	34.13	47.78	47.6	77.00	61.60

Notes:

1) Pan Coefficient for Oakville, CA is sourced from *Table 6.3 Pan Coefficient for Class A Evaporation Pans Placed in Reference Crop Area (Doorenbos and Pruitt, 1977)* for a moderate wind speed (4.5-11 mi/h) and medium relative humidity (40%-70%)

2) PRISM 30-year normal rainfall data from 1981-2010 averaged from one (1) 800 m^2 spatial grid that encompass the total project area; see http://prism.oregonstate.edu/

3) 10-year Rainfall = Rainfall x 1.4

4) ETo values for Oakville are sourced from the Napa County Planning, Building and Environmental Services Water Efficient Landscaping Application and Guidance *Appendix A: Napa County Reference Evapotranspiration (ETo) Table*.

5) Pan Evaporation for Berryessa Lake from 1950-1970 is sourced from the Western Region Climate Center Evaporation Stations; see https://wrcc.dri.edu/

6) Lake Evaporation = Pan Coefficient (K_{PAN}) x Pan Evaporation (E_{PAN})

PROCESS WASTEWATER FLOW CALCULATIONS

BARTELT ENGINEERING

Starting Month: September

TABLE IV-A - ESTIMATED PONDS #1 & #2 WATER BALANCE

Month	Initial Depth[1] (feet)	Initial Volume (gal)	10-year Rainfall (gal)	Pond Evaporation[2] (gal)	Influent PW Flow (gal)	Transferred to Pond #3 (gal)	Final Volume (gal)	Final Depth[1] (feet)
September	6.0	458,017	6,011	-24,678	1,328,640	-649,728	1,118,262	10.0
October	10.0	1,051,166	43,646	-16,281	960,000	-1,195,776	842,755	8.0
November	8.0	720,676	98,008	-7,059	506,880	-624,000	694,505	7.0
December	7.0	581,348	174,324	-4,725	376,320	-329,472	797,795	8.0
January	8.0	720,676	177,460	-4,355	775,680	-244,608	1,424,853	11.0
February	11.0	1,244,246	182,687	-6,120	545,280	-775,680	1,190,413	10.0
March	10.0	1,051,166	125,973	-10,788	552,960	-545,280	1,174,031	10.0
April	10.0	1,051,166	52,532	-16,566	506,880	-552,960	1,041,052	9.0
May	9.0	876,963	23,783	-25,333	506,880	-506,880	875,413	8.0
June	8.0	720,676	5,227	-31,310	529,920	-608,256	616,257	7.0
July	7.0	581,348	261	-37,629	368,640	-635,904	276,716	4.0
August	4.0	255,478	2,091	-34,327	721,920	-487,144	458,017	6.0
TOTALS			892,004	-219,172	7,680,000	-7,155,688		

Notes:

1) Minimum depth of pond is limited to four (4) feet for adequate operation of the surface aerators

2) Pond Evaporation = Lake Evaporation (see *Climate Data*) x Pond Surface Area (see *Pond Volume*)

PROCESS WASTEWATER FLOW CALCULATIONS

BARTELT ENGINEERING

Starting Month: September

TABLE IV-B - ESTIMATED POND #3 WATER BALANCE

Month	Initial Depth[1] (feet)	Initial Volume (gal)	10-year Rainfall (gal)	Pond Evaporation[2] (gal)	Influent PW Flow From Ponds #1 & #2 (gal)	2018 Vineyard Irrigation Application[3] (gal)	Final Volume (gal)	Final Depth[1] (feet)
September	8.0	1,504,930	8,011	-149,202	649,728	-690,128	1,323,339	7.0
October	7.0	1,323,339	58,169	-91,148	1,195,776	-826,722	1,659,415	8.0
November	8.0	1,659,415	130,619	-42,678	624,000	-689,045	1,682,310	8.0
December	8.0	1,682,310	232,327	-28,567	329,472	-498,637	1,716,905	8.0
January	8.0	1,716,905	236,507	-26,330	244,608	0	2,171,690	10.0
February	10.0	2,171,690	243,473	-42,793	775,680	-350,613	2,797,437	12.0
March	12.0	2,797,437	167,888	-75,435	545,280	-481,684	2,953,486	12.0
April	12.0	2,953,486	70,012	-115,840	552,960	-584,245	2,876,372	12.0
May	12.0	2,876,372	31,697	-177,144	506,880	-743,259	2,494,546	11.0
June	11.0	2,494,546	6,966	-218,942	608,256	-628,294	2,262,533	10.0
July	10.0	2,262,533	348	-263,128	635,904	-574,535	2,061,122	9.0
August	9.0	1,773,006	2,787	-223,495	487,144	-534,512	1,504,930	8.0
TOTALS			1,188,803	-1,454,701	7,155,688	-6,601,674		

Notes:

1) Initial depth is maintained at six (6) feet for adequate fire protection

2) Pond Evaporation = Lake Evaporation (see *Climate Data*) x Pond Surface Area (see *Pond Volume*)

3) Represents minimum volume sourced from irrigation fire protection storage pond based on exisitng irrigation values from the vineyard manager

Napa County Department of
Environmental Management

SITE EVALUATION REPORT

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.

