

Wastewater Feasibility Study

Castlevale Winery P09-00529-UP Planning Commission Hearing Date August 1, 2018



October 2013 #08-22

Kim Withrow Napa County Planning, Building & Environmental Services Environmental Health Division 1195 Third Street, Second Floor Napa, CA 94559

Re: Onsite Wastewater Disposal Feasibility Study for the proposed Castlevale Winery at 3450 Chiles Pope Valley Road, Napa County, CA, APN 025-230-014 & 016

Dear Ms. Withrow:

At the request of Carolyn Martini, we have evaluated the feasibility of providing onsite wastewater disposal for a new winery facility located at 3450 Chiles Pope Valley Road in Napa County, California. It is our understanding that the winery will have a full crushing production of 30,000 gallons of wine per year.

This feasibility study is based on a land survey performed by Michael W. Brooks and Associates, Inc., Professional Land Surveyors, in January 2009 and the site evaluations performed on December 11, 2008 and January 16, 2009 by Bartelt Engineering and witnessed by a representative from Napa County Environmental Health (see attached site evaluation form). As part of our work we have reviewed the files at Napa County Environmental Health as well as performed several site visits to evaluate existing conditions. Based on our review of the files and observations made in the field, it is our opinion that either a conventional gravity type disposal field or a pressure distribution type disposal field can be constructed on this property to accommodate the proposed wastewater flow generated by the new winery facility.

The owners of 3450 Chiles Pope Valley Road are proposing to construct a full crush winery facility with a production of 30,000 gallons of wine per year. The proposed winery's staff will consist of 4 full-time and 2 part-time/harvest employees. The applicant intends to establish a private tasting room with tours and tasting and to hold food and wine pairings at the winery. Private tours and tasting will not be held on the same day as food and wine pairings.



The following is a summary of the proposed marketing plan for the winery:

<u>Description</u> Private Tours & Tasting Food & Wine Pairings <u>Frequency</u> 3 per day 1 per month Number of Visitors 6 per tour 30 per event

Water Use Analysis

A Phase One Water Availability Analysis has been completed by Bartelt Engineering for the proposed winery. According to the Phase One Analysis, the parcel is allotted 27.68 acre-feet of water per year. The Phase One Analysis estimates that the proposed water use for the entire parcel (existing residence, existing vineyard and the proposed 30,000 gallon per year winery) will be approximately 15.90 acre-feet of water per year (see the Phase One Water Availability Analysis prepared by Bartelt Engineering dated October 2013 for more information on the proposed water use).

Winery Process Wastewater Flow

Peak Winery Process Wastewater Flow =

(30,000 gallons of wine per year)(1.5 gallons of water per 1 gallon of wine) 30 days of crush per year

Peak Winery Process Wastewater Flow = 1,500 gallons per day (gpd)

Average Winery Process Wastewater Flow:

(30,000 gallons of wine per year)(6 gallons of water per 1 gallon of wine) 365 days per year

Average Winery Process Wastewater Flow = 494 gpd

Winery Sanitary Wastewater Flow

Peak sanitary wastewater flows at the proposed winery can be itemized as follows:

Employees:

(4 full-time employees) x (15 gpd per employee) = 60 gpd (2 part-time employees) x (15 gpd per employee) = 30 gpd

Private Tours & Tasting:

(18 visitors per day) x (3 gallons per visitor) = 54 gpd

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Food & Wine Pairings:

(30 guests per event) x (5 gallons per guest) = 150 gpd

Private tours and tasting will not be held on days with food and wine pairings.

The peak winery sanitary wastewater flow is calculated as follows:

(Full Time Employees) + (Part Time Employees) + (Food and Wine pairings) 60 gpd + 30 gpd + 150 gpd

Peak Winery Sanitary Wastewater Flow = 240 gpd

Total Proposed Site Wastewater Flow

The total proposed site wastewater flow is the combination of the proposed winery process wastewater and the proposed winery sanitary wastewater shown as follows:

(Winery Process Wastewater) + (Winery Sanitary Wastewater) 1,500 gpd + 240 gpd

Total peak wastewater produced = 1,500 gpd + 240 gpd = 1,740 gpd

Septic Tank Requirements

The following table summarizes the underground storage tank requirements for the proposed process wastewater and septic system.

Septic Tank Wastewater Source	Peak Flow (gpd)	Retention Time (days)	Recommended Tank Capacity (gallons)
Process Wastewater	1,500	4	6,000
Winery Sanitary	240	5	1,500

The process wastewater septic tank system for the winery should have a Zabel A300 filter or approved equal installed at the outlet to aid in the screening of suspended solids and the reduction of BOD from the wastewater. The process wastewater septic tank(s) storage capacity should be sized to provide a minimum of three days of storage capacity during peak wastewater flow.

