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Wastewater Feasibility Study

Behrens Family Winery P15-00203-MOD & P15-00341-VAR
Planning Commission Hearing Date April 5, 2017

APPLIED
CIVIL ENGINEERING
INCORPORATED

June 9, 2015

Job No. 14-131

Kim Withrow, REHS
Environmental Health Division
Napa County Planning, Building and Environmental Services Department
1195 Third Street, Suite 210
Napa, CA 94559

Re: Onsite Wastewater Disposal Feasibility Study for the
Behrens Family Winery Use Permit Modification Application
4078 Spring Mountain Road, St. Helena, California APN 020-300-035
97433-UP

Dear Ms. Withrow:

At the request of Behrens Family Winery we have evaluated the process and sanitary wastewater flows associated with the proposed Use Permit Modification. We have also analyzed the capacity of the existing process and sanitary wastewater system serving the winery facility to determine if it is adequate to serve the proposed changes in use.

The Use Permit Modification application under consideration proposes the following characteristics:

- Wine Production:
  - 20,000 gallons of wine per year (increase from 10,000 currently permitted)
  - Crushing, fermenting, aging and bottling

- Employees:
  - 5 full time employees
  - 2 part time employees

- Marketing Plan:
  - Daily Tours and Tastings by Appointment
    - 32 visitors per day maximum
    - 15 visitors per day average

- Smaller Private Marketing Event
  - 20 guests maximum
  - 4 events per year
  - Food prepared offsite by catering company
- Medium Private Marketing Event
  - 60 guests maximum
  - 1 event per year
  - Food prepared offsite by catering company
- Larger Private Marketing Event
  - 300 guests maximum
  - 1 per year
  - Food prepared offsite by catering company

Existing structures on the property include several winery buildings and a single family residence. As part of the Use Permit Modification existing unpermitted buildings will be properly permitted and a new winery building as well as a new tasting room will be constructed.

Please see the Winery Use Map prepared by Albion Surveys for approximate locations of existing and proposed facilities.

The remainder of this letter describes the existing process and sanitary wastewater disposal system, its design capacity, peak flows associated with the proposed changes in use and our analysis and recommendations related to the system's capability to handle the anticipated wastewater flows.

Existing Septic Systems

The winery facility and residence is serviced by one combined domestic and process waste septic system. According to permit records on file with Napa County the septic system is a pressure distribution type system and installation was completed in February 2000. The system was designed to serve a 10,000 gallon per year winery with a peak flow of 732 gallons per day (gpd). The residence was constructed later and connected to the winery septic system without permits.

Based on our review of the design calculations, plans and As-Built Drawings prepared by Reichers Spence and Associates we understand that the existing septic system is comprised of two 1,500 gallon process waste septic tanks, one 1,200 gallon sanitary sewer septic tank, one 1,200 gallon sump tank and 560 lf of pressure distribution leach line trenches. The system was designed based on 48 inches of acceptable soil at an assigned percolation rate of 3 inches per hour as determined by the site evaluation performed by Napa County on September 29, 1998. The trenches are 24 inches deep and therefore provide 24 inches of acceptable soil beneath the trench bottom.

All septic system components are located just northeast of the winery building on a sloping hillside as shown on the Winery Use Map prepared by Albion Surveys.

The existing septic system was inspected by Mark Dixon in January 20115 and was found to be in good operating condition as described in the attached inspection report forms.

Proposed Process Wastewater Design Flows

We have used the generally accepted standard that six gallons of winery process wastewater are generated for each gallon of wine that is produced each year and that 1.5 gallons of wastewater are generated during the crush period for each gallon of wine that is produced. Based on the 20,000 gallon production capacity and the expectation that both white and red wine will be produced at the winery, we have assumed a conservative 30 day crush period. Using these assumptions, the annual, average daily and peak winery process wastewater flows are calculated as follows:

$$\text{Annual Winery Process Wastewater Flow} = \frac{20{,}000 \text{ gallons wine}}{\text{year}} \times \frac{6 \text{ gallons wastewater}}{1 \text{ gallon wine}}$$

Annual Winery Process Wastewater Flow = 120,000 gallons per year

$$\text{Average Daily Process Wastewater Flow} = \frac{120{,}000 \text{ gallons wastewater}}{\text{year}} \times \frac{1 \text{ year}}{365 \text{ days}}$$

