DELTA CONSULTING & ENGINEERING
OF ST. HELENA

SEPTIC FEASIBILITY REPORT

FOR THE

FEATHERED HORSE VINEYARDS
LAKE RIDGE WINERY
USE PERMIT MODIFICATION

PROJECT LOCATED AT

90 LONG RANCH ROAD
ST. HELENA, CA 94574

County: NAPA
APN: 032-010-068

DECEMBER 23, 2008
REVISION 1: APRIL 20, 2009
REVISION 2: DECEMBER 21, 2009
REVISION 3: FEBRUARY 17, 2010
REVISION 4: MARCH 17, 2010

PREPARED FOR REVIEW BY:

NAPA COUNTY DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
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Introduction

The applicant is applying to the County of Napa for a Use Permit to operate a 10,000 gallon per year winery on the subject parcel. This report has been prepared to estimate the wastewater flows generated by the operation of the winery and to evaluate the feasibility of constructing a wastewater disposal system to serve the domestic and winery wastewater generated by the proposed project.

The winery will consist of a winery building and associated caves. It will be a full crushing, fermenting, and barrel aging facility. Bottling will be performed via mobile bottling vendors. A typical day will consist of four full-time employees. The maximum staffing level will be eight employees, which included four seasonal employees. The winery marketing plan calls for ten visitors per day as well as six special events per year with a maximum of twenty visitors at the event. The maximum amount of visitors at the winery per day will be twenty, as the special events will preclude regular visitors to the winery.

All plumbing fixtures in the proposed winery shall be low flow, water-saving fixtures per the Uniform Plumbing Code as adopted by the Napa County Building Department.

Winery Sanitary Wastewater Flow

Peak daily domestic wastewater flows for the tasting room are based on twenty visitors and eight employees during harvest or bottling. The values used for the projected wastewater are based on the Napa County Department of Environmental Management guidelines[1].

$$(20\,visitors/day)(3 gallons/visitor) = 60\,gpd$$
$$(8\,employees/day)(15 gallons/employee) = 120\,gpd$$

The total anticipated peak domestic flow is 180 gallons per day.

Winery Process Wastewater Flow

Peak Flow (Crush period):

Using the Napa County method for determining the peak process effluent from a winery, the peak flow is estimated to be:

$$HarvestPeakFlow = \frac{(10{,}000 gal-wine/year)(1.5 gal-water/gal-wine)}{30 days-crush/year} = 500\,gpd$$

[1] Table 4, Napa County Environmental Management Regulations for Design, Construction, and Installation of Alternative Sewage Treatment System.

Average Daily Flow(Non-Crush period):
Depending on the winery, the amount of wastewater generated per gallon of wine produced typically ranges from 3-10 gallons per gallon of wine produced. This variation is based on the individual winery water conservation practices. This variation is based on the individual winery water conservation practices. We have estimated, for this project, that 10 gallons of process effluent shall be produced for each gallon of wine produced. Using a method which ties the amount of process wastewater generated to each gallon of wine produced, the average daily flow is estimated to be:

$$\frac{(10{,}000\,gal-wine/year)(10\,gal-water/gal-wine)}{335\,days/year}=298\,gpd$$

Using the County Peak Harvest Method, the estimated total peak flow of 500 gpd is to occur during harvest with an average day producing 298 gallons of process wastewater assuming that 10 gallons of wastewater are produced per gallon of wine.

In situations where the effluent is to be recycled and used for drip irrigation, a more conservative approach is taken. The approach shown in the water balance combines the total annual estimated non-harvest flows and the total annual estimated harvest flows (which is calculated from the County's peak harvest flow method) to generate a single annual estimated process wastewater flow figure. This single value is then multiplied by the corresponding month's estimated percentage of the annual flow.

Every winery differs in winemaking practices including the months for bottling, racking, and fining. The month(s) for harvest are dictated by Mother Nature and they type of varietal grown; generally they coincide with late summer into fall. Based on experience with winery wastewater treatment system design, the twelve months have been assigned a percentage of the annual flow figure (see the Water Balance, Wastewater Flow Generation page, section named Process Flow Design for Peak Flow in the Appendix.) The approach is a conservative and generates increased wastewater flows over the County peak harvest flow method during the harvest months.

The conservative approach is taken for the surface drip irrigation situation only as the water balance in surface drip irrigation depends heavily on saturated soil conditions for the applied recycled water to infiltrate the soil. By taking the conservative approach using increased monthly flows over the County Peak Harvest Method and saturated soil conditions, the required drip area becomes larger which allows the recycled water to be distributed over a larger area which reduces the demand on the saturated soil to absorb the recycled water as the distribution area increases.

The water balance reviews two sources of saturated soil information (Site Soil Evalution and the Natural Resource Conservation District Soil Survey for Napa County). The water balance compares the results from both sources and uses the most rate limiting factor from each for the saturated soil conductivity. Once the source value is choosen, only applies 4% of this value for

used in the design. This is a conservative approach which assumes on 4% of the saturated hydraulic conductivity is available for recycled water application during the rainy months.

