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Wastewater Feasibility Study

Wheeler Farms Use Permit Major Modification P19-00130
Planning Commission Hearing January 20, 2021

BARTELT ENGINEERING

ONSITE WASTEWATER DISPERSAL FEASIBILITY STUDY FOR WHEELER FARMS WINERY 588 ZINFANDEL LANE, ST. HELENA, CA APN 030-260-016

As required by Napa County Planning, Building and Environmental Services (PBES), this study outlines the feasibility of providing onsite wastewater dispersal for an existing winery and tasting room on the above referenced parcel located at 588 Zinfandel Lane, St. Helena, CA 94574.

PROJECT DESCRIPTION

It is our understanding that Wheeler Farms Winery is proposing to increase the wine production limit from 50,000 gallons per year to 70,000 gallons per year and the number of employees from 22 to 23. Refer to Use Permit #P08-00672-UP and minor modification #P14-00283 for additional information on approved uses. This feasibility study evaluates the increase in wastewater generated from the proposed project and proposes improvements to the existing wastewater systems to accommodate the additional wastewater flows.

Table 1 summarizes the approved and proposed staffing plan:

TABLE 1: STAFFING PLAN SUMMARY

Description	Number of Employees	
	Existing	Proposed
Full-time Employees	14	15
Part-time Employees	0	0
Harvest/Seasonal Employees	8	8

Table 2 summarizes the marketing plan:

TABLE 2: MARKETING PLAN SUMMARY

Description	Number of Guests	Event Staff	Frequency
Tour & Tasting Visitors	32 per day	0 per day	Daily
Food & Wine Pairings	24 per event	0 per event	4 per month
Wine Club / Release Events	75 per event	7 per event	4 per year
Large Event	120 per event	7 per event	2 per year

As part of our services, representatives from Bartelt Engineering have reviewed the operational methods for the winery with our Client, reviewed the parcel files at Napa County PBES, held conversations with Napa County PBES staff, performed a reconnaissance of the site to view existing conditions and conducted a site evaluation on November 14, 2008 and April 3, 2009 to evaluate the feasibility of installing and/or expanding an onsite wastewater dispersal system.

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

WASTEWATER ANALYSIS

Process Wastewater Flow

The winery facility's production wastewater (PW) flow rates for harvest and non-harvest seasons can be calculated as follows:

Harvest Peak Winery PW Flow:

70,000 gallons of wine/year x 1.5 gallons of water/gallon of wine ÷ 60 days harvest =

Harvest Peak Winery PW Flow = 1,750 gallons per day (gpd)

Non-Harvest Peak Winery PW Flow:

70,000 gallons of wine/year x 4.5 gallons of water/gallon of wine ÷ 305 days non-harvest =

Non-Harvest Peak Winery PW Flow = 1,033 gpd

Sanitary Wastewater Flow

Sanitary wastewater (SW) generated at the winery production facility, offices, and tasting room including full-time employees, seasonal (harvest) employees, event staff, and guests and can be itemized as follows:

Employees:

- 15 Full-Time Employees x 15 gpd per employee = 225 gpd
- 8 Harvest Season x 15 gpd per employee = 120 gpd

Guests[1]:

- Tour and Tasting Visitors:
  - (32 guests per day) x (3 gpd per guest) = 96 gpd per day
- Food and Wine Pairings (Lunch/Dinner):
  - (24 guests per day) x (3 gpd per guest) = 72 gpd per day
- Wine Club / Release Events:
  - (75 guests per event) x (3 gpd per guest) = 225 gpd per event
  - (7 event staff) x (15 gpd per event staff) = 105 gpd per event
- Large Events:
  - (120 guests per event) x (3 gpd per guest) x 25% usage rate = 90 gpd per event
  - (7 event staff) x (15 gpd per event staff) = 105 gpd per event

> ***Note:*** *This feasibility study assumes that portable toilets are utilized for all events with more than 75 guests in attendance regardless of the season and that 25% of the event guests are assumed to use the winery restrooms during these events.*

Commercial Kitchen Sanitary Wastewater Flow

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

Guests[2,3]:

- Food and Wine Pairings (Lunch/Dinner):
  - (24 guests per event) x (8 gpd per guest) = 192 gpd per event
- Wine Club / Release Events:
  - (75 guests per event) x (8 gpd per guest) = 600 gpd per event
- Large Events:
  - (120 guests per event) x (8 gpd per guest) = 960 gpd per event

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

The total proposed harvest season peak SW flow is the combination of the winery production facility SW flows during the months of September through October (harvest). The total proposed non-harvest season peak SW flow is the combination of the winery production facility SW flows during the months of November through August (non-harvest).

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[1] Wastewater generation rate is 3 gpd for restroom use per Napa County Planning, Building and Environmental Services Regulations.

[2] Wastewater generation rate is 8 gpd per guest from the commercial kitchen waste per Napa County Planning, Building and Environmental Services Regulations.

[3] Product represents a maximum calculated wastewater flow for each event. Events may occur during any season and are calculated individually from other events.

Table 3 uses the marketing schedule to calculate the SW flows generated by employees and guests during daily event sequences in harvest and non-harvest seasons. SW flows in the same column indicate the events may occur on the same day.

TABLE 3: HARVEST AND NON-HARVEST SEASON DAILY SANITARY WASTEWATER FLOWS

	Daily Occurrence					
	Harvest			Non-Harvest		
Employees	345	345	345	225	225	225
Tours and Tastings	96	96	-	96	96	-
Food and Wine Pairing	264	-	-	264	-	-
Wine Club Event	-	930	-	-	930	-
Large Event	-	-	1,155	-	-	1,155
Total Flow (gpd)	705	1,371	1,500	585	1,251	1,380

Table 3 shows that the greatest SW flow during the harvest and non-harvest seasons is generated during a Large Event hosted at the winery.

Design Wastewater Flows

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

TABLE 4: HARVEST AND NON-HARVEST SEASON PEAK DAILY FLOW SUMMARY

Wastewater Source	Harvest (gpd)	Non-Harvest (gpd)
Process Wastewater	1,750	1,033
Sanitary Wastewater	1,500	1,380

WASTEWATER TREATMENT AND DISPERSAL METHODS

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

Existing Process Wastewater System Evaluation

The existing process wastewater system permitted under Permit #E15-00664 includes a Cloacina pretreatment system followed by surface irrigation on vineyard and landscaped areas. The Cloacina pretreatment system is sized to treat an average daily influent flow of 2,000 gpd and a maximum daily influent flow of 4,500 gpd. Treated PW effluent from the Cloacina pretreatment system is pumped to an existing 81,000 gallons irrigation storage tank prior to being dispersed on 5.3 acres of existing vineyard (5,920 existing grape vines) and 0.8± acres of existing landscaped areas located on the subject parcel.

The proposed increase in wine production to 70,000 gallons per year equates to a peak flow of 1,750 gpd. The existing pretreatment system and irrigation dispersal system is designed for an average of 2,000 gpd and a maximum of 4,500 gpd. Since the existing PW system is sized to treat the estimated peak PW flow generated from the proposed wine production increase, an expansion of the existing PW system is not required with this Use Permit Application. However, the Owner would like the option to disperse the treated PW via a subsurface dispersal system.

Proposed PW Dispersal Field Options

This feasibility study proposes two additional options for dispersal of treated PW from the Cloacina pretreatment system. Although treated PW can still be utilized as a source for onsite vineyard/landscape irrigation, the Owner desires the option to use only well water for irrigation. When not utilized for irrigation, the treated PW would be dispersed through either a subsurface drip field or a pressure distribution field. To accommodate the optional dispersal field, a new dosing tank would be installed downstream of the Cloacina unit to collect treated PW effluent prior to being pumped to either a subsurface drip field or pressure distribution (PD) leachfield. The proposed dosing tank will be sized per Napa County PBES guidelines and include a minimum hydraulic retention time of 1.5 days. The proposed minimum volume for the process wastewater dosing tank is calculated below:

PW Dosing Tank Volume = 1.5 days x 1,750 gallons
= 2,625 gallons minimum, 3,000 gallons recommended

The minimum recommended process wastewater dosing tank volume is 3,000 gallons.

PW Subsurface Drip Field & 200% Replacement Area – Option A

The proposed PW subsurface drip field would be located near the northeasterly portion of the property per Napa County PBES standards. When surface irrigation is not desired, the proposed subsurface drip field would be utilized for dispersal of treated PW.

A site evaluation was conducted by Bartelt Engineering on the subject parcel on April 3, 2009 under permit #E09-00029. Test pits #9B and #10B are located near the proposed subsurface drip dispersal area. Both test pits showed similar results with an acceptable soil depth of 56 inches with strong structure. The soil texture was observed to be Sandy Loam to Loam material. The more restrictive soil type of Loam material is proposed to be used to size the dispersal field. GeoFlow Incorporated (the dripline manufacturer) recommends a soil hydraulic loading rate[4] of 0.80 gal/sf/day for pretreated effluent. A copy of the Site Evaluation Report is attached for reference.

The minimum required primary area for the subsurface drip field is calculated below:

$$\text{Subsurface Drip Field Area} = \frac{\text{design flow rate}}{\text{hydraulic loading rate}} = \frac{1{,}750 \ \frac{\text{gal}}{\text{day}}}{0.8 \ \frac{\text{gal}}{\text{day/ft}^2}} = 2{,}188 \text{ ft}^2$$

[4] Referenced from *Table 1 Drip Loading Rates Considering Soils Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated.

Based on site slopes less than 5% in the primary area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended drip field will contain 10 driplines each 110 feet long. The total recommended primary area is 2,200 square feet which is greater than the minimum required area of 2,188 square feet.

The 200% replacement area is proposed in the vicinity of the primary area near test pits #9B and #10B. Utilizing the same hydraulic loading rate at the primary area, the 200% replacement area is calculated below:

Replacement Area =

$$200\% \times \frac{\text{design flow rate}}{\text{hydraulic loading rate}} = (200\%) \times \frac{1{,}750 \ \frac{\text{gal}}{\text{day}}}{0.8 \ \frac{\text{gal}}{\text{day/ft}^2}} = 4{,}375 \text{ ft}^2$$

Based on site slopes less than 5% in the replacement area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended replacement area is 4,400 square feet.

PW Pressure Distribution (PD) Leachfield & 100% Replacement Area – Option B

The PD leachfield is proposed to be located in the same area as the subsurface drip field option near the northeasterly portion of the property per Napa County PBES standards. If selected for installation, the proposed PD leachfield would be utilized for dispersal of treated PW when surface irrigation is not desired.

A site evaluation was conducted by Bartelt Engineering on the subject parcel on April 3, 2009 under permit #E09-00029. Test pits #9B and #10B are located near the proposed PW PD leachfield. Both test pits showed similar results with an acceptable soil depth of 56 inches with strong structure. The soil texture was observed to be Sandy Loam to Loam material.

The proposed PD trench section includes twelve (12) inches of native backfill material, two (2) inches of drain rock over the top of the distribution lateral and 18 inches of drain rock between the top of the distribution lateral to the trench bottom. This provides a total trench depth of 32 inches and a sidewall effective surface area of 3.0 square feet per lineal foot (lf). A separation distance of 24 inches is proposed for pretreated effluent (PTE) between the proposed trench bottom and the observed limiting layer. The hydraulic loading rate for septic tank effluent (STE) of 0.8 gal/day/ft^2 is used for Loam soil.

The required lateral length of the dispersal field is calculated below:

$$\text{Total PD Lateral Length} = \frac{\text{design flow rate}}{\text{effective surface area x soil application rate}}$$

$$= \frac{1{,}750 \text{ gallons per day}}{0.8 \text{ gallon/ft}^2\text{/day x } 3.0 \text{ ft}^2\text{/lf}} = 730 \text{ lf}$$

To make the best use of the available dispersal field area, a total PD lateral length of 750 lf is proposed. The dispersal field is proposed to consist of 10 laterals each 75 lf long. Slopes within the dispersal field are less than 5%. Each lateral trench will be 18 inches wide and spaced five (5) feet apart (6.5 feet spacing on center).

The 100% replacement area is proposed in the vicinity of the primary area near test pits #9B and #10B. Utilizing the same hydraulic loading rate and effective sidewall area as the primary area, the 100% replacement area is calculated below:

$$\text{Replacement area} = 100\% \times \frac{1{,}750 \text{ gallons per day}}{0.8 \text{ gallon/ft}^2\text{/day} \times 3.0 \text{ ft}^2\text{/lf}} = 730 \text{ lf}$$

Based on site slopes less than 5% in the replacement area, five (5) foot spacing is recommended between each trench per Napa County Standards. The recommended replacement area includes 750 lf and has an area of 4,875 square feet.

Existing Sanitary Wastewater System Evaluation

The existing sanitary wastewater system that currently serves the winery and hospitality building is permitted under Permit E15-00663 and includes the following components:

- One (1) 2,000 gallons septic tank for Hospitality Building SW flows
- One (1) 1,500 gallons septic tank for Production Building SW flows
- One (1) 2,000 gallons grease interceptor tank for Kitchen SW flows
- One (1) 2,000 gallons effluent dose tank for all SW flows
- Pressure distribution (PD) leachfield (1,080 lineal feet (ft) total)

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

TABLE 5: SANITARY WASTEWATER TREATMENT TANK SUMMARY				
Septic Tank Wastewater Source	Peak Flow (gpd)	Existing Tank Capacity (gallons)	Minimum Recommended Retention Time (days)	Calculated Retention Time (days)
Sanitary Wastewater (Hospitality)[5]	360	2,000	3	5.5
Sanitary Wastewater (Production)[6]	310	1,500	3	4.8
Grease Interceptor Tank[7]	960	2,000	2	2
Dose Tank[8]	1,500	2,000	1.5	1.3

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

The existing PD leachfield includes 18 inch wide trenches with a total trench depth of 28 inches. The sidewall depth to the top of the distribution lateral is 14 inches. The total installed trench line length is 1,080 lf in Loam type soils with a corresponding hydraulic loading rate of 0.6 gal/sf/day. The installed trench section has a total sidewall area of 2.33 square feet. The total PD leachfield dispersal capacity is calculated below:

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

= 1,080 lf x 2.33 sf/lf x 0.6 gal/sf/day = 1,509 gpd

Proposed Peak SW Flow = 1,500 gpd

Since the existing 1,509 gpd capacity of the SW PD leachfield is greater than the proposed increase of SW to 1,500 gpd an expansion of the system is not being proposed at this time.

[5] The peak SW Hospitality flow is estimated to occur on a wine club/release event day that includes restroom use for two (2) employees as well as 100% restroom use for wine club event guests and event staff.

[6] The peak SW from the production building accounts for 90% restroom use from employees during harvest.

[7] Peak kitchen SW flow occurs during a large event.

[8] Existing dosing tank includes a duplex pumping system.

Operation and Maintenance

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

Summary & Conclusions

Process wastewater and sanitary wastewater generated from the existing winery and administration/hospitality building is anticipated to increase as a result of the proposed changes to the wine production limit as well as an increase in employees. This study demonstrates that all wastewater generated from the proposed project can feasibly be treated and dispersed onsite per Napa County PBES requirements. Expansion of the existing process wastewater and sanitary wastewater systems are not being proposed at this time because existing infrastructure is adequately sized to treat and disperse the proposed wastewater flows. The optional PW dispersal fields proposed with this Use Permit Modification Application will allow the Owner the option of dispersing treated PW subsurface when vineyard/landscape irrigation is not desirable.

Full design calculations and improvement plans will be completed after approval of the Use Permit under consideration for the optional process wastewater dispersal fields.

Attachments

Proposed Wastewater Treatment Diagram

Table I – Process Wastewater Flow

Table II – Vineyard Process Wastewater Irrigation

Table III – Treated Process Wastewater Irrigation Storage Tank Balance

Site Evaluation Reports

REFERENCES

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

Geoflow, Inc. Wastewater Design, Installation and Maintenance Guidelines. v1, 2007.

Napa County Department of Environmental Management. "Design, Construction and Installation of Alternative Sewage Treatment Systems." April 12, 2010.

Telsco Industries. "Turf Irrigation Manual." By James A. Watkins. 1987.

U.S. Department of Health, Education and Welfare, Public Health Service Publication. Manual of Septic-Tank Practice. 1967.

U.S. Environmental Protection Agency. "Onsite Wastewater Treatment Systems Manual." February 2002.

Napa County Planning, Building and Environmental Services, "Napa County Onsite Wastewater Treatment Systems (OWTS) Technical Standards." Final Draft.

Orenco Systems, Incorprated. "AdvanTex Design Criteria for Commercial Treatment Systems". Rev.1.6. January 2016.

