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Wastewater Feasibility Study

Etude Winery P15-00355
Planning Commission Hearing December 21, 2016

WASTEWATER FEASIBILITY STUDY

Etude Wine Company

Napa, California
APN 047-230-033

SUMMIT

CIVIL STRUCTURAL ELECTRICAL WATER|WASTEWATER

Project No. 2015142
November 18, 2016

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ETUDE WINERY
Napa, California
WASTEWATER SYSTEM FEASIBILITY

PROJECT OVERVIEW

Etude Wine Company is proposing to increase annual wine production capacity from 150,000 gallons to 300,000 gallons and increase the number of employees and visitors. To accommodate the proposed changes, it is feasible to expand the facility's existing process wastewater (PW) and sanitary sewage (SS) management systems. The PW management system will be updated for irrigation/disposal of treated effluent over approximately 6 acres of vineyards and/or landscape as needed. The SS management system will be expanded to accommodate additional visitation and employees. This wastewater feasibility study details the proposed changes to each system.

SITE DESCRIPTION

The facility is located south of Highway 12/121 and west of highway 29 in an agricultural area with vineyards to the north, east, and west and Cuttings Wharf Road to the south. The site topography slopes gradually downward to the north. Surface drainage flows overland to the east. Prior to the development of the winery, the property was used as agricultural land and a brandy distillery from 1982 to 2003. Distillation no longer occurs at the facility. An overall site plan for the facility is provided in Enclosure A.

WINERY PROCESS WASTEWATER MANAGEMENT SYSTEM

The existing PW management system includes a PW collection system, a PW pump station, an inline screen to remove solids from the waste stream, and a 3.78 Mgal facultative aerated pond with two 7.5 horsepower brush style aerators, currently being used as an evaporation pond. To accommodate the proposed wine production increase of up to 300,000 gallons of wine, aeration/mixing system is proposed to be installed in the facultative aerated pond. Evaporation will be the primary means of process wastewater disposal. A conservative pond water balance that does not consider evaporation due to surface aeration was prepared indicating the potential need for diversion/disposal of treated effluent (see Enclosure B). If process wastewater diversion is required, disposal pumps will be installed and treated PW will be reclaimed for irrigation of approximately 6 acres of winery vineyards and/or landscaping. Should additional BOD & TSS removal be required to meet waste discharge requirements, a baffle can be added to the existing pond system.

Any PW management system additions will be designed and installed in accordance with the memorandum of understanding and all necessary Napa County Environmental Health Division and Regional Water Quality Control Board criteria and permits.

PROCESS WASTEWATER CHARACTERISTICS

Process wastewater will consist primarily of wastewater collected at floor drains and trenches within the winery, receiving, crush, tank, and wash down areas. No sanitary wastewater will be discharged into the PW management system. Exterior tank and process areas not under a roof will be diverted using an automatic diversion valve capable of providing a means of routing rainwater to the storm drainage system when those areas are not in use for process purposes. As an alternative to automatic diversion, the external areas may be covered. Typical winery wastewater characteristics are as summarized below:

Characteristic	Units	Crushing Season Range	Non-crushing Season Range
pH	--	2.5 - 9.5	3.5 - 11.0
Dissolved Oxygen	mg/L	0.5 - 8.5	1.0 - 10.0
BOD_s	mg/L	500 – 12,000	300 – 3,500
COD	mg/L	800 – 15,000	500 – 6,000
Grease	mg/L	5 - 30	5 - 50
Settleable Solids	mg/L	25 - 100	2 - 100
Nonfilterable Residue	mg/L	40 - 800	10 - 400
Volatile Suspended Solids	mg/L	150 - 700	80 - 350
Total Dissolved Solids	mg/L	80 – 2,900	80 – 2,900
Nitrogen	mg/L	1 - 40	1 - 40
Nitrate	mg/L	0.5 - 4.8	-
Phosphorous	mg/L	1 - 10	1 - 40
Sodium	mg/L	35 - 200	35 - 200
Alkalinity ($CaCO_3$)	mg/L	40 - 730	10 - 730
Chloride	mg/L	3 - 250	3 - 250
Sulfate	mg/L	10 - 75	20 - 75

PROCESS WASTEWATER DESIGN FLOWS

Based on typical flow data from wineries of similar size and characteristics and corresponding process wastewater (PW) generation rates, projected flows are calculated as follows:

Proposed Annual production	=	300,000 gal wine/year
PW generation rate	=	6 gal PW/gal wine[a]
Annual PW Flow	=	300,000 gal wine x 6 gal PW/gal wine
	=	1,800,000 gal PW/year
Average PW Flow	=	(1,800,000 gal PW/year) / (365 days)
	=	4,940 gal PW/day
Peak PW Flow	=	(1,800,000 gal PW/year x 16.4[b] %)/(30 day)
	=	**9,840 gal PW/day**

[a] Generation rate based on industry standards and water data for similar wineries
[b] The harvest month of September accounts for approximately 16.4 percent of the annual water demand.

PROCESS WASTEWATER CONVEYANCE, TREATMENT, AND DISPOSAL

The existing process wastewater system consists of the components listed below. Refer to Enclosure A for the PW management system schematic and Overall Site Plan.

1. Initial screening – Provided by screened baskets and strainers installed on the trench drains and floor drains within the winery. Screen opening sizes are approximately 1/4 inch for exterior drains and 1/8 inch for interior drains.
2. Gravity collection system – Designed to provide low maintenance and no infiltration or exfiltration. Piping is assumed to be compatible with PW and satisfies Uniform Plumbing Code and local requirements.
3. Inline screen – The existing screen, located inline and upstream of the existing pump sump helps to minimize solids passage into the PW pond. The screen is designed to remove the large solids from the system and, as a result, reduce the organic biological loading and the accumulation of solids in the aerated pond system.
4. PW pump station – The existing duplex pump station transfers screened PW collected in the conveyance system to the process wastewater pond. Storage in the pump sump and the existing former distillery cooling tray provide some equalization for peak flow events.
5. pH control system (as needed) – Over more than 10 years of operation, Etude has not required pH neutralization of winery PW for their pond system. The combination of naturally occurring alkalinity in source water and alkaline cleaning compounds used within wineries usually provides sufficient

buffering to maintain pond pH above 6.5. Neutralizing chemicals should only be used when absolutely necessary. Since the PW is ultimately disposed via irrigation, the neutralizing chemicals would be applied to the land.

If any changes to the facility require pH adjustment of the wastewater to above 6.5 or below 8.5, the future automatic adjustment system would consist of a pH sensor, controller/recorder and control piping manifold, sparger and chemical storage. A pH probe will be available for monitoring. Anhydrous or aqueous ammonia may be used as the neutralizing chemical and will be introduced in the pumping station wetwell. Where appropriate, pH adjustment may provide a more favorable environment for the growth of aerobic bacteria in the aerated ponds; use of ammonia will also serve as a supplemental nutrient in the biological process. The adjustment of the pH also reduces the chances for emission of hydrogen sulfide odors that can occur in a low pH environment.