Permit #: E15-00899
APN: 031-010-011
(County Use Only) Reviewed by: Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner Cakebread Properties II, c/o Bruce Cakebread	☐ New Construction ☒ Addition ☐ Remodel ☒ Relocation ☐ Other:
Property Owner Mailing Address P.O. Box 216	☐ Residential - # of Bedrooms: Design Flow : gpd
City State Zip Rutherford, CA 94573	☒ Commercial – Type: Winery Sanitary Waste: 4,500 gpd Process Waste: gpd
Site Address/Location 8300 St. Helena Highway, Napa County, CA	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name Bartelt Engineering	Evaluator's Name Richard A. Paxton, P.E.	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist) Richard A. Paxton
Mailing Address: 1303 Jefferson Street, 200 B		Telephone Number (707) 258-1301
City State Zip Napa CA 94559		Date Evaluation Conducted November 12, 2015 and July 5, 2016

Primary Area See below	Expansion Area See below
Acceptable Soil Depth: 66 in. Test pits #: 3, 4, 5, 6 & 10	Acceptable Soil Depth: 60 to 69 in. Test pits #: 1, 2, 7, 8, 9 & 12
Soil Application Rate (gal. /sq. ft. /day): STE 0.6; PTE 0.75	Soil Application Rate (gal. /sq. ft. /day): STE 0.6; PTE 0.75
System Type(s) Recommended: Pressure Distribution	System Type(s) Recommended: Pressure Distribution
Slope: 1 %. Distance to nearest water source: 100+ feet	Slope: 1 %. 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 November 12, 2015 by Paul Bartelt, Rich Paxton, Christina Nicholson and Cameron Smith of Bartelt Engineering. Test pits were excavated by Taylor Bailey Construction using a backhoe with a 30 inch bucket. Kim Withrow of Napa County Environmental Health visited the site to inspect soil conditions.

A follow-up site evaluation was conducted on July 5, 2016 by Rich Paxton and Nick Warnock of Bartelt Engineering. Test pits were excavated by Eakle Construction & Trucking using a JS200L excavator with a 30 inch bucket. Kim Withrow and Armeda Van Dam of Napa County Environmental Health visited the site to inspect soil conditions.

Test Pits # 1 through 10 & 12 showed suitable soil for the installation of an Alternative Sewage Treatment System (ASTS) Pressure Distribution dispersal field within the area tested with the required replacement area. Additional fill will be placed over the dispersal field to both maximize the trench sidewalls and provide a minimum of 12 inches and a maximum of 18 inches of cover over the dispersal field.

Test Pit # 1 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36*		15-30	SCL	SSB	SH	FRB	S	MVF, MF, FM	FF, CM	None
36-50*	D	30-50	S	SSB	SH	FRB	S	CVF, CF, FM	FM	None
50-64*	C	0-15	SCL	SSB	H	FRB	S	FF, FM, FVF	FF	None

Slope = 1%. Acceptable soil depth observed: 36 inches (Conventional) – 64 inches (ASTS).
Assigned soil application rate = STE 0.8 gal/sf/day for ASTS
PTE 1.0 gal/sf/day for ASTS
Subsurface Drip = 0.7 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 64 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 1, 2015.

Test Pit # 2 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-42*		0-15	SCL	SSB	SH	FRB	S	CF, CVF	FM, CF, CVF	None
42-67*	G	0-15	CL	SSB	H	FRB	S	CVF	FVF	None

Slope = 1%. Acceptable soil depth observed: 67 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 67 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 1, 2015.

Test Pit # 3

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-44		0-15	SCL	SSB	SH	VFRB	SS	CF, CVF, FM	CF, CVF, CM	None
44-66	G	0-15	CL	SSB	H	F	S	FVF, FF	FVF	None

Slope = 1%. Acceptable soil depth observed: 66 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 66 inches deep.
No Groundwater observed.

Test Pit # 4 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-45*		15-30	SCL	SSB	SH	VFRB	SS	CF, CVF, FM	CM, CF, CVF, FC	None
45-72	C	0-15	CL	SSB	H	F	S	FVF	FF, FVF	None

Slope = 1%. Acceptable soil depth observed: 72 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 72 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 1, 2015.