WHEELER FARMS WINERY

WINERY BUILDING | HOSPITALITY BUILDING

PROCESS WASTEWATER

PEAK PROCESS WASTEWATER FLOW
1,375 GPD
(HARVEST)

SANITARY WASTEWATER

KITCHEN WASTEWATER

SANITARY WASTEWATER

(E) SEPTIC TANK
(1,500 GAL)

(E) GREASE WASTE INTERCEPTOR TANK
(2,000 GAL)

(E) SEPTIC TANK
(2,000 GAL)

(E) PROCESS WASTEWATER LIFT STATION

(E) CLOACINA PRETREATMENT SYSTEM

(OPTIONAL)

(P) PROCESS WASTEWATER DOSING TANK
(3,000 GAL)

(OPTION A)

(OPTION B)

(E) SANITARY SEWER DOSING TANK
(2,000 GAL)

(OPTIONAL)

(E) WELL

AIR GAP

(E) IRRIGATION STORAGE TANK
(81,000 GAL)

(E) VINEYARD IRRIGATION

PEAK SANITARY WASTEWATER FLOW
1,500 GPD

(OPTION B)

(P) 100% PRESSURE DISTRIBUTION REPLACEMENT AREA
(4,875 SQ FT)

(P) PRESSURE DISTRIBUTION LEACH FIELD
(4,875 SQ FT)

(E) PRESSURE DISTRIBUTION LEACH FIELD
(1,080 LF)

(P) 200% SUBSURFACE DRIP REPLACEMENT AREA (4,400 SQ FT)

(P) SUBSURFACE DRIP DISPERSAL FIELD
(2,200 SQ FT)

(E) 100% PRESSURE DISTRIBUTION REPLACEMENT AREA
(1,080 LF)

(OPTION A)

PROPOSED WASTEWATER TREATMENT DIAGRAM

NO SCALE

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Wheeler Farms Winery
588 Zinfandel Lane
St. Helena, CA 94574
APN 030-260-016
Job No. 08-16
December 2020 - Revised
Sheet 1 of 1

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BARTELT ENGINEERING

Wheeler Farms Winery
Process Wastewater Flow
Table I

Total annual wine production (gallons):	**70,000**
Harvest water usage per gallon of wine (gallons):	1.5
Length of Harvest (days):	60
Harvest process wastewater flow (gallons per day):	**1,750**
Non-harvest water usage per gallon of wine (gallons):	4.5
Length of Non-Harvest (days):	305
Non-harvest process wastewater flow (gallons per day):	**1,033**

MONTHLY WASTEWATER FLOW (gallons/month):

Process Wastewater Flow		
Month	**Wastewater Flow**	**Days in Month**
September	30,984	30
October (start of crush)	54,250	31
November	51,783	30
December	32,016	31
January	32,016	31
February	28,918	28
March	32,016	31
April	30,984	30
May	32,016	31
June	30,984	30
July	32,016	31
August	32,016	31
TOTALS	420,000	365

Notes:

> Wastewater monthly proportioning is based on historical information and information provided by the winemaker

>The annual water usage per gallon of wine is assumed to be 6 gallons.

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Wheeler Farms Winery
Vineyard Process Wastewater Irrigation
Table II

Vineyard area (acres):	5.30
Row width (feet):	6.5
Vine spacing (feet):	6
Total number of irrigated vines:	5,920
Seasonal irrigation (May - October)	
Seasonal irrigation per vine (gallons/season):	**57**

ESTIMATED VINEYARD PROCESS WASTEWATER IRRIGATION				
		Estimated		
Month	Seasonal Percent (%)	Seasonal Irrigation (gal/vine)	Non-Seasonal Irrigation (gal/vine)	Total Irrigation (gallons)
September	8.8%	5.0		29,599
October	19.3%	11.0		65,117
November[1]	3.5%	2.0		11,839
December[1]			3.00	17,759
January[1]			4.00	23,679
February[1]			4.25	25,159
March[1]			4.25	25,159
April[1]	10.5%	6.0		35,518
May	12.3%	7.0		41,438
June	15.8%	9.0		53,277
July	19.3%	11.0		65,117
August	10.5%	6.0		35,518
TOTAL	100.0%	57.0	15.5	**429,179**
				1.32 acre-feet

[1] *Total non-seasonal irrigation =*

*(vineyard area) * (43,560 sq.-ft./acre) * (depth of irrigation/12 in./ft.) * (7.48 gal./cu.-ft.)*

> Vineyard irrigation values based on information provided by winemaker

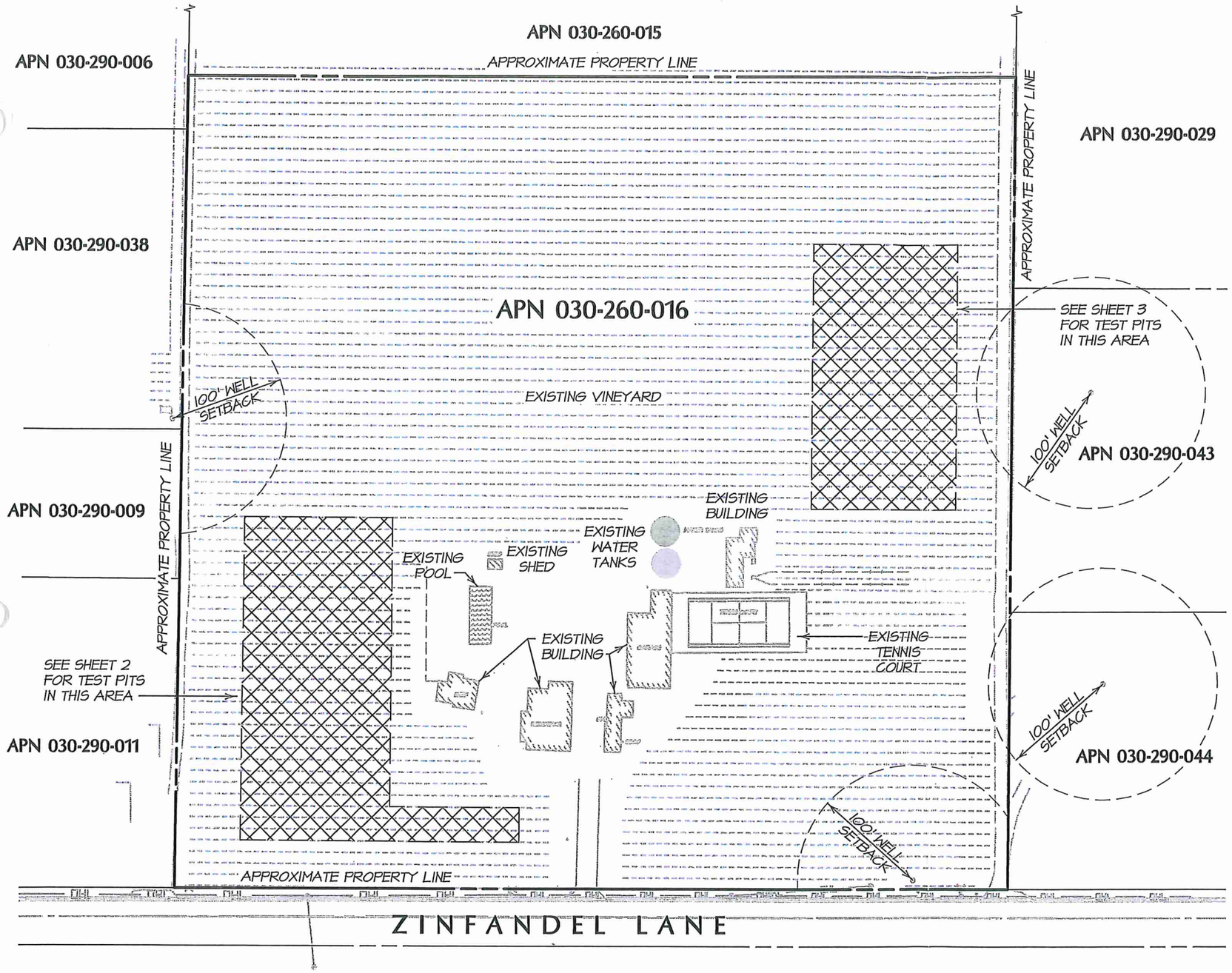
BARTELT ENGINEERING

Wheeler Farms Winery
Treated Process Wastewater Irrigation Storage Tank Balance
Table III

Month	Beginning Balance (gallons)	Wastewater Flow (gallons)	Vineyard Irrigation (gallons)	Tank Volume (gallons)
September	300	30,984	29,599	1,685
October	1,685	54,250	65,117	0
November	0	51,783	11,839	39,943
December	39,943	32,016	17,759	54,201
January	54,201	32,016	23,679	62,538
February	62,538	28,918	25,159	66,297
March	66,297	32,016	25,159	73,155
April	73,155	30,984	35,518	68,620
May	68,620	32,016	41,438	59,199
June	59,199	30,984	53,277	36,905
July	36,905	32,016	65,117	3,804
August	3,804	32,016	35,518	300
	TOTALS	**420,000**	**429,179**	
	Average	**35,000**	**35,765**	**38,887**

Recommended Tank Storage (gallons): 80,000
Recommended Tank Storage (acre-feet): 0.25

Notes:
> Water balance calculations assume storage tank is empty at the beginning of November due to post-harvest irrigation.
> In months when the irrigation demand exceeds the beginning balance plus the wastewater flow it is assumed that the full irrigation demand is not met or that the additional irrigation water is supplied from an alternate source (ie. onsite well).



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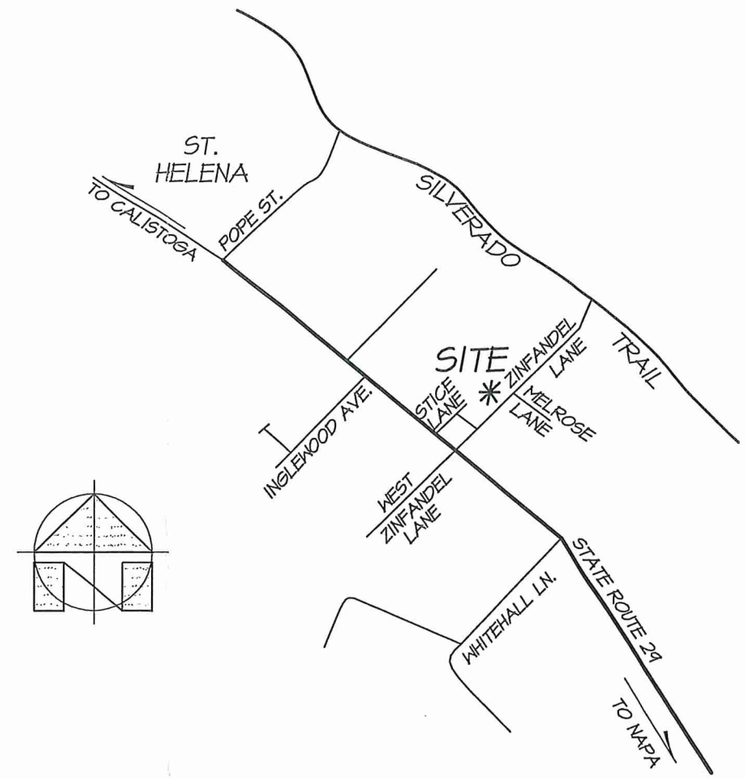

LOCATION MAP

NO SCALE

OVERALL SITE MAP

SCALE: 1" = 100'

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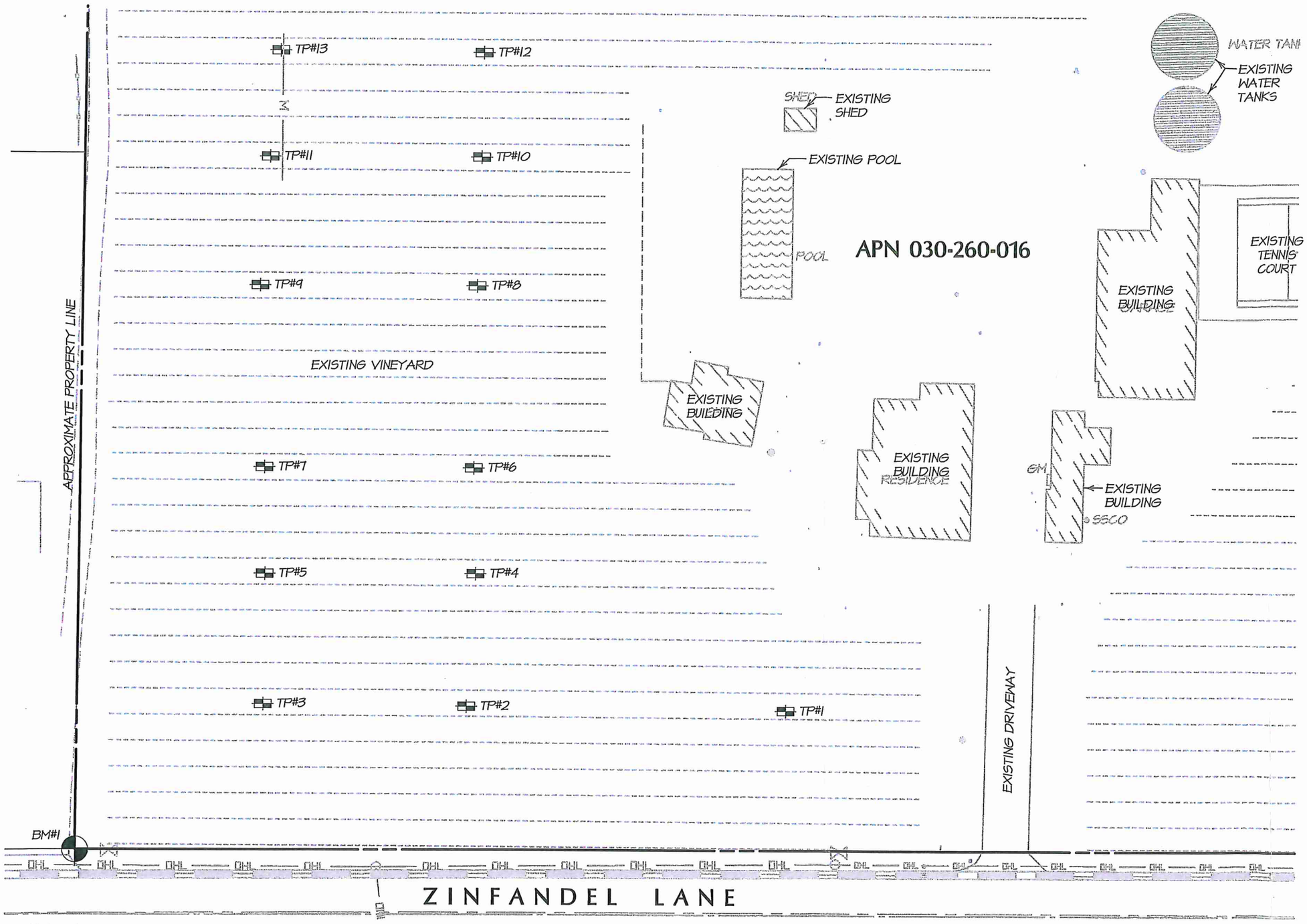
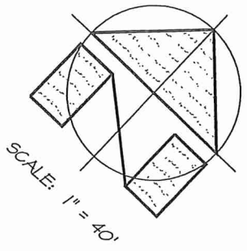
(707) 258-1301 · fax (707) 258-2926

Wheeler Winery
588 Zinfandel Lane
St. Helena, CA
APN 030-260-016
Job No. 08-16
May 2009





TEST PIT #	NORTHING	EASTING
BM#1	1,939,144.67	6,436,317.34
1	1,939,371.15	6,436,479.77
2	1,939,288.17	6,436,389.37
3	1,939,235.00	6,436,331.63
4	1,939,327.38	6,436,358.14
5	1,939,271.69	6,436,297.70
6	1,939,356.30	6,436,328.56
7	1,939,301.17	6,436,269.44
8	1,939,407.91	6,436,281.40
9	1,939,350.61	6,436,220.15
10	1,939,445.00	6,436,248.43
11	1,939,389.14	6,436,188.71
12	1,939,474.65	6,436,221.40
13	1,939,421.38	6,436,163.51

TEST PIT EXPLORATION NOTES:

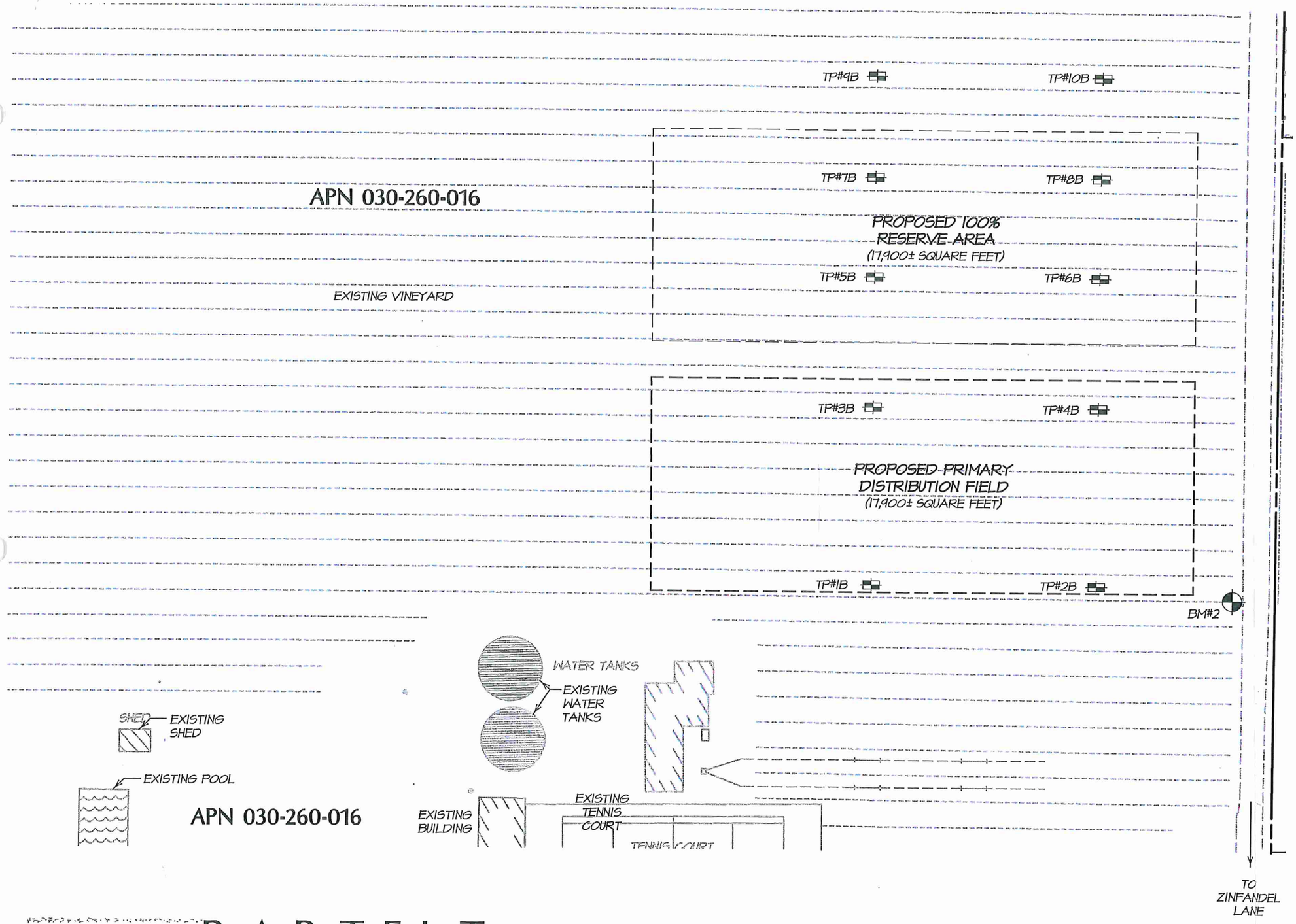
TEST PITS #1 THROUGH #13 WERE EXCAVATED BY BRUCE SAKAI GENERAL ENGINEERING ON NOVEMBER 14, 2008 AND WITNESSED BY A REPRESENTATIVE FROM BARTELT ENGINEERING AND NAPA COUNTY DEPARTMENT OF ENVIRONMENTAL MANAGEMENT.

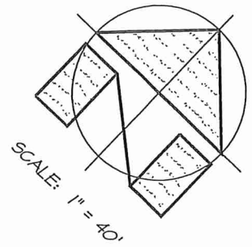
TEST PIT LOCATION MAP

SCALE: 1" = 40'

BARTELT engineering
civil engineering · land planning
1303 jefferson street, 200 B, napa, ca 94559
(707) 258-1301 · fax (707) 258-2926

Wheeler Winery
588 Zinfandel Lane
St. Helena, CA
APN 030-260-016
Job No. 08-16
May 2009





TEST PIT #	NORTHING	EASTING
BM#2	1,939,871.50	6,436,603.05
1B	1,939,784.09	6,436,495.49
2B	1,939,844.84	6,436,560.53
3B	1,939,834.96	6,436,447.98
4B	1,939,895.71	6,436,513.03
5B	1,939,872.31	6,436,413.09
6B	1,939,933.06	6,436,478.13
7B	1,939,901.00	6,436,386.29
8B	1,939,961.75	6,436,451.33
9B	1,939,930.00	6,436,359.20
10B	1,939,990.75	6,436,424.24

NOTE:

BENCHMARK LOCATION: VINEROW #35 ENDPOST

TEST PIT EXPLORATION NOTES:

TEST PITS #1B THROUGH #10B WERE EXCAVATED BY BRUCE SAKAI GENERAL ENGINEERING ON APRIL 3, 2009 AND WITNESSED BY A REPRESENTATIVE FROM BARTELT ENGINEERING AND NAPA COUNTY DEPARTMENT OF ENVIRONMENTAL MANAGEMENT.

BARTELT engineering
civil engineering · land planning
1303 jefferson street, 200 B, napa, ca 94559
(707) 258-1301 · fax (707) 258-2926

TEST PIT LOCATION MAP

SCALE: 1" = 40'

Wheeler Winery
588 Zinfandel Lane
St. Helena, CA
APN 030-260-016
Job No. 08-16
May 2009

Napa County Department of
Environmental Management

SITE EVALUATION REPORT

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

Permit #: E09-00029
APN: 030-260-016
(County Use Only) Reviewed by: Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner Kohala Investment Works, LLC c/o Duane Kanuha	☒ New Construction ☐ Addition ☒ Remodel ☐ Relocation ☐ Other:
Property Owner Mailing Address 101 Aupuni Street	☒ Residential - # of Bedrooms: 5 Design Flow : 750 gpd
City State Zip Hilo Hawaii 96721	☒ Commercial – Type: Winery Sanitary Waste: 720 gpd Process Waste: 1,667 gpd
Site Address/Location 588 Zinfandel Lane, St. Helena, CA	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name Bartelt Engineering	Evaluator's Name Paul N. Bartelt, P.E.	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
Mailing Address: 1303 Jefferson Street, 200 B		Telephone Number (707) 258-1301
City State Zip Napa CA 94559		Date Evaluation Conducted April 3, 2009

Primary Area See below	Expansion Area See below
Acceptable Soil Depth: 54 in. Test pit #'s: 1B, 2B, 3B & 4B Soil Application Rate (gal. /sq. ft. /day): STE 0.8	Acceptable Soil Depth: 54 in. Test pit #' : 5B, 6B, 7B, 8B, 9B & 10B Soil Application Rate (gal. /sq. ft. /day): STE 0.8
System Type(s) Recommended: Pressure Distribution	System Type(s) Recommended: Pressure Distribution
Slope: 0-2 %. Distance to nearest water source: 100 ft.+	Slope: 0-2 %. Distance to nearest water source: 100 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 ☒ Yes ☐ (attach results)

Site constraints/Recommendations:

See Septic System Feasibility Study prepared by Bartelt Engineering dated April 24, 2009 for septic system recommendations.

Test Pit # 1B * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36		<15	L	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
36-64	D	<15	L	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 54 inches;
Assigned soil application rate = STE 0.8 / PTE 1.0 gal /sf/day for an alternative sewage treatment system.

Groundwater observed at 54 inches (10" of water). *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated April 8, 2009.

Test Pit # 2B

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-29		<15	L	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
29-70	D	<15	L	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 59 inches;
Assigned soil application rate = STE 0.8 / PTE 1.0 gal /sf/day for an alternative sewage treatment system.

Groundwater observed at 59 inches (11" of water).

Test Pit # 3B

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-28		<15	L	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
28-68	D	<15	L	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 59 inches;
Assigned soil application rate = STE 0.8 / PTE 1.0 gal /sf/day for an alternative sewage treatment system.

Groundwater observed at 59 inches (9" of water).

Test Pit # 4B *Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-38		<15	SL/SCL	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
38-65	D	<15	SL	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 54 inches;
Assigned soil application rate = STE 0.8 / PTE 1.0 gal /sf/day for an alternative sewage treatment system.

Groundwater observed at 54 inches (11" of water). *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated April 8, 2009.

Test Pit # 5B

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-37		<15	L	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
37-69	D	<15	L	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 54 inches;
Assigned soil application rate = STE 0.8 / PTE 1.0 gal /sf/day for an alternative sewage treatment system.

Groundwater observed at 54 inches (15" of water).

Test Pit # 6B * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-32		<15	L	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
32-67	D	<15	L	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 55 inches;
Assigned soil application rate = STE 08/ PTE 1.0 gal /sf/day for an alternative sewage treatment system.

Groundwater observed at 55 inches (12" of water). *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated April 8, 2009.

Test Pit # 7B * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-28		<15	L	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
28-35	G	15-30	LS	G	S	FRB	SS	MF	FF/FM	None
35-67	G	<15	L	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 56 inches;
Assigned soil application rate = STE 0.8 / PTE 1.0 gal /sf/day for an alternative sewage treatment system.

Groundwater observed at 56 inches (11" of water). *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated April 8, 2009.

Test Pit # 8B * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-29		<15	SCL	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
29-68	D	<15	L	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 55 inches;
Assigned soil application rate = STE 0.8 / PTE 1.0 gal /sf/day for an alternative sewage treatment system.

Groundwater observed at 55 inches (13" of water). *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated April 8, 2009.

Test Pit # 9B * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-21		<15	SL	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
21-38	D	15-30	LS	G	S	FRB	SS	MF	FF/FM	None
38-70		<15	SL	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 56 inches;
Assigned soil application rate = STE 0.8 / PTE 1.0 gal /sf/day for an alternative sewage treatment system.

Groundwater observed at 56 inches (14" of water). *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated April 8, 2009.

Test Pit # 10B * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-23		<15	SL	SSB	SH	FRB	SS	MVF/FM	FC/MM/ MF	None
23-72	D	<15	L	SSB	SH	FRB	SS	MVF/MF	FVF	None

Slope = 0-2 %. Acceptable soil depth to limiting condition: 56 inches;
Assigned soil application rate = STE 0.8 / PTE 1.0 gal /sf /day for an alternative sewage treatment system.

Groundwater observed at 56 inches (16" of water). *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated April 8, 2009.

Table of Abbreviations

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

Attach additional sheets as needed

Alternative Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2 /day)	
	Shape	Grade	STE[1]	PTE[1,2]
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	1.0	1.2
Fine Sand, Loamy Fine Sand	Single grain	Structureless	0.6	1.0
Sandy Loam, Loamy Sand	Massive	Structureless	0.35	0.5
	Platy	Weak	0.35	0.5
	Prismatic, blocky, granular	Weak	0.5	0.75
		Moderate, Strong	0.8	1.0
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.5	0.75
		Strong	0.8	1.0
Sandy Clay, Silty Clay Loam, Clay Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.35	0.5
		Strong	0.6	0.75
Clay, Silty Clay	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak		
		Moderate, strong	0.2	0.25

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

MINIMUM SURFACE AREA GUIDELINES TO DISPOSE OF 100 GPD OF SECONDARY TREATED EFFLUENT FOR SUBSURFACE DRIP DISPERSAL SYSTEMS

		Soil Absorption Rates		Design Application Rate (Gal/ft^2/day)	Total Area Required Sq. ft./100 gallons per day
Soil Class	Soil Type	Est. Soil Perc. Rate minutes/inch	Hydraulic Conductivity inches/hour		
I	Coarse sand	1 – 5	>2	1.400	71.5
I	Fine sand	5 – 10	1.5 – 2	1.200	83.3
II	Sandy loam	10 – 20	1.0 – 1.5	1.000	100.0
II	Loam	20 – 30	0.75 – 1.0	0.700	143.0
III	Clay loam	30 – 45	0.5 – 0.75	0.600	167.0
III	Silt - clay loam	45 – 60	0.3 – 0.5	0.400	250.0
IV	Clay non-swell	60 – 90	0.2 – 0.3	0.200	500.0
IV	Clay - swell	90 – 120	0.1 – 0.2	0.100	1000.0

1. For design purpose, the "Soil Type" category to be used in the above table shall be based on the most restrictive soil type encountered within two feet below the bottom of the drip line.
2. Dispersal field area calculation: Total square feet area of dispersal field = Design flow divided by loading rate.

Conventional Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2 /day)
	Shape	Grade	STE
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	Prohibited
Sandy Loam, Loamy Sand	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.33
		Moderate, strong	0.5
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.25
		Moderate, Strong	0.33
Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	0.25
		Strong	0.33
Sandy Clay, Silty Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	Prohibited
		Strong	0.25
Clay, Silty Clay	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak	Prohibited
		Moderate, strong	Prohibited

CONVENTIONAL SEWAGE TREATMENT SYSTEM SOIL APPLICATION RATES BASED ON PERCOLATION RATES	
Percolation Rate (mpi)	Application Rate (STE)
< 5 MPI	Prohibited
5 to 10 MPI	0.5
10-20 MPI	0.33
20-60 MPI	0.25
60 MPI	Prohibited

Experience is the difference

April 8, 2009
File: 9147.13

Bartelt Engineering
1339 Pearl Street, Suite 205
Napa, CA 94559

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
58 ZINFANDEL

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on April 3, 2009

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

Size/Density	TP-1 HORIZON-1
+#10 Sieve	3.9 %
Sand	47.0 %
Clay	22.8 %
Silt	30.2 %
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

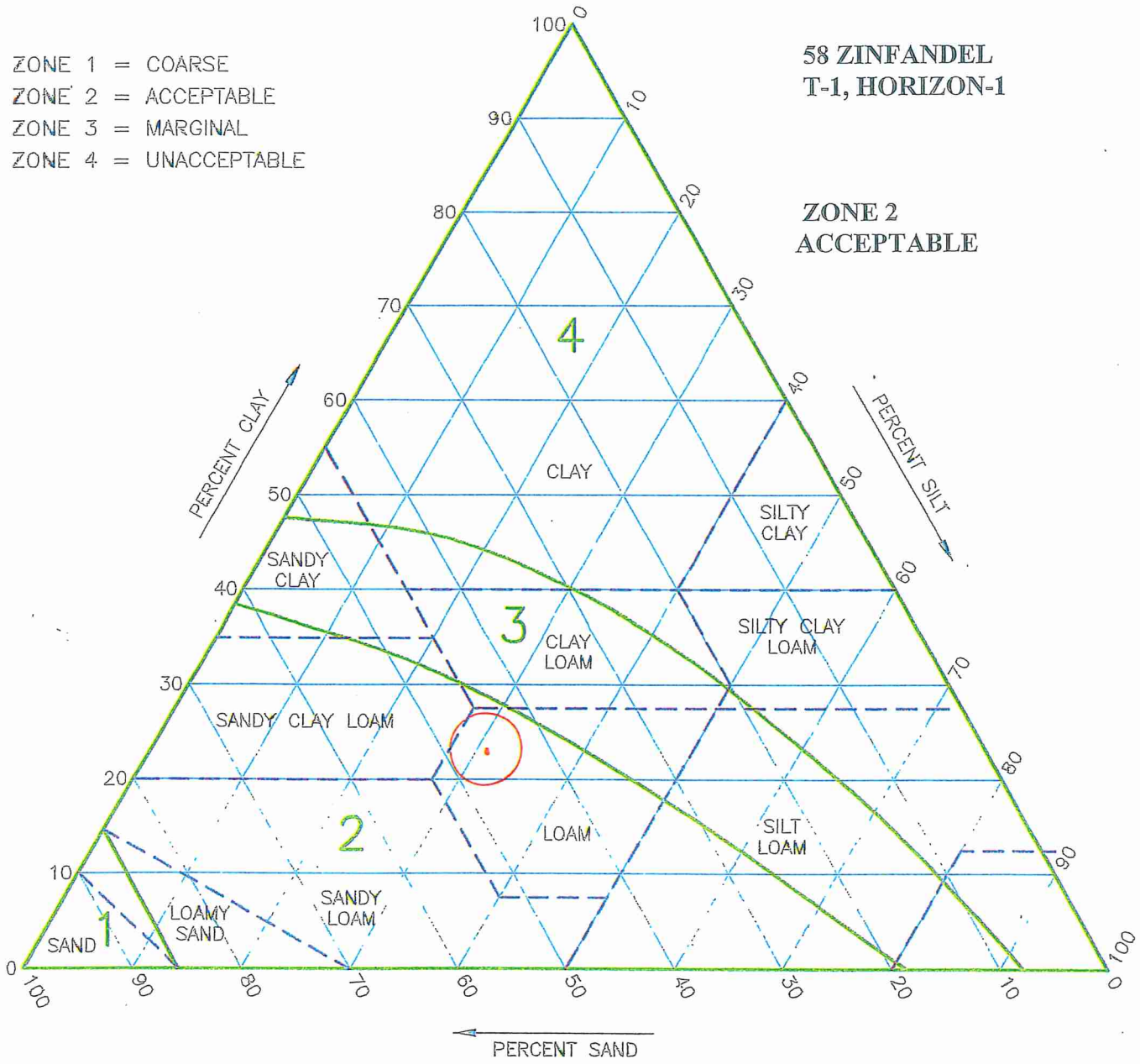
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

