



PACIFIC WATERSHED ASSOCIATES INC.

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www.pacificwatershed.com



October 24, 2018

Dennis and Karen Silva
1323 Champagne Circle
Roseville, CA 95747

Re: Preliminary Onsite Wastewater Treatment System Evaluation for A.P. No.: 210-012-019, located near McClellan Rock, Bridgeville, Humboldt County, California.

Dear Dennis and Karen:

Introduction

This letter presents results of an onsite wastewater treatment evaluation for A.P. No.: 210-012-019, located near McClellan Rock, Bridgeville, Humboldt County, California (Figure 1). Pacific Watershed Associates, (PWA) understands that there currently is existing and proposed development and that at this time you require a permitted onsite wastewater treatment system (OWTS).

Therefore, at your request PWA conducted a site investigation to determine suitability for the onsite treatment of wastewater on this parcel. Preliminary site investigations were conducted in accordance with Humboldt County Health Department (HCDEH) and the North Coast Regional Water Quality Control Board (NCRWQCB) regulations and standards and have determined that this site is suitable for the onsite treatment of wastewater.

This parcel is served by a private water source and no wells, springs or drainages are located within 100 feet of the proposed leachfield areas.

Investigations and Testing

Due to late season rains during the 2018 wet weather testing season, HCDEH approved PWA to conduct wet weather testing on this site.

Therefore, on 4/4/18, three (3) subsurface exploration test pits were advanced by backhoe to depths ranging between 96-inches below the ground surface (bgs), and 132-inches bgs. Test pits were logged according to the United States Department of Agriculture (USDA) Classification System, and representative samples were collected during excavation.

Also on 4/4/18, six (6) percolation tests were conducted within the proposed leachfield areas, P-1a (27"-33" bgs), P-1b (49"-55" bgs), P-2a (36"-42" bgs), P-2b (27"-33" bgs), P-3a (48"-54" bgs), and P-3b (34"-40" bgs).

On 4/27/18, PWA submitted six (6) soils samples collected during site investigations to SHN Consulting Engineers & Geologist, Inc. (SHN) for textural analysis, to determine if adequate fines (silts and clays) were present within the soil matrix. On 5/3/18, PWA received the results of the textural analysis, which are presented in Table 1 below:

Table 1: Results of Textural Analysis

Sample ID	Depth	% Sand	% Clay	% Silt	% Fines	% Coarse Fragments (by volume)	Zone
TP-1	4'-5'	47.0	25.7	27.3	53.0	37.9	2
TP-1	7'	52.1	24.2	23.7	47.9	46.5	2
TP-2	3'-4'	50.5	24.2	25.3	49.5	28.8	2
TP-2	7'	49.9	26.0	24.1	50.1	37.1	2
TP-3	3'-4'	48.3	20.0	31.7	5.7	39.6	2
TP-3	5'-6'	49.1	29.7	21.2	50.9	46.9	2

All soil samples submitted for laboratory testing plotted as Zone 2 on the Soil Percolation Suitability Chart. Soils plotted as either a SANDY LOAM or a SANDY CLAY LOAM.

Based on results of subsurface investigations on this property and the subsequent laboratory testing, PWA considers this site suitable for a gravity distribution OWTS.

Site Conditions

The site conditions consist of the physical setting, soil classification, groundwater and percolation testing. Descriptions of site conditions encountered by PWA are briefly discussed below. For more details, refer to PWA's Subsurface Exploration Logs, Soil Percolation Suitability Charts, and Percolation Test Results attached to this letter.

Physical Setting

The project area is located on the lower slopes within the Van Duzen watershed approximately 1,600 feet above mean sea level and east of the community of Bridgeville. Proposed leachfield areas are located to the northeast of proposed and existing development areas. Slopes range between 15 and 25 percent throughout the Project Site.

Soil Classifications

Soils in test pits were logged and described in the field by PWA staff. Representative soil samples from test pits with selected samples being laboratory tested for textural analysis.