Based on the soil water balance, a minimum of 20 drip lines each 100 feet in length will be required to adequately distribute the recycled wastewater without overburdening the saturated in-situ soils. The associated minimum distribution area required is 4,000 ft^2 with a 7,500 gallon storage tank. The storage tank shall have a pump, pressure tank, and filter system to distribute the effluent to the landscape irrigation system. In addition, the storage tank will be outfitted with an alarm for high water notification. The location of landscape distribution areas are shown on the exhibit which is located at the end of the Appendix.

Site Evaluation

This feasibility study is based on the site evaluation performed September 21, 2009 by Delta Consulting and Engineering and field review by a member of the staff from Napa County Department of Environmental Management.

On September 21, 2009, six test pits were excavated. All test pits are acceptable. Due to soil conditions, the test pit depths were limited to an excavation of depth 28"-30". The soil texture for each horizon was determined in the field by the Feel Method and verified by laboratory testing.

The attached site evaluation form describes the pits in greater detail. Based on the soil types encountered, Napa County design guidelines dictate the allowable wastewater application rate and the allowable soil depth dictates the allowable type(s) of distribution system to be constructed.

The field results were as follows:

Test Pit	Depth	Abbreviation	Texture	Structure	Grade	Application Rate (gal/ft^2/day)*
1	0-30"	CL	Clay Loam	Moderate	Subangular blocky	0.6
	30" +	-	Hard Clay	-	-	-
2	0-30"	SCL	Clay Loam	Moderate	Subangular blocky	0.9
	30" +	-	Hard Clay	-	-	-
3	0-30"	CL	Clay Loam	Moderate	Subangular blocky	0.6
	30" +	-	Hard Clay	-	-	-
4	0-28"	CL	Clay Loam	Moderate	Subangular blocky	0.6
	28" +	-	Hard Clay	-	-	-
5	0-30"	CL	Clay Loam	Moderate	Subangular blocky	0.6
	30" +	-	Hard Clay	-	-	-
6	0-28"	CL	Clay Loam	Moderate	Subangular blocky	0.6
	28" +	-	Hard Clay	-	-	-

*Pretreated effluent

Wastewater Disposal Recommendations

Due to the limited soil depths encountered in each test pit and the number of trees in the area of the test pits, the wastewater system will consist of a subsurface drip dispersal system with pretreatment for the domestic effluent and a surface drip system with pretreatment for the winery process effluent. A combined at-grade dispersal field was eliminated from consideration due to the number of trees in the area which would need to be removed for the construction of the at-grade field.

Domestic Wastewater Treatment System Design Overview

The domestic effluent from the winery shall be treated via standard septic tank (primary treatment), an Orenco Systems AdvanTex filter (secondary treatment), and final disposal through a subsurface drip field. The primary treatment system will treat and remove settleable solids to acceptable concentration levels. The secondary treatment system is required to distribute the effluent via the subsurface drip system (final treatment). The septic tank shall be equipped with an effluent filter.

Required Subsurface Drip System Area:

$$primary\ disposal\ \ field: \frac{180\,gpd}{0.6\,gal/\,ft^2-day} = 300\ ft^2$$

The primary disposal area will consist of (2) 75 feet subsurface drip lines spaced two feet apart which yields 300 ft^2 of disposal area. The 200% reserve area will require an additional 600 ft^2.

The pump in the dosing tank shall be programmed to dose the field at regular intervals as specified by the Napa County design guidelines.

The drip lines will be laid on the 4" below existing ground with 2" of soil over the top of the system. This provides a minimum of 24" of undisturbed acceptable soil below the disposal lines.

Following is a schematic of the proposed domestic wastewater treatment system:

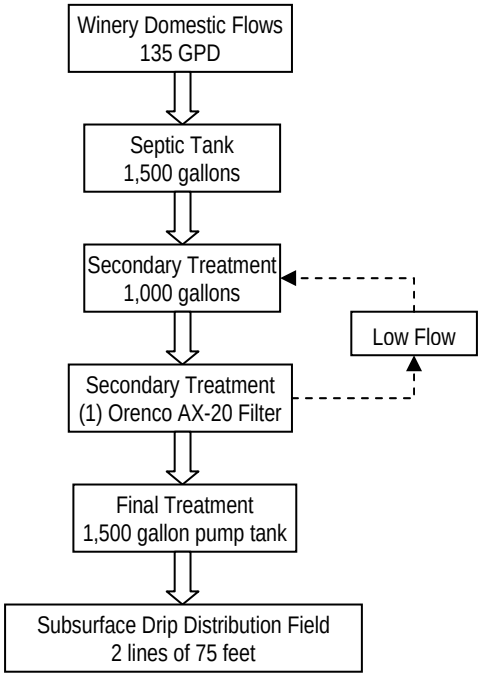


Figure 1: Proposed Domestic Wastewater Treatment System

Process Wastewater Treatment System Design Overview

The recommended option for process waste disposal is similar to the domestic treatment system. The difference is the final disposal drip lines will be laid and secured on existing grade (no soil cover).

The design assumes a process effluent strength of:

Biochemical Oxygen Demand (BOD)	2,500 mg/L (small winery)
Total Suspended Solids (TSS)	250 mg/L (harvest)

The strength parameters for any winery are difficult to obtain as the BOD and TSS vary drastically during the winemaking year. The BOD is low during the non-harvest months and varies during the harvest months as not every day during harvest does crushing occur. The primary treatment system provides six days of hydraulic detention time and shall reduce the BOD by approximately 30% to 1,750 mg/L as the effluent enters the secondary treatment tank. During secondary treatment, the BOD level shall be reduced by approximately 95% to 88 mg/L prior to entering the dosing tank (final disposal).