6. Flow measurement – An existing inline magnetic flow measurement device measures flows from the PW pump station to the facultative aerated pond.
7. Facultative aerated pond – Biological stabilization occurs in the existing 3.78 million gallon facultative aerated pond. This pond system is capable of providing minimum recommended residence times between 90 to 120 days at average and peak flow conditions. The existing pond will provide sufficient storage capacity to maintain 2 feet of freeboard during the 10-yr storm. Refer to the Pond Water Balance in Enclosure B.

   Currently, two 7.5 horsepower aerators are utilized within the pond (see Enclosure B for Aeration requirement calculations). If required, additional aeration may be provided to adequately aerate and mix the pond to prevent odors, enhance evaporation, and reduce biochemical oxygen demand to required levels for irrigation disposal. The aerators will utilize timer operated controls to allow operations personnel to adjust aerator operation to changing winery activities and pond conditions. If evaporation does not provide sufficient disposal, vineyard irrigation will be utilized. Additional aeration or baffling of the ponds may be used to meet Napa County vineyard irrigation disposal water quality requirements.
8. Irrigation/disposal pump (as needed) – A future PW effluent irrigation/disposal pump will be installed to provide reclaimed wastewater for vineyard irrigation and/or landscape irrigation around the winery buildings.
9. Flow Measurement (as needed) – An additional flow measurement device will be provided to measure the flows from the aerated pond to the irrigation system.
10. Filter (as needed) – A filter will be provided to screen secondary effluent prior to landscape irrigation.
11. Irrigation disposal area (as needed) – If needed, reuse/disposal of effluent will be via drip irrigation of approximately 6.0 acres of vineyards/landscape. Refer to the Overall Site Plan in Enclosure A for the potential irrigation area. The irrigation demand of the vineyards and landscaping exceed the estimated annual process wastewater volume. Refer to the pond water balance in Enclosure B for proposed disposal area application rates and effluent storage volumes. To meet the additional irrigation demand the treated PW can be supplemented with irrigation water. The irrigation demand is the lowest during the wet weather season (November through April) and application rates during this period are less than 0.75 inches per month. An air gap or separate plumbing will be installed for the existing irrigation

system discharge to prevent cross-contamination with treated effluent applied to the irrigation distribution network.

SOLID WASTES

Solid wastes from the winery primarily include pomace, seeds, and stems. The estimated quantities of these wastes (at peak capacity) are as follows:

$$Peak\ annual\ production = \ 300{,}000\ gal\ wine\ \times \frac{1\ ton}{165\ gal} = 1{,}818\ tons$$

$$Ultimate\ Annual\ Total = \ 35\% \times \ 1{,}818\ tons = 636\ tons$$

Based on a unit weight of 38 pounds per cubic foot, the annual volume of solids wastes would be:

$$636\ tons\ \times \frac{2{,}000\ lb}{1\ ton} = 1{,}272{,}000\ lb$$

$$1{,}272{,}000\ \text{lbs}\ \times \frac{1\ ft^3}{38\ lb} \times \frac{1\ yd^3}{27\ ft^3} = 1{,}240\ yd^3$$

These organic solids will be hauled to an off-site composting location. Currently, the solids are sent to the Napa County food waste composting program.

SANITARY SEWAGE MANAGEMENT SYSTEM

Etude Wine Company intends to expand their sanitary sewage (SS) wastewater management system in accordance with all necessary Napa County Planning, Building, and Environmental Services (PBES) and Regional Water Quality Control Board criteria and permits. Sanitary wastewater flows will be handled separately from the PW flows.

The SS management system currently includes an existing SS collection system, septic tank with effluent filter, Orenco Systems Inc. AdvanTex pre-treatment system, pump sump, disinfection system, and a 1.23 Mgal evaporation pond. To accommodate the increase in number of employees and visitors, additional septic tankage and an AdvanTex AX20 treatment pod will be added. The proposed SS management system improvements have been sized for a peak daily SS wastewater flow of approximately 1,660 gal/day.

SANITARY SEWAGE CHARACTERISTICS

SS will consist primarily of wastewater generated from restrooms, laboratories, and tasting room facilities. No PW will be discharged into the SS management system. Typical SS characteristics are as summarized below:

Characteristic	Units	Raw Wastewater[1] Range
BOD_s	mg/L	110 - 220
Grease	mg/L	50-100
Total Suspended Solids (TSS)	mg/L	100 - 220
Volatile Suspended Solids	mg/L	80 - 165
Total Dissolved Solids (TDS)	mg/L	250 - 500
Nitrogen	mg/L	20 - 40
Nitrate	mg/L	0
Phosphorous	mg/L	4 - 8
Alkalinity ($CaCO_3$)	mg/L	50 - 100
Chloride	mg/L	30 - 50
Sulfate	mg/L	20 - 30

[1]Typical composition of untreated domestic wastewater, Metcalf & Eddy, “Wastewater Engineering, Third Edition”, 1991

WINERY SANITARY SEWAGE DESIGN FLOWS

The proposed SS management system at Etude Wine Company will consist of typical wastewater generated from restrooms, laboratories, and tasting room facilities. It is proposed to have food pairing available for tasting visitors, but all food will be catered and prepared off-site. SS flows associated with a potential cheese and charcuterie plate that would be brought in and plated for food pairing, is included below. All SS generated from marketing events will be managed using portable toilets. The estimated peak day harvest flows are provided below. Average daily flows for each month are provided in Enclosure B.

Average Day with tasting and Event							
Employee (full-time)	22	x	15	gpcd	=	330	gal/day
Employee (part-time)	5	x	15	gpcd	=	75	gal/day
Tasting Visitors [a]	143	x	3	gpcd	=	429	gal/day
Tasting Visitors Food Pairing [b]	36	x	0.75	gpcd	=	27	gal/day
Private Tasting Visitors	15	x	3	gpcd	=	45	gal/day
Total					=	906	gal/day
					=	**910**	**gal/day**

Peak Tasting Day with Event							
Employee (full-time)	22	x	15	gpcd	=	330	gal/day
Employee (part-time)	5	x	15	gpcd	=	75	gal/day
Tasting Visitors [a]	350	x	3	gpcd	=	1,050	gal/day
Tasting Visitors Food Pairing [b]	88	x	0.75	gpcd	=	66	gal/day
Private Tasting Visitors	45	x	3	gpcd	=	135	gal/day
Total					=	1,656	gal/day
					=	**1,660**	**gal/day**

[a] 143 visitors per day for 7 days a week represents the average of 1,000 visitors per week (350 peak visitation per day)
[b] Food pairing assumed for 25% of tasting visitors

The SS management system will be designed to handle the peak daily SS flow of 1,660 gal/day.