Field Classification

Field classification of soils on this site consist of approximately two feet of CLAY LOAM TOPSOIL underlain by VERY ROCKY CLAY LOAM to CLAY and EXTREMELY ROCKY CLAY LOAM by 4 feet (TP-1) bgs.

Laboratory Classification

Field classification of soils on this site consist of SANDY CLAY LOAM and SANDY LOAM.

Ground Water Conditions

Free water was not encountered during subsurface excavations within the proposed leachfield areas and mottled soils were not observed. Therefore, groundwater observation wells were not installed on this site.

Percolation Testing

On 4/4/18, six (6) wet-weather percolation tests were conducted within the proposed leachfield areas. Percolation rates ranged between 1 minutes per inch (mpi) in P-1b (49"-55" bgs) and 30 mpi in P-2a (36"-42" bgs).

Conclusions and Recommendations

Leachfield sizing and design is a function of: the expected daily wastewater load of a system, maximum loading rate of the underlying soils, separation to ground water, and total available absorption area. Based on the soils encountered on this site, percolation rates of 30 mpi and faster, and the lack of ground water in the upper soil profile, PWA considers this site suitable for a gravity distribution system. Exact sizing of this OWTS will depend on the existing and proposed development.

Limitation

The project site was evaluated in accordance with Humboldt County Division of Environmental Health and the North Coast Regional Water Quality Control Board regulations and standards. Subsurface conditions, shown on the Subsurface Exploration Logs attached, apply only at the specific excavation location and at the date indicated and are not warranted to be representative of subsurface conditions at other locations at other times.

Investigations and site evaluations were conducted based on technical information and current regulations available today. There is no guarantee that any system, existing or proposed will work or continue to work since the performance of all onsite wastewater treatment systems depends on a variety of factors that include: amount and frequency of effluent discharge; composition of effluent; site conditions (soil, slope, drainage, vegetation, etc); climate; system design; proper installation of the system; user habits and system maintenance; and age of system. A geologic hazard evaluation was not a part of this investigation.

We trust this letter provides you with the necessary information required at this time. Please note that this is a preliminary report of findings for these site investigations. A full report, complete with system

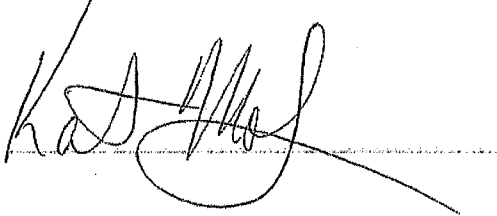
Onsite Wastewater Treatment Evaluation, A.P. No.: 210-012-019
Silva
Pacific Watershed Associates, Inc.

October, 2018
Page 4

design specifications will be developed upon your request. If you need any further information or documentation at this time, please feel free to contact our office.

Sincerely,

PACIFIC WATERSHED ASSOCIATES INC.

A handwritten signature in black ink, appearing to read 'Kathy Moley', written over a horizontal dashed line.

Kathy Moley, Senior Geologist PG 7594
kathym@pacificwatershed.com

Enclosure(s):

Subsurface Exploration Logs (3) and Key
Soil Percolation Suitability Charts (2)
Percolation Test Sheets (3)