Test Pit # 5

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-46		0-15	SCL	SSB	H	FRB	S	MF, FM, MVF	FF, FVF, FM	None
46-67	C	0-15	CL	SSB	VH	F	S	FVF, FF	None	None

Slope = 1%. Acceptable soil depth observed: 67 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 67 inches deep.
No groundwater observed.

Test Pit # 6 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-27*		0-15	SCL	SSB	H	FRB	S	MF, FM, MVF	CM, CVF, FC, MF	None
27-51*	G	15-30	SL	SSB	H	FRB	S	MF, FM, MVF	MF, FVF	None
51-67	C	0-15	CL	SSB	VH	F	S	FVF, FF	None	None

Slope = 1%. Acceptable soil depth observed: 67 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 67 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 1, 2015.

Test Pit # 7

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottlin
					Side Wall	Ped	Wet			
0-49		0-15	SCL	SSB	H	FRB	S	MF, FM, MVF	FC, CM, CF, CVF	None
49-65	G	0-15	CL	SSB	VF	F	S	FF, FVF	None	None

Slope = 1%. Acceptable soil depth observed: 65 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

Refusal at 65 inches deep.
No groundwater observed.

Test Pit # 8

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-47		15-30	SCL	SSB	H	F	SS	CF, CVF, FM	CF, CVF, FM	None
47-65	C	30-50	CL	SSB	H	F	SS	FF, FVF, FM	FF, FVF	None

Slope = 1%. Acceptable soil depth observed: 65 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 65 inches deep.
No groundwater observed.

Test Pit # 9 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-18*		0-15	SiL	SSB	H	FRB	S	MVF, MF, CM	MF, MVF, FC	None
18-46*	C	0-15	SL	SSB	H	F	S	MVF, MF, CM	FM, FF	None
46-69*	C	0-15	L	SSB	VH	F	S	FF, FVF	None	None

Slope = 1%. Acceptable soil depth observed: 69 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.8 gal/sf/day for ASTS
PTE 1.0 gal/sf/day for ASTS
Subsurface Drip = 0.7 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.8 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 69 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 1, 2015.

Test Pit # 10

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-49		15-30	CL	SSB	H	FRB	S	MF, MVF, CM,FC	MF, MVF, FC	None
49-66	C	0-15	L	SSB	VH	F	S	FF, FVF	None	None

Slope = 1%. Acceptable soil depth observed: 66 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 66 inches deep.
No groundwater observed.

Test Pit # 11

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36*		0-15	CL	SSB	SH	FRB	SS	MVF, MF, FC	FF, FM, FC	None
36-72	G									CCD

Slope = 1%. Acceptable soil depth observed: 36 inches.
Assigned soil application rate = Insufficient soil for a Conventional – Standard System
Insufficient soil for an ASTS (STE) – Pressure Distribution Dispersal Field
PTE 0.75 gal/sf/day for ASTS with import of approved soil to cover dispersal field
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 72 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated July 19, 2016.

Test Pit # 12

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-44*		0-15	L	SSB	H	FRB	SS	CF, FM	FVF, FF, FM, FC	None
44-60*	C	0-15	SL	MSB	SH	FRB	SS	CVF, CF, FC	FF, FM	None
60-78	G	0-15								CMD

Slope = 1%. Acceptable soil depth observed: 60 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.8 gal/sf/day for ASTS
PTE 1.0 gal/sf/day for ASTS
Subsurface Drip = 0.7 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.8 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 78 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated July 19, 2016.

Test Pit # 13

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-48*		0-15	CL/L	SSB	H	FRB	SS	CVF, CF, FC	FVF, FF, FM	None
48-64	G	0-15								CMD

Slope = 1%. Acceptable soil depth observed: 48 inches.
Assigned soil application rate = Insufficient soil for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 64 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated July 19, 2016.