Average Daily Winery Process Wastewater Flow = 328 gallons per day

$$\text{Peak Winery Process Wastewater Flow} = \frac{20{,}000 \text{ gallons wine}}{\text{year}} \times \frac{1.5 \text{ gallons wastewater}}{1 \text{ gallon wine}} \times \frac{1 \text{ year}}{30 \text{ crush days}}$$

Peak Winery Process Wastewater Flow = 1,000 gallons per day (gpd)

Proposed Winery Sanitary Wastewater Design Flows

The peak sanitary wastewater flow from the winery is calculated based on the number of winery employees, the number of daily visitors for tastings and the number of guests attending scheduled marketing events. In accordance with Table 4 of the Napa County "Regulations for Design, Construction, and Installation of Alternative Sewage Treatment Systems" we have used a design flow rate of 15 gallons per day per employee and 3 gallons per day per visitor for tastings. Table 4 does not specifically address design wastewater flows for guests at marketing events. Since the applicant is proposing that food will be catered and prepared offsite we have conservatively assumed 5 gallons of wastewater per guest at marketing events. Based on these assumptions, the peak winery sanitary wastewater flows are calculated as follows:

Employees

Peak Sanitary Wastewater Flow = 7 employees X 15 gpd per employee
Peak Sanitary Wastewater Flow = 105 gpd

Daily Tastings

Peak Sanitary Wastewater Flow = 32 visitors per day X 3 gallons per visitor
Peak Sanitary Wastewater Flow = 96 gpd

Marketing Events (4 per year)

Peak Sanitary Wastewater Flow = 20 guests X 5 gallons per guest
Peak Sanitary Wastewater Flow = 100 gpd

Marketing Events (1 per year)

Peak Sanitary Wastewater Flow = 60 guests X 5 gallons per guest
Peak Sanitary Wastewater Flow = 300 gpd

Marketing Events (1 per year)

Peak Sanitary Wastewater Flow = 300 guests X 5 gallons per guest
Peak Sanitary Wastewater Flow = 1,500 gpd

Total Peak Winery Sanitary Wastewater Flow

In order to manage the peak sanitary wastewater flows to the disposal field portable toilets will be used for all events with more than 20 guests in attendance. Therefore, the worst case peak winery sanitary wastewater flow is calculated based on 7 employees, 32 visitors for tours and tastings and a marketing event for 20 people. The peak flow for this scenario is calculated as follows:

Total Peak Winery Sanitary Wastewater Flow = 105 gpd + 96 gpd + 100 gpd

Total Peak Winery Sanitary Wastewater Flow = 301 gpd

Proposed Residential Sanitary Wastewater Design Flows

The peak flow from the existing residence is calculated based on 120 gpd per bedroom assuming water efficient fixtures. There are a total of two potential bedrooms in the existing residence and the design flow is therefore 240 gpd.

Peak Residential Sanitary Wastewater Flow = 240 gpd

Combined Peak Wastewater Flow

Combined Peak Wastewater Flow = Peak Winery Process Wastewater Flow + Total Peak Winery Sanitary Wastewater Flow + Peak Residential Sanitary Wastewater Flow

Combined Peak Winery Wastewater Flow = 1,000 gpd + 301 gpd + 240 gpd

Combined Peak Winery Wastewater Flow = 1,541 gpd

Proposed Design Flow vs Existing Capacity

The predicted Combined Peak Winery Wastewater Flow for the proposed winery operational characteristics and residence (1,541 gpd) is greater than the design capacity of the existing wastewater disposal field (732 gpd).

Recommendations

In order to accommodate the changes being proposed in the Use Permit Modification we recommend that the winery process wastewater stream be separated from the winery and residence sanitary wastewater streams and that the two waste streams be treated and disposed of separately. The conceptual design of the process and sanitary waste streams is outlined in the following sections of this letter.

Winery Process Wastewater Disposal

We have determined that it is feasible to dispose of the winery process wastewater either via hold and haul or via onsite pretreatment and surface irrigation. In the hold and haul scenario the wastewater would be collected in a holding tank and then would be hauled offsite for treatment and disposal by the Napa Sanitation District, East Bay Municipal Utility District or similar municipal wastewater treatment plant. The winery process wastewater hold and haul system must be designed to hold at least seven days of peak flow (7 days x 1,000 gallons per day = 7,000 gallons), have a water level alarm and be designed and constructed in accordance with the requirements for hold and haul systems as outlined in Napa County Code Section 13.52.035.