The sanitary wastewater septic tank for the winery should have a Zabel A300 filter or approved equal installed at the outlet to aid in the screening of suspended solids and the reduction of BOD from the wastewater. The sanitary wastewater septic tank should be sized to provide a minimum of three days of storage capacity during peak wastewater flow.



Proposed Wastewater Disposal Methods

PRIMARY SYSTEM – CONVENTIONAL GRAVITY DISTRIBUTION DISPOSAL FIELD

Required Length of Trench

The gravity distribution laterals would be installed in 18 inch wide by 30 inch deep trenches with 24 inches of ³/₄ to 1¹/₂ Clear Lake lava rock under the invert of the distribution laterals, 6 inches of ³/₄ to 1¹/₂ inch Clear Lake lava rock over the inverts of the distribution laterals to match original grade. 12 inches of fill material will be placed over the entire disposal field to direct surface water away from the disposal field. The proposed trench section provides 3.67 square feet of effective surface area per lineal foot of trench. For this calculation, we have used an application rate of 0.33 gallon per square foot of sidewall per day based on the clay loam type soils found at this site. (See attached site evaluation and laboratory test results on soil texture analysis).

Required length of trench = $\frac{1,740 \text{ gpd}}{(3.67 \text{ sf/lf})(0.33 \text{ gal/sf/lf})} = 1,437 \text{ lf}$

Assuming fifteen (15) lines at 100 feet long and 10 foot spacing between each leach line equates to approximately 15,000 square feet of disposal area.

Available Primary Disposal Field Area

There is adequate area available to install a conventional gravity distribution disposal field for wastewater disposal as shown on the attached Use Permit Drawings prepared by Bartelt Engineering dated October 2013.

100% RESERVE AREA – PRESSURE DISTRIBUTION DISPOSAL FIELD

Required Length of Trench

The pressure distribution laterals would be installed in 18 inch wide by 28 inch deep trenches with 18 inches of ³/₄ to 1¹/₂ Clear Lake lava rock under the invert of the distribution laterals, 4 inches of ³/₄ to 1¹/₂ inch Clear Lake lava rock over the inverts of the distribution laterals and 6 inches of soil to match original grade. The entire disposal field area will be covered with 6 inches of native soil to direct surface water away from the disposal field. The proposed trench section provides 3.0 square feet of sidewall per lineal foot of trench. For this calculation, we have used an application rate of 0.60 gallons per day per square foot of sidewall per gallon per day based on the clay loam type soils found at this site. (See attached site evaluation and laboratory test results on soil texture analysis).

Required length of trench = $\frac{1,740 \text{ gpd}}{(3.0 \text{ sf/lf})(0.60 \text{ gal/sf/lf})} = 967 \text{ lf}$

Assuming ten (10) lines at 100 feet long and 10 foot spacing between each leach line equates to approximately 10,000 square feet of disposal area.

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Available 100% Reserve Area

There is adequate area available to install a pressure distribution disposal field within the 100% reserve area as shown on the attached Use Permit Drawings prepared by Bartelt Engineering dated October 2013.

Conclusions

The parcel will be able to adequately dispose of the wastewater produced by the proposed 30,000 gallon winery utilizing either a conventional gravity distribution disposal field or a pressure distribution type septic system.

The above calculations should be adequate for the Use Permit application to Napa County. Full design calculations and construction plans will be completed after approval of the Use Permit currently under consideration. If you have any questions regarding our recommendations please feel free to call me at (707) 258-1301.

Sincerely, CIS. Paul N. Bartelt, P.E. No. 45102 REC **Principal Engineer** PNB:sd

Enclosures

cc: Carolyn Martini Donna Oldford, Plans4Wine

SITE EVALUATION REPORT

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

Permit #: E08-00700

APN: 025-230-016

(County Use Only) Reviewed by:

Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner Carolyn Martini	☑ New Construction □ Addition □ Remodel □ Relocation □ Other:
Property Owner Mailing Address P.O. Box 61	□ Residential - # of Bedrooms: Design Flow : gpd
CityStateZipSt. HelenaCA94574	⊠ Commercial – Type: Winery
Site Address/Location	Sanitary Waste: 240 gpd Process Waste: 1,500 gpd
3450 Chiles Pope Valley Road, Napa County	Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:		A. A 1
Company Name	Evaluator's Name	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
Bartelt Engineering	Paul N. Bartelt, P.E.	MIN MILT
Mailing Address:	raarn. Baron, r.e.	Telephone Number
1303 Jefferson Street, 200 B		(707) 258-1301
City	State Zip	Date Evaluation Conducted
Napa	CA 94559	December 11, 2008 & January 16, 2009