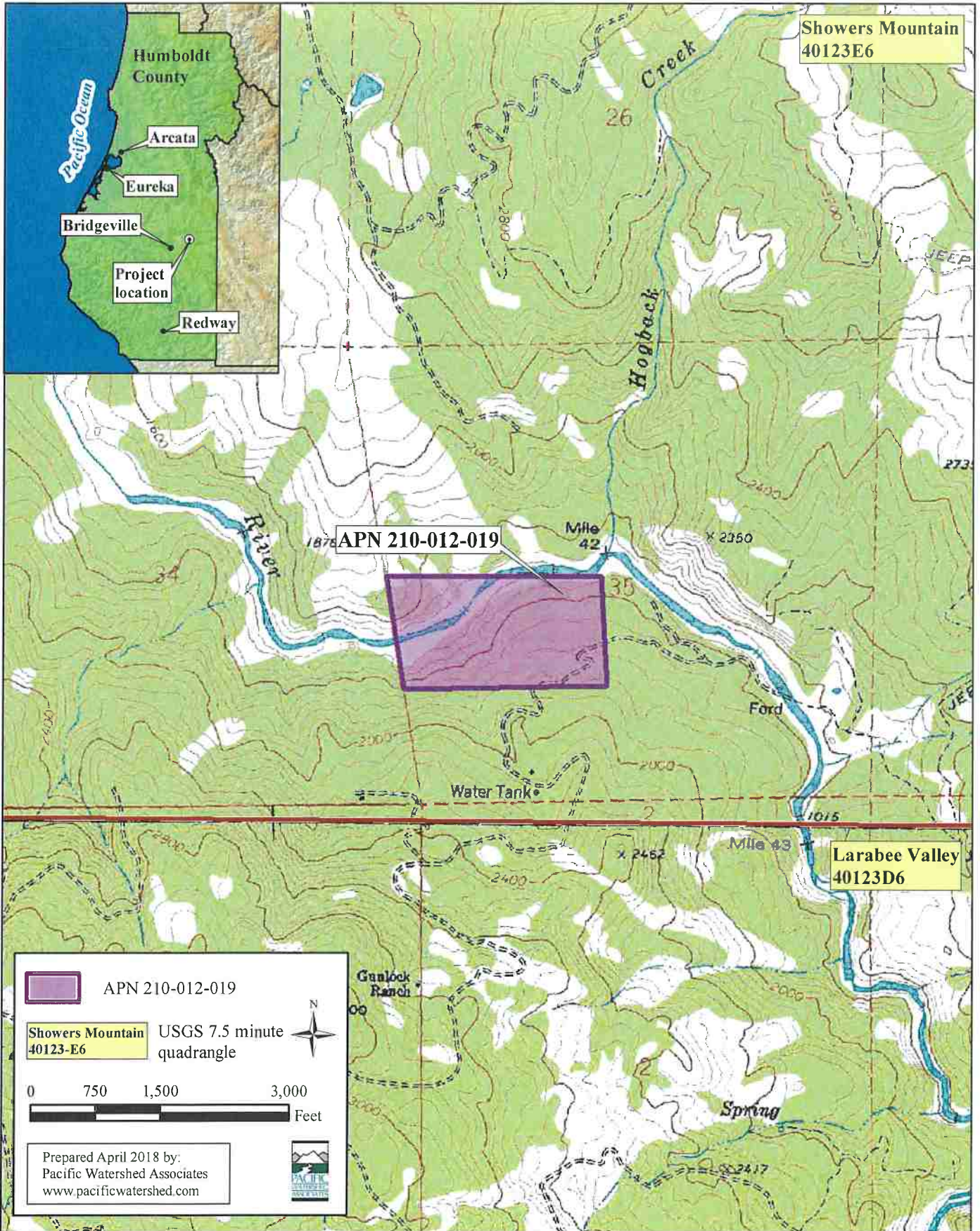


Figure 1. Location Map for Silva, APN 210-012-019, located near McCellan Mountain, East of Bridgeville, Humboldt County, CA.

SUBSURFACE EXPLORATION LOG-KEY



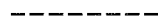

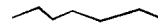
Descriptions are presented using USDA nomenclature in the following order:

Texture, dry consistence, moist consistence, wet consistence, moisture, mottles, clay films, color, structure, roots, pores, notes.