58 ZINFANDEL
T-1, HORIZON-1

ZONE 2
ACCEPTABLE



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

Size/Density	TP-10 HORIZON-2
+ #10 Sieve	4.7 %
Sand	46.8 %
Clay	19.0 %
Silt	34.2 %
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

Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

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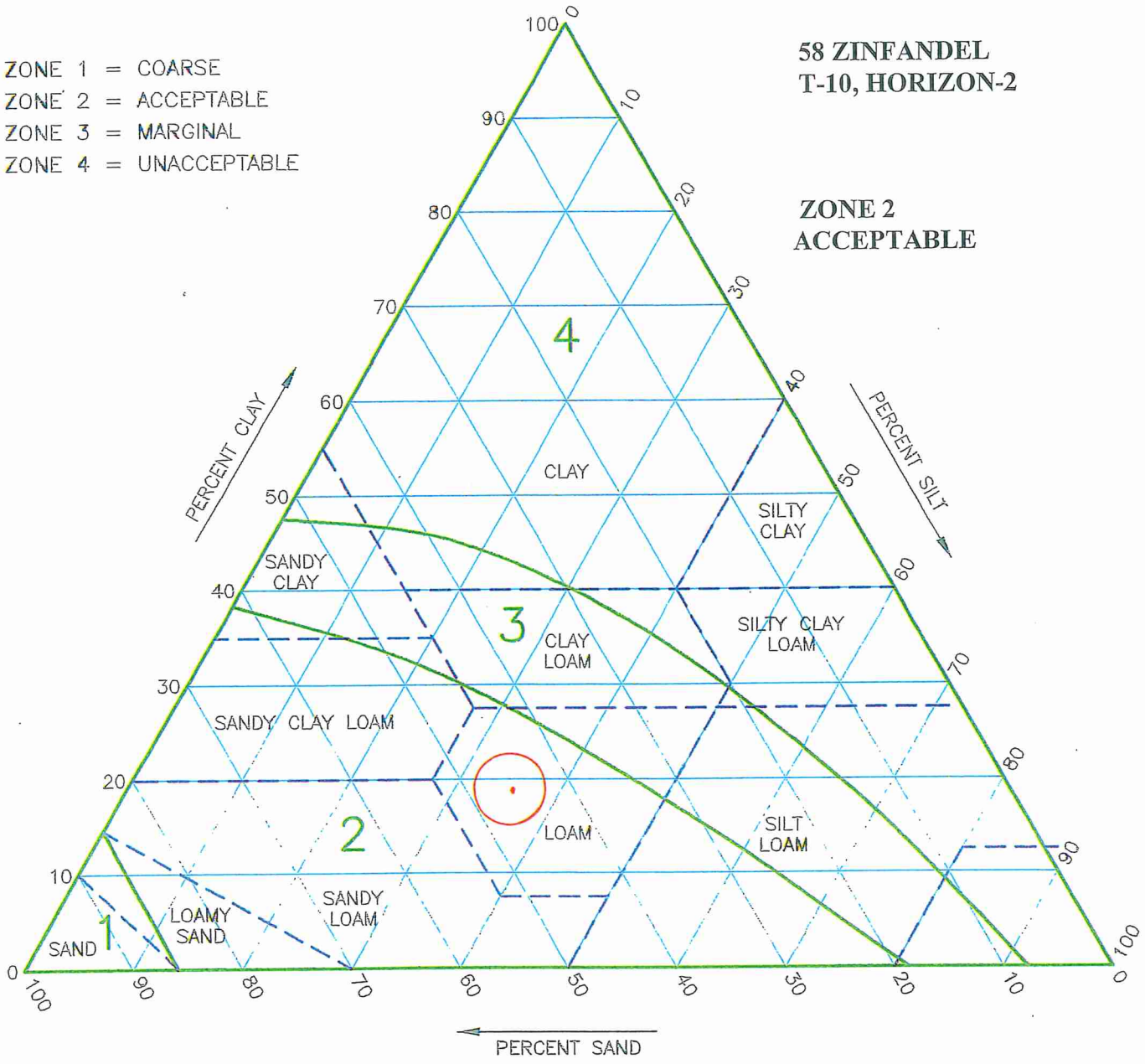
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

58 ZINFANDEL
T-10, HORIZON-2

ZONE 2
ACCEPTABLE



Instructions:

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

Size/Density	TP-10 HORIZON-1
+ #10 Sieve	10.6 %
Sand	56.6 %
Clay	18.8 %
Silt	24.6 %
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

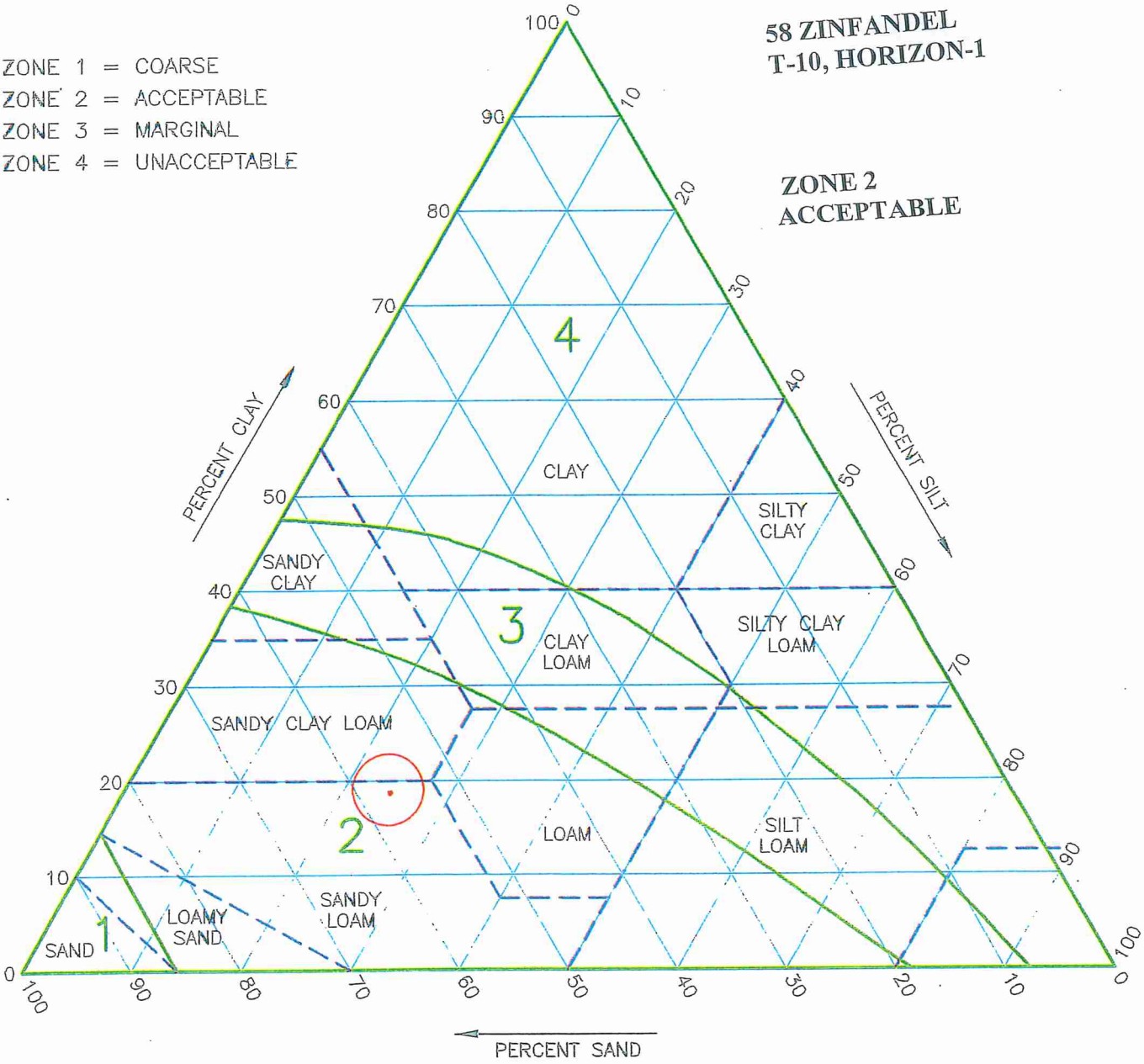
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

58 ZINFANDEL
T-10, HORIZON-1

ZONE 2
ACCEPTABLE



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.

Experience is the difference

April 8, 2009
File: 9147.13

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1339 Pearl Street, Suite 205
Napa, CA 94559

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Bouyoucos Hydrometry Method
58 ZINFANDEL

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This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on April 3, 2009

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

Size/Density	TP-9 HORIZON-3
+#10 Sieve	23.3 %
Sand	55.8 %
Clay	16.0 %
Silt	28.2 %
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

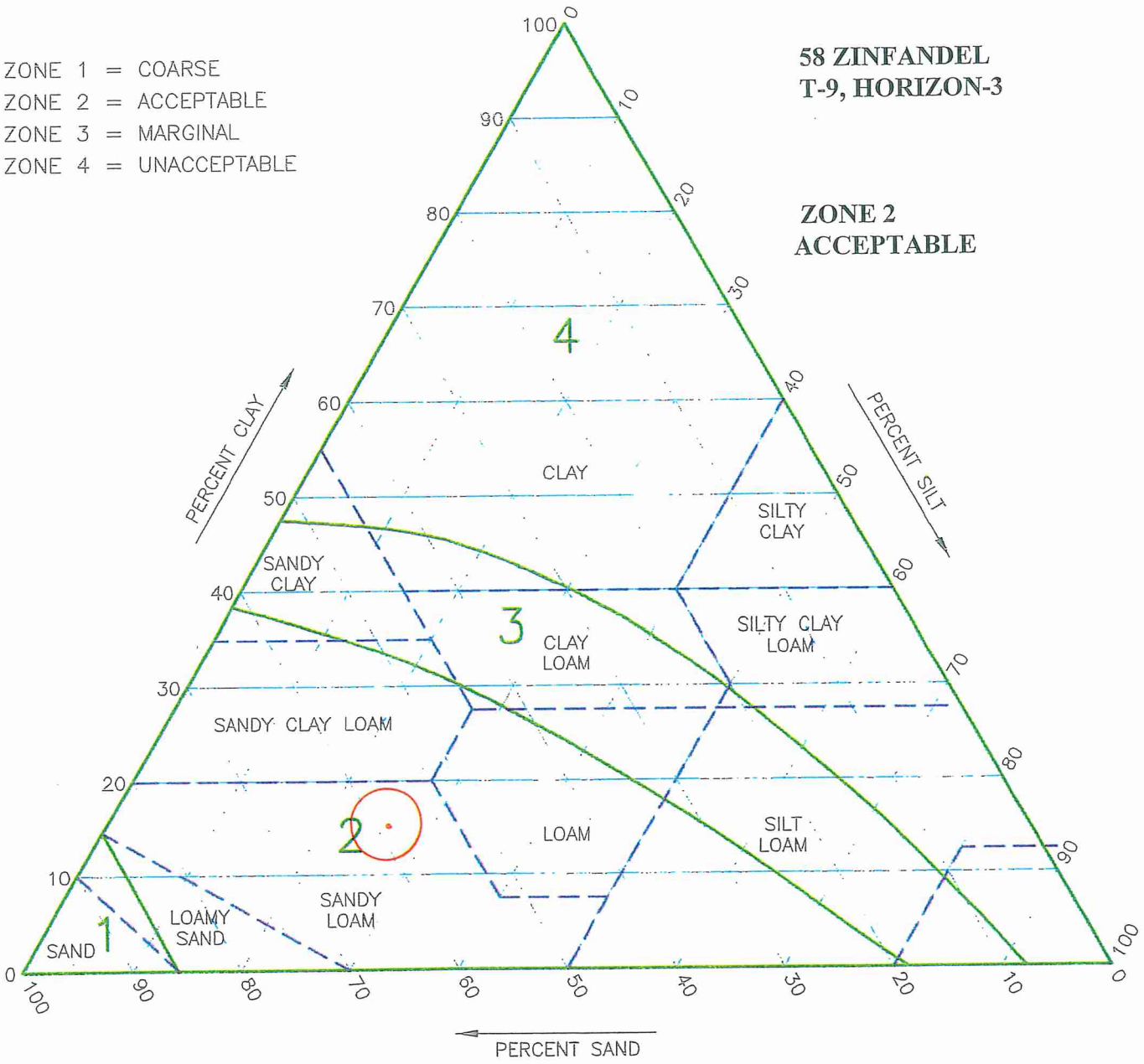
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

58 ZINFANDEL
T-9, HORIZON-3

ZONE 2
ACCEPTABLE



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.

RGH CONSULTANTS

Experience is the difference

April 8, 2009
File: 9147.13

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1339 Pearl Street, Suite 205
Napa, CA 94559

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Soil Texture Analysis by
Bouyoucos Hydrometry Method
58 ZINFANDEL

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This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on April 3, 2009

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

Size/Density	TP-9 HORIZON-2
+#10 Sieve	71.0 %
Sand	85.8 %
Clay	8.0 %
Silt	6.2 %
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

Tarance E. McCue

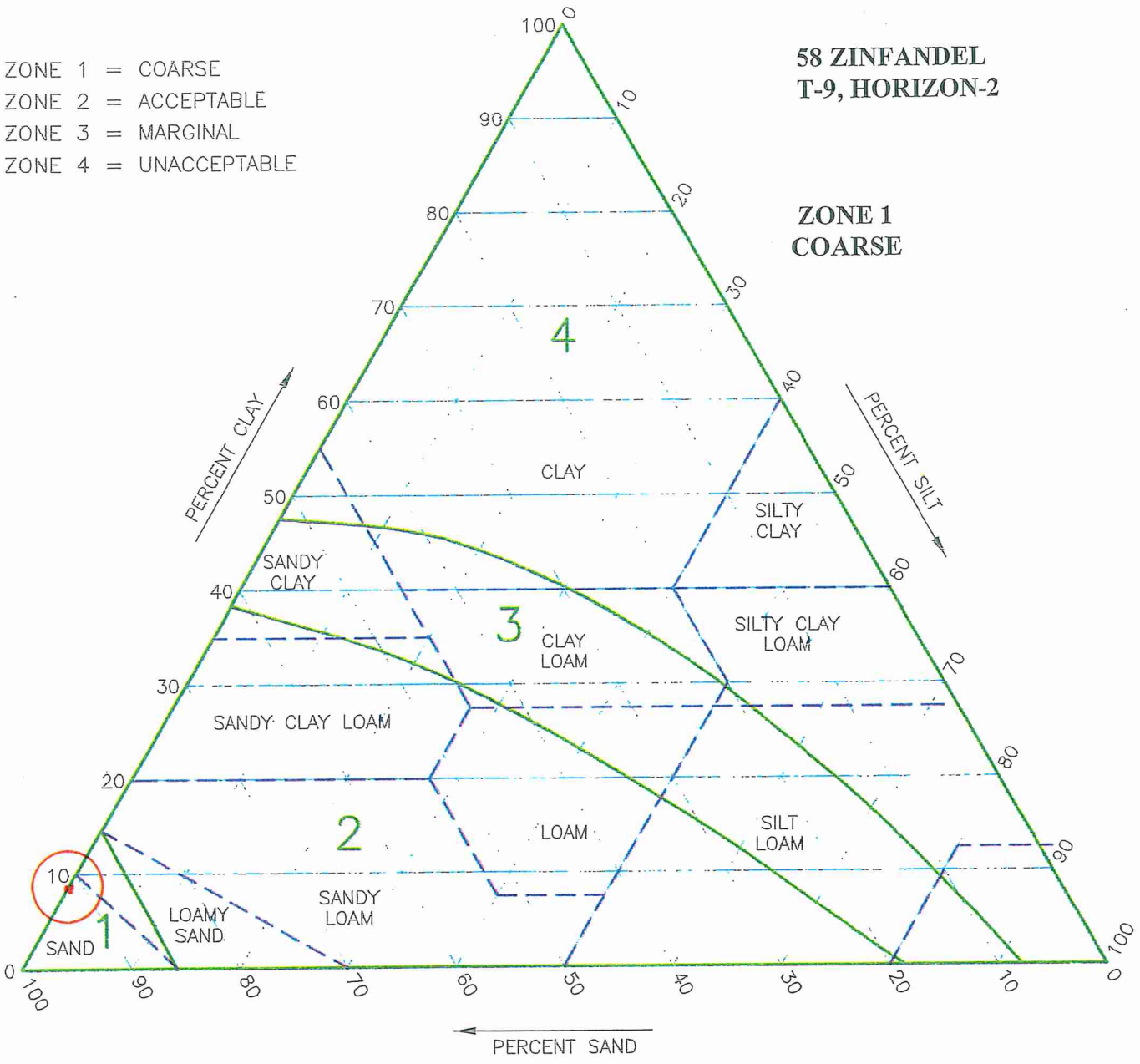
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

58 ZINFANDEL
T-9, HORIZON-2

ZONE 1
COARSE



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.