Primary Area See below	Expansion Area See below
Acceptable Soil Depth: 60 - 67 in. Test pit #'s: 1, 3, 4, 8 - 11	Acceptable Soil Depth: 60 - 67 in. Test pit # : 6, 7, 12 - 15
Soil Application Rate (gal. /sq. ft. /day): 0.6	Soil Application Rate (gal. /sq. ft. /day): 0.6
System Type(s) Recommended: Pressure Distribution	System Type(s) Recommended: Pressure Distribution
Slope: 15 %. Distance to nearest water source: > 300 ft.+	Slope: 15 %. Distance to nearest water source: > 300 ft. +
Hydrometer test performed? No □ Yes ⊠ (attach results)	Hydrometer test performed? No □ Yes ⊠ (attach results)
Bulk Density test performed? No ⊠ Yes □ (attach results)	Bulk Density test performed? No ⊠ Yes □ (attach results)
Groundwater Monitoring Performed? No ⊠ Yes □ (attach results)	Groundwater Monitoring Performed? No \boxtimes Yes \Box (attach results)

Site constraints/Recommendations:

The property owner is planning to develop a new winery on APN 025-230-016. The site evaluation was conducted on December 11, 2008 and January 16, 2009 by Bartelt Engineering and witnessed by Ray Franklin of Napa County Environmental Health. The goal of the site evaluation was to find a disposal area for the process and sanitary wastewater produced by the proposed 30,000 gallon per year winery. The site evaluation was successful in finding useable soil over a large area in a vineyard near the proposed winery site. The final septic system design will be dependent on the winery design and could possibly be a standard or pressure distribution system. Based on the site evaluation. Bartelt Engineering is confident that there is an adequate area of useable soil to properly dispose of wastewater from a 30,000 gal/year winery on APN 025-230-016. Please see the attached site evaluation results.

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Test Pit #	

* Hydrometer Test Performed

		015			C	Consistence	9			
Horizon Depth (Inches)	Boundary	%Roc k	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
0-40*		<15	CL	SSB	SH	FRB	SS	MVF/MF/ CC	MF	None
	Difuse for root									
40-67*	change	<15	CL	SSB	SH	FRB	SS	MVF/MF	None	None
Slope = 5 Assigned s	- 15%. Acce	ptable soi n rate = S F	ll depth: 67 TE 0.33 ga STE 0.6 ga PTE 0.75 g		conventional FS STS			MVF/MF	None	None

Test Pit # 2

Lleringe				Structuro	C	onsistence		-		N		
Horizon Depth	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling		
(Inches)					vvali							
0-33		<15	CL	MSB	SH	VFRB	S	MVF/MF	MVF/FF/ FM	None		
33-44	Abrupt	>50	Shale Refu	sal				None	None	None		
	15%. Accepta oil application i	rate = STE STE PTE		ay for a Conv ay for ASTS day for ASTS		Standard S	System					
No ground	No groundwater observed.											

3 Test Pit #

* Hydrometer Test Performed

11-1-1-1					(Consistence	е	Daraa	Decto	NA - Hilling at
Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
								· MVF/MF/	CF/FM/	
0-60*		<15	SCL	SAB	Н	FRB	S	FC	FC	None
Slope = 5 Assigned s	- 15%. Acce soil applicatio	n rate = ST				– Standaro	d System			

STE 0.6 gal/sf/day for ASTS PTE 0.75 gal/sf/day for ASTS

Subsurface Drip = 0.6 gal/sf/day

No refusal at 60 inches deep. No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 18, 2008.

Test Pit # 4

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Horizon Boundary		%Rock	Texture	Structure		Consistence		Pores	Roots	Mottling
Depth (Inches)	Boundary	MILOCK	Texture	Structure	Side Wall	Ped	Wet	1 0103	Noots	Motaling
			_					MVF/MF/	MVF/MF/	
0-66		<15	SCL	SAB	Н	FRB	S	FM	FC	None
Assigned s	15%. Accepta	rate = STE STE PTE Sub	0.33 gal/sf 0.6 gal/sf 0.75 gal/s		S TS	– Standard	d System			
The second	at 66 inches de	a contract of the second se								
No ground	water observed									

Test Pit # 5

Horizon					(Consistence	е	-		
Depth	Boundary	%Rock	Texture	Structure	Side	Ped	Wet	Pores	Roots	Mottling
(Inches)					Wall					
								MVF/MF/	MVF/MF/	CMD @
0-46		<15	CL	SAB	Н	FRB	S	FC	FC	38"
46-60	G	30-50	Shale Re	fusal at 60 in	ches.				FF	FFFt
1										
Slope = 5 -	15%. Accepta	able soil de	pth: 38 incl	nes.						
Assigned s	oil application	rate = STE	0.33 gal/sf	/day for a Co	nventional	- Standard	d System			
		STE	E 0.6 gal/sf/	day for ASTS	5					
		PTE	0.75 gal/s	f/day for AST	ſS					
				ip = 0.6 gal/s						
No ground	water observed									
					5					