WINERY SANITARY SEWAGE CONVEYANCE, TREATMENT AND DISPOSAL

The winery SS treatment and disposal system has the components described below. Refer to Enclosure A for the SS management system schematic and Overall Site Plan.

1) Gravity Collection System – Designed to provide low maintenance and no infiltration or exfiltration. Piping is compatible with process wastewater and satisfies Uniform Plumbing Code and local requirements.

2) Septic Tank with Effluent Filter – The required septic tank size for the increased winery SS flows was determined by evaluating sizing recommendations based on the Uniform Plumbing Code (UPC) formula and Orenco's commercial SS recommendation for a 3 day retention time, as shown below:

   Uniform Plumbing Code Method:

   $$Volume = 1{,}125 + 0.75 \times Flow\ Rate$$
   $$Volume = 1{,}125 + 0.75 \times 1{,}660\ gpd$$
   $$Volume = 2{,}270\ gallons$$

   3 Day Retention Time Method:

   $$Volume = 1{,}660\ gpd \times 3\ days = 4{,}980 gallons$$

   The more conservative method was used to select a total precast concrete septic tank volume of approximately 5,000 gallons for solids removal prior to pre-treatment.
   Removal of solids in the septic tank helps to reduce BOD loads on the system and minimize the frequency of sludge removal in aerobic systems. Since the existing septic tank provides 3,000 gallons of solids settling, an additional 2,000 gallon septic tank will be provided at a minimum. An effluent filter will also be provided on the outlet of the final septic tank to remove additional suspended solids which do not settle out in the tank.
3) AdvanTex Textile Filter Pre-treatment System – Orenco System's AdvanTex Treatment System is a packed bed textile filter that supports attached growth biological treatment. Package treatment systems have been widely utilized for sanitary sewage treatment and have been successful in providing consistent reliable treatment when properly designed and operated. The facility currently utilizes two AdvanTex AX20 treatment pods. An additional AX20 treatment pod will be added to accommodate the flows from the increased number of employees and visitation.
   Orenco Systems Inc. recommends a recirculation/blending tank volume of a minimum of 80 percent of peak daily flows. The recirculation/blending tank will be provided for dilution and buffering of peak hydraulic and organic loads. The existing 1,500 gallon recirculation tank should provide adequate volume to accommodate the additional SS flows. A simplex pumping system is installed in the recirculation/blending tank to dose the AdvanTex Treatment System.
4) SS pump station – An existing duplex pump station, conveys the screened SS to the disinfection system, contact chamber, and ultimately to the evaporation pond.
5) Flow measurement – An inline magnetic flow measurement device will be provided to measure flows from the SS pump station to the contact chamber.
6) Disinfection system – The existing hypochlorination disinfection system utilizes commercially available calcium hypochlorite in solid form. The disinfection system is a complete packaged unit located in the existing equipment shed and includes a mixing chamber, low concentration liquid calcium hypochlorite solution storage tank, feed pump, injector, and inline static mixer and control panel.
   a) Contact chamber – Disinfection contact time is provided with the use of an in-line length of schedule 80, PVC pipe buried below the top of the main dike separating the PW and SS ponds. The system operates in a batch mode in conjunction with the SS pump station. If required, additional disinfection

contact volume will be provided for a minimum 90-minute contact time in the inline contact chamber after disinfection.

7) Evaporation pond – The existing 1.23 Mgal pond disposes of the pretreated and disinfected SS wastewater through evaporation. A conservative pond water balance is provide for the SS evaporation pond in Enclosure C. Based on a multiple year model, a 10-year rainfall event year followed by four average rainfall event years, the ponds would be capable of equilibrating to a net zero water volume change while always maintaining two feet of freeboard.
   Historical SS pond use also suggests that the SS flow generation rate may be lower than estimated and that the SS pond will be capable of more evaporation than estimated in the pond water balance. Should additional evaporation area be required, a pond expansion area has been reserved on the property (approximately 92,300 square feet). Refer to the Overall Site Plan in Enclosure A. If required, a solar powered aerator may be installed in the evaporation pond to help control odors.
   As an alternative to pond expansion, a new SS in-ground disposal system may also be installed if acceptable onsite soils are found or an advanced pre-treatment system may be installed to permit surface disposal.

OTHER CONSIDERATIONS

ODOR CONTROL

There should be no noxious odors from a properly designed and operated treatment system. See Alternative Courses of Action for operation alternatives.

GROUND WATER CONTAMINATION

The nearest water well to the PW and SS treatment and disposal systems is a minimum of 100 feet. No disposal of wastewater effluent will occur within 100 feet of any existing wells.

Irrigation with or disposal of treated PW effluent is considered a beneficial use and is an effective means to protect groundwater quality. Well water may supplement treated PW for irrigation when capacity permits. SS will not be used for irrigation.

PROTECTION

Exposed wastewater treatment facilities should be posted with appropriate warning signs. The treatment areas will be protected to restrict access and potential damage to the system.

ALTERNATIVE COURSES OF ACTION

Although no operational difficulties are foreseen, the following additional courses of action would be available if necessary for the PW system:

- Additional stages of treatment to increase effluent quality
- Increased use of irrigation/disposal area to increase discharge capacity

- The ponds have been designed for retention of treated PW throughout the majority of the rainy season with minimal discharges to irrigation/disposal fields. Should there be a winter with more rainfall than the design condition, several operational procedures are available to compensate:
    - Additional water conservation at winery
    - Light irrigation during periods between storms – not exceeding the assimilative capacity of the soil
    - Increased irrigation during the months of planned irrigation with the soil percolation capacity
    - Pumping and truck transfer of treated and diluted wastewater to an approved treatment plant or land disposal site

For the SS management system, should there be any unforeseen operational difficulties, the following additional courses of action would be available if necessary:

- Pumping and truck transfer of treated and diluted wastewater to an approved treatment plant or land disposal site would be used as additional courses of action
- Pond expansion to accommodate additional SS disposal
- Additional treatment of SS for land disposal

ENCLOSURE A

OVERALL SITE PLAN

WASTEWATER MANAGEMENT SYSTEM SCHEMATIC

APPROXIMATE PROPERTY LINE, TYP

GATE

0 50 100
GRAPHIC SCALE IN FEET

WINERY PROCESS WASTEWATER POND EXPANSION AREA

SANITARY WASTEWATER EVAPORATION POND EXPANSION AREA

VINEYARD

100' SETBACK

(E) AGRICULTURAL WELL 3

(E) FENCE

(E) 16' DOUBLE SWING GATE

(E) WINERY PROCESS WASTEWATER POND (3.78 MGAL)

(P) PW IRRIGATION PUMP PAD

(E) SCREENING EQUIPMENT

(E) PUMP SUMP AND PUMPS

(E) CONCRETE COOLING TRAY STRUCTURE

(E) IRRIGATION RESERVOIR

(E) SANITARY WASTEWATER EVAPORATION POND (1.23 MGAL)