Total Suspended Solids (TSS) shall be reduced by approximately 60%-80%. Using a conservative removal rate of 60%, the TSS will be 125 mg/L entering the secondary treatment tank. The

secondary treatment shall reduce approximately 85% of the remaining TSS to 13 mg/L prior to entering the dosing tank (final disposal).

The septic tanks shall be equipped with an effluent filter.

The final disposal design is based on saturated soil infiltration and evaporation and plant uptake (evapotranspiration). A water balance has been performed to verify that the soils and plants can handle the proposed waste water disposal. The distribution area is covered with annual grasses and native tree species (madrone, live oak, pine, bay). The numerous mature trees in the area shall take a significant amount of the applied effluent. The Water Balance calculations are found in the Appendix and referred to in the following design overview.

Wet Weather Storage

During the rainy season, discharges are not allowed 48 hours prior to a forecasted rain/storm event, during a rain/storm event, 48 hours after a rain/storm event, or when the soils are saturated. As the rainy season (December through April) coincides with the non-growing/non-harvest season, it is anticipated that the winery shall generate approximately 32% of its total annual process wastewater during this five month period. The winery generates 114,995 gallons of process wastewater annually and the winery will generate 32% of this amount (36,799 gallons) over the five month rain season (240 gallons/day). (See Design for Peak Flow section of the Water Balance in the Appendix.) A storage tank with a capacity of 7,500 gallons shall be utilized for wet weather storage.

It is assumed that during the rainy season, between 10 and 15 days per month are available to dispose of the waste water, therefore 20 days of wet weather storage will be provided.

$$Wet\ weather\ storage\ \ capacity: (240\,gallons/day)(20\,days) = 4800\,gallons$$

The final design shall provide 7,500 gallons of wet weather storage and shall also contain the pumping system to dose the field. If, due to continued rain events, release to the distribution field is prohibited, and the wet weather storage tank becomes fully loaded, the operator will need to 1) reduce winery process wastewater generating activities and 2) have the tank pumped by a septage hauler.

Saturated Soil Loading Rate

Based on the site evaluations performed, the soil's application rate was determined to be 0.6 gallon/ft^2 per day. This application rate is equivalent to a soil percolation rate of 24 minutes/inch or 2.5 inches/hour or72.0 inches/month.

In addition to the site evaluation, the soil properties per the U.S.D.A. Soil Survey were evaluated. The U.S.D.A. Soil Survey states the soil in the area is clay from 0-6", clay loam from 6-30" and unweathered bedrock from 30-34". This soil type allows for 0.6 inches/hour which corresponds 408.1 inches per month of saturated infiltration. According to Crites and Tchobanoglous, this value

should be reduced to 4%-10% of its rated value for design. Taking the most conservative approach this value was reduced to 4% of its rated value to 16.3 inches/month for design. This value of 16.3 inches/month was compared to the site evaluation rate of 72 inches/month; the more restrictive value of 16.3 inches/month was used for design to calculate the size of the disposal field. (See Soil Properties section of the Water Balance in the Appendix.)

Disposal Field Sizing

The Water Balance takes into account the vegetation evapotranspiration rate, the precipitation rate, the soil percolation rate which then gives the available loading rate of the site. This value is then compared to the inches of waste water applied. The inches of waste water applied to the site is calculated from the total waste water generated per month, the estimated number of available application days per month, the irrigation cycle time, the volume of each irrigation emitter per cycle. (See Drip Irrigation Disposal section of the Water Balance in the Appendix.)

The applied loading rate (inched applied per month) must be less than the available loading rate. At 20 laterals, each 100 feet long, spaced 2 feet about and with the emitters placed 2 feet apart, (4,000 square feet disposal field size) the applied loading rate is less than the available soil loading rate, thus the uptake of the soil and vegetation is greater than the inflow of waste water. Each month of the year meets these criteria. (See Soil Water Balance section of the Water Balance in the Appendix.)

In addition, the subject parcel has approximately 3.5 acres of vineyard and greater than 30 acres of woodland all of which are suitable for distribution of the recycled water.

Following is a schematic of the proposed winery process wastewater treatment system:

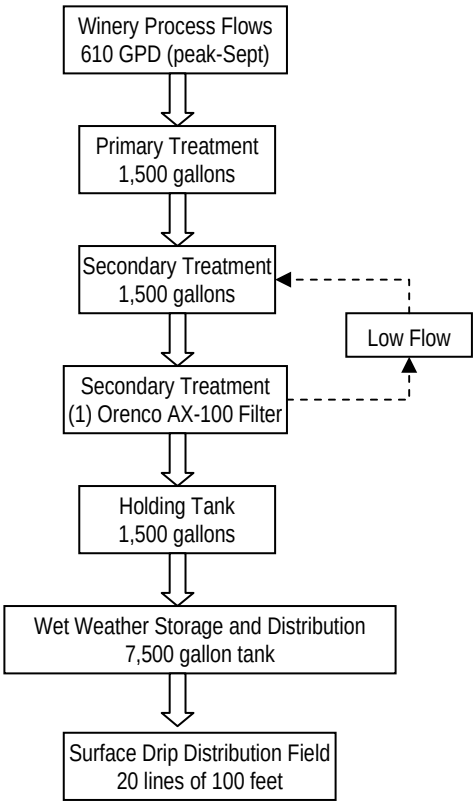


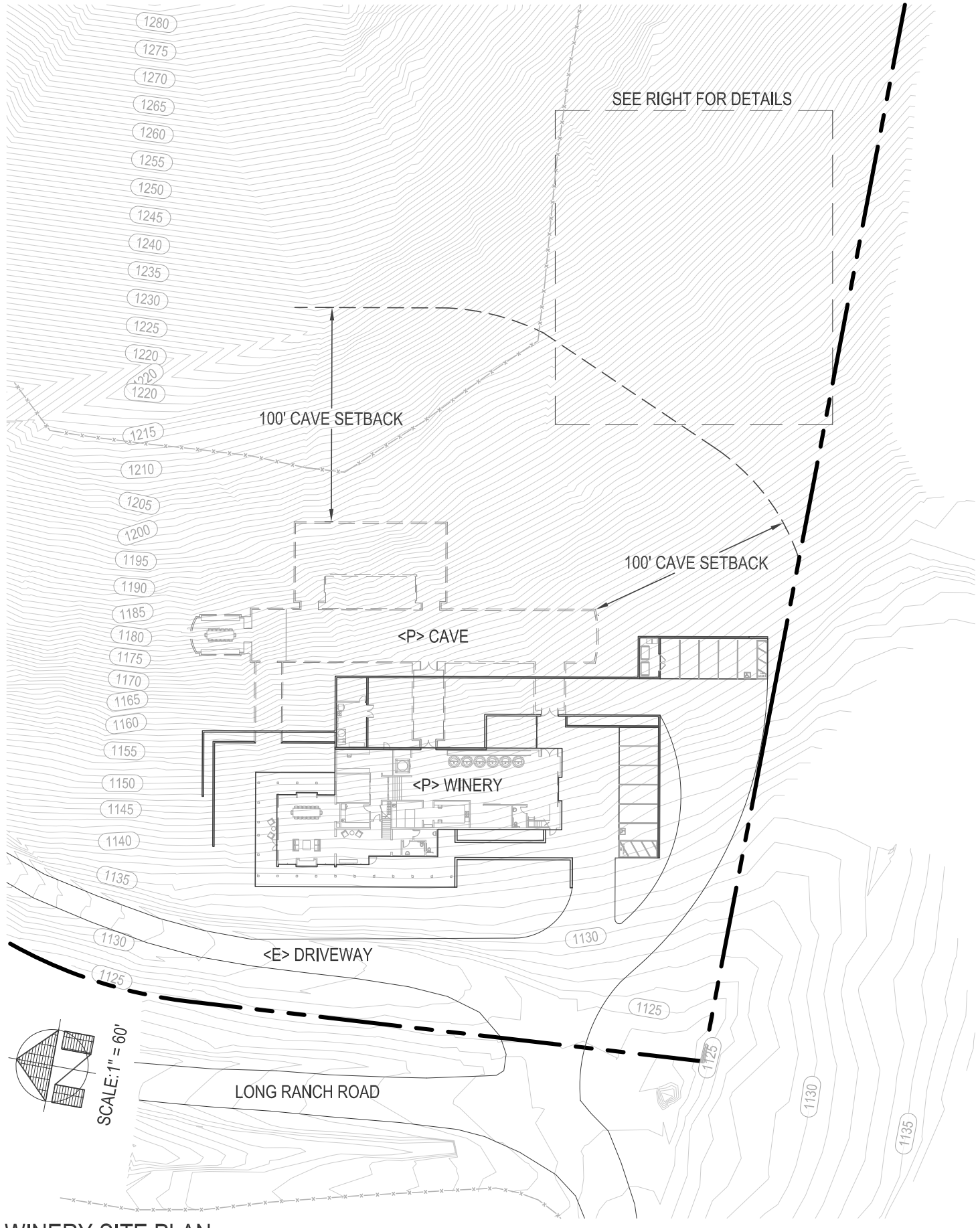
Figure 2: Proposed Process Wastewater Treatment System Schematic

Conculsion

Based on the previous narrative and calculations, the Feathered Horse Vineyards project is feasible with regard to wastewater disposal. The parcel is more than adequate to support the proposed project from a wastewater treatment perspective. See the attached exhibit for the proposed sizes and location of the primary and reserve areas for both the domestic and process waste disposal fields. Detailed calculations and construction plans will be submitted to the Napa County Department of Environmental Management for approval prior to the construction of the final disposal systems.