Key for some common USDA abbreviations

consistence	Ex: so, vfr, ssps (soft, very friable, slightly sticky, slightly plastic)
dry	lo-loose, so-soft, sh-slightly hard, h=hard, vh-very hard, eh-extremely hard
moist	lo-loose, vfr-very friable, fr-friable, fi-firm, vfi-very firm, efi-extremely firm
wet-stickiness	so-nonsticky, ss-slightly sticky, s-sticky, vs, very sticky
wet-plasticity	po-nonplastic, ps-slightly plastic, p, plastic, vp, very plastic
mottles	Ex: fm2 (few medium distinct)
abundance	vf-very few, f-few, c, common, m-many
size	f-fine, m-medium, l-large
contrast	1-faint, 2-distinct, 3-prominent
clay films	Ex: 1fpf, 2dpfpo (few prominent on ped faces and common distinct on ped faces and pores)
abundance	v1-very few, 1-few, 2, common, 3-many
thickness	f-faint, d-distinct, p-prominent
location	pf-ped faces, po-pores, br-bridges, co-colloid, cl-clasts
structure	Ex: 1fsbk (weak fine subangular blocky)
grade	v1-very weak, 1-weak, 2-moderate, 3-strong
size	vf-very fine, f-fine, m-medium, c-coarse, vc-very coarse
shape	g-granular, pl-platy, pr-prismatic, cpr-columnar, abk-angular blocky, sbk-subangular blocky, m-massive, sg-single grained
roots and pores	Ex: v1vf, f and 1m (very few and very fine to fine and few and medium)
abundance	v1-very few, 1-few, 2, common, 3-many
size	vf-very fine, f-fine, m-moderate, c-coarse, vc-very coarse

Boundaries

	abrupt and clear
	gradual
	diffuse
	wavy
	irregular

SUBSURFACE EXPLORATION LOG

Project Name: Silva, Dennis
A.P. No. 210-012-019
Hole Location: McClellan Rock
Excavation Method: Backhoe
Comments:

Date: 4/4/2018
Hole Number: TP-1
Monitor Well Depth: N/A
Height:
Logged By: KMV
Weather: Cloudy

Field Classification Based on USDA Soil Classification Texture, Consistence, Moisture, Color, Structure, Remarks	Depth (feet)	Samples (Key Below)	Groundwater Level	Percolation Rate (MPI)	Laboratory Data			
					Suitability Chart	Bulk Density	% Fines	% Coarse Fragments
Clay Loam Topsoil , ss, sp, fri, moist, dark brown to black, granular to strong sbk, rocky- pea to 2-3 inches, no mottles, roots- many and fine to medium, pores- common and medium.	-							
	1	X						
Rocky Clay Loam to Clay , s, p, firm, moist, dark brown to greyish brown, strong sbk, v rocky- pea to 2-3 inches, no mottles, roots- common and medium, pores- common and fine.	2	X		2				
	3	X						
Extremely Rocky Clay Loam to Clay , s, p, fri to firm, moist, yellowish brown, strong sbk, ex rocky- BE to 3-4 inches, no mottles, roots- common and medium, pores- common and fine. Some oxidation around root channels.	4	X		1	2	N/C	53	37.9
	5	X						
Extremely Rocky Clay Loam to Clay , s, p, firm, moist, greyish brown, strong sbk, ex rocky- BE to 3-4 inches, no mottles, roots- few and coarse, pores- few and fine to common and medium..	6							
	7	X						
	8							
	9							
	10							
	11	X				2	N/C	49.5
Bottom of Test Pit at 132-inches Test Pit Remained Dry During Excavation	12							

Key: Water Level ∇ Disturbed Sample X Shelby Tube Sample II

SUBSURFACE EXPLORATION LOG

Project Name: Silva, Dennis
A.P. No. 210-012-019
Hole Location: McClellan Rock
Excavation Method: Backhoe
Comments:

Date: 4/4/2018
Hole Number: TP-2
Monitor Well Depth: N/A
Height:
Logged By: KMV
Weather: Cloudy

Field Classification Based on USDA Soil Classification Texture, Consistence, Moisture, Color, Structure, Remarks	Depth (feet)	Samples (Key Below)	Groundwater Level	Percolation Rate (MPI)	Laboratory Data			
					Suitability Chart	Bulk Density	% Fines	% Coarse Fragments
Rocky Clay Loam to Clay Topsoil , ss, sp, fri, moist, v dark brown to black, granular to strong sbk, rocky- pea to 2-3 inches, no mottles, roots- common and coarse to many and medium, pores- common and fine to medium.	-							
	1	X						
Rocky Clay Loam to Clay , s, p, firm, moist, yellowish brown, mod sbk, rocky- pea to 2-3 inches, no mottles, roots- common and fine to medium, pores- few and fine. Some oxidation around root channels.	2	X		5				
	3	X		30				
	4	X			2	N/C	49.5	28.8
	5							
	6							
	7							
	8	X				2	N/C	50.1
Bottom of Test Pit at 96-inches Test Pit Remained Dry During Excavation	9							
	10							
	11							