RGH CONSULTANTS

Experience is the difference

April 8, 2009
File: 9147.13

Bartelt Engineering
1339 Pearl Street, Suite 205
Napa, CA 94559

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
58 ZINFANDEL

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on April 3, 2009

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

Size/Density	TP-9 HORIZON-1
+#10 Sieve	21.9 %
Sand	53.8 %
Clay	18.0 %
Silt	27.2 %
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

Tarance E. McCue

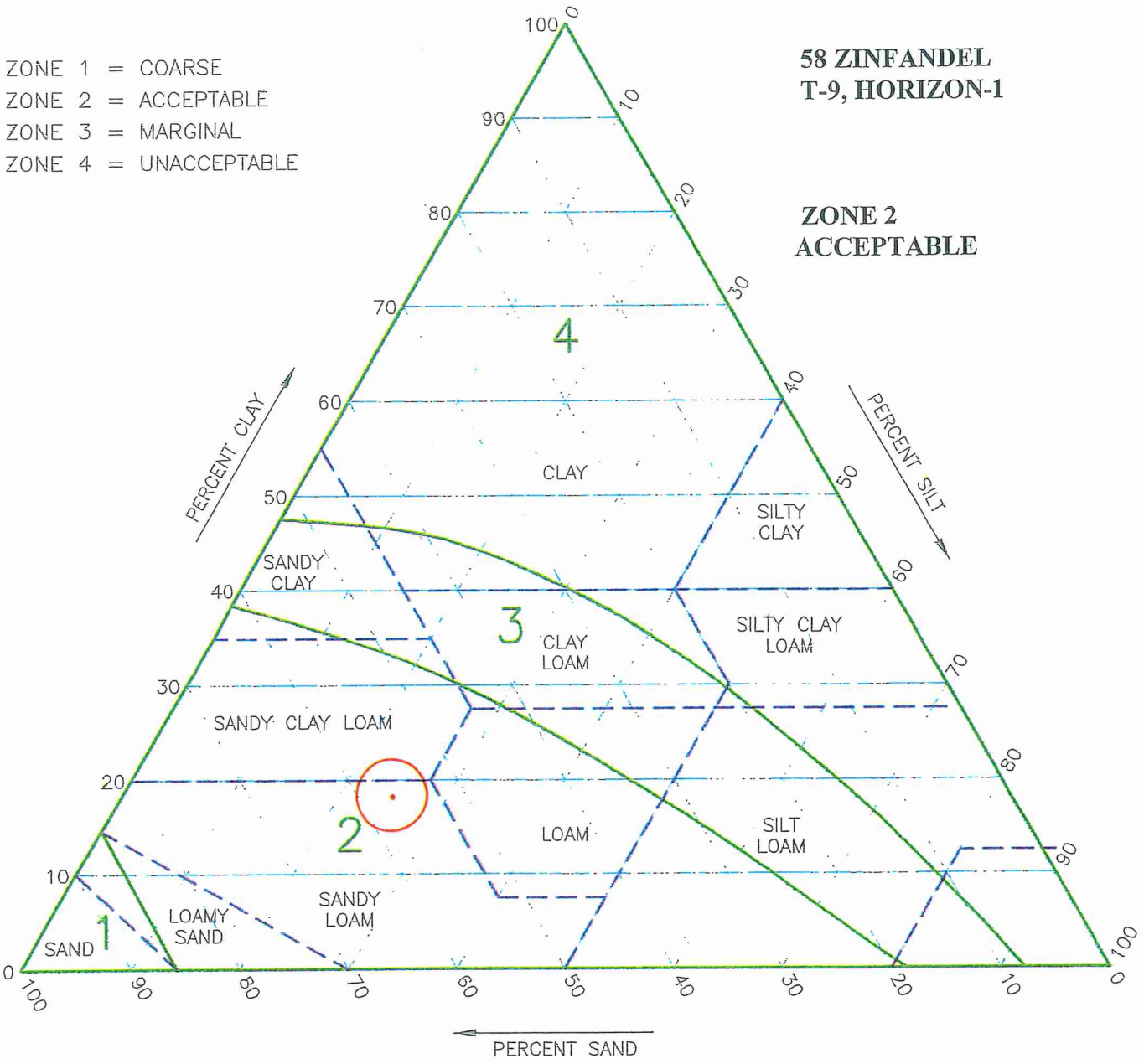
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

58 ZINFANDEL
T-9, HORIZON-1

ZONE 2
ACCEPTABLE



Instructions:

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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:

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RGH CONSULTANTS

Experience is the difference

April 8, 2009
File: 9147.13

Bartelt Engineering
1339 Pearl Street, Suite 205
Napa, CA 94559

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
58 ZINFANDEL

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on April 3, 2009

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

Size/Density	TP-8 HORIZON-2
+ #10 Sieve	1.0 %
Sand	45.8 %
Clay	18.0 %
Silt	36.2 %
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

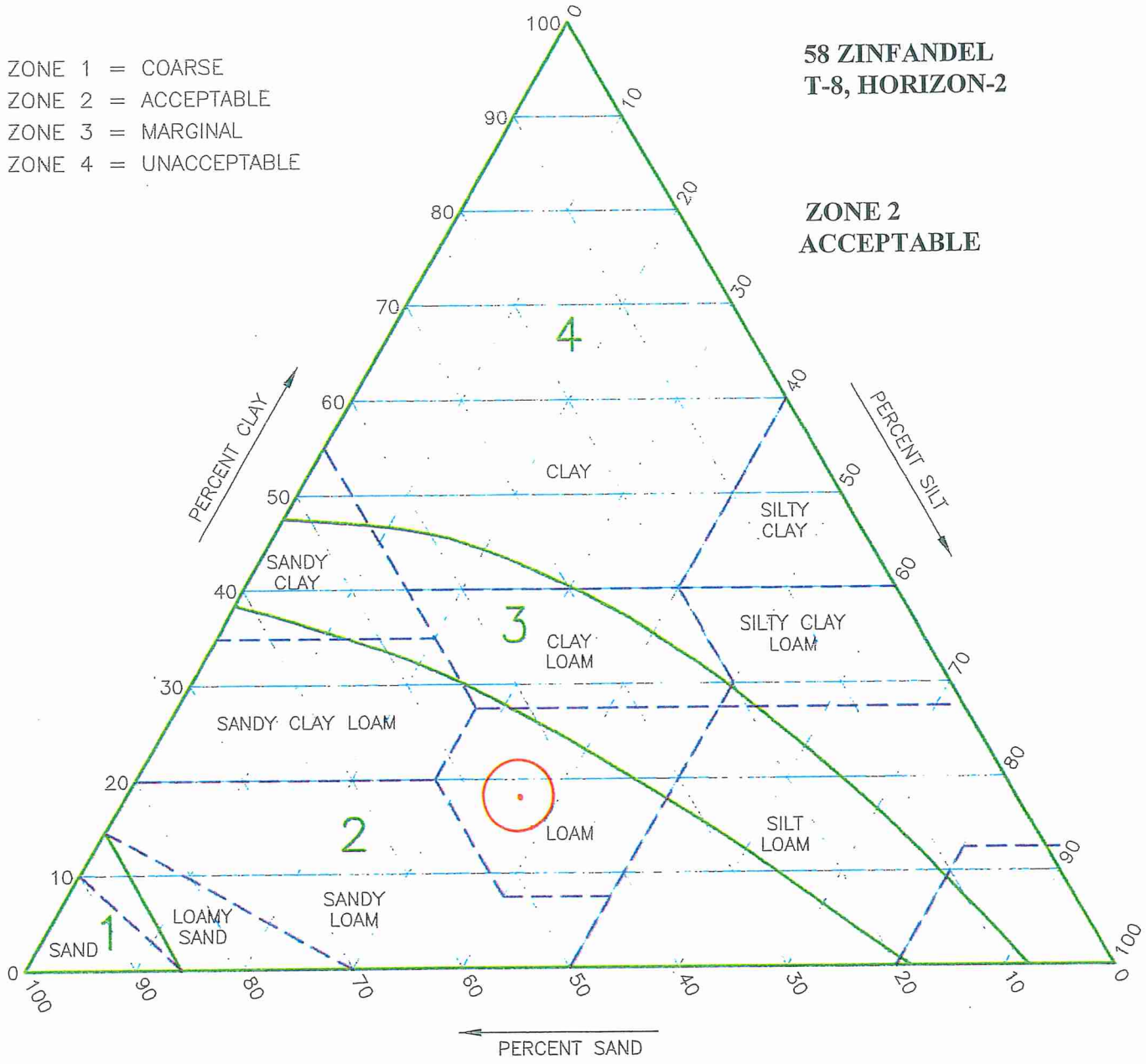
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

58 ZINFANDEL
T-8, HORIZON-2

ZONE 2
ACCEPTABLE



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RGH CONSULTANTS

Experience is the difference

April 8, 2009
File: 9147.13

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1339 Pearl Street, Suite 205
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Soil Texture Analysis by
Bouyoucos Hydrometry Method
58 ZINFANDEL

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on April 3, 2009

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

Size/Density	TP-8 HORIZON-1
+ #10 Sieve	9.0 %
Sand	55.6 %
Clay	21.0 %
Silt	23.4 %
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

Tarance E. McCue

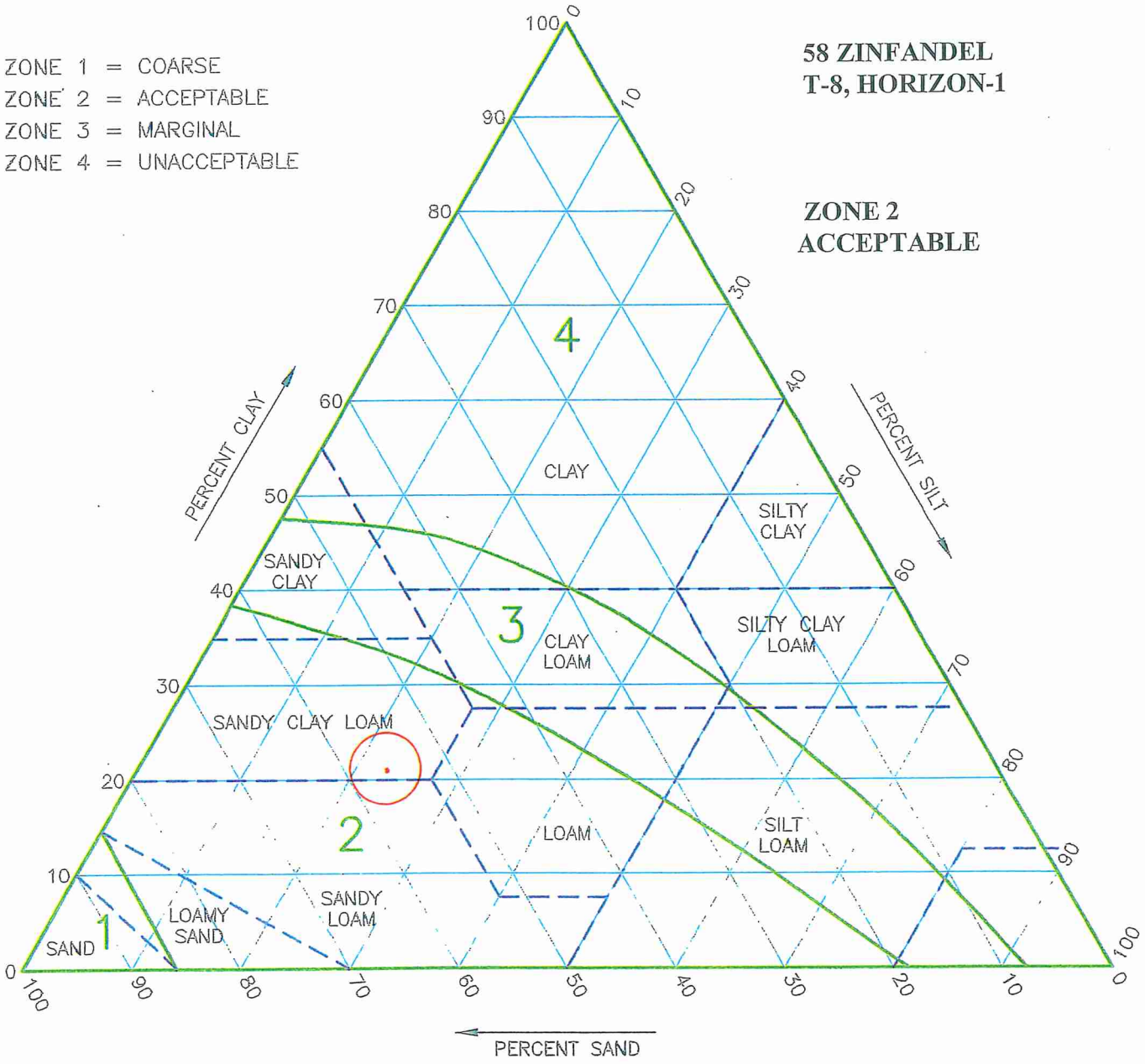
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

58 ZINFANDEL
T-8, HORIZON-1

ZONE 2
ACCEPTABLE



Instructions:

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RGH CONSULTANTS

Experience is the difference

April 8, 2009
File: 9147.13

Bartelt Engineering
1339 Pearl Street, Suite 205
Napa, CA 94559

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
58 ZINFANDEL

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on April 3, 2009

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

Size/Density	TP-7 HORIZON-2
+ #10 Sieve	75.2 %
Sand	91.8 %
Clay	4.0 %
Silt	4.2 %
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