APPENDIX

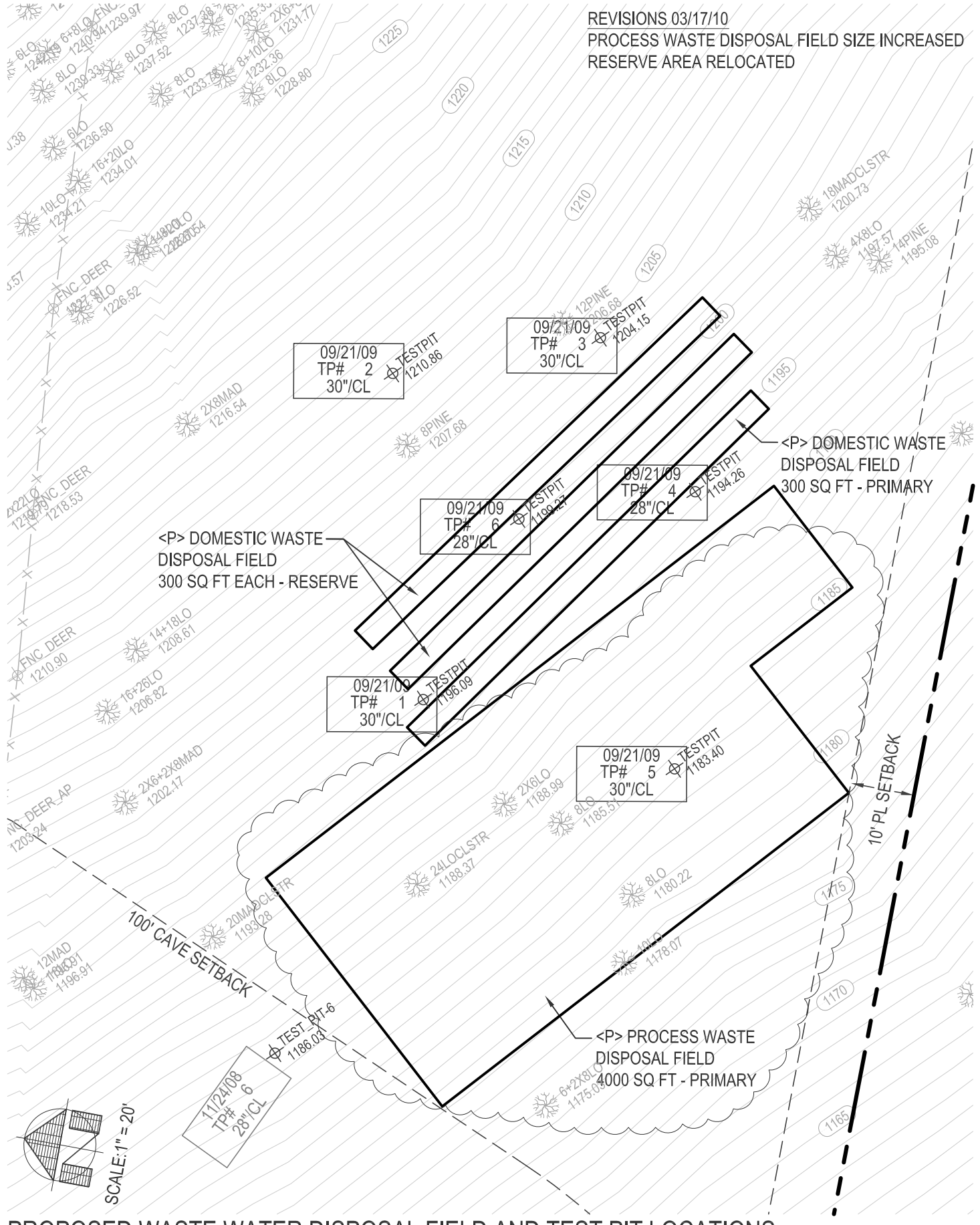
a. Wastewater Disposal Field Locations, revised 02/17/10
b. Site Evaluation Report (09/21/09) (not included in Revision 3)
c. Water Balance: Revision 4 dated March 17, 2010



WINERY SITE PLAN

SCALE: 1" = 60'

REVISIONS 03/17/10
PROCESS WASTE DISPOSAL FIELD SIZE INCREASED
RESERVE AREA RELOCATED



PROPOSED WASTE WATER DISPOSAL FIELD AND TEST PIT LOCATIONS

SCALE: 1" = 20'

FEATHERED HORSE VINEYARDS
WASTE WATER DISPOSAL FIELD LOCATIONS
CALIFORNIA

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DATE: 03/17/09
SCALE: AS NOTED
APN: 032-010-068

SCALE:1" = 100'

REVISIONS 03/17/10
PROCESS WASTE DISPOSAL FIELD SIZE INCREASED
RESERVE AREA RELOCATED

<E> RESIDENCE

<P> PROCESS WASTE DISPOSAL FIELD
3.5 ACRES OF <E> VINEYARD
AVAILIBLE FOR RESERVE FIELD

LONG RANCH ROAD

<E> DRIVEWAY

<P> CAVE

<P> WINERY

OVERALL SITE PLAN

SCALE: 1" = 100'

FEATHERED HORSE VINEYARDS
WASTE WATER DISPOSAL FIELD LOCATIONS
CALIFORNIA

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Wastewater Flow Generation

Process Wastewater

Winery Production (WP) =	4,167	cases/year
	10,000	gallons (2.4 gallons/case)

Harvest Period: Estimated Peak Process Flows*

Number of Crush Days=	30	
Process Wastewater (Harvest Period) =	500	gpd
Estimated theoretical total PEAK PW generated during Harvest period=	14,999	gallons PW generated during harvest

*Napa County Enviromental Management Method

Non-Harvest (Remainder of Wine Making Year outside of Harvest Period)