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

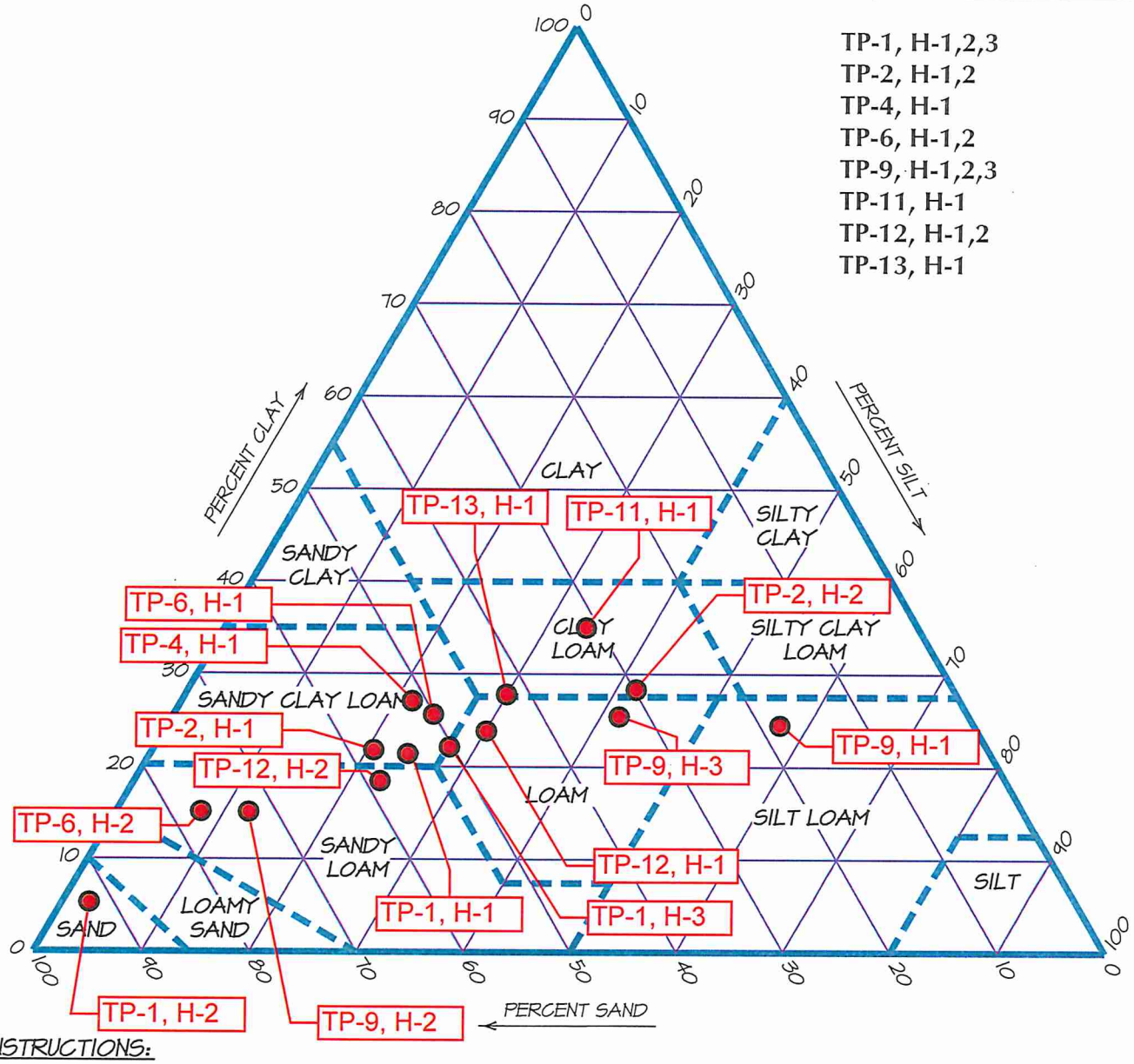
TABLE 1

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 TEXTURE ANALYSIS CHART
BY BOUYOUCOS HYDROMETER METHOD



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 1.7gm/cc.

NOTE:

FOR SOILS FALLING IN SAND, LOAMY SAND OR SANDY LOAM CLASSIFICATION, A BULK DENSITY ANALYSIS WILL GENERALLY NOT AFFECT SUITABILITY AND ANALYSIS IS NOT NECESSARY.

BARTELT ENGINEERING
CIVIL ENGINEERING · LAND PLANNING
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www.barteltengineering.com
· Telephone: 707-258-1301 ·

Cakebread Cellars
8300 St. Helena Highway
Rutherford, CA
APN 031-010-011
Job No. 98-62 July 2016

RGH CONSULTANTS

Experience is the difference

December 1, 2015
File: 9147.63

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

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
Cakebread Cellars, # 98-62

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-1 Hor. 1
+ #10 Sieve	24.4 %
Sand	51.0 %
Clay	21.0 %
Silt	28.0 %
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

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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-1 Hor. 2
+ #10 Sieve	63.2 %
Sand	85.0 %
Clay	5.0 %
Silt	10.0 %
Db g/cc	--

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

Yours very truly,

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Laboratory Manager

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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-1 Hor. 3
+ #10 Sieve	19.6 %
Sand	46.0 %
Clay	23.0 %
Silt	31.0 %
Db g/cc	--