Test Pit # 6

Horizon	Horizon Boundany %Po					Consistence		_		
Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
0-43		<15	CL	SAB	SH	VFRB	S	MVF/MF/ FC	MVF/MF/ FC	CMD @ 32"
43-64	Difuse change in density	<15	CL	SAB	H/VH	FRB	S	MVF/MF	FF	CMD
	- 15%. Accer soil applicatio	n rate = ST S P	E 0.33 gal TE 0.6 gal/ TE 0.75 ga		TS STS	al – Standaro	d System			
	at 64 inches water observ	· ·								

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Test Pit #

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* Hydrometer Test Performed

Horizon					(Consistenc	e	_		
Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
0-75*		<15	SCL	SSB	SH/H	FRB	S	MVF/MF/ FC	MVF/MF/ FM	None
	- 15%. Accej soil applicatio	n rate = ST S P	E 0.33 gal/s TE 0.6 gal/sf TE 0.75 gal/s		S FS	– Standar	d System			
No ground	at 75 inches lwater observ ts, Inc. dated	ed. *See a		Texture Anal	ysis by Bou	uyoucos Hy	/drometry	Method prepa	ared by RGH	l
Test Pit #	8				C	Consistence	9	[
Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
0-66		<15	SCL	SAB	SH	FRB	SS	MF/MVF/ FM	MF	None

Slope = 5 - 15%. Acceptable soil depth: 66 inches. Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System STE 0.6 gal/sf/day for ASTS PTE 0.75 gal/sf/day for ASTS

Subsurface Drip = 0.6 gal/sf/day

No refusal at 66 inches deep. No groundwater observed.

9 Test Pit #

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Horizon			_		(Consistence	Э	_	_	
Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
								FC/MVF/		
0-66		<15	SCL	SAB	SH	FRB	SS	FM	FC/MF	None
Assigned s		n rate = ST S P S	E 0.33 gal/s TE 0.6 gal/sf TE 0.75 gal/s	hes. f/day for a Co /day for ASTS sf/day for AST ip = 0.6 gal/s	S S	– Standard	d System			
	at 66 inches									
No ground	water observe	ed.								

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Test Pit # 10

Horizon	_				(Consistence	е			
Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
								FC/MVF/		
0-72		<15	SCL	SAB	SH	FRB	SS	FM	FC/MF	None
Assigned s	- 15%. Accep soil applicatio	n rate = ST S P S	E 0.33 gal/st TE 0.6 gal/sf TE 0.75 gal/s		S TS	– Standard	d System			
In all your subsects the subsection reports	at 72 inches	· · · ·								
No ground	water observ	ed.								

Test Pit # 11

Horizon					(Consistence	Э	_		
Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
0-71		<15	SCL	SAB	SH	FRB	SS	MF/FM	MF/FC	None
	- 15%. Accep soil applicatio	n rate = ST S P	E 0.33 gal/si TE 0.6 gal/sf TE 0.75 gal/s	f/day for a Co /day for ASTS sf/day for AST	S TS	– Standard	d System			
N 6 1			ubsurface Dr	ip = 0.6 gal/s	f/day					
	at 71 inches water observ									

12 Test Pit #

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Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
0-32		30-50	SCL	SAB	SH	FRB	SS	MF/FM	MF/FC	None
32-65	с	<15	SCL	SAB	SH	FRB	SS	MF/FM	MF/FC	None
Assigned s	- 15%. Accep soil applicatio	n rate = ST S P S	E 0.33 gal TE 0.6 gal/ TE 0.75 ga		TS STS	al – Standaro	d System			
	at 65 inches									
No ground	water observ	ea.								_

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13 Test Pit

Horizon			-			Consistence		_		
Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
								FM/MF/		
0-36		30-50	SCL	MAB	L	FRB	SS	MVF	MF/FC	None
								FM/MF/		
36-72	С	<15	SCL	SAB	SH	FRB	SS	MVF	MF/FC	None

Slope = 5 - 15%. Acceptable soil depth: 72 inches. Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System STE 0.6 gal/sf/day for ASTS

PTE 0.75 gal/sf/day for ASTS

Subsurface Drip = 0.6 gal/sf/day

No refusal at 72 inches deep. No groundwater observed.