AREA FOR (E) SEPTIC TANK, TREATMENT SYSTEM, RECIRCULATION TANK, PUMP TANK AND DISINFECTION SYSTEM, AND (P) 8G EXPANSION SEPTIC TANK AND AX20 POD

POTENTIAL PW EFFLUENT IRRIGATION AREA

(E) WINERY BUILDING

(N) WELL 2

(E) VINEYARD

4.7 ACRES

14 ACRES

CUTTINGS WHARF ROAD

(E) WELL 1

(E) WATER TREATMENT SYSTEM

(E) FIRE PROTECTION STORAGE POND

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APPROXIMATE PROPERTY LINE, TYP

OVERALL SITE PLAN

SCALE: 1"=50'

SUMMIT
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ETUDE WINE COMPANY
1250 CUTTINGS WHARF ROAD
NAPA COUNTY, CALIFORNIA
APN 047-230-033

WASTEWATER SYSTEM EXPANSION

OVERALL SITE PLAN

2016-06-20 PERMIT SUBMITTAL

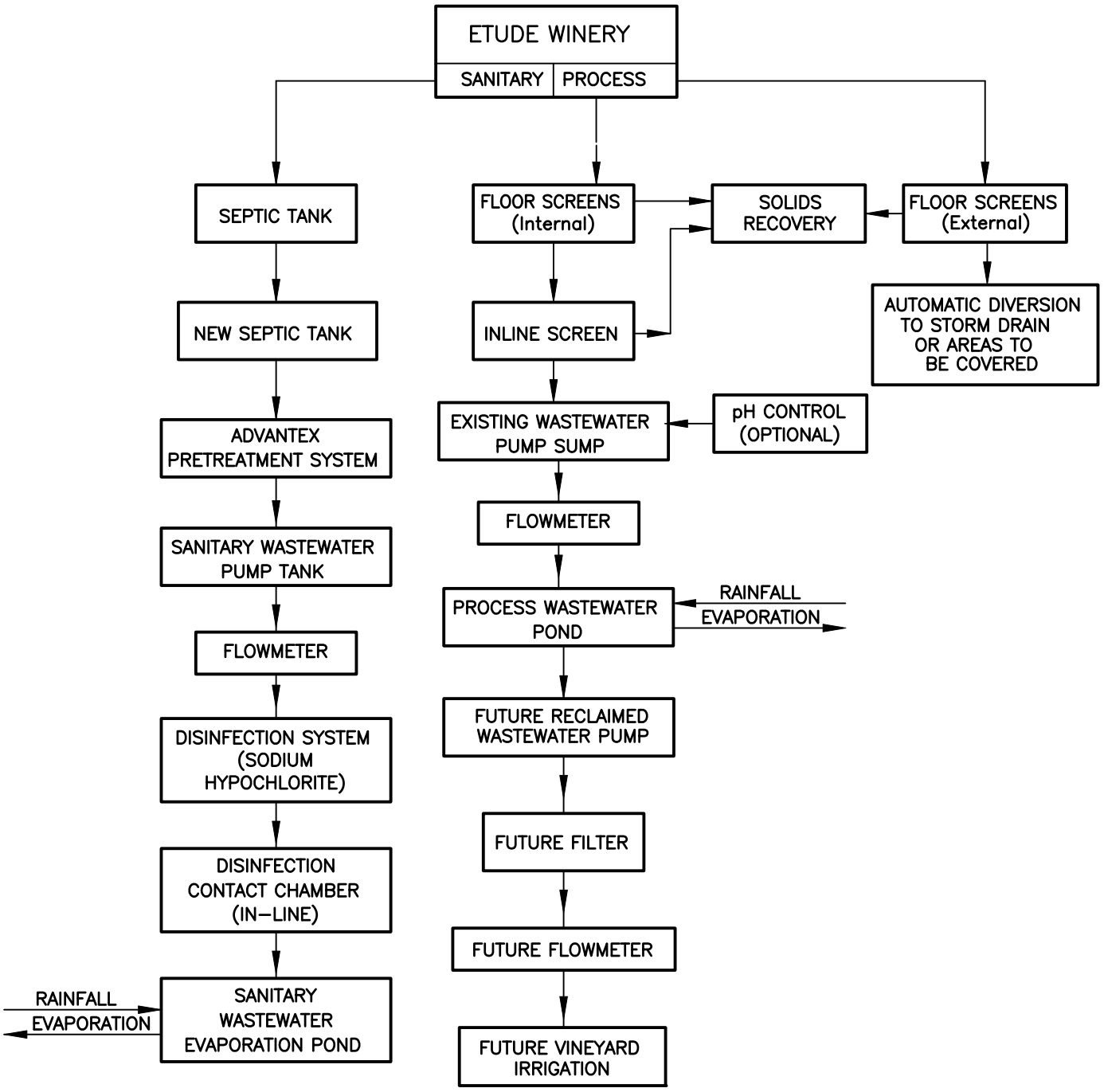
DATE: XXXX-XX-XX1
JOB NO: 2015142
SCALE: AS SHOWN
DRAWN: TF
CHECKED: ST
SHEET **W1**

SUMMIT

ETUDE WINE COMPANY
1250 CUTTINGS WHARF ROAD
NAPA COUNTY, CALIFORNIA
APN 047-230-033

WASTEWATER MANAGEMENT SYSTEMS SCHEMATIC

PROJECT NO. 2015142
DATE 2015-09-03
SHT NO 1 OF 1
BY TF CHK SHT



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ENCLOSURE B

PW MANAGEMENT SYSTEM POND WATER BALANCE

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Process Wastewater Design Criteria 300,000 Gallon Production	PROJECT NO. 2015142 BY: SHT CHK: GG

FULL PRODUCTION

Annual Harvest	1,818	ton/year	
Wine Generation Rate	165	gal wine/ton	
Annual Production	300,000	gal wine/year	
PW Generation Rate	6.0	gal PW/gal wine	
Annual PW Flow	1,800,000	gal PW/year	
Months of Harvest	Aug-Oct		
Average Day Flow	4,940	gal PW/day	
Average Day Harvest Flow	7,800	gal PW/day	
Average Day Peak Harvest Month Flow	9,840	gal PW/day	
Pond Capacity (at maximum water level)	3.78	Mgal	
Pond HRT Based on Minimum Water Level	114	days	Based on Average Day, Peak Week Flow
Recommended HRT	90 to 120	days	
Minimum Volume for 90 day HRT	1.6	Mgal	Based on Average Day, Peak Week Flow

DESIGN PROCESS WASTEWATER FLOWS

Month	Monthly Percentage of Annual Flow[a] (%)	Monthly Flow (Mgal)
August	10.5%	0.188
September	16.4%	0.295
October	12.9%	0.232
November	7.4%	0.133
December	6.4%	0.115
January	6.6%	0.118
February	7.2%	0.130
March	7.6%	0.137
April	6.8%	0.122
May	6.4%	0.116
June	5.6%	0.101
July	6.2%	0.112
Total	**100%**	**1.800**

[a] Monthly percentage of annual flow based on average of PW flow data from eleven wineries.