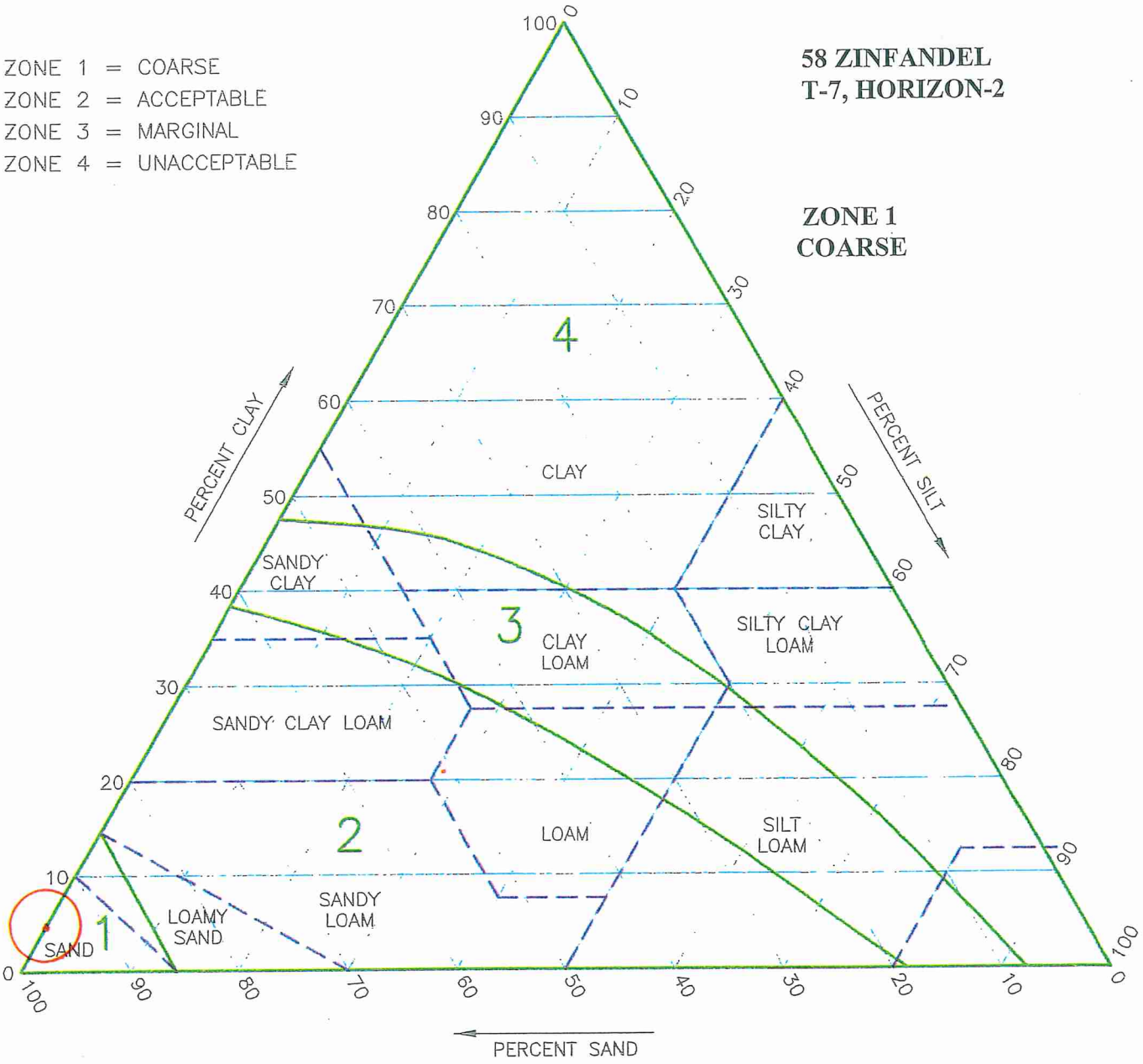
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

58 ZINFANDEL
T-7, HORIZON-2

ZONE 1
COARSE



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.
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Experience is the difference

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1339 Pearl Street, Suite 205
Napa, CA 94559

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Soil Texture Analysis by
Bouyoucos Hydrometry Method
58 ZINFANDEL

Dear Mr. Bartelt:

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

Size/Density	TP-6 HORIZON-2
+ #10 Sieve	5.0 %
Sand	50.6 %
Clay	19.0 %
Silt	30.4 %
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

Tarance E. McCue

Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

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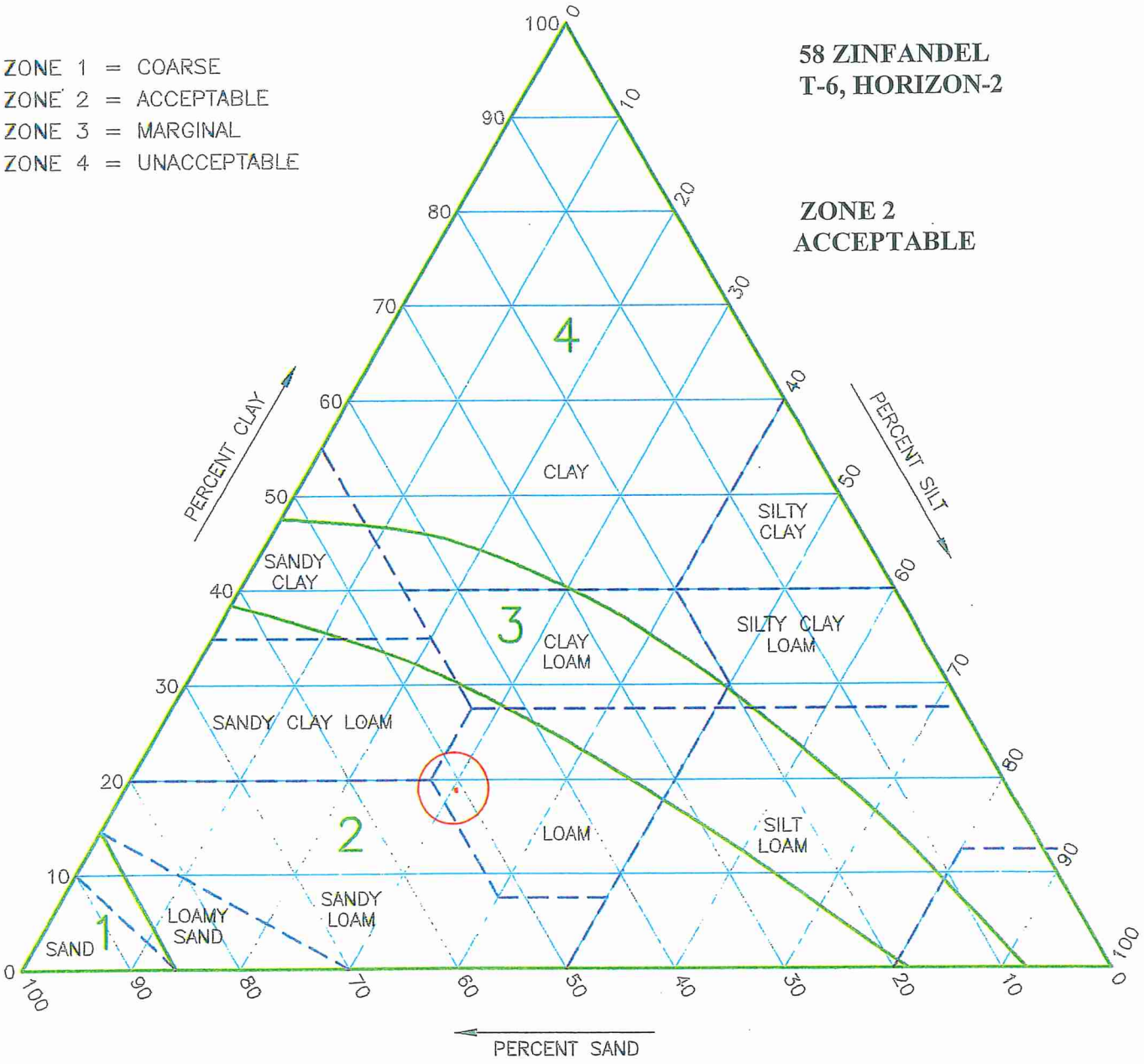
58 ZINFANDEL
T-6, HORIZON-2

ZONE 2
ACCEPTABLE



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

Size/Density	TP-6 HORIZON-1
+ #10 Sieve	10.8 %
Sand	50.8 %
Clay	20.0 %
Silt	29.2 %
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

Tarance E. McCue

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Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

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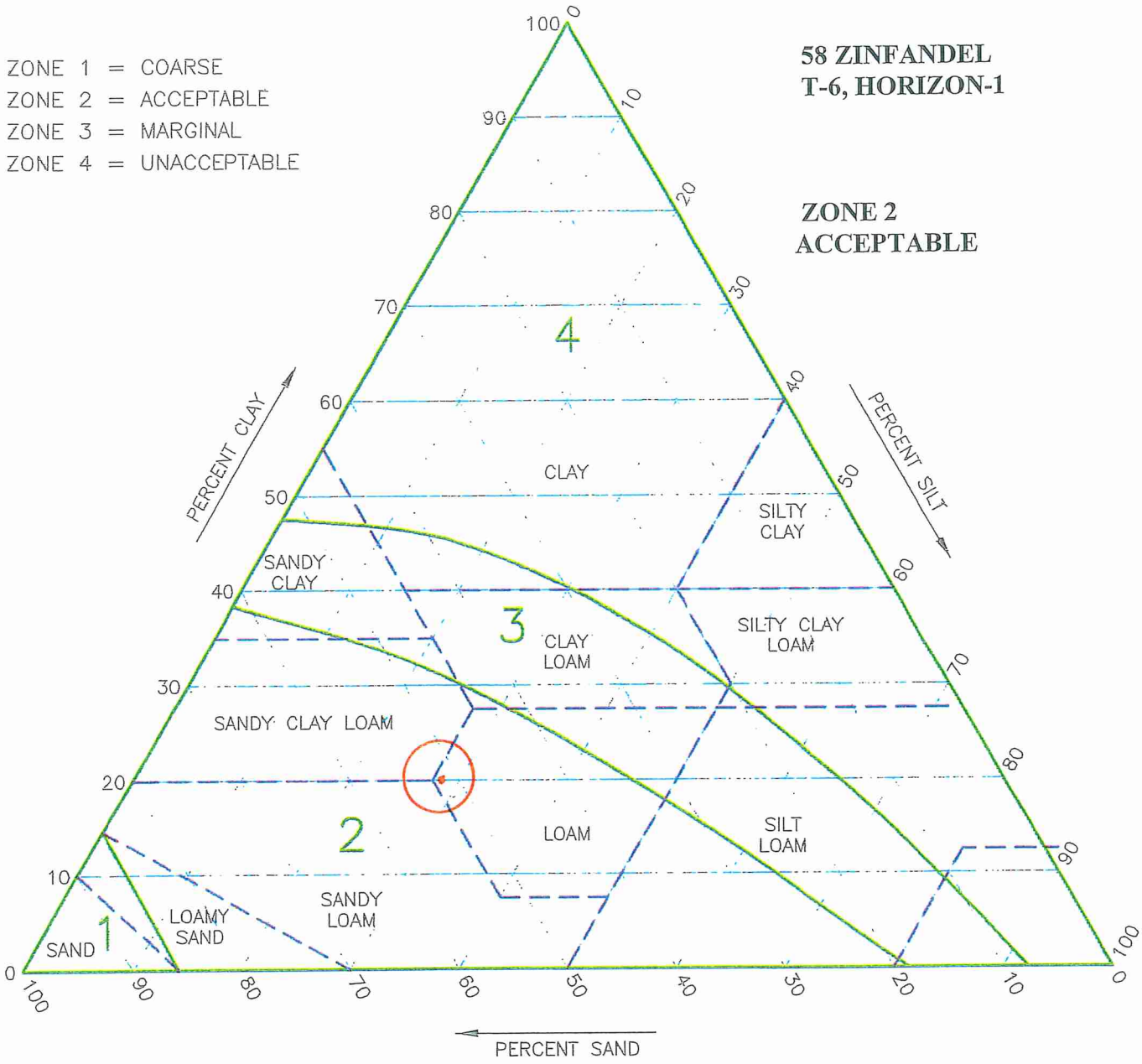
58 ZINFANDEL
T-6, HORIZON-1

ZONE 2
ACCEPTABLE



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

Size/Density	TP-4 HORIZON-2
+ #10 Sieve	5.1 %
Sand	56.8 %
Clay	16.0 %
Silt	27.2 %
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

Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

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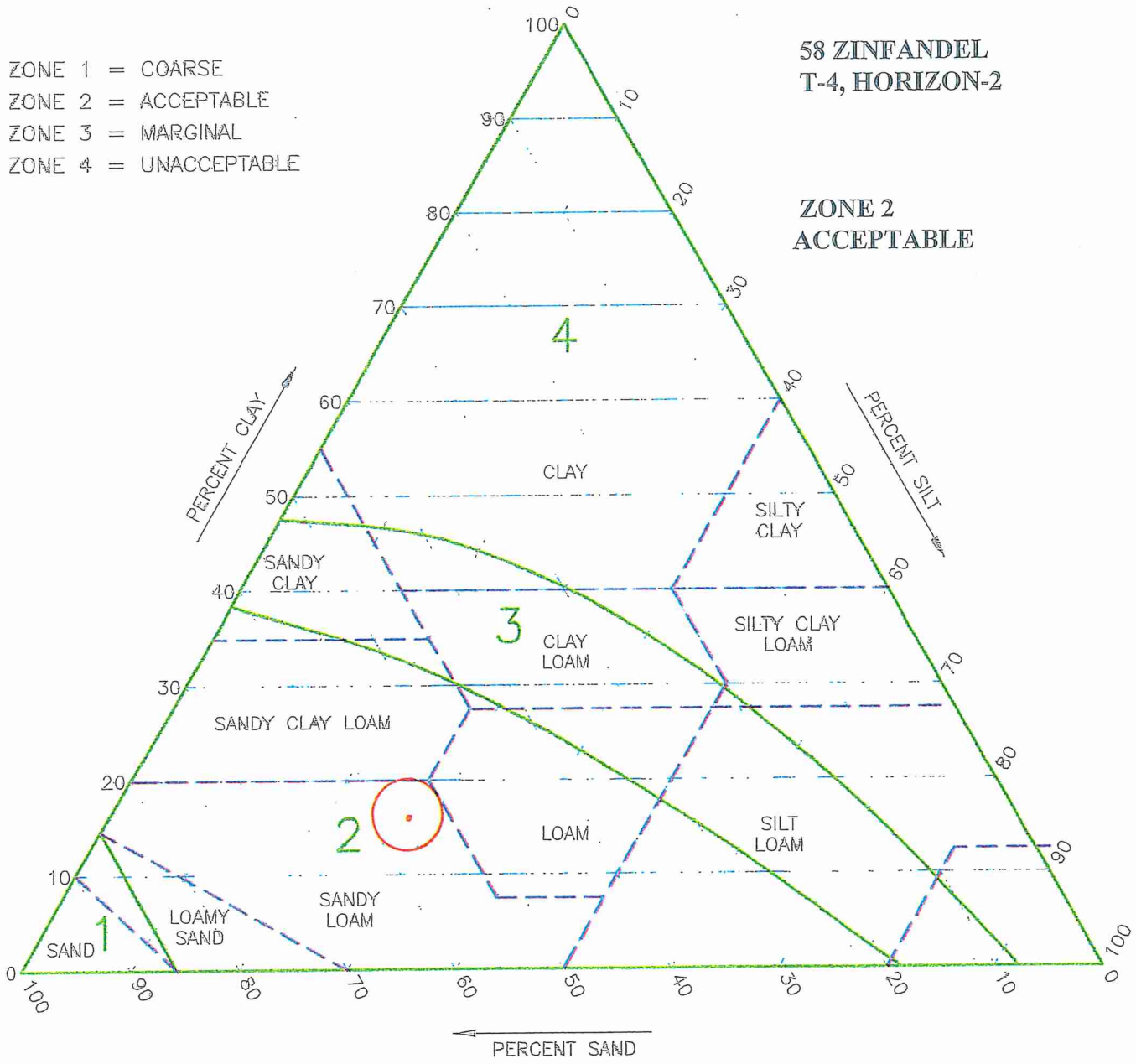
58 ZINFANDEL
T-4, HORIZON-2

ZONE 2
ACCEPTABLE



Instructions:

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

Size/Density	TP-4 HORIZON-1
+#10 Sieve	8.4 %
Sand	55.0 %
Clay	19.8 %
Silt	25.2 %
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