14 Test Pit

Horizon						Consistence		_		
Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
								FM/MF/		
0-16		30-50	SCL	SAB	SH	FRB	SS	MVF	MF/FC	None
								FM/MF/		
16-72	С	<15	SCL	SAB	SH	FRB	SS	MVF	MF/FC	None
	- 15%. Accer soil applicatio	n rate = ST S	E 0.33 gal TE 0.6 gal/		TS	al – Standaro	d System			

Subsurface Drip = 0.6 gal/sf/day

No refusal at 72 inches deep. No groundwater observed.

15 Test Pit #

Horizon				_		Consistence)			
Depth (Inches)	Boundary	%Rock	Texture	Structure	Side Wall	Ped	Wet	Pores	Roots	Mottling
								MF/MVF/		
0-70		<15	SCL	SAB	SH	FRB	SS	FM	MF/FC	None
Assigned s	- 15%. Acception of application	n rate = ST S P S	E 0.33 gal. TE 0.6 gal/ TE 0.75 ga		TS STS	al – Standar	d System			
	at 70 inches									
No ground	water observe	ed.	_				CONTRACT OF A			

Table of Abbreviations

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

Attach additional sheets as needed

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Alternative Sewage Treatment System Soil Application Rates

TEXTURE	ST	RUCTURE	APPLICAT (Gal/ft	ION RATE ²/day)
	Shape	Grade	STE ¹	PTE ^{1,2}
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	1.0	1.2
Fine Sand, Loamy Fine Sand	Single grain	Structureless	0.6	1.0
	Massive	Structureless	0.35	0.5
	Platy	Weak	0.35	0.5
Sandy Loam, Loamy Sand	Prismatic, blocky,	Weak	0.5	0.75
	granular	Moderate, Strong	0.8	1.0
	Massive	Structureless		
Loam, Silt Loam, Sandy Clay	Platy	Weak, moderate, strong		
Loam, Fine Sandy Loam	Prismatic, blocky,	Weak, moderate	0.5	0.75
	granular	Strong	0.8	1.0
	Massive	Structureless		
Sandy Clay, Silty Clay Loam,	Platy	Weak, moderate, strong		
Clay Loam	Prismatic, blocky,	Weak, moderate	0.35	0.5
	granular	Strong	0.6	0.75
	Massive	Structureless		
Clay, Silty Clay	Platy	Weak, moderate, strong		
Glay, Silly Glay	Prismatic, blocky,	Weak		
	granular	Moderate, strong	0.2	0.25

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

MINIMU	M SÜRFACE AREA		POSE OF 100 GPD E DRIP DISPERSAL	OF SECONDARY TREATE SYSTEMS	D EFFLUENT FOR
		Soil Absorp	otion Rates	Design Application Pote	Total Area Required
Soil Class	Soil Type	Est. Soil Perc. Rate minutes/inch	Hydraulic Conductivity inches/hour	Design Application Rate (Gal/ft ² /day)	Sq. ft./100 gallons per day
1	Coarse sand	1 – 5	>2	1.400	71.5
]	Fine sand	5 - 10	1.5 – 2	1.200	83.3
11	Sandy loam	10 – 20	1.0 – 1.5	1.000	100.0
11	Loam	20 - 30	0.75 – 1.0	0.700	143.0
111	Clay loam	30 – 45	0.5 - 0.75	0.600	167.0
III	Silt - clay loam	45 – 60	0.3 – 0.5	0.400	250.0
IV	Clay non-swell	60 – 90	0.2 - 0.3	0.200	500.0
IV	Clay - swell	90 – 120	0.1 – 0.2	0.100	1000.0

For design purpose, the "Soil Type" category to be used in the above table shall be based on the most restrictive soil type encountered within two feet below the bottom of the drip line. 1.

Dispersal field area calculation: Total square feet area of dispersal field = Design flow divided by loading rate. 2.

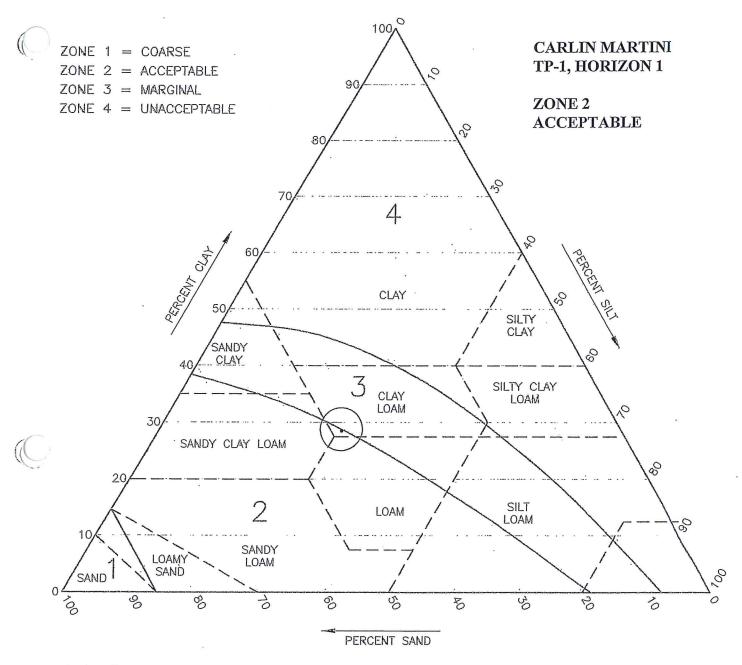
Conventional Sewage Treatment System Soil Application Rates