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Climate Data 300,000 Gallon Ultimate Production	PROJECT NO. 2015142 BY: SHT CHK: GG

Month	Days	Average Temp[a] (F)	Reference Evapotranspiration[b] (in)	Pan Evaporation[c] (in)	Lake Evaporation[d] (in)	Average Precipitation[e] (in)	10-Year Precipitation[f] (in)	100-Year Precipitation[f] (in)
August	31	68.5	5.9	8.5	6.5	0.1	0.2	0.2
September	30	67.5	4.5	7.0	5.4	0.4	0.6	0.8
October	31	62.7	3.1	4.7	3.6	1.4	2.0	2.9
November	30	53.5	1.5	2.3	1.8	3.7	5.3	7.6
December	31	47.7	0.9	1.5	1.2	3.9	5.5	7.9
January	31	47.9	0.9	1.4	1.1	5.4	7.6	10.9
February	28	51.8	1.7	2.1	1.6	5.0	7.2	10.2
March	31	54.3	2.8	3.9	3.0	4.1	5.8	8.3
April	30	57.6	4.2	5.7	4.4	1.5	2.1	3.0
May	31	62.1	5.6	7.8	6.0	0.8	1.1	1.6
June	30	66.6	6.3	9.2	7.1	0.2	0.2	0.3
July	31	68.6	6.5	9.5	7.3	0.1	0.1	0.1
Total	**365**		**43.9**	**63.6**	**49.0**	**26.5**	**37.8**	**53.9**

[a] Average monthly temperature observed between 1971 and 2000 at Napa State Hospital. National Oceanic & Atmospheric Administration, updated February 2004.

[b] ET_o values based on California Irrigation Management Information System (CIMIS) Zone 5 Northern Inland Valleys

[c] Average monthly pan evaporation rates observed at Duttons Landing, 1956-1973. DWR 73-1.

[d] Pan evaporation rates adjusted by a factor of 0.77 to determine lake evaporation.

[e] Average monthly rainfall observed at Napa State Hospital, 1971 to 2000. National Oceanic & Atmospheric Administration, updated February 2004.

[f] Average monthly rainfall adjusted by the ratio of 10-yr and 100-yr wet year return storm identified by Pearsons Log III Distribution. Distribution calculated from Napa, CA data from 1945 to 2000.

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study PW Pond Worksheet 300,000 Gallon Ultimate Production	PROJECT NO. 2015142 BY: SHT CHK: GG

Pond

Bottom Width	145.0'	Bottom Radius	15.0'	Start Month	August
Bottom Length	395.0'	Top Radius	35.0'	Min. Depth	0.0'
Interior Side Slope (x:1)	2.5	Depth	7.5'	Divert Volume	0.195 Mgal
Length:Width	0.4	Freeboard	2.0'	Initial Depth	5.0'

Depth (ft)	Length (ft)	Width (ft)	Radius (ft)	Surface Area (ft^2)	Total Volume (Mgal)
0	395	145	15	57,083	0.000
0.5	398	148	16	58,413	0.216
1	400	150	17	59,753	0.437
1.5	403	153	18	61,105	0.617
2	405	155	19	62,467	0.847
2.5	408	158	20	63,840	1.082
3	410	160	21	65,223	1.322
3.5	413	163	22	66,618	1.567
4	415	165	23	68,023	1.818
4.5	418	168	24	69,439	2.125
5	420	170	25	70,866	2.387
5.5	423	173	26	72,304	2.654
6	425	175	27	73,752	2.927
6.5	428	178	28	75,212	3.204
7	430	180	29	76,682	3.488
7.5	433	183	30	78,163	3.776
8	435	185	31	79,654	4.070
8.5	437.5	187.5	32	81,157	4.370
9	440	190	33	82,670	4.675
9.5	442.5	192.5	34	84,194	4.985

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Aeration Requirements 300,000 Gallon Ultimate Production	PROJECT NO. 2015142 BY: SHT CHK: GG

DESIGN CRITERIA

Sizing Parameters

BOD Concentration[a]	7,700	mg/L	
Average Day, Peak Harvest Month Flow	9,840	gal PW/day	Average Day Peak Harvest Month Flow
Oxygen Requirement	1.0	lbs O_2/lb BOD	
Oxygen Transfer Rate (Vertical Turbine Aerator)	1.8	lbs O_2/HP - hr	
Power/ Volume Ratio, Cell No. 1	0.10 - 0.30	Hp/ 1,000 cu ft	
Pond No. 1 Volume	3.78	Mgal	

Aeration Pond 1

BOD Mass Loading	632	lbs BOD/day
Aerator Run Time	24	Hrs/day
Oxygen Requirement	26	lbs O_2/hr
Aerator Horsepower Required	15	Hp
Aerator Horsepower Recommended	15	Hp (Two 7.5 HP brush aerators)
Check Power-to-Volume Ratio	0.03	Hp/ 1,000 CF

Note that due to the large pond volume the P/V ratio does not meet the ideal design parameter.
It is anticipated that sufficient treatment will still be provided. Additional aeration may be added as needed.

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study PW Pond Water Balance 300,000 Gallon Ultimate Production	PROJECT NO. 2015142 BY: SHT CHK: GG

Pond

Month	Initial Volume (Mgal)	Pond Evaporation (Mgal)	PW Inflow (Mgal)	10 Year Precipitation (Mgal)	Volume Change (Mgal)	Total Volume (Mgal)	Divert Volume (Mgal)	Final Volume (Mgal)	Final Pond Depth (ft)
August	2.387	-0.289	0.188	0.008	-0.092	2.295	0.195	2.100	4.4
September	2.100	-0.232	0.295	0.031	0.094	2.194	0.195	1.999	4.2
October	1.999	-0.154	0.232	0.107	0.185	2.184	0.150	2.034	4.3
November	2.034	-0.076	0.133	0.279	0.336	2.370	0.120	2.250	4.7
December	2.250	-0.050	0.115	0.291	0.356	2.606	0.040	2.566	5.3
January	2.566	-0.048	0.118	0.401	0.471	3.037	0.050	2.987	6.1
February	2.987	-0.074	0.130	0.377	0.433	3.420	0.040	3.380	6.8
March	3.380	-0.142	0.137	0.307	0.302	3.682	0.108	3.574	7.1
April	3.574	-0.210	0.122	0.109	0.021	3.594	0.121	3.473	6.9
May	3.473	-0.285	0.116	0.058	-0.111	3.363	0.151	3.212	6.5
June	3.212	-0.331	0.101	0.012	-0.218	2.993	0.195	2.798	5.7
July	2.798	-0.332	0.112	0.004	-0.216	2.582	0.195	2.387	4.9
Total		**-2.223**	**1.800**	**1.983**	**1.560**		**1.560**		