Alternatively, winery process wastewater can be pretreated and applied to the land via surface irrigation of the onsite vineyard. In this scenario we recommend that treatment be achieved through the use of a package plant type system or other treatment system designed to accept winery process wastewater that is capable of meeting the following treatment requirements:

Parameter	Pre-treatment*	Post Treatment**
pH	3 to 10	6 to 9
BOD_5	500 to 12,000 mg/l	<160 mg/l
TSS	40 to 800 mg/l	<80 mg/l
SS	25 to 100 mg/l	<1 mg/l

* Reference California Regional Water Quality Control Board Central Coast Region General Waste Discharge Requirements Order No. R3-2008-0018 for winery process wastewater characteristics

** Required for discharge to land via surface irrigation by Napa County for samples taken at the discharge of the treatment unit.

To simplify this analysis we have assumed that final disposal of the treated effluent will be via surface drip irrigation in the existing onsite vineyard. There are approximately 0.6 acres of vineyard area available outside of the required well and stream setbacks. The treated process wastewater may also be able to be used for landscape irrigation outside of all required setbacks and can also be applied to the forested hillside areas outside of required setbacks which would provide additional flexibility in operation of the disposal system. All application of treated winery process wastewater must comply with the requirements of the Napa County Winery Process Wastewater Guidelines for Surface Drip Irrigation and general wastewater setback requirements for wells and blue-line streams.

In order to accommodate differences in the timing of wastewater generation, irrigation demand and prohibitions on applying water to the land during rainy periods a storage tank will be required. We have prepared a water balance calculation to size a tank that will temporarily store wastewater generated at the winery before it is applied to the vineyard. The water balance calculation assumes a monthly wastewater generation rate and a monthly vineyard irrigation schedule based on our past experience with projects of this type. The water balance calculations show that the water generated by winery production operations each month can be effectively managed after treatment by using it for irrigation and also applying it to the identified vineyard area for infiltration without excess carryover from month to month except during the peak months of September and October. We recommend a minimum storage tank capacity of 10,000 gallons to provide operational flexibility in timing of land applications (see Appendix 4).

Winery and Residence Sanitary Wastewater Disposal

We recommend that the existing pressure distribution septic system be used to dispose of the winery and residence sanitary wastewater. The total sanitary wastewater design flow for the winery (301 gpd) plus the residence (240 gpd) is 541 gpd. This is well under the design capacity of 723 gpd for the existing pressure distribution leach field.

Current code requires 36 inches of acceptable soils beneath trench bottoms or pretreatment and at least 24 inches of soil beneath trench bottoms. Since the existing pressure distribution leach lines only provide 24 inches of acceptable soil beneath trench bottom it will be necessary to install a pretreatment system to clean the winery and residential sanitary wastewater before it goes to the disposal field. This can be accomplished by installing an Orenco AdvanTex or equivalent type of pretreatment system in the vicinity of the existing septic tanks.

Reserve Area

Napa County code requires that an area be set aside to accommodate a future onsite wastewater disposal system in the event that the primary system fails or the soil in the primary area is otherwise rendered unsuitable for wastewater disposal.

Given the relatively shallow acceptable soil depths encountered during our Site Evaluation on March 25, 2015 (E15-00172) we recommend that the reserve area be designated as a subsurface drip type disposal field. Per Napa County requirements the reserve area for subsurface drip disposal fields must be 200% of the size of the calculated disposal field area. Furthermore, since the reserve area has a natural ground slope over 20% a slope factor of 1.5 is applied to allow for increased spacing between drip tubes. Based on these design parameters, the required reserve area is calculated as follows:

$$\text{Required Reserve Area} = 200\% \times \frac{\text{Peak Flow}}{\text{Soil Application Rate}} \times 1.5$$

$$\text{Require Reserve Field Area} = 200\% \times \frac{541 \text{ gpd}}{0.6 \text{ gpd per square foot}} \times 1.5$$

Required Reserve Area =2,705 square feet

Based on the site plan and topographic data, we have determined that there is enough area to set aside for 2,800 square feet of subsurface drip disposal field in the vicinity of Test Pits #1, #2, #3, #4 & #6 as shown on the Winery Use Map prepared by Albion Surveys (attached).