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TEX	TURE	STRU	CTURE	APPLICATION RATE (Gal/ft ² /day)
	_	Shape	Grade	STE
Coarse Sand, Sand,	Loamy Coarse Sand	Single grain	Structureless	Prohibited
	~	Massive	Structureless	Prohibited
	Learnin Daniel	Platy	Weak, mod, strong	Prohibited
Sandy Loam	, Loamy Sand	Prismatic,	Weak	0.33
		blocky, granular	Moderate, strong	0.5
		Massive	Structureless	Prohibited
Loam Silt Loam Sa	andy Clay Loam, Fine	Platy	Weak, mod, strong	Prohibited
	y Loam	Prismatic,	Weak	0.25
		blocky, granular	Moderate, Strong	0.33
		Massive	Structureless	Prohibited
		Platy	Weak, moderate, strong	Prohibited
Clay	Loam	Prismatic,	Weak, moderate	0.25
	÷	blocky, granular	Strong	0.33
		Massive	Structureless	Prohibited
».	-	Platy	Weak, moderate, strong	Prohibited
Sandy Clay,	Silty Clay Loam	Dim la bi-	Weak, moderate	Prohibited
		Prismatic, blocky, granular	Strong	0.25
		Massive	Structureless	Prohibited
	21th Olar	Platy	Weak, moderate, strong	Prohibited
Clay, S	Silty Clay	Prismatic, blocky,	Weak	Prohibited
		granular	Moderate, strong	Prohibited

Percolation Rate (mpi)	Application Rate (STE)
	Prohibited
< 5 MPI	
5 to 10 MPI	0.5
10-20 MPI	0.33
20-60 MPI	0.25
> 60 MPI	Prohibited

SOIL F_RCOLATION SUITABILITY JART



Instructions:

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

Note:

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

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Geotechnical Geological And Laboratory Services

CONSULTANTS, INC.

File: 9147.12

December 18, 2008 Bartelt Engineering 1339 Pearl Street, Suite 205 Napa, CA 94559

Subject: Laboratory Test Results Soil Texture Analysis by Bouyoucos Hydrometry Method CARLIN MARTINI

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on December 15, 2008.

We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

6	TP-1	
Size/Density	Horizon 1	
+#10 Sieve	19.4 %	
Sand	40.4 %	
Clay	28.8 %	
Silt	30.8 %	
Db g/cc		

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

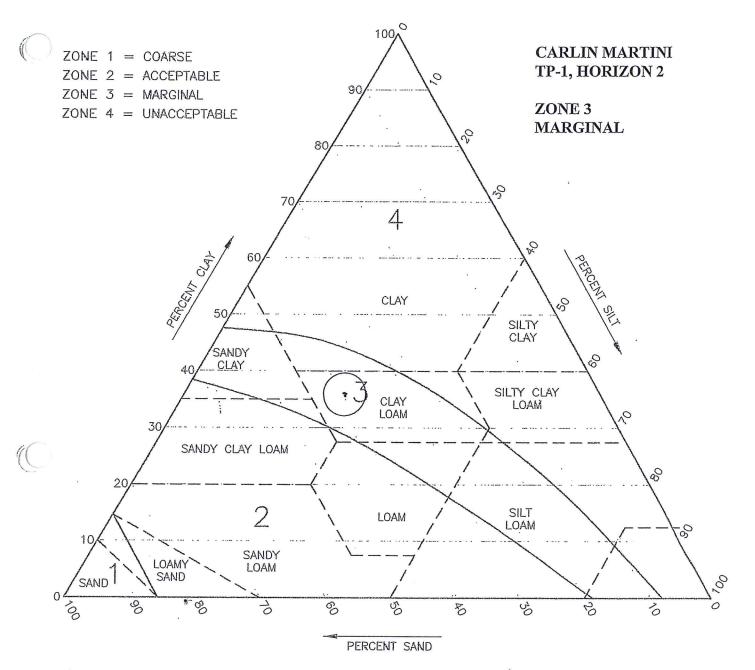
Yours very truly,

RGH GEOTECHNICAL

branca E. ME

Tarance E. McCue Senior Laboratory Advisor

SOIL F_RCOLATION SUITABILITY JART



Instructions:

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

Note:

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

 R_{G}

Geotechnical Geological And Laboratory Services

CONSULTANTS, INC.