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study PW Irrigation & Effluent Application Rates 300,000 Gallon Ultimate Production	PROJECT NO. 2015142 BY: SHT CHK: GG

Applied Irrigation Area

Vineyard	6.0	acres
Landscape	0.0	acres

Total Area Available for Irrigation

Vineyard	10.0	acres
Landscape	2.5	acres

Month	Reference ET[a]	Landscape Crop Coefficient[b]	Vineyard Crop Coefficient[c]	Landscape ET[d]	Vineyard ET[d]	Precipitation[e]	Irrigation Demand[f]		Operating Days per Month[g]	Percolation Capacity[h]		Assimilative Capacity[i]		Effluent Applied		Excess Capacity
	(in)			(in)	(in)	(in)	(in)	(Mgal)	(d)	(in)	(Mgal)	(in)	(Mgal)	(Mgal)	(in)	(Mgal)
August	5.9	0.8	0.53	4.6	3.1	0.2	3.0	0.483	31	1.79	0.291	4.8	0.774	0.195	1.20	0.58
September	4.5	0.8	0.38	3.7	1.7	0.6	1.1	0.183	30	1.73	0.282	2.9	0.465	0.195	1.20	0.27
October	3.1	0.7	0.55	2.1	1.7	2.0	0.0	0.000	16	0.92	0.150	0.9	0.150	0.150	0.92	0.00
November	1.5	0.6	0.63	0.9	0.9	5.3	0.0	0.000	14	0.81	0.131	0.8	0.131	0.120	0.74	0.01
December	0.9	0.7	0.90	0.7	0.8	5.5	0.0	0.000	5	0.29	0.047	0.3	0.047	0.040	0.25	0.01
January	0.9	1.0	1.00	0.9	0.9	7.6	0.0	0.000	6	0.35	0.056	0.3	0.056	0.050	0.31	0.01
February	1.7	0.3	0.71	0.4	1.2	7.2	0.0	0.000	5	0.29	0.047	0.3	0.047	0.040	0.25	0.01
March	2.8	0.0	0.60	0.1	1.7	5.8	0.0	0.000	12	0.69	0.113	0.7	0.113	0.108	0.66	0.00
April	4.2	0.1	0.62	0.6	2.6	2.1	0.5	0.087	13	0.75	0.122	1.3	0.209	0.121	0.74	0.09
May	5.6	0.3	0.64	1.4	3.6	1.1	2.5	0.401	16	0.92	0.150	3.4	0.551	0.151	0.93	0.40
June	6.3	0.5	0.54	3.4	3.4	0.2	3.2	0.517	17	0.98	0.160	4.2	0.677	0.195	1.20	0.48
July	6.5	0.8	0.49	4.9	3.2	0.1	3.1	0.508	30	1.73	0.282	4.8	0.790	0.195	1.20	0.59
Total	**43.9**			**23.8**	**24.9**	**37.8**	**13.4**	**2.2**	**195.0**	**11.2**	**1.8**	**24.6**	**4.0**	**1.6**	**9.6**	**2.45**

(a) Average monthly reference evapotranspiration rates, see Climate Data Worksheet.

(b) Kc coefficients for landscape estimated from Irrigation Training and Research Center, Cal Poly, San Luis Obispo, CA Zone 6 misc deciduous, average year, drip/microspray application. Crop Coefficient calculated from K=ET/ET0 and then applied to Zone 2 CIMIS ET0 data.

(c) Kc coefficients as calcuted from ITRC data.

(d) ET=ETo x Kc. A weighted value is determined on the basis of the available irrigated acreage of vineyard and pasture. Vineyard data from ITRC, assumed to have 60% canopy and ground cover, irrigation by drip/micro spray.

(e) Precipitation, 10-year rainfall event, see Climate Data Worksheet.

(f) Irrigation Demand = ET-Precipitation, inches. A weighted value is determined on the basis of the available irrigated acreage of vineyard and pasture.

(g) Number of operating days per month based on estimated irrigation days available based on 24-hr post storm criteria for a 100-year return period. Summit Engineering, NBRID Capacity Study, April 1996.

(h) Design percolation rate is a maximum of 0.06 inches per day for the number of operating days per month. Perc rate based on Napa County Soil Survey (USDA) type 146 (Haire Loam 2-9% slope) permeability 0.2-0.6 in/hr to 27 inches and less than 0.06 in/hr from 27-60 inches. Use conservative adjustment including adjustment of the total potential percolation by 4% to account for typical slow rate land application design methodology.

(i) Assimilative capacity is the sum of irrigation demand and percolation capacity.

ENCLOSURE C

SS MANAGEMENT SYSTEM POND WATER BALANCE

SUMMIT ENGINEERING, INC.	ETUDE WINE COMPANY Wastewater Feasibility Study Sanitary Sewage Flows at Peak Production	PROJECT NO. 2015142 BY: SHT CHK: GG

PEAK SANITARY SEWAGE GENERATION

Peak Tasting Day Harvest							
Employee (full-time)	22	x	15	gpcd	=	330	gal/day
Employee (part-time)	5	x	15	gpcd	=	75	gal/day
Tasting Visitors	350	x	3	gpcd	=	1,050	gal/day
Business Visitors [1]	45	x	3	gpcd	=	135	gal/day
Cheese/chartucerie plates[2]	90	x	0.75	gal/plate	=	67.5	gal/day
Total					=	**1,658**	**gal/day**

AVERAGE SANITARY SEWAGE GENERATION

Average Non-Harvest Weekday							
Employee (full-time)	13	x	15	gpcd	=	195	gal/day
Employee (part-time)	1	x	15	gpcd	=	15	gal/day
Tasting Visitors	25	x	3	gpcd	=	75	gal/day
Business Visitors [1]	5	x	3	gpcd	=	15	gal/day
Cheese/chartucerie plates[2]	90	x	0.75	gal/plate	=	67.5	gal/day
Total					**=**	**368**	**gal/day**

Average Non-Harvest Weekend							
Employee (full-time)	4	x	15	gpcd	=	60	gal/day
Employee (part-time)	1	x	15	gpcd	=	15	gal/day
Tasting Visitors	85	x	3	gpcd	=	255	gal/day
Business Visitors [1]	5	x	3	gpcd	=	15	gal/day
Cheese/chartucerie plates[2]	21	x	0.75	gal/plate	=	15.75	gal/day
Total					=	**361**	**gal/day**

Average Harvest Weekday							
Employee (full-time)	21	x	15	gpcd	=	315	gal/day
Employee (part-time)	1	x	15	gpcd	=	15	gal/day
Tasting Visitors	30	x	3	gpcd	=	90	gal/day
Business Visitors [1]	5	x	3	gpcd	=	15	gal/day
Cheese/chartucerie plates[2]	8	x	0.75	gal/plate	=	6	gal/day
Total					=	**441**	**gal/day**