Key: Water Level ∇ Disturbed Sample X Shelby Tube Sample II

SUBSURFACE EXPLORATION LOG

Project Name: Silva, Dennis
A.P. No. 210-012-019
Hole Location: McClellan Rock
Excavation Method: Backhoe
Comments:

Date: 4/4/2018
Hole Number: TP-3
Monitor Well Depth: N/A
Height:
Logged By: KMV
Weather: Cloudy

Field Classification Based on USDA Soil Classification Texture, Consistence, Moisture, Color, Structure, Remarks	Depth (feet)	Samples (Key Below)	Groundwater Level	Percolation Rate (MPI)	Laboratory Data			
					Suitability Chart	Bulk Density	% Fines	% Coarse Fragments
Rocky Clay Loam to Clay , ss, sp, fri, moist, v dark brown to black, granular, rocky- pea to 1-1/2 inch, no mottles, roots- common and fine and many and medium to coarse, pores- common and fine to medium. <hr/> Very Rocky to Extremely Rocky Clay Loam , s, p, firm, moist, v dark brown w/ pockets of yellowish brown, strong sbk, ex rocky- pea to 3-4 inches, no mottles, roots- few and fine and common and medium, pores- common and fine to medium.	-							
	-							
	1							
	-							
	-	X						
	2							
	-							
	-							
	3				15			
	-	X				2	N/C	51.7
4								
-	X			2				
5								
-								
-	X				2	N/C	50.9	46.9
6								
-								
-								
7								
-								
-								
8								
-								
-								
9								
-								
-								
10								
Bottom of Test Pit at 120-inches Test Pit Remained Dry During Excavation	-							
	-							
	-							
	11							

Key: Water Level ▽ Disturbed Sample X Shelby Tube Sample II


CONSULTING ENGINEERS & GEOLOGISTS, INC.

812 W.Wabash Eureka, CA 95501-2138 Tel:707/441-8855 FAX:707/441-8877 E-mail:shninfo@shn-engr.com

Reference: 015186

May 3, 2018

 Pacific Watershed
 P.O. Box 4433
 Arcata, CA 95519

SOIL PERCOLATION SUITABILITY / TEXTURAL ANALYSIS RESULTS
Job Name: Silva
Date Sampled: 04/04/18
Date Received: 04/27/18
Sampled By: KM
Date Tested: 05/03/18
AP Number: Not Provided

<u>Sample ID</u>	<u>Depth</u>	<u>% Sand</u>	<u>% Clay</u>	<u>% Silt</u>	% Coarse Fragments by		<u>Bulk Density</u>
					<u>Volume</u>	<u>Zone</u>	
TP-1	4.5'	47.0	25.7	27.3	37.9	2	*
	Material: Sandy Clay Loam						
TP-1	7'	52.1	24.2	23.7	46.5	2	*
	Material: Sandy Loam						
TP-2	3-4'	50.5	24.2	25.3	28.8	2	*
	Material: Sandy Clay Loam						

* = no peds provided

Regional Water Quality Control Board Zone Descriptions:

Zone 1 - Soils in this zone are very high in sand content. They readily accept effluent, but because of their low silt and clay content they provide minimal filtration. These soils demand greater separation distances from groundwater.

Zone 2 - Soils in this zone provide adequate percolation rates and filtration of effluent. They are suitable for use of a conventional system without further testing.