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

Yours very truly,

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Size/Density	TP-2 Hor. 1
+ #10 Sieve	11.1 %
Sand	51.0 %
Clay	22.0 %
Silt	27.0 %
Db g/cc	--

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

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Size/Density	TP-2 Hor. 2
+ #10 Sieve	5.2 %
Sand	29.0 %
Clay	28.0 %
Silt	43.0 %
Db g/cc	--

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

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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-4 Hor. 1
+ #10 Sieve	14.9 %
Sand	49.0 %
Clay	25.0 %
Silt	26.0 %
Db g/cc	--

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

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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-6 Hor. 1
+ #10 Sieve	20.0 %
Sand	48.2 %
Clay	24.8 %
Silt	27.0 %
Db g/cc	--

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

Yours very truly,

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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-6 Hor. 2
+ #10 Sieve	51.4 %
Sand	67.2 %
Clay	14.8 %
Silt	18.0 %
Db g/cc	--

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

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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-9 Hor. 1
+ #10 Sieve	26.8 %
Sand	14.2 %
Clay	22.8 %
Silt	63.0 %
Db g/cc	--

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Size/Density	TP-9 Hor. 2
+ #10 Sieve	42.8 %
Sand	62.2 %
Clay	14.8 %
Silt	23.0 %
Db g/cc	--

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

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Size/Density	TP-9 Hor. 3
+ #10 Sieve	2.6 %
Sand	33.2 %
Clay	26.8 %
Silt	40.0 %
Db g/cc	--

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

Yours very truly,

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July 19, 2016
File: 9147.66

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1303 Jefferson Street, Ste. 200B
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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-11 Hor. 1
+ #10 Sieve	7.8 %
Sand	31.2 %
Clay	34.0 %
Silt	34.8 %
Db g/cc	--

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

Yours very truly,

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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-12 Hor. 1
+ #10 Sieve	13.7 %
Sand	43.2 %
Clay	23.0 %
Silt	33.8 %
Db g/cc	--

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

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Size/Density	TP-12 Hor. 2
+ #10 Sieve	20.6 %
Sand	55.2 %
Clay	18.0 %
Silt	26.8 %
Db g/cc	--

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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:

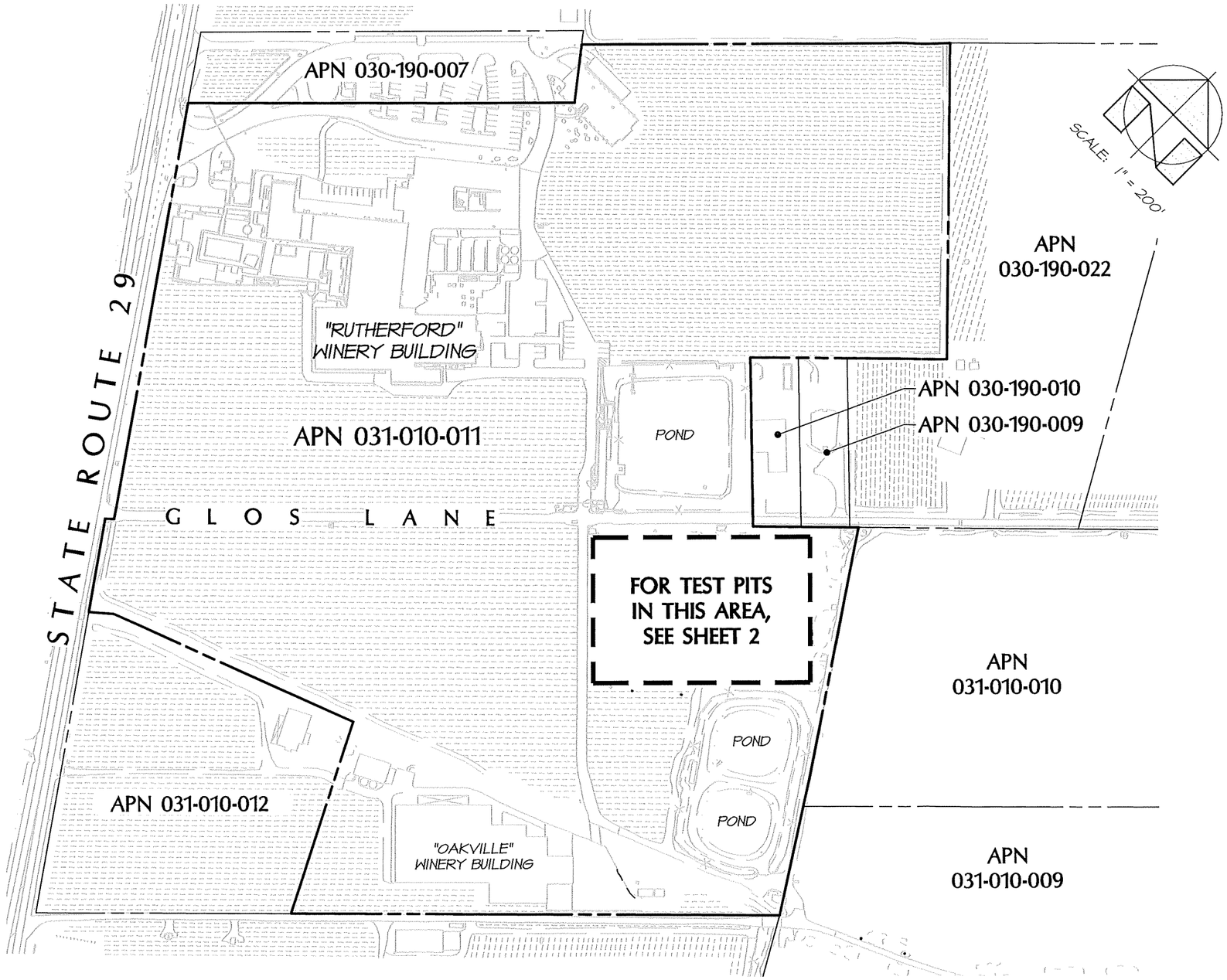
Size/Density	TP-13 Hor. 1
+ #10 Sieve	15.3 %
Sand	39.2 %
Clay	28.2 %
Silt	32.6 %
Db g/cc	--