Estimated Gallons of Process Water Generated per Gallon of Wine Produced=	10	gallons ww/gallon of wine produced
Gallons of Process Waste Generated Per Year=	99,996	gallons/year
MG of Prcoess Watse Generated Per Year=	0.100	MG/year
Remaining Days of Year Outside Crush Period=	335	days
Estimated Process Daily (non-crush) Flows=	298	gpd

Process Waste Production Summary

Crush Period Flows=	14,999	Gallons/year
Non-Harvest Flows=	99,996	Gallons/year
Total Estimated PW Flows	114,995	Gallons per year

Domestic Wastewater

Use Type	Maximum Quantity (persons)	Waste Flow (GPP)*	Days Contributed	Gallons per Day	Annual DW Produced (gallons)	
Guests/day	0	3	365	-	-	
staff/day	0	15	365	-	-	
			Total Estimated DW Flows =		-	**Gallons per year**
				Average Daily DW Flows=	-	gpd

*GPP = gallons per person; Values From Napa County Department of Environmental Management

Visitation Information (Winery Estimates)

Month/Year	Guests per Month	Monthly %
Jan	80	8%
Feb	80	8%
Mar	80	8%
Apr	80	8%
May	80	8%
Jun	80	8%
Jul	80	8%
Aug	80	8%
Sep	80	8%
Oct	80	8%
Nov	80	8%
Dec	80	8%
Total	960	100%

NOTE: Domestic Waste flows not included in this evaluation.

Combined Annual Estimated Wastewater Flow Summary

			Percentage
Total Estimated PW Flows=	114,995	gallons/year	100%
Total Estimated DW Flows=	-	gallons/year	0%

	Total Estimated Wastewater Flows=	114,995	**Gallons per year**

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Design for Peak Flow

Month	Day/mo	Estimated Percentage of PW*	Monthly PW Flow (gallons)	Daily PW Flows (gallons)	Estimated Percentage of DW**	Monthly DW Flow (gallons)	Daily DW Flows (gallons)	Total Monthly Flows (gallons)	Combined Annual Percentage Flow:	Month	Combined ADF (gallons)
Jan	31	6%	6,900	220	8%	0	0	6,900	6%	Jan	220
Feb	28	6%	6,900	250	8%	0	0	6,900	6%	Feb	250
Mar	31	7%	8,050	260	8%	0	0	8,050	7%	Mar	260
Apr	30	7%	8,050	270	8%	0	0	8,050	7%	Apr	270
May	31	7%	8,050	260	8%	0	0	8,050	7%	May	260
Jun	30	6%	6,900	230	8%	0	0	6,900	6%	Jun	230
Jul	31	6%	6,900	220	8%	0	0	6,900	6%	Jul	220
Aug	31	11%	12,649	410	8%	0	0	12,649	11%	Aug	410
Sep	30	16%	18,399	610	8%	0	0	18,399	16%	Sep	610
Oct	31	15%	17,249	560	8%	0	0	17,249	15%	Oct	560
Nov	30	7%	8,050	270	8%	0	0	8,050	7%	Nov	270
Dec	31	6%	6,900	220	8%	0	0	6,900	6%	Dec	220
	TOTAL	100%	114,995	3,780	100%	-	-	114,995	100%	*Annual ADF-->*	315
Dec-Apr	151	32%	36,799	240							

**Percentages from Starmont Vineyards Delta Engineering Report*

***Percentages provided from winery*

Peak Flow Month Breakdown by Each Flow Stream

Summary		Monthly Flows (gallons)			Daily Flows (gallons)				
Peak Type	Peak Month	Monthly Flows	Other Stream Flow	Total	Domestic	Process	Daily flow	Domestic	Process
From Peak DW Standpoint:	-	-	6,900	6,900	-	-	-	0%	100%
From Peak PW Standpoint:	Sep	18,399	-	18,399	-	613	613	0%	100%
Maximum Month:	Sep	18,399	613	16.0%	<---percentage of annual flow				

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Historical Local Annual Average Precipitation & Evaporation Rates

Rainfall Data from:	California Department of Water Resources
Location:	St. Helena, CA
Pan Evaporation Data:	Western Regional Climate Center
Location:	Berryessa Lake, CA

		Precipitation Data				Evaporation Data	
Month	Estimated Combined WW Flow (gallons)	Avg Rainfall[a] (in)	10-Year Rainfall[b] (in)	Monthly Percentage	Calculated Rain Days	PAN Evaporation[c] (in)	Lake Evaporation (In)
Jan	6,900	7.46	10.44	21.4%	10	1.53	1.18
Feb	6,900	7.10	9.94	20.4%	10	2.15	1.66
Mar	8,050	5.31	7.43	15.2%	10	3.79	2.92
Apr	8,050	1.74	2.44	5.0%	30	5.82	4.48
May	8,050	0.68	0.95	1.9%	30	8.90	6.85
Jun	6,900	0.17	0.24	0.5%	30	11.00	8.47
Jul	6,900	0.04	0.06	0.1%	30	13.22	10.18
Aug	12,649	0.08	0.11	0.2%	30	12.06	9.29
Sep	18,399	0.41	0.57	1.2%	30	8.67	6.68
Oct	17,249	1.84	2.58	5.3%	30	5.72	4.40
Nov	8,050	4.83	6.76	13.8%	15	2.48	1.91
Dec	6,900	5.22	7.31	15.0%	15	1.66	1.28
	114,995	34.88	48.83	100%		77.00	59.29