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Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on December 15, 2008.

We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

Size/Density	TP-1 Horizon 2
+ #10 Sieve	18.1 %
Sand	38.4 %
Clay	35.0 %
Silt	26.6 %
Db g/cc	

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

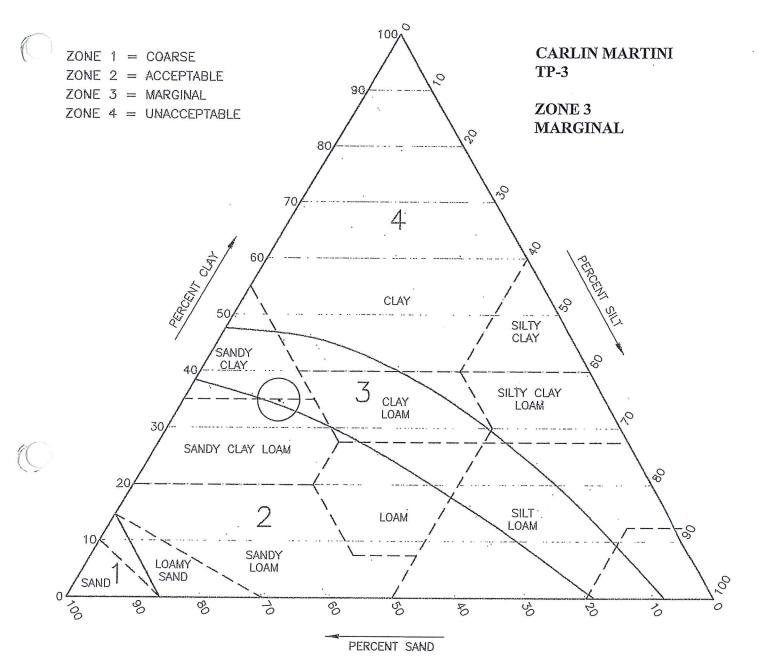
Yours very truly,

RGH GEOTECHNICAL

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Tarance E. McCue Senior Laboratory Advisor

SOIL F_RCOLATION SUITABILITY JART



Instructions:

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

Note:

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

$R G_H$

Geotechnical Geological And Laboratory Services

CONSULTANTS, INC.

File: 9147.12

December 18, 2008 Bartelt Engineering 1339 Pearl Street, Suite 205 Napa, CA 94559

Subject: Laboratory Test Results Soil Texture Analysis by Bouyoucos Hydrometry Method CARLIN MARTINI

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on December 15, 2008.

We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

	TP-3			
Size/Density				
+ #10 Sieve	5.8 %			
Sand	50.0 %			
Clay	34.8 %			
Silt	15.2 %			
Db g/cc				

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

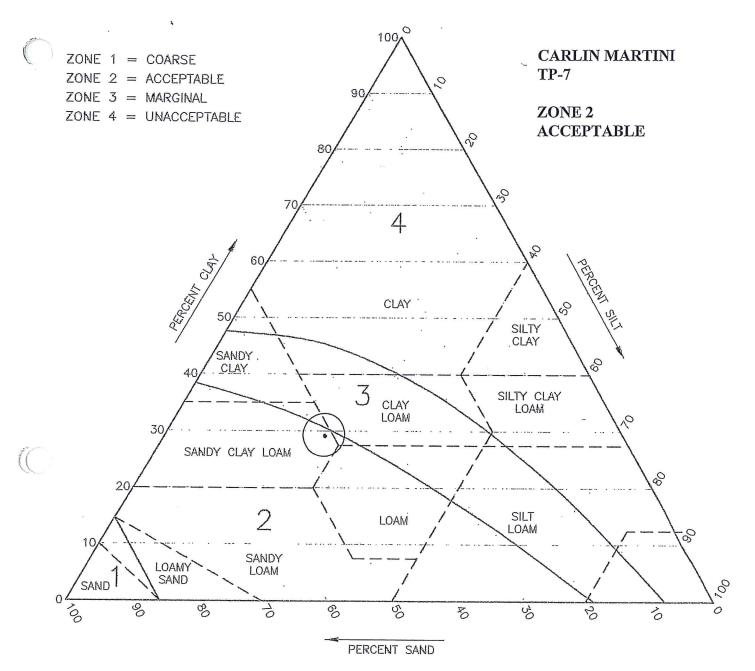
Yours very truly,

RGH GEOTECHNICAL

Ste E.W

Tarance E. McCue Senior Laboratory Advisor

SOIL F_RCOLATION SUITABILITY JART



Instructions:

1. Plot texture on triangle based on percent sand, silt, and clay as determined by

- 2. Adjust for coarse fragments by moving the plotted point in the sand direction an additional 2% for each 10% (by volume) of fragments greater than 2mm in diameter.
- 3. Adjust for compactness of soil by moving the plotted point in the clay direction an additional 15% for soils having a bulk-density greater than 1.7 gm/cc.