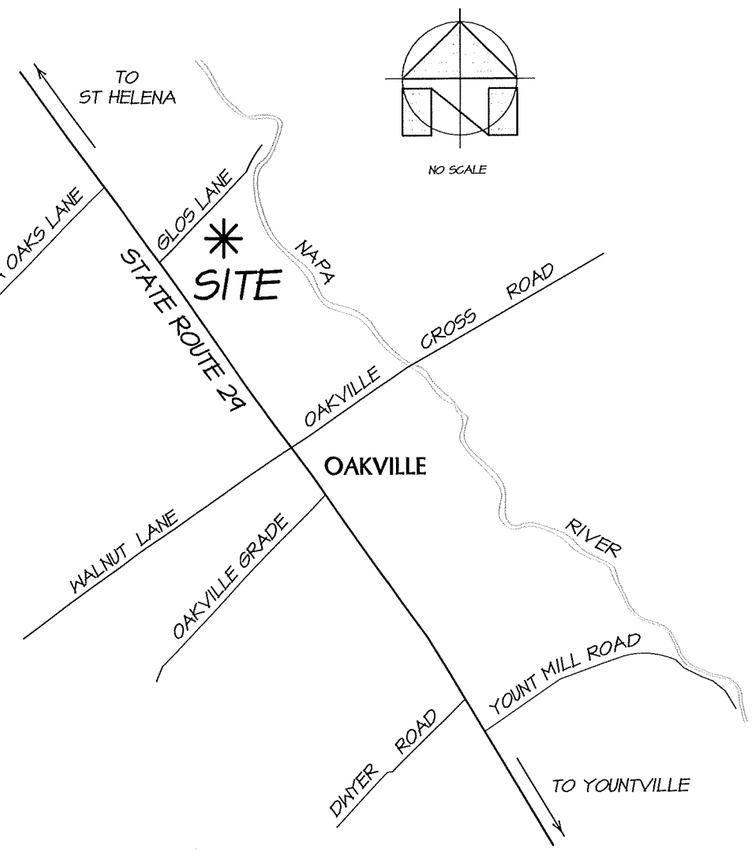
We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager



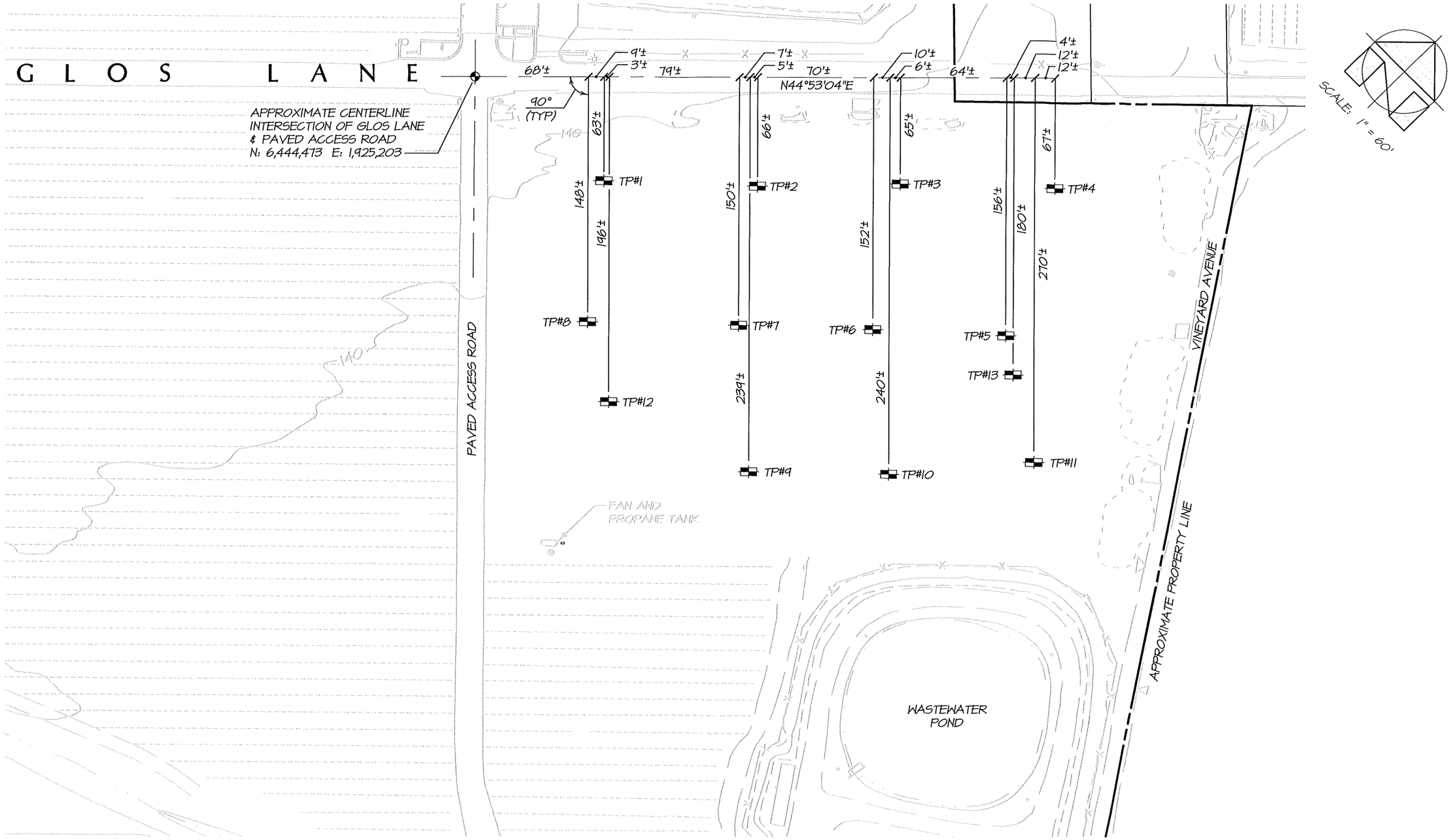


LOCATION MAP
NO SCALE

BARTELT
ENGINEERING
CIVIL ENGINEERING · LAND PLANNING
1303 Jefferson Street, 200 B, Napa, CA 94559
www.barteltengineering.com
· Telephone: 707-258-1301 ·

OVERALL SITE PLAN
TEST PIT EXHIBIT
SCALE: 1" = 200'

Cakebread Cellars
8300 St. Helena Highway
(State Route 29)
Rutherford, CA 94558
APN 031-010-011
Job No. 98-62
July 2016
Sheet 1 of 2



TEST PIT LOCATION MAP

SCALE: 1" = 60'

TEST PIT EXPLORATION NOTES:

1. ⊏ REPRESENTS TEST PIT LOCATION.
2. TEST PITS #1 THROUGH #10 WERE EXCAVATED BY TAYLOR BAILEY CONSTRUCTION ON NOVEMBER 12, 2015 AND WITNESSED BY A REPRESENTATIVE FROM BARTELT ENGINEERING AND NAPA COUNTY ENVIRONMENTAL HEALTH.
3. TEST PITS #11 THROUGH #13 WERE EXCAVATED BY EAKLE CONSTRUCTION & TRUCKING ON JULY 5, 2016 AND WITNESSED BY A REPRESENTATIVE FROM BARTELT ENGINEERING AND NAPA COUNTY ENVIRONMENTAL HEALTH.