Summary

The calculations presented above illustrate that the wastewater flows associated with the proposed Use Permit Modification will exceed the capacity of the existing wastewater system. However, by separating the winery process waste stream from the sanitary waste stream and installing pretreatment the existing leach field can handle the sanitary wastewater from the winery facility and two bedroom residence. The winery process wastewater can be handled either via hold and haul or via pretreatment and irrigation / land application.

Full design specifications for the required improvements must be prepared for County review and permitting after the subject Use Permit Modification is approved and before any work is started.

We trust that this provides the information you need to process the subject Use Permit Modification. Please feel free to contact us at (707) 320-4968 if you have any questions.

Sincerely,

Applied Civil Engineering Incorporated

By:

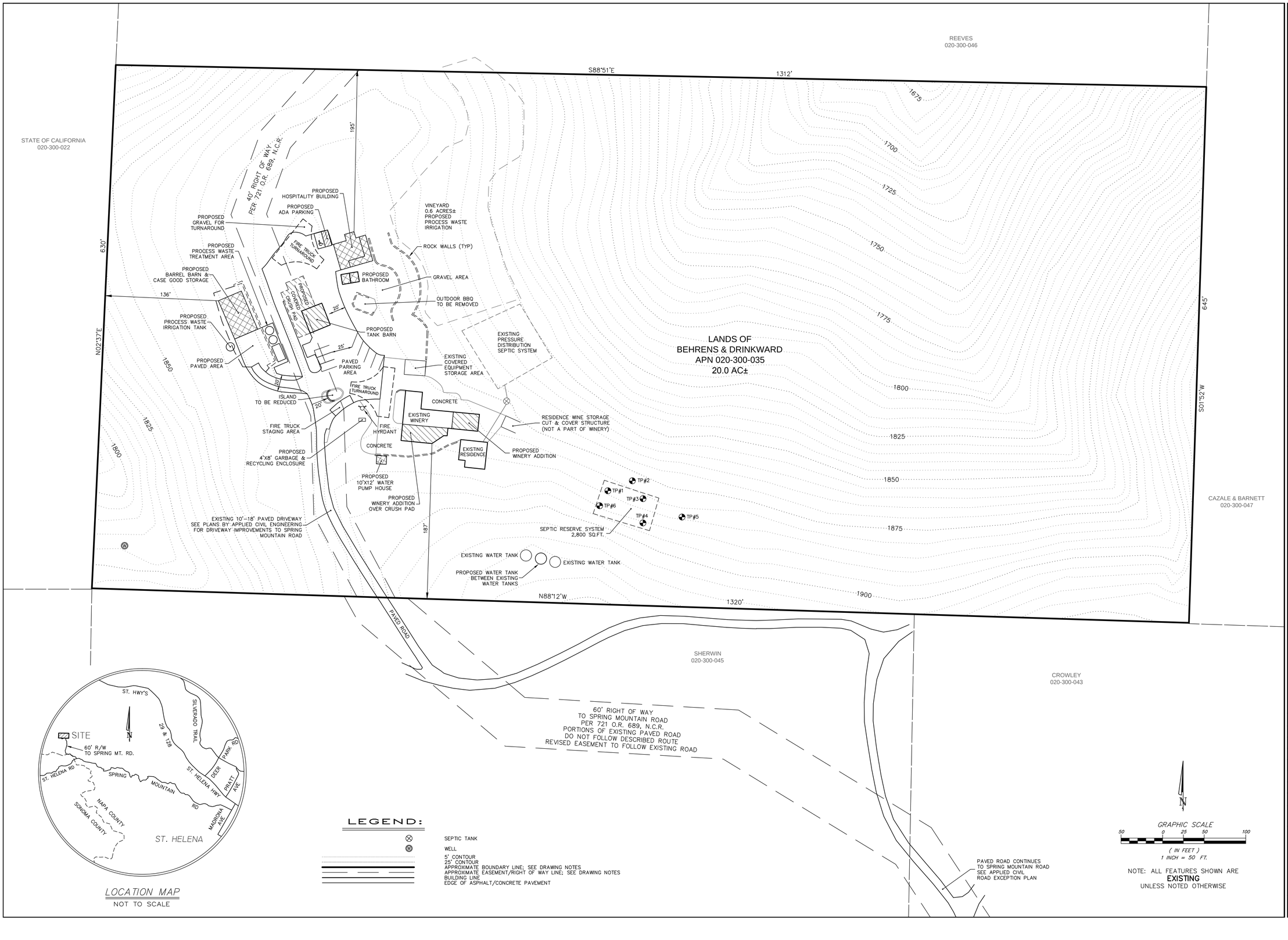
Michael R. Muelrath RCE 67435
Principal

Copy:

Les Behrens, Behrens Family Winery (via email)
Lisa Drinkward, Behrens Family Winery (via email)
Schatzi Throckmorton, Behrens Family Winery (via email)
Jon Webb, Albion Surveys (via email)

Attachments:

Winery Use Map by Albion Surveys
Septic System Inspection Reports by Mark Dixon
Irrigation Storage Tank Water Balance



LOCATION MAP
NOT TO SCALE

LEGEND:

- SEPTIC TANK
- WELL
- 5' CONTOUR
- 25' CONTOUR
- APPROXIMATE BOUNDARY LINE; SEE DRAWING NOTES
- APPROXIMATE EASEMENT/RIGHT OF WAY LINE; SEE DRAWING NOTES
- BUILDING LINE
- EDGE OF ASPHALT/CONCRETE PAVEMENT