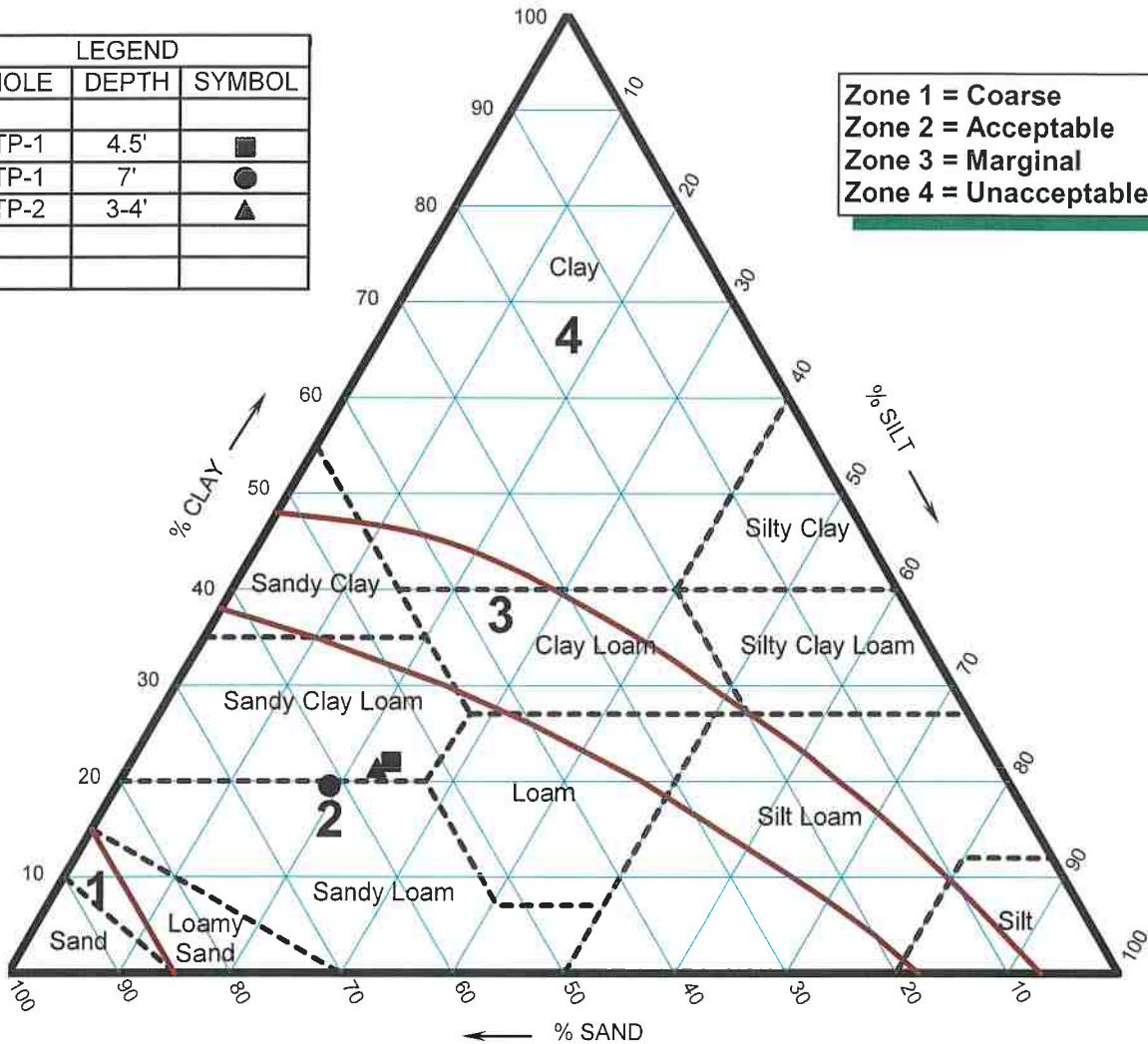
Zone 3 - Soils in this zone are expected to provide good filtration of effluent, but their ability to accept effluent at a suitable rate is questionable. These soils require wet-weather percolation tests to verify their suitability for effluent disposal by conventional leachfield methods.

Zone 4 - Soils in this zone are unsuitable for a conventional leachfield because of their severe limitations for accepting effluent.