BARTELT
ENGINEERING
CIVIL ENGINEERING · LAND PLANNING
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www.barteltengineering.com
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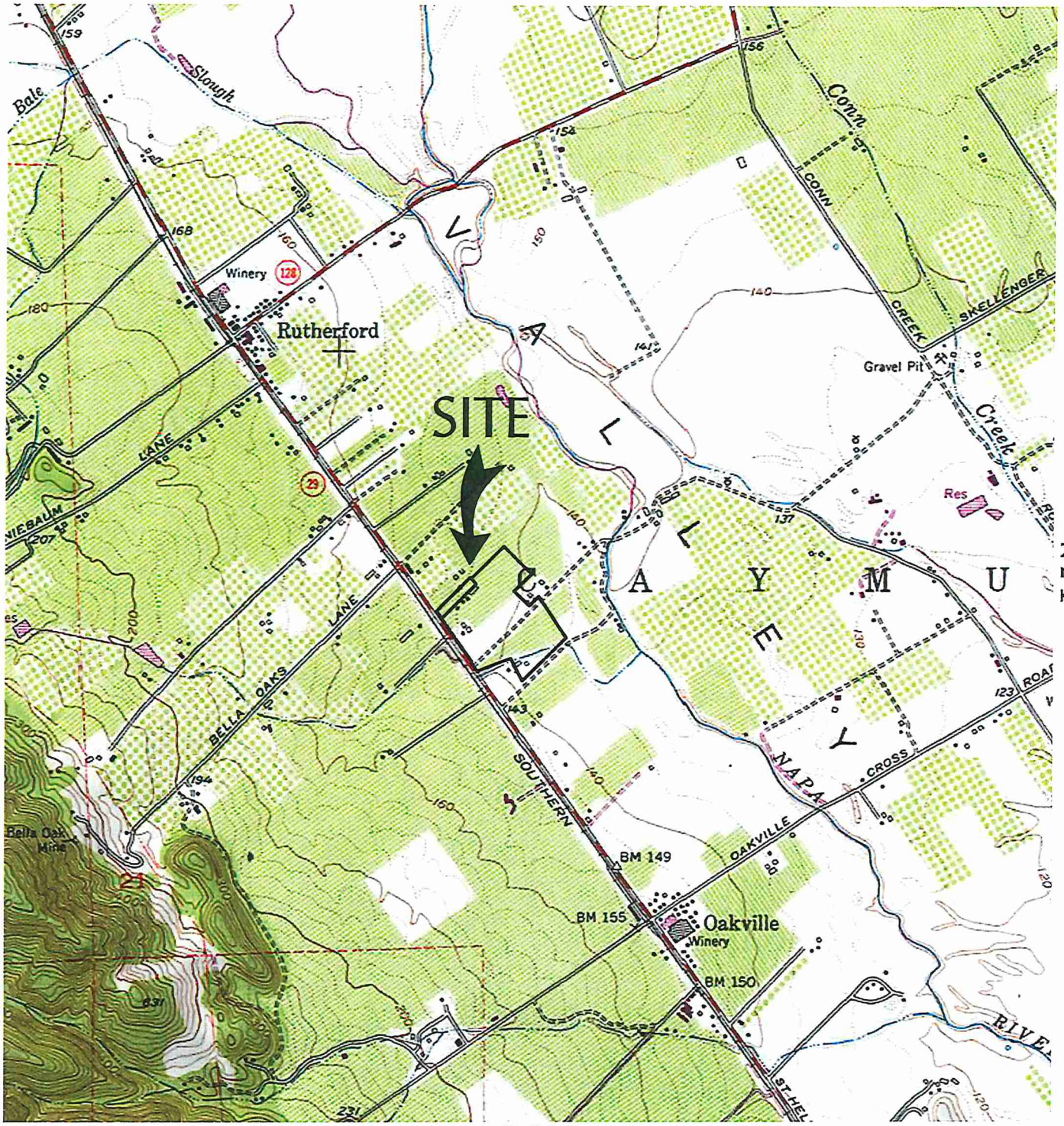
Cakebread Cellars
8300 St. Helena Highway
(State Route 29)
Rutherford, CA 94558
APN 031-010-011
Job No. 98-62
July 2016
Sheet 2 of 2

TOPOGRAPHIC SITE LOCATION INFORMATION

USGS 7.5 MINUTE QUADRANGLE "RUTHERFORD"

Scale: 1" = 2000'



BARTELT ENGINEERING

CIVIL ENGINEERING · LAND PLANNING

1303 Jefferson Street, 200 B, Napa, CA 94559

www.barteltengineering.com

· Telephone: 707-258-1301 ·

Cakebread Cellars

8300 St. Helena Highway

Rutherford, CA 94573

APNs 030-190-007 & 031-010-011

Job No. 98-62

July 2016