Average Harvest Weekend							
Employee (full-time)	19	x	15	gpcd	=	285	gal/day
Employee (part-time)	1	x	15	gpcd	=	15	gal/day
Tasting Visitors	115	x	3	gpcd	=	345	gal/day
Business Visitors [1]	5	x	3	gpcd	=	15	gal/day
Cheese/chartucerie plates[2]	30	x	0.75	gal/plate	=	22.5	gal/day
Total					=	**683**	**gal/day**

DESIGN FLOW					=	**683**	**gal/day**

Notes:

1. Business visitors will be wine tasting only
2. Assumed that the number of plates prepared is based on 25% of the number tasting visitors

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Sanitary Wastewater Flow Distribution	PROJECT NO. 2015142 BY: SHT CHK: GG

DESIGN SANITARY SEWAGE FLOWS

Month	No. Weekdays [1]	No. Weekends [1]	Monthly Percentage of Annual Flow (%)	Monthly Flow (Mgal)	Average Daily Flow (gpd)
August	21	10	11.0%	0.016	519
September	22	8	10.3%	0.015	505
October	22	9	10.8%	0.016	511
November	21	9	7.5%	0.011	365
December	23	8	7.7%	0.011	366
January	22	9	7.7%	0.011	366
February	20	8	7.0%	0.010	366
March	22	9	7.7%	0.011	366
April	22	8	7.5%	0.011	366
May	21	10	7.7%	0.011	365
June	22	8	7.5%	0.011	366
July	23	8	7.7%	0.011	366
Total	**261**	**104**	**100%**	**0.147**	

Notes:

1. Monthly flows estimated based on Average harvest and non-harvest weekday and weekend flows. Harvest is assumed to occur from August through September and non-harvest is assumed to be December through July.

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Climate Data	2015142 SHT GG

Month	Days	Average Temp[a] (F)	Reference Evapotranspiration[b] (in)	Pan Evaporation[c] (in)	Lake Evaporation[d] (in)	Average Precipitation[e] (in)	10-Year Precipitation[f] (in)	100-Year Precipitation[f] (in)
August	31	67.8	5.9	8.5	6.5	0.1	0.2	0.2
September	30	66.7	4.5	7.0	5.4	0.4	0.6	0.8
October	31	62.2	3.1	4.7	3.6	1.4	2.0	2.9
November	30	53.4	1.5	2.3	1.8	3.7	5.3	7.6
December	31	47.5	0.9	1.5	1.2	3.9	5.5	7.9
January	31	46.9	0.9	1.4	1.1	5.4	7.6	10.9
February	28	51.4	1.7	2.1	1.6	5.0	7.2	10.2
March	31	53.2	2.8	3.9	3.0	4.1	5.8	8.3
April	30	56.1	4.2	5.7	4.4	1.5	2.1	3.0
May	31	61.2	5.6	7.8	6.0	0.8	1.1	1.6
June	30	65.7	6.3	9.2	7.1	0.2	0.2	0.3
July	31	67.8	6.5	9.5	7.3	0.1	0.1	0.1
Total	**365**		**43.9**	**63.6**	**49.0**	**26.5**	**37.8**	**53.9**

[a] Average monthly temperature observed between 1971 and 2000 at Napa State Hospital. National Oceanic & Atmospheric Administration, updated February 2004.

[b] ET_o values based on California Irrigation Management Information System (CIMIS) Zone 5 Northern Inland Valleys

[c] Average monthly pan evaporation rates observed at Duttons Landing, 1956-1973. DWR 73-1.

[d] Pan evaporation rates adjusted by a factor of 0.77 to determine lake evaporation.

[e] Average monthly rainfall observed at Napa State Hospital, 1971 to 2000. National Oceanic & Atmospheric Administration, updated February 2004.

[f] Average monthly rainfall adjusted by the ratio of 10-yr and 100-yr wet year return storm identified by Pearsons Log III Distribution. Distribution calculated from Napa, CA data from 1945 to 2000.

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study SS Pond Worksheet	PROJECT NO. 2015142 BY: SHT CHK: GG

Pond

Bottom Width	76.0'	Bottom Radius	12.0'	Start Month	August
Bottom Length	166.0'	Top Radius	35.0'	Min. Depth	0.0'
Interior Side Slope (x:1)	2.5	Depth	9.0'	Divert Volume	0.00 Mgal
Length:Width	0.5	Freeboard	2.0'	Initial Depth	6.0'

Depth (ft)	Length (ft)	Width (ft)	Radius (ft)	Surface Area (ft^2)	Total Volume (Mgal)
0	166	76	12	12,493	0.000
1	171	81	14	13,681	0.098
2	176	86	16	14,912	0.205
3	181	91	18	16,186	0.321
4	186	96	20	17,502	0.447
5	191	101	22	18,860	0.583
6	196	106	25	20,261	0.729
7	201	111	27	21,705	0.886
8	206	116	29	23,191	1.054
9	211	121	31	24,720	1.234
10	216	126	33	26,291	1.424
11	221	131	35	27,905	1.627

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Year One of a Five Year SS Pond Water Balance	PROJECT NO. 2015142 BY: SHT CHK: GG

Pond

Month	Initial Volume (Mgal)	Pond Evaporation (Mgal)	SS Inflow (Mgal)	10 Year Precipitation (Mgal)	Volume Change (Mgal)	Total Volume (Mgal)	Divert Volume (Mgal)	Final Volume (Mgal)	Final Pond Depth (ft)
August	0.727	-0.082	0.016	0.003	-0.063	0.664	0.000	0.664	5.5
September	0.664	-0.065	0.015	0.010	-0.040	0.624	0.000	0.624	5.2
October	0.624	-0.043	0.016	0.036	0.008	0.632	0.000	0.632	5.3
November	0.632	-0.021	0.011	0.092	0.082	0.714	0.000	0.714	5.9
December	0.714	-0.014	0.011	0.096	0.093	0.808	0.000	0.808	6.5
January	0.808	-0.014	0.011	0.133	0.130	0.938	0.000	0.938	7.3
February	0.938	-0.022	0.010	0.125	0.113	1.051	0.000	1.051	8.0
March	1.051	-0.043	0.011	0.102	0.070	1.121	0.000	1.121	8.4
April	1.121	-0.065	0.011	0.036	-0.018	1.103	0.000	1.103	8.3
May	1.103	-0.088	0.011	0.019	-0.057	1.046	0.000	1.046	7.9
June	1.046	-0.101	0.011	0.004	-0.086	0.960	0.000	0.960	7.4
July	0.960	-0.101	0.011	0.001	-0.088	0.872	0.000	0.872	6.9
Total		**-0.659**	**0.147**	**0.657**	**0.145**		**0.000**		