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 INCH = 50 FT.

NOTE: ALL FEATURES SHOWN ARE **EXISTING** UNLESS NOTED OTHERWISE

ALBION

ALBION SURVEYS
CONSULTING LAND SURVEYORS
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ST. HELENA, CA 94574
(707) 963-1217
www.albionsurveys.com

DRAWING NOTES

THIS MAP IS NOT A BOUNDARY SURVEY.
IT IS PROVIDED TO LOCATE THE SUBJECT PROPERTY IN RELATION TO ADJOINING LANDS, HIGHWAYS, ROADS, STREETS AND NOT TO GUARANTEE ANY FIXED DIMENSION, ACREAGE OR EASEMENT LOCATIONS. A FIELD SURVEY SHOULD BE PERFORMED PRIOR TO ANY CRITICAL DESIGN WORK, CONSTRUCTION OR CONVEYANCE. EASEMENTS MAY AFFECT THIS PROPERTY. THIS SURVEYOR WAS NOT PROVIDED ANY INFORMATION REGARDING EASEMENTS BY THE OWNER.

SITE INFORMATION

APN: 020-300-035
STREET: 4078 SPRING MOUNTAIN ROAD
CITY: ST. HELENA
SITE CONTACT: SCHATZI THROCKMORTON
PHONE: 707-963-1774

ARCHITECT

COMPANY: WAYNE HOLLAND & ASSOCIATES
CONTACT: WAYNE HOLLAND
PHONE: 707-226-7309
EMAIL: wayneholland@mac.com

ENGINEER

COMPANY: APPLIED CIVIL ENGINEERING
CONTACT: MIKE MUELRATH
PHONE: 707-320-4968
EMAIL: mike@appliedcivil.com

OWNER'S REPRESENTATIVE

COMPANY: ALBION SURVEYS
CONTACT: JON WEBB
PHONE: 707-963-1217
EMAIL: jwebb@albionsurveys.com

WINERY USE MAP
OF THE LANDS OF
BEHRENS & DRINKWARD
COUNTY OF NAPA STATE OF CALIFORNIA

REVISIONS & ADDITIONS

DATE: DRAFTER:	FB:	PG:
DATE: DRAFTER:	FB:	PG:
DATE: DRAFTER:	FB:	PG:
DATE: DRAFTER:	FB:	PG:
DATE: DRAFTER:	FB:	PG:
DATE: DRAFTER:	FB:	PG:

ALBION REFERENCES

PROJECT NO: 2466
PROJECT MANAGER: J. WEBB
DATE: JUNE 8, 2015

VERTICAL DATUM BASED ON NAVD'88
PER NAPA COUNTY GIS TOPOGRAPHY
CONTOUR INTERVAL = 5'