Notes:
[a]Rainfall values obtained from Callifornia State Division of Water Resources for Saint Helena, Period of Record: 1931-2007
[b]10-Year Rainfall Is the Month Average Rainfall multiplied by 1.4
[c]Average Monthly Evaporation Rates Observed at Lake Berryessa, CA. Source : Western Regional Climate Center
[d]PAN Evaporation Rates Adjusted By A Factor Of 0.77 To Determine Lake Evaporation

Standard daily pan evaporation is measured using the four-foot diameter Class A evaporation pan. The pan water level reading is adjusted when precipitation is measure to obtain the actual evaporation. Most Class A pans are installed above ground, allowing effects such as radiation on the side walls and heat exchnges with the pan material. These effects tend to increase the evaporation totals. The amounts can then be adjusted by multiplying the totals b 0.70 or 0.80 to more closely estimate the evaporation from naturally existing urfaces such as a shallow lake, wet soil or other moist natural surfaces.

Landscape and Plant Water Demand

Source and General Planting Information

Evapotranspiration Rate (ET_0) from[1]:	California Irrigation Management Information System
Station Location:	Oakville, CA, Station 77

Vineyard with Cover Crop:	No		
Landscape Planting Water Requirements	Low (L)	10 -30% Etc	20%

General Water Demand

		Crop Coefficient, Kc				
Month	Reference Et_o[1] (in/mo)	Landscape Et_L (in/mo)	Vines (no cover crop)[2] (in/mo)	Vines w/ Cover Crop[3] (in/mo)	Vineyard Et_c[4] (in/mo)	Total Et Uptake (in/mo)
Jan	1.03	0.21	0.06	0.09	-	0.21
Feb	1.53	0.31	0.06	0.09	-	0.31
Mar	2.83	0.57	0.10	0.15	-	0.57
Apr	4.71	0.94	0.20	0.30	-	0.94
May	5.82	1.16	0.80	1.20	-	1.16
Jun	6.85	1.37	0.80	1.20	-	1.37
Jul	7.21	1.44	0.80	1.20	-	1.44
Aug	6.44	1.29	0.80	1.20	-	2.49
Sep	4.87	0.97	0.40	0.60	-	1.57
Oct	3.53	0.71	0.20	0.30	-	1.01
Nov	1.64	0.33	0.06	0.09	-	0.33
Dec	1.17	0.23	0.06	0.09	-	0.32
Total	47.63				-	11.72

[1] Reference ET_0 from California Irrigation Management Information System

[2] Crop Coefficients (Kc) for vineyards Table 5-2, Irrigation and Reclaimed Municipal Wastewater-A Guidance Manual, 84-1 wr, SWRCB

[3] 50% increase in vineyard uptake due to cover crop per reference note 2.

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Soil Properties

Site Evaluation Conclusions

Performed By:	Delta Consulting	Rate Limiting Soil Type:	(CL) Clay Loam
Site Evaluation Date:	9/21/2009	Structure-Grade:	(M) Moderate
Test Pits Evaluated:	6	Structure-Shape:	(SB) Subangular Blocky

Application Rate Determined from Field Analysis:	0.6	gal/ft^2/day
Corresponding Hydraulic Loading Rate (County Table 3):	0.6	gal/ft^2/day
Corresponding Percolation Rate (County Table 3):	24	min/in
Percolation Rate:	2.50	in/hr

U.S.D.A. Soil Survey

USDA, NRCS Report Name: Custom Soil Resource Report for Napa County, CA, Feathered Horse Winery
Report Date: February 11, 2010

Site Coordinates:	Latitude	Longitude
	38.470847	-122.357872

Site Soil Mapping Unit: 179 — Sobrante Loam, 30-50% slopes

General Soil Information[1]:

Depth to Restrictive Layer: 25 to 40 inches

Typical Profile:	
0-6"	Clay
6-30"	Clay Loam
30-34"	Unweathered bedrock

Physical Soil Properties[1]

Component Breakdown

Depth (in)	Sand (%)	Silt (%)	Clay (%)
0-6	43	40	17
6-30	25	45	30
30-34	-	-	-

Saturated Hydraulic Conductivity (micro m/s)

Depth (in)	Low	High	Average	Rating (µm/s)	Rating (in/hr)
0-6	4.00	14.00	9.0	4	0.6
6-30	4.00	14.00	9.0		8.48 gal/ft2*day
30-34	1.00	1.40	1.2		

Moist Bulk Density (g/cc)

Depth (in)	Low	High	Average
0-6	1.40	1.50	1.5
6-30	1.35	1.50	1.4
30-34	-	-	-

Available Water Capacity (in/in)

Depth (in)	Low	High	Average
0-6	0.13	0.18	0.16
6-30	0.13	0.19	0.16
30-34	-	-	-

Infiltration Rate for Design

	Reduction[2] (%)	in/hr	Available Percolation (in/mo)	Applied Percolation (in/mo)	gal/ft2/day
Site Evaluation Rate:	0.04	2.50	1,800.0	72.0	1.496 gal/ft2*day
NRCS Rate:	0.04	0.6	408.1	16.3	0.34 gal/ft2*day