SOIL PERCOLATION SUITABILITY CHART

LEGEND		
HOLE	DEPTH	SYMBOL
TP-1	4.5'	■
TP-1	7'	●
TP-2	3-4'	▲

Zone 1 = Coarse
Zone 2 = Acceptable
Zone 3 = Marginal
Zone 4 = Unacceptable



NOTES

1. Soil texture is plotted on triangle based on percent sand, silt, and clay as determined by hydrometer analysis.
2. Adjustment for coarse fragments has been made 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. Adjustment for compactness of soil has been made by moving the plotted point in the clay direction an additional 15% for soils having a bulk-density greater than 1.7 gm/cc, when analyzed.
4. For soils falling in sand, loamy sand, or sandy loam, classification adjustment for bulk density will generally not affect suitability and a bulk-density analysis was not necessary.

JOB NUMBER: 015186

DATE: 05/03/18

JOB NAME: Silva

APN: Not Provided

SEW

Consulting Engineers & Geologists, Inc.

812 W. Wabash
 Eureka, CA 95501-2138
 (707) 441-8855


CONSULTING ENGINEERS & GEOLOGISTS, INC.

812 W.Wabash Eureka, CA 95501-2138 Tel:707/441-8855 FAX:707/441-8877 E-mail:shninfo@shn-engr.com

Reference: 015186

May 3, 2018

 Pacific Watershed
 P.O. Box 4433
 Arcata, CA 95519

SOIL PERCOLATION SUITABILITY / TEXTURAL ANALYSIS RESULTS

Job Name: Silva	Sampled By: KM
Date Sampled: 04/04/18	Date Tested: 05/03/18
Date Received: 04/27/18	AP Number: Not Provided

<u>Sample ID</u>	<u>Depth</u>	<u>% Sand</u>	<u>% Clay</u>	<u>% Silt</u>	% Coarse Fragments by		<u>Bulk Density</u>
					<u>Volume</u>	<u>Zone</u>	
TP-2	7'	49.9	26.0	24.1	37.1	2	*
	Material: Sandy Clay Loam						
TP-3	3-4'	48.3	20.0	31.7	39.6	2	*
	Material: Sandy Loam						
TP-3	5-6'	49.1	29.7	21.2	46.9	2	*
	Material: Sandy Clay Loam						

* = no peds provided

Regional Water Quality Control Board Zone Descriptions:

Zone 1 - Soils in this zone are very high in sand content. They readily accept effluent, but because of their low silt and clay content they provide minimal filtration. These soils demand greater separation distances from groundwater.

Zone 2 - Soils in this zone provide adequate percolation rates and filtration of effluent. They are suitable for use of a conventional system without further testing.