HORIZONTAL DATUM BASED ON NAD'83
PER TRIMBLE NETWORK GPS OBSERVATIONS

FROM :
FAX NO. : 7079873197 Dec. 05 2014 10:37AM P1

NAPA COUNTY DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
EXISTING INDIVIDUAL SEPTIC SYSTEM INSPECTION REPORT FORM

PROPERTY OWNER Les Behrens/Lisa Dinkward DATE 1-15-15
ADDRESS 4078 Spring Mtn. Road APN 020-300-35

PRIMARY TREATMENT-SEPTIC TANK
Distance to closest well: This parcel: 800' Adjacent parcel: 420'
Date tank was last pumped 1-21-15
Distance from foundation 60' Pumped by Les Behrens / owner
Distance from property line 360' Pre-fab tank or poured in place (describe) Pre-Fab
Material-tank Cement lid Cement Number of compartments 2
Inside length ___ width ___ depth ___ Total Capacity 5700 gallons
(3) 1500 gallons 106" x 70" x 56" (1) 1200 gallons 106" x 58" x 56"

SECONDARY TREATMENT-DISPOSAL FIELD (if other than leach field describe below)
Distance to closest well: This parcel ___ Adjacent parcel ___
Distance to property line ___ Distance from foundation ___
Total length on leach line ___ Total effective sidewall ___
Type of filter material ___ Amount of filter material: ___
Type of pipe ___ Number of lines ___
Depth of cover over rock: Above pipe: ___ Below pipe: ___
Trench width: ___ depth ___

GENERAL INFORMATION
Is the house/structure presently occupied? Yes How many bedrooms? 2
If commercial use-how many employees (FT and PT) 2 / 1
How many units served by this system 2
Any other septic systems on the property No If yes, how many? ___

CONDITION OF SYSTEM
Make a statement on the condition of the septic tank and interior surfaces, including baffles and fittings. How was this determined? Note: If tank is over five years old, it must be inspected (pumping is required to allow inspection).
Concrete and plumbing appear in perfect condition. Tanks were pumped and washed clean. Visibly inspected w/ flashlight.
Make a statement on the condition of the sump/pump (if applicable), including size, alarm, structure, etc.
All parts in good working Order

Make a statement on the condition of the distribution box, leaching lines, etc. How was the length and location of the disposal field determined
Designed by Riecher & Spence. All componets are in excellent condition.
Note: Information on disposal field must be determined by physically locating each line by exposing the ends. All distribution boxes must be uncovered and inspected.

A PLOT PLAN OF THE SEPTIC SYSTEM AND ALL OTHER IMPROVEMENTS MUST BE ATTACHED TO THIS REPORT-DISTANCE TO PONDS/STREAMS, WELLS, BUILDINGS, ETC. MUST BE SHOWN

(Licensed Contractor) Dixon's Backhoe & Engineering

Note: In order to secure clearance of an individual sewage disposal system from the Department of Environmental Management, the system must be inspected by a licensed sewage connector and the completed form returned to our office for evaluation. It should be accompanied by a plot plan showing the septic system, wells, buildings and other improvements on the property and the 100% expansion area.

FROM :

FAX NO. : 7079873197

Dec. 05 2014 12:44PM P1

PRESSURE DISTRIBUTION SYSTEM

SOIL COVER/VEGETATION:

1. Vegetation growth: NONE [GOOD] OVERGROWN
2. Soil cover: DRY [MOIST] WET(spongy/saturated)
3. Surface drainage away from system [YES] NO

Comments: Moisture on surface is rain related.

VALVE BOXES:

1. Condition of valve boxes: [GOOD] DAMAGED
2. Condition of valves: [GOOD] DAMAGED
3. Ponding in valve boxes: YES [NO]

Comments: _____

MONITORING WELLS:

Monitoring well data:

Well #	Distance from surface of ground to water	Well #	Distance from surface of ground to water	Well #	Distance from surface of ground to water
1	No Water	5		9	
2	No Water	6		10	
3	No water	7		11	
4	No Water	8		12	

3' to dry gravel at bottom of hole.

Condition of the monitoring wells: [GOOD] DAMAGED

Note the location and extent of the damaged monitoring well, if any: _____

Squirt Test Performed? [YES] NO

If yes, squirt height: 1' to 3' discharge graduated up hill.