Restrictive Infiltration Rate: 16.3 in/mo

[1] United Stated Department of Agriculture & Natural Resource Conservation Service, Web Soil Survey data for the subject location.
[2] 0.04 to 0.10 adjustment factor to account for the resting period between applications, Crites & Tchobanoglous, page 670

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Drip Irrigation Disposal

Land Application Irrigation Data: Drip System Layout

Drip Line Information			
Drip Lateral Length (ft)	Lateral Spacing (ft)	Emmitter Spacing (ft)	# Laterals
100	2	2	20

Minimum Distribution Area Required: 4,000 ft2

Emmitter& Dispersal Flow Information

Total # Emmitters	Emitter Flowrate (gph)	Drip Radius (ft)	Drip Area (ft^2)	Field Flow Rate (gph)	Field Flow Rate (gpm)
980	1.0	1	3.14	980	16.33

Irrigation Information Based on Drip System

Tank Storage Volume: 7,500 gallons

	NON-GROWING SEASON [1]				GROWING SEASON [1]					NON-GROWING SEASON [1]		
	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun	1-Jul	1-Aug	1-Sep	1-Oct	1-Nov	1-Dec
Estimated # Available Application Days[1]	10	10	10	30	30	30	30	30	30	30	15	15
Total WW Generated (gallons)	6,900	6,900	8,050	8,050	8,050	6,900	6,900	12,649	18,399	17,249	8,050	6,900
WW Applied/Cycle:	690	690	805	268	268	230	230	422	613	575	537	460
Irrigation Time per Cycle (hrs):	0.7	0.7	0.8	0.3	0.3	0.2	0.2	0.4	0.6	0.6	0.5	0.5
Irrigation Time per Cycle (min):	42	42	49	16	16	14	14	26	38	35	33	28
Volume per Emmitter per Cycle (gal):	0.70	0.70	0.82	0.27	0.27	0.23	0.23	0.43	0.63	0.59	0.55	0.47
Inches Applied per Month (in/mo):	3.60	3.60	4.19	4.19	4.19	3.60	3.60	6.59	9.59	8.99	4.19	3.60
Available Storage[2] (days):	34.09	30.00	28.85	27.78	28.85	32.61	34.09	18.29	12.30	13.39	27.78	34.09
Storage Met:	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

Notes:

[1] Application days is a function of the particular month's percentage of annual rainfall.
Non-Growing Season assumes rain events which prohibit effluent application 2 days prior to, during, and 2 days after a rain event;
Growing season: assumes no or minimal rain events, all irrigation water to be applied to ground

[2] Available Storage assumes tank is empty at beginning of month. Tank(s) shall provide the number of days storage shown. If the sum of Available Application Days and Available Storage Days is greater than the number of days in the month, adequate storage is provided.

Soil Water Balance

Site Specific Water Balance

Month	Vegetation ET_v[1], ET (in/mo)	Precipitation Rate[2], Pr (in/mo)	Net ET (ET_v-Pr) (in/mo)	Percolation Rate[3], P (in/mo)	Available Loading Rate[4] [L_w] (in/mo)	Applied Loading Rate[5] (in/mo)	Net[6] (in/mo)	Check
Jan	0.21	10.44	(10.24)	16.3	6.09	3.60	2.49	Good, Uptake Exceeds Inflow
Feb	0.31	9.94	(9.63)	16.3	6.69	3.60	3.09	Good, Uptake Exceeds Inflow
Mar	0.57	7.43	(6.87)	16.3	9.46	4.19	5.26	Good, Uptake Exceeds Inflow
Apr	0.94	2.44	(1.49)	16.3	14.83	4.19	10.63	Good, Uptake Exceeds Inflow
May	1.16	0.95	0.21	16.3	16.54	4.19	12.34	Good, Uptake Exceeds Inflow
Jun	1.37	0.24	1.13	16.3	17.46	3.60	13.86	Good, Uptake Exceeds Inflow
Jul	1.44	0.06	1.39	16.3	17.71	3.60	14.11	Good, Uptake Exceeds Inflow
Aug	2.49	0.11	2.38	16.3	18.70	6.59	12.11	Good, Uptake Exceeds Inflow
Sep	1.57	0.57	1.00	16.3	17.32	9.59	7.74	Good, Uptake Exceeds Inflow
Oct	1.01	2.58	(1.57)	16.3	14.75	8.99	5.77	Good, Uptake Exceeds Inflow
Nov	0.33	6.76	(6.43)	16.3	9.89	4.19	5.69	Good, Uptake Exceeds Inflow
Dec	0.32	7.31	(6.98)	16.3	9.34	3.60	5.74	Good, Uptake Exceeds Inflow
Totals (in/yr)--->	11.72	48.83	(37.12)	195.88	158.76	59.92	98.84	

[1]From Crop Uptake table

[2]From Precip & Evap table

[3]From Soil Info table

[2]From Precip & Evap table

[4]Sum of Net ET and the soil Percolation Rate

[5] Treated WW applied per month converted to inches

[6]Net distribution to ground (positive=additional ww may be applied, negative=capacity is exceeded)
This value reflect the soils ability to accept additional water.

Hydraulic Loading Rate

$$L_w = ET + P + \mathrm{Pr}$$

where :

L_w = *wastewater hydraulic loading rate, in / mo*

ET = *evapotranspiration rate, in / mo*

Pr = *precipitation rate, in / mo*

P = *saturated soil percolation rate, in / mo*