Tarance E. McCue

Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

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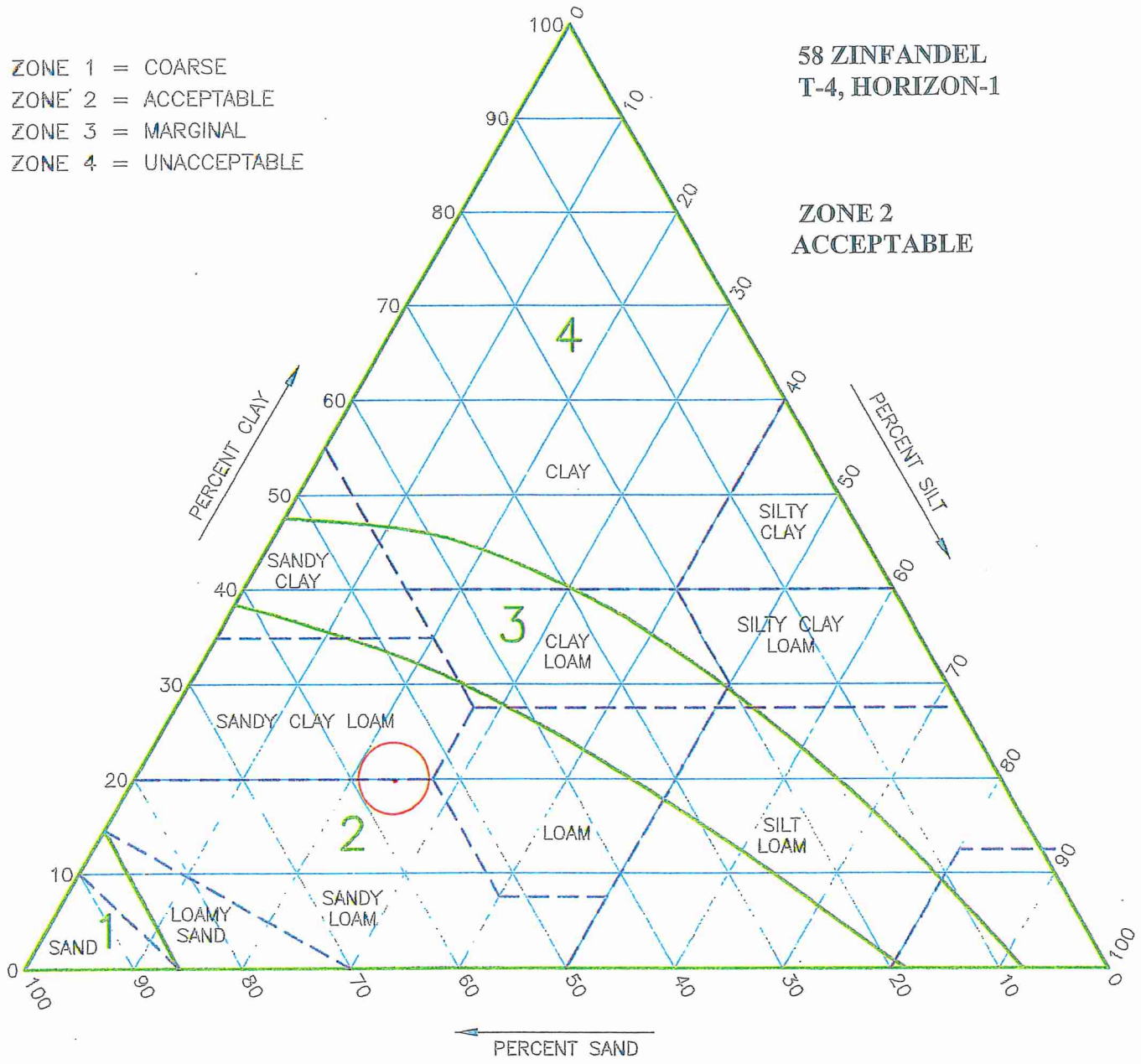
58 ZINFANDEL
T-4, HORIZON-1

ZONE 2
ACCEPTABLE



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

Size/Density	TP-1 HORIZON-2
+ #10 Sieve	1.1 %
Sand	41.0 %
Clay	23.8 %
Silt	35.2 %
Db g/cc	--

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

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Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

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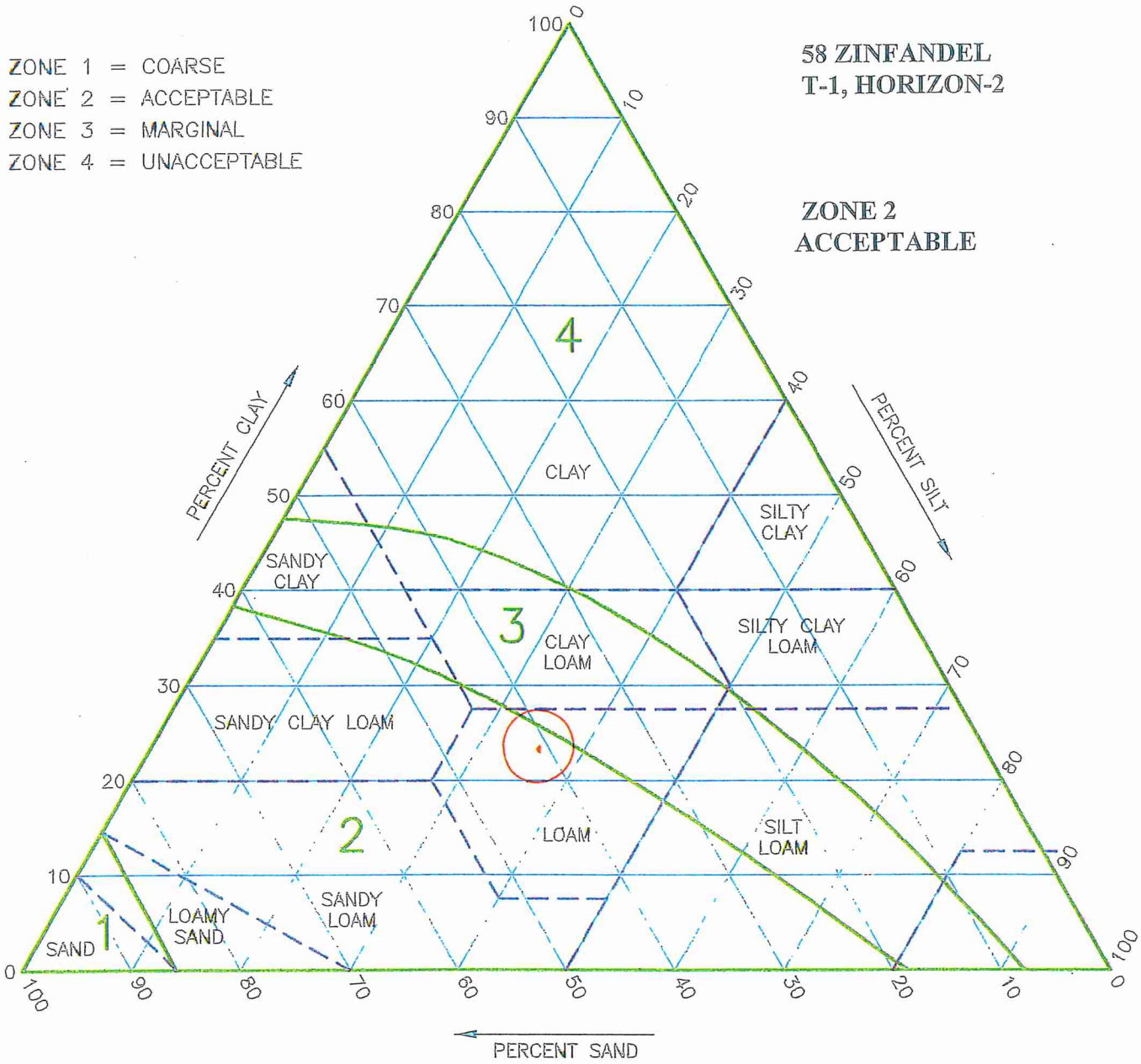
58 ZINFANDEL
T-1, HORIZON-2

ZONE 2
ACCEPTABLE



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RGH CONSULTANTS

Experience is the difference

BOUYOCOUS HYDROMETER (Red)

CLIENT Bartelt JOB NAME 588 Zinfandel JOB# 0816

SAMPLE NUMBER	TP-10 (8)						
DEPTH	Hor 2						
A. Oven dry wt. (grams)	50g						
B. Starting Time (hr: min: sec:)	1057						
C. Temp. @ 40 sec. (degrees F)	66.0						
D. Hydro reading @ 40 sec. (gm/l)	33.5						
E. Composite Corr. (gm/l)	6.9						
F. True Density @ 40 sec. (gm/l) D-E ●	26.6						
G. Temp. @ 2 hrs. (degrees F)	65.4						
H. Hydro reading @ 2 hrs. (gm/l)	16.5						
I. Composite Corr. (gm/l)	-7.0						
J. True Density @ 2 hrs. (gm/l) H-I ●	9.5						
K. % Sand = 100 – [(F/A) x 100]	46.8						
L. % Clay = [(J/A) x 100]	19.0						
M. % Silt = 100-(K+L)	34.2						
N. % No. 10 =	4.7						

Cup Number	B-21						
Dry Before Wash + Tare	813.8						
Dry After Wash + Tare	132.3						
Dry Wt. Passing #10	691.5						
Tare Weight	98.6						
Dry Wt. Before Wash	715.2						
% Passing #10	95.3						
% #10	4.7						

RGH CONSULTANTS

Experience is the difference

Red

BOUYOCOUS HYDROMETER

CLIENT Bartelt JOB NAME 588 Zinfandel JOB# 0816

	①	②	③	④	⑤	⑥	⑦
SAMPLE NUMBER	TP-4	TP-6	TP-7	TP-8	TP-9	TP-9	TP-9
DEPTH	Hor-2	Hor 1	Hor-2	Hor-2	Hor-1	Hor-2	Hor 3
A. Oven dry wt. (grams)	50g	50.g	50g	50g	50g	50g	50g
B. Starting Time (hr: min: sec:)	1043	1045	1047	1049	1051	1053	1055
C. Temp. @ 40 sec. (degrees F)	65.4	66.0	66.2	66.0	66.0	66.0	66.0
D. Hydro reading @ 40 sec. (gm/l)	28.5	31.5	11.0	34.0	30.0	14.0	29.0
E. Composite Corr. (gm/l)	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9
F. True Density @ 40 sec. (gm/l) D-E ●	21.6	24.6	4.1	27.1	23.1	7.1	22.1
G. Temp. @ 2 hrs. (degrees F)	65.3	65.4	65.5	65.5	65.5	65.5	65.4
H. Hydro reading @ 2 hrs. (gm/l)	15.0	17.0	9.0	16.0	16.0	11.0	15.0
I. Composite Corr. (gm/l)	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0
J. True Density @ 2 hrs. (gm/l) H-I ●	8.0	10.0	2.0	9.0	9.0	4.0	8.0
K. % Sand = 100 – [(F/A) x 100]	56.8	50.8	91.8	45.8	53.8	85.8	55.8
L. % Clay = [(J/A) x 100]	16.0	20.0	4.0	18.0	18.0	8.0	16.0
M. % Silt = 100-(K+L)	27.2	29.2	4.2	36.2	27.2	6.2	28.2
N. % No. 10 =	5.1	10.8	75.2	1.0	21.9	71.0	23.3

Cup Number	B-2	B-7	B-18	B-17	R-1	B-16	B-14
Dry Before Wash + Tare	381.3	398.6	1460.6	875.8	668.1	1452.6	817.2
Dry After Wash + Tare	115.9	133.3	1123.6	110.5	225.4	1046.7	267.5
Dry Wt. Passing #10	265.4	265.3	337.0	765.3	442.7	385.9	549.7
Tare Weight	101.5	101.3	103.5	103.1	101.6	100.1	100.8
Dry Wt. Before Wash	279.8	297.3	1357.1	772.7	566.5	1332.5	716.4
% Passing #10	94.9	89.2	24.8	99.0	78.1	29.0	76.7
% #10	5.1	10.8	75.2	1.0	21.9	71.0	23.3

RGH CONSULTANTS

Experience is the difference

BOUYOCOUS HYDROMETER

CLIENT BARTELT ENG. JOB NAME SB ZIFANDEL JOB# _____

SAMPLE NUMBER		TP-10	TP-8	TP-6	TP-4	TP-1	TP-1
DEPTH		HOR-1	HOR-1	HOR-2	HOR-1	HOR 2	HOR 1
A. Oven dry wt. (grams)		50.0	50.0	50.0	50.0	50.0	50.0
B. Starting Time (hr: min: sec:)		0937	0935	0933	0931	0929	0927
C. Temp. @ 40 sec. (degrees F)		69.0	68.9	69.2	68.0	68.0	67.9
D. Hydro reading @ 40 sec. (gm/l)		28.0	28.5	31.0	29.0	36.0	33.0
E. Composite Corr. (gm/l)		-6.3	-6.3	-6.3	-6.5	-6.5	-6.5
F. True Density @ 40 sec. (gm/l) D-E ●		21.7	22.2	24.7	22.5	29.5	26.5
G. Temp. @ 2 hrs. (degrees F)		67.7	67.8	67.9	67.6	67.4	67.4
H. Hydro reading @ 2 hrs. (gm/l)		16.0	17.0	16.0	16.5	18.5	18.0
I. Composite Corr. (gm/l)		-6.6	-6.5	-6.5	-6.6	-6.6	-6.6
J. True Density @ 2 hrs. (gm/l) H-I ●		9.4	10.5	9.5	9.9	11.9	11.4
K. % Sand = 100 – [(F/A) x 100]		56.6	55.6	50.6	55.0	41.0	47.0
L. % Clay = [(J/A) x 100]		18.8	21.0	19.0	19.8	23.8	22.8
M. % Silt = 100-(K+L)		24.6	23.4	30.4	25.2	35.2	30.2
N. % No. 10 =		10.6	9.0	5.0	8.4	1.1	3.9

Cup Number		B-9	B-15	B-7	B-19	B-1	B-3
Dry Before Wash + Tare		986.5	772.8	776.3	710.6	993.7	892.8
Dry After Wash + Tare		192.7	158.0	126.7	151.8	112.2	133.7
Dry Wt. Passing #10		793.8	579.8	649.6	558.8	881.5	759.1
Tare Weight		98.9	100.4	102.1	100.3	102.2	102.6
Dry Wt. Before Wash		887.6	677.4	673.7	610.2	891.5	790.2
% Passing #10		89.4	91.0	95.0	91.6	98.9	96.1
% #10		10.6	9.0	5.0	8.4	1.1	3.9

Napa County Department of
Environmental Management

SITE EVALUATION REPORT

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

Permit #: E08-00639
APN: 030-260-016
(County Use Only) Reviewed by: Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner Kohala Investment Works, c/o Duane Kanuha	☒ New Construction ☐ Addition ☒ Remodel ☐ Relocation ☐ Other:
Property Owner Mailing Address 101 Aupuni Street, Suite 206	☒ Residential - # of Bedrooms: 3 Design Flow : 450 gpd
City State Zip Hilo Hawaii 96721	☒ Commercial – Type: Winery Sanitary Waste: 495 gpd Process Waste: 1,500 gpd
Site Address/Location 588 Zinfandel Lane, St. Helena	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name Bartelt Engineering	Evaluator's Name Paul N. Bartelt, P.E.	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
Mailing Address: 1303 Jefferson Street, 200 B		Telephone Number (707) 258-1301
City State Zip Napa CA 94559		Date Evaluation Conducted November 14, 2008

Primary Area See below	Expansion Area See below
Acceptable Soil Depth: 65-87 in. Test pit #'s: 2, 3, 4 & 5	Acceptable Soil Depth: 69-71 in. Test pit #' : 6 ,7 ,8 ,9 ,10, 11, 12 & 13
Soil Application Rate (gal. /sq. ft. /day): STE 0.35 / 0.25	Soil Application Rate (gal. /sq. ft. /day): STE 0.35 / 0.25
System Type(s) Recommended: Pressure Distribution / Conventional	System Type(s) Recommended: Pressure Distribution / Conventional
Slope: 0 - 2 %. Distance to nearest water source: 100 ft.+	Slope: 0 - 2 %. Distance to nearest water source: 100 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 ☒ Yes ☐ (attach results)

Site constraints/Recommendations:

See Septic System Feasibility Study prepared by Bartelt Engineering dated December 10, 2008 for septic system recommendations.

Test Pit # 1 ** Could Have Dug Deeper

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-27		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
27-50	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None
50-55	A	15-30	CL	WG	SH	L	SS	CVF/CF/ CM	FVF	None
55-65	A	<15	CL	SAB	H	VFRB	SS	MVF/MF/ MM	FVF	None

Slope = 0-2 %. Acceptable soil depth: 65 inches. **Assigned soil application rate = STE 0.50 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.25 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 2 *Hydrometer Test Performed
** Could Have Dug Deeper

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-21		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
21-65	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None

Slope = 0-2 %. Acceptable soil depth: 65 inches. **Assigned soil application rate = STE 0.6 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.33 gal /sf /day for a conventional sewage treatment system.

No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 24, 2008.