INSPECTOR: _____ DATE: 1/21/15

Dixon's Backhoe & Engineering

Irrigation Storage Tank Water Balance

Month	Beginning Balance	Process Wastewater	Irrigation Demand	Additional Land Application Capacity	Total Land Application Capacity	Ending Balance
January	0	6,000	0	13,033	13,033	0
February	0	6,000	0	13,033	13,033	0
March	0	6,000	0	13,033	13,033	0
April	0	4,800	0	13,033	13,033	0
May	0	4,800	9,948	13,033	22,981	0
June	0	6,000	11,149	13,033	24,182	0
July	0	12,000	11,949	13,033	24,982	0
August	0	15,600	10,463	13,033	23,496	0
September	0	30,000	8,176	13,033	21,209	8,791
October	8,791	15,600	5,489	13,033	18,522	5,869
November	5,869	7,200	0	13,033	13,033	36
December	36	6,000	0	13,033	13,033	0
		120,000			213,570	

Notes:

1. All values shown above for beginning balance, inflow, outflow and ending balance are in units of gallons.
2. See attached tables for detailed explanation of process wastewater and irrigation data presented in this table.
3. This water balance is based on the assumption that the tank is empy in August, just prior to crush.
4. This table is intended to illustrate waste disposal capability only. Where irrigation demand exceeds availble treated wastewater availability additional irrigation water will be provided by another source.

Winery Process Wastewater Generation Analysis

Annual Wine Production	20,000	gallons
Wastewater Generation Rate	6	gallons per gallon of wine
Annual Wasewater Generation	120,000	gallons
Crush Season Length	30	days
Wastewater Generated During Crush	1.5	gallons per gallon of wine
Peak Wastewater Generation Rate	1,000	gallons per day

Winery Process Wastewater Generation Table			
Month	Percentage of Annual Total	Monthy Flow (gallons)	Average Flow (gpd)
January	5.0%	6,000	194
February	5.0%	6,000	214
March	5.0%	6,000	194
April	4.0%	4,800	160
May	4.0%	4,800	155
June	5.0%	6,000	200
July	10.0%	12,000	387
August	13.0%	15,600	503
September	25.0%	30,000	1,000
October	13.0%	15,600	503
November	6.0%	7,200	240
December	5.0%	6,000	194
Total	100.0%	120,000	

Notes:

1. Wastewater generation rates and monthly proportioning are based on our past experience with similar projects.

Irrigation Schedule Analsysis

Vineyard Information:

Total acres of vines	0.6	acres
Vine Row Spacing (approx)	4	feet
Vine Spacing (approx)	4	feet
Vine density	2,723	vines per acre (average)
Total Vine Count	1,634	vines

Irrigation Information:

Seasonal Irrigation[1]	35.0	gallons per vine (May through October)
Non-Irrigation Application	0.8	inches October through April

Irrigation Schedule					
Month	Monthly Percentage[2]	Irrigation per Vine (gallons)	Irrigation (gallons)	Non-Seasonal Irrigation Application (gallons)	Total (gallons)
January		0.0	0	13,033	13,033
February		0.0	0	13,033	13,033
March		0.0	0	13,033	13,033
April		0.0	0	13,033	13,033
May	17.4%	6.1	9,948	13,033	22,981
June	19.5%	6.8	11,149	13,033	24,182
July	20.9%	7.3	11,949	13,033	24,982
August	18.3%	6.4	10,463	13,033	23,496
September	14.3%	5.0	8,176	13,033	21,209
October	9.6%	3.4	5,489	13,033	18,522
November		0.0	0	13,033	13,033
December		0.0	0	13,033	13,033
Total	100%	35.0	57,173	156,398	213,570

Notes:

1. Irrigation per vine is based on 0.3 acre-feet per acre of vines per Phase 1 WAA.

2. Monthly vineyard irrigation percentages are based on CIMIS ET_o estimates for Zone 8.

3. Non-Irrigation Application is for managing tank levels and assumes a maximum of 5 operational days per month based on historic weather data (Summit Engineering NBRID Capacity Study, 1996) and a saturated soil infiltration rate of 0.1 gallons per square foot per day uniformly over the entire area.