Note:

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

 R_{G} H

Geotechnical Geological And Laboratory Services

CONSULTANTS, INC.

File: 9147.12

December 18, 2008 **Bartelt Engineering** 1339 Pearl Street, Suite 205 Napa, CA 94559

Subject: Laboratory Test Results Soil Texture Analysis by **Bouyoucos Hydrometry Method CARLIN MARTINI**

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on December 15, 2008.

We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

Size/Density	TP-7
+ #10 Sieve	17.1 %
Sand	44.2 %
Clay	29.0 %
Silt	26.8 %
Db g/cc	

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

Yours very truly,

RGH GEOTECHNICAL

E. MEtro

Tarance E. McCue Senior Laboratory Advisor

Geotechnical Geological And Laboratory Services

CONSULTANTS, INC.

 $R_{G_{H}}$

Red BOUYOCOUS HYDROMETER

CLIENT No.+tell JOB NAME Cartin JOB# 91/7-12 SAMPLE NUMBER TP-7 TP-3 TP-1 TP-1 TP-1 A. Oven dry wt. (grams) SOq SOq SOq SOq SOq B. Starting Time (grams) SOq SOq SOq SOq SOq SOq B. Starting Time (grams) SOq SOq SOq SOq SOq SOq B. Starting Time (grams) SOq SOq SOq SOq SOq SOq B. Starting Time (grams) SOq SOq SOq SOq SOq SOq B. Starting Time (grams) SOq SOq SOq SOq SOq D. Hydro reading @40 sec. (gm/l) 36.5 400.0 39.5 S8.5 E. Composite Corr. (grams) S7.9 S7.7 S8.0 S7.6 21.8 G. Temp.@2 hrs. (gram.) 22.0 22.0 22.0 22.0 22.0 22.0 22.0 J. True Density @ 147.5 147.4	CLIENT Bartel	4	JOB NAME Contin M	which JOB# (7147-12
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J. True Density @ $14:5$ $17:4$ $17:5$ $14:4$ 2 hrs. (gm/l) H-I $14:5$ $17:4$ $17:5$ $14:4$ K. % Sand = $44:7$ $50:0$ $38:4$ $40:4$ 100 - [(F/A) x 100] $44:7$ $50:0$ $38:4$ $40:4$ L. % Clay = $29:0$ $34:8$ $35:0$ $28:8$ [(J/A) x 100] $29:0$ $34:8$ $35:0$ $28:8$ M. % Silt = $16:8$ $15:7$ $36:6$ 30.8 100-(K+L) $26:8$ $15:7$ $36:6$ 30.8 N. % No. 10 = 7.1 $5:8$ $18:1$ $19:4$ Dry Before Wash + 717.6 $16:2$ $46:3.6$ 550.5 Dry After Wash + Tare 207.9 138.2 168.1 189.0 Dry Wt. Passing #10 $709:7$ $572:0$ $295:5$ $364:5$ Tare Weight 103.1 163.4 163.6 $448:5$ % Passing #10 $69:7:1$ $340:6$ $448:5$ $44:8:5$				-0 -	
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f_1 g_10 811 $19c 4$ Cup Number $B-17$ $B-3$ $B-12$ $B-22$ Dry Before Wash + Tare 717.6 716.2 463.6 550.5 Dry After Wash + Tare 207.9 138.2 168.1 189.0 Dry Wt. Passing #10 709.7 572.0 295.5 $3bli 5$ Tare Weight 103.1 163.1 103.0 102.0 Mt. Before Wash 614.5 607.1 360.6 448.5 % Passing #10 82.9 94.7 81.9 80.6		VERO	15:0	0.670	10.0
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Dry After Wash + Tare 207.9 138.2 168.1 189.0 Dry Wt. Passing #10 709.7 572.0 295.5 366.5 Tare Weight 103.1 163.1 102.0 102.0 (Nt. Before Wash 614.5 607.1 360.6 448.5 % Passing #10 82.9 94.7 81.9 80.6	-	717 6	715.2	467.6	
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Tare Weight 103.1 103.1 103.0 102.0 Wt. Before Wash 614.5 607.1 360.6 448.5 % Passing #10 82.9 94.7 81.9 80.6	-			295,5	
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	% #10		5.8	1811	1904