Test Pit # 3

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-30		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
30-48	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None
48-54	A	15-30	CL	WG	SH	L	SS	CVF/CF/ CM	FVF	None
54-67	A	<15	CL	SAB	H	VFRB	SS	MVF/MF/ MM	FVF	None

Slope = 0-2 %. Acceptable soil depth: 67 inches. Assigned soil application rate = STE 0.50 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.25 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 4

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
24-70	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None

Slope = 0-2 %. Acceptable soil depth: 70 inches. Assigned soil application rate = STE 0.6 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.33 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 5

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-22		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
22-87	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None

Slope = 0-2 %. Acceptable soil depth: 87 inches. Assigned soil application rate = STE 0.6 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.33 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 6

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
24-40	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None
40-60	A	15-30	CL	WG	SH	L	SS	CVF/CF/ CM	FVF	None
60-70	A	<15	CL	SAB	H	VFRB	SS	MVF/MF/ MM	FVF	None

Slope = 0-2 %. Acceptable soil depth: 70 inches. Assigned soil application rate = STE 0.50 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.25 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 7

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-31		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
31-48	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None
48-55	A	15-30	CL	WG	SH	L	SS	CVF/CF/ CM	FVF	None
55-71	A	<15	CL	SAB	H	VFRB	SS	MVF/MF/ MM	FVF	None

Slope = 0-2 %. Acceptable soil depth: 71 inches. Assigned soil application rate = STE 0.50 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.25 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 8

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structur e	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
24-70	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None

Slope = 0-2 %. Acceptable soil depth: 70 inches. Assigned soil application rate = STE 0.6 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.33 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 9 ** Could Have Dug Deeper

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-28		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
28-51	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None
51-57	A	15-30	CL	WG	SH	L	SS	CVF/CF/ CM	FVF	None
57-69	A	<15	CL	SAB	H	VFRB	SS	MVF/MF/ MM	FVF	None

Slope = 0-2 %. Acceptable soil depth: 69 inches. **Assigned soil application rate = STE 0.50 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.25 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 10

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-35		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
35-50	C	<15	CL	SSB	SH/H	FRB	SS	MVF/MF/ MM	MVF/FM/ FC	None
50-57	A	15-30	CL	WG	SH	L	SS	CVF/CF/ CM	FVF	None
57-71	A	<15	CL	SAB	H	VFRB	SS	MVF/MF/ MM	FVF	None

Slope = 0-2 %. Acceptable soil depth: 71 inches. Assigned soil application rate = STE 0.50 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.25 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 11

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-40		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
40-63	A	15-30	CL	WG	SH	L	SS	CVF/CF/ CM	FVF	None
63-71	A	<15	CL	SAB	H	VFRB	SS	MVF/MF/ MM	FVF	None

Slope = 0-2 %. Acceptable soil depth: 71 inches. Assigned soil application rate = STE 0.50 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.25 gal /sf /day for a conventional sewage treatment system.

No groundwater observed. Encountered irrigation water line during excavation.

Test Pit # 12 ** Could Have Dug Deeper

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-42		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
42-62	A	15-30	CL	WG	SH	L	SS	CVF/CF/ CM	FVF	None
62-69	A	<15	CL	SAB	H	VFRB	SS	MVF/MF/ MM	FVF	None

Slope = 0-2 %. Acceptable soil depth: 69 inches. **Assigned soil application rate = STE 0.50 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.25 gal /sf /day for a conventional sewage treatment system.

No groundwater observed.

Test Pit # 13 ** Could Have Dug Deeper

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-30		<15	CL	SSB	SH	FRB	SS	MVF/FM	MVF/FM/ FC	None
30-60	A	15-30	CL	WG	SH	L	SS	CVF/CF/ CM	FVF	None
60-69	A	<15	CL	SAB	H	VFRB	SS	MVF/MF/ MM	FVF	None
Slope = 0-2 %. Acceptable soil depth: 69 inches. **Assigned soil application rate = STE 0.50 / PTE 0.75 gal /sf /day for an alternative sewage treatment system; 0.25 gal /sf /day for a conventional sewage treatment system.										
No groundwater observed. Encountered irrigation water line during excavation.										

Table of Abbreviations

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

Attach additional sheets as needed

Alternative Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2/day)	
	Shape	Grade	STE[1]	PTE[1,2]
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	1.0	1.2
Fine Sand, Loamy Fine Sand	Single grain	Structureless	0.6	1.0
Sandy Loam, Loamy Sand	Massive	Structureless	0.35	0.5
	Platy	Weak	0.35	0.5
	Prismatic, blocky, granular	Weak	0.5	0.75
		Moderate, Strong	0.8	1.0
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.5	0.75
		Strong	0.8	1.0
Sandy Clay, Silty Clay Loam, Clay Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.35	0.5
		Strong	0.6	0.75
Clay, Silty Clay	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak		
		Moderate, strong	0.2	0.25

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

MINIMUM SURFACE AREA GUIDELINES TO DISPOSE OF 100 GPD OF SECONDARY TREATED EFFLUENT FOR SUBSURFACE DRIP DISPERSAL SYSTEMS

		Soil Absorption Rates		Design Application Rate (Gal/ft^2/day)	Total Area Required Sq. ft./100 gallons per day
Soil Class	Soil Type	Est. Soil Perc. Rate minutes/inch	Hydraulic Conductivity inches/hour		
I	Coarse sand	1 – 5	>2	1.400	71.5
I	Fine sand	5 – 10	1.5 – 2	1.200	83.3
II	Sandy loam	10 – 20	1.0 – 1.5	1.000	100.0
II	Loam	20 – 30	0.75 – 1.0	0.700	143.0
III	Clay loam	30 – 45	0.5 – 0.75	0.600	167.0
III	Silt - clay loam	45 – 60	0.3 – 0.5	0.400	250.0
IV	Clay non-swell	60 – 90	0.2 – 0.3	0.200	500.0
IV	Clay - swell	90 – 120	0.1 – 0.2	0.100	1000.0

1. For design purpose, the "Soil Type" category to be used in the above table shall be based on the most restrictive soil type encountered within two feet below the bottom of the drip line.
2. Dispersal field area calculation: Total square feet area of dispersal field = Design flow divided by loading rate.

Conventional Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2/day)
	Shape	Grade	STE
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	Prohibited
Sandy Loam, Loamy Sand	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.33
		Moderate, strong	0.5
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.25
		Moderate, Strong	0.33
Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	0.25
		Strong	0.33
Sandy Clay, Silty Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	Prohibited
		Strong	0.25
Clay, Silty Clay	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak	Prohibited
		Moderate, strong	Prohibited

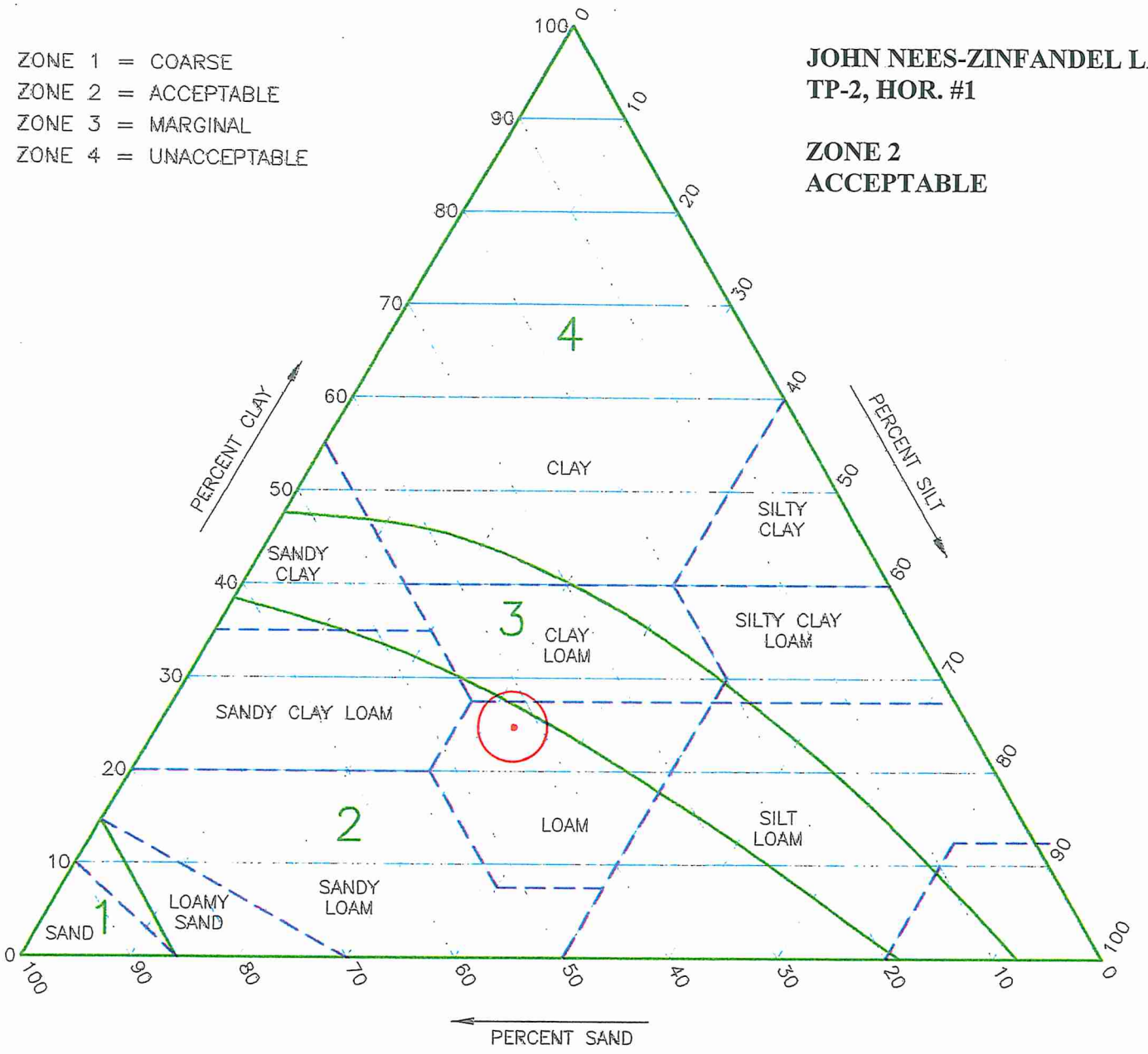
CONVENTIONAL SEWAGE TREATMENT SYSTEM SOIL APPLICATION RATES BASED ON PERCOLATION RATES	
Percolation Rate (mpi)	Application Rate (STE)
< 5 MPI	Prohibited
5 to 10 MPI	0.5
10-20 MPI	0.33
20-60 MPI	0.25
> 60 MPI	Prohibited

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

JOHN NEES-ZINFANDEL LANE
TP-2, HOR. #1

ZONE 2
ACCEPTABLE



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 H

CONSULTANTS, INC.

Geotechnical
Geological
And Laboratory Services

File: 9147.9

November 24, 2008
Bartelt Engineering
1339 Pearl Street, Suite 205
Napa, CA 94559

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
JOHN NEESE-ZINFANDEL LANE

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on November 19, 2008.

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

Size/Density	TP-2 HOR. #1
+ #10 Sieve	5.8 %
Sand	42.0 %
Clay	25.0 %
Silt	33.0 %
Db g/cc	--

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

Yours very truly,

RGH GEOTECHNICAL

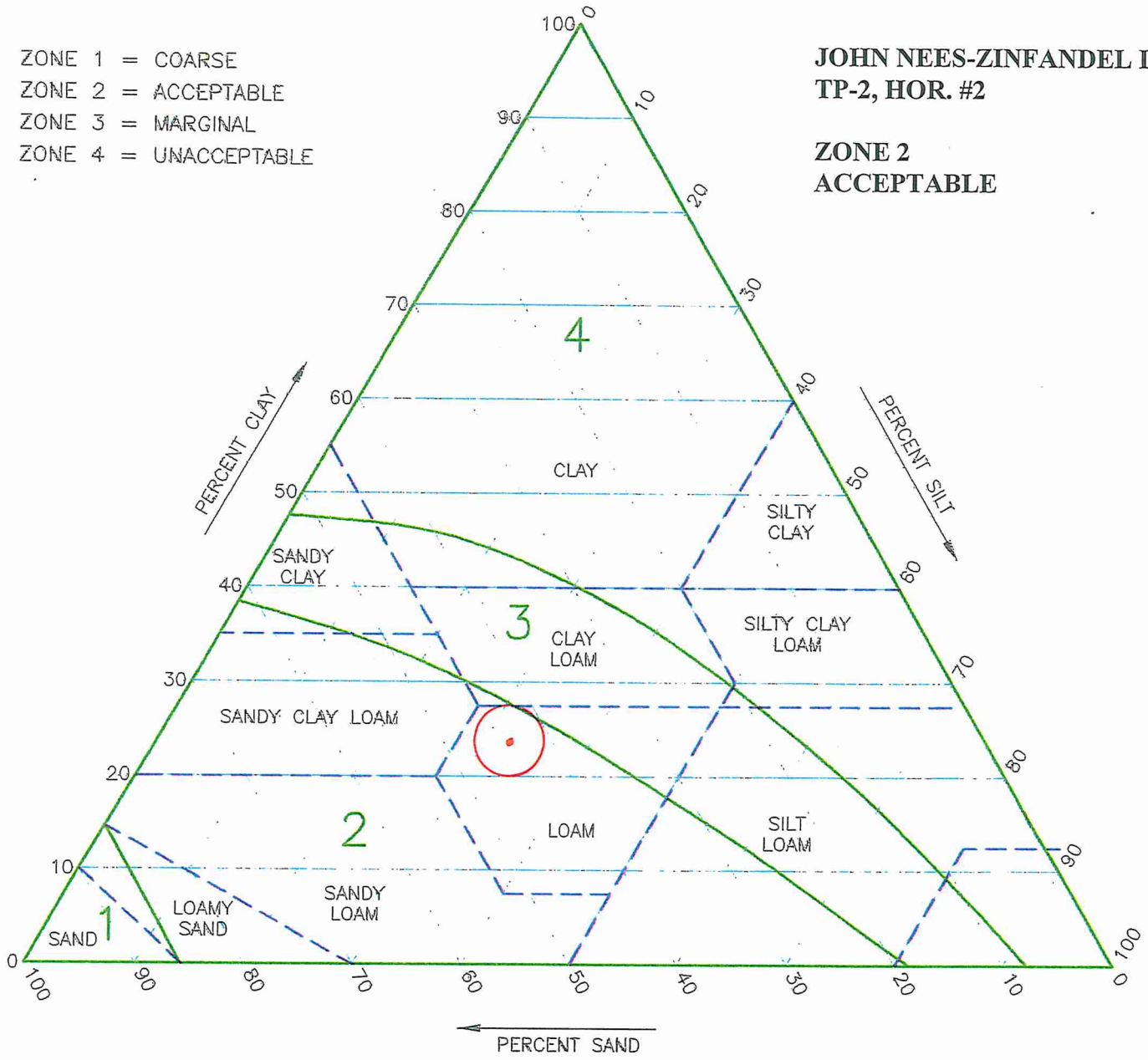
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

JOHN NEES-ZINFANDEL LANE
TP-2, HOR. #2

ZONE 2
ACCEPTABLE



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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November 24, 2008
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1339 Pearl Street, Suite 205
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Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
JOHN NEESE-ZINFANDEL LANE

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on November 19, 2008.

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

Size/Density	TP-2 HOR. #2
+ #10 Sieve	0.5 %
Sand	44.0 %
Clay	23.8 %
Silt	32.2 %
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

Tarance E. McCue
Senior Laboratory Advisor

R G H

CONSULTANTS, INC.

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And Laboratory Services

Red
BOUYOCOUS HYDROMETER

CLIENT Bartelt JOB NAME John Deere JOB# 0316

SAMPLE NUMBER	(8) TP-2		(7) TP-2				
DEPTH	West 2		West 1				
A. Oven dry wt. (grams)	50g		50g				
B. Starting Time (hr: min: sec:)	1241		1239				
C. Temp. @ 40 sec. (degrees F)	67.8		67.8				
D. Hydro reading @ 40 sec. (gm/l)	34.5		35.5				
E. Composite Corr. (gm/l)	+6.5		+6.5				
F. True Density @ 40 sec. (gm/l) D-E ●	28.0		29.0				
G. Temp. @ 2 hrs. (degrees F)	67.7		67.8				
H. Hydro reading @ 2 hrs. (gm/l)	18.5		19.0				
I. Composite Corr. (gm/l)	+6.6		+6.5				
J. True Density @ 2 hrs. (gm/l) H-I ●	11.9		12.5				
K. % Sand = 100 – [(F/A) x 100]	44.0		42.0				
L. % Clay = [(J/A) x 100]	23.8		25.0				
M. % Silt = 100-(K+L)	32.2		33.0				
N. % No. 10 =	0.5		5.8				

Cup Number	B-10		B-17				
Dry Before Wash + Tare	592.4		530.4				
Dry After Wash + Tare	103.8		127.9				
Dry Wt. Passing #10	488.6		402.5				
Tare Weight	101.5		103.2				
Dry Wt. Before Wash	491.1		425.2				
% Passing #10	99.5		94.2				
% #10	0.5		5.8				