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Year Two of a Five Year SS Pond Water Balance	PROJECT NO. 2015142 BY: SHT CHK: GG

Pond

Month	Initial Volume (Mgal)	Pond Evaporation (Mgal)	SS Inflow (Mgal)	Ave Year Precipitation (Mgal)	Volume Change (Mgal)	Total Volume (Mgal)	Divert Volume (Mgal)	Final Volume (Mgal)	Final Pond Depth (ft)
August	0.872	-0.087	0.016	0.002	-0.069	0.803	0.000	0.803	6.4
September	0.803	-0.070	0.015	0.007	-0.047	0.755	0.000	0.755	6.1
October	0.755	-0.046	0.016	0.025	-0.005	0.750	0.000	0.750	6.1
November	0.750	-0.022	0.011	0.065	0.053	0.804	0.000	0.804	6.5
December	0.804	-0.015	0.011	0.067	0.064	0.868	0.000	0.868	6.9
January	0.868	-0.014	0.011	0.093	0.090	0.958	0.000	0.958	7.4
February	0.958	-0.022	0.010	0.087	0.075	1.033	0.000	1.033	7.9
March	1.033	-0.043	0.011	0.071	0.040	1.073	0.000	1.073	8.1
April	1.073	-0.063	0.011	0.025	-0.027	1.046	0.000	1.046	7.9
May	1.046	-0.086	0.011	0.014	-0.061	0.985	0.000	0.985	7.6
June	0.985	-0.099	0.011	0.003	-0.085	0.900	0.000	0.900	7.1
July	0.900	-0.099	0.011	0.001	-0.087	0.813	0.000	0.813	6.5
Total		**-0.666**	**0.147**	**0.460**	**-0.059**		**0.000**		

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Year Three of a Five Year Pond SS Water Balance	PROJECT NO. 2015142 BY: SHT CHK: GG

Pond

Month	Initial Volume (Mgal)	Pond Evaporation (Mgal)	SS Inflow (Mgal)	Ave Year Precipitation (Mgal)	Volume Change (Mgal)	Total Volume (Mgal)	Divert Volume (Mgal)	Final Volume (Mgal)	Final Pond Depth (ft)
August	0.813	-0.085	0.016	0.002	-0.067	0.746	0.000	0.746	6.1
September	0.746	-0.068	0.015	0.007	-0.046	0.700	0.000	0.700	5.8
October	0.700	-0.045	0.016	0.025	-0.004	0.696	0.000	0.696	5.7
November	0.696	-0.022	0.011	0.065	0.054	0.750	0.000	0.750	6.1
December	0.750	-0.015	0.011	0.067	0.064	0.814	0.000	0.814	6.5
January	0.814	-0.014	0.011	0.093	0.090	0.905	0.000	0.905	7.1
February	0.905	-0.022	0.010	0.087	0.076	0.980	0.000	0.980	7.5
March	0.980	-0.042	0.011	0.071	0.041	1.021	0.000	1.021	7.8
April	1.021	-0.062	0.011	0.025	-0.026	0.995	0.000	0.995	7.6
May	0.995	-0.084	0.011	0.014	-0.059	0.936	0.000	0.936	7.3
June	0.936	-0.097	0.011	0.003	-0.083	0.853	0.000	0.853	6.8
July	0.853	-0.097	0.011	0.001	-0.085	0.768	0.000	0.768	6.2
Total		**-0.652**	**0.147**	**0.460**	**-0.045**		**0.000**		

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Year Four of a Five Year SS Pond Water Balance	PROJECT NO. 2015142 BY: SHT CHK: GG

Pond

Month	Initial Volume (Mgal)	Pond Evaporation (Mgal)	SS Inflow (Mgal)	Ave Year Precipitation (Mgal)	Volume Change (Mgal)	Total Volume (Mgal)	Divert Volume (Mgal)	Final Volume (Mgal)	Final Pond Depth (ft)
August	0.768	-0.083	0.016	0.002	-0.065	0.703	0.000	0.703	5.8
September	0.703	-0.067	0.015	0.007	-0.044	0.658	0.000	0.658	5.5
October	0.658	-0.044	0.016	0.025	-0.003	0.655	0.000	0.655	5.5
November	0.655	-0.021	0.011	0.065	0.054	0.710	0.000	0.710	5.8
December	0.710	-0.014	0.011	0.067	0.065	0.774	0.000	0.774	6.3
January	0.774	-0.014	0.011	0.093	0.091	0.865	0.000	0.865	6.8
February	0.865	-0.021	0.010	0.087	0.076	0.941	0.000	0.941	7.3
March	0.941	-0.041	0.011	0.071	0.041	0.982	0.000	0.982	7.6
April	0.982	-0.061	0.011	0.025	-0.025	0.957	0.000	0.957	7.4
May	0.957	-0.083	0.011	0.014	-0.058	0.899	0.000	0.899	7.1
June	0.899	-0.096	0.011	0.003	-0.082	0.817	0.000	0.817	6.5
July	0.817	-0.095	0.011	0.001	-0.083	0.734	0.000	0.734	6.0
Total		**-0.641**	**0.147**	**0.460**	**-0.034**		**0.000**		

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	Etude Wine Company Wastewater Feasibility Study Year Five of a Five Year SS Pond Water Balance	PROJECT NO. 2015142 BY: SHT CHK: GG

Pond

Month	Initial Volume (Mgal)	Pond Evaporation (Mgal)	SS Inflow (Mgal)	Ave Year Precipitation (Mgal)	Volume Change (Mgal)	Total Volume (Mgal)	Divert Volume (Mgal)	Final Volume (Mgal)	Final Pond Depth (ft)
August	0.734	-0.082	0.016	0.002	-0.064	0.670	0.000	0.670	5.6
September	0.670	-0.066	0.015	0.007	-0.044	0.627	0.000	0.627	5.3
October	0.627	-0.043	0.016	0.025	-0.003	0.624	0.000	0.624	5.3
November	0.624	-0.021	0.011	0.065	0.055	0.679	0.000	0.679	5.6
December	0.679	-0.014	0.011	0.067	0.065	0.743	0.000	0.743	6.1
January	0.743	-0.014	0.011	0.093	0.091	0.834	0.000	0.834	6.6
February	0.834	-0.021	0.010	0.087	0.077	0.911	0.000	0.911	7.1
March	0.911	-0.041	0.011	0.071	0.042	0.953	0.000	0.953	7.4
April	0.953	-0.061	0.011	0.025	-0.024	0.928	0.000	0.928	7.2
May	0.928	-0.082	0.011	0.014	-0.057	0.871	0.000	0.871	6.9
June	0.871	-0.095	0.011	0.003	-0.081	0.791	0.000	0.791	6.4
July	0.791	-0.094	0.011	0.001	-0.082	0.708	0.000	0.708	5.8
Total		**-0.633**	**0.147**	**0.460**	**-0.026**		**0.000**		

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