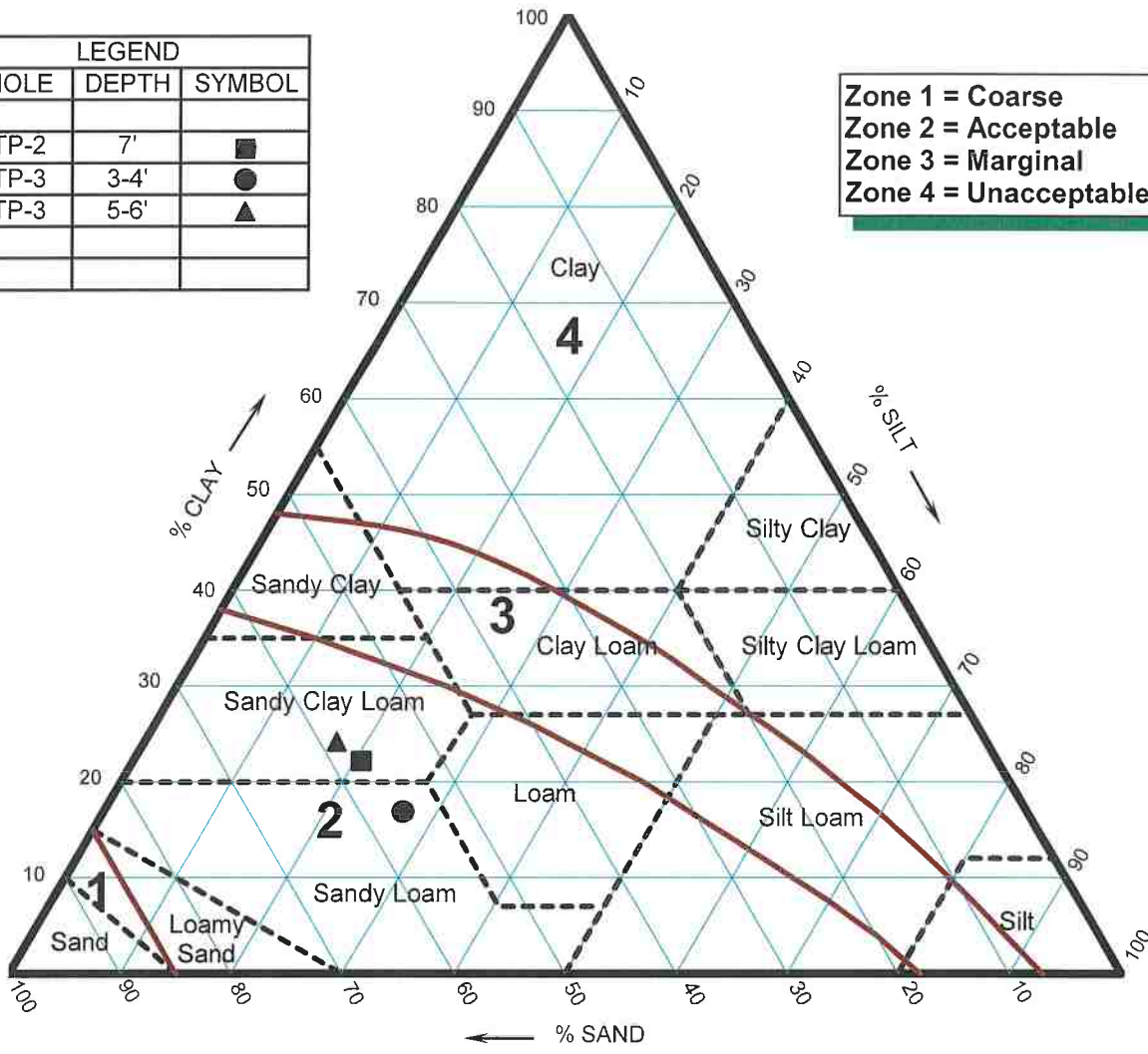
Zone 3 - Soils in this zone are expected to provide good filtration of effluent, but their ability to accept effluent at a suitable rate is questionable. These soils require wet-weather percolation tests to verify their suitability for effluent disposal by conventional leachfield methods.

Zone 4 - Soils in this zone are unsuitable for a conventional leachfield because of their severe limitations for accepting effluent.

SOIL PERCOLATION SUITABILITY CHART

LEGEND		
HOLE	DEPTH	SYMBOL
TP-2	7'	■
TP-3	3-4'	●
TP-3	5-6'	▲

Zone 1 = Coarse
Zone 2 = Acceptable
Zone 3 = Marginal
Zone 4 = Unacceptable



NOTES

1. Soil texture is plotted on triangle based on percent sand, silt, and clay as determined by hydrometer analysis.
2. Adjustment for coarse fragments has been made 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. Adjustment for compactness of soil has been made by moving the plotted point in the clay direction an additional 15% for soils having a bulk-density greater than 1.7 gm/cc, when analyzed.
4. For soils falling in sand, loamy sand, or sandy loam, classification adjustment for bulk density will generally not affect suitability and a bulk-density analysis was not necessary.

JOB NUMBER: 015186

DATE: 05/03/18

JOB NAME: Silva

APN: Not Provided



812 W. Wabash
 Eureka, CA 95501-2138
 (707) 441-8855

Percolation Test Data

Project Name Silva, Dennis
A.P. No: 210-012-019

Hole Location: McClellan Rock
Date: 4/4/2018

Presoak Method: **4 Complete Refillings**
 12 Hour Continuous Presoaking
 X **Presoak Not Required (Wet Weather Testing)**

Start Date and Time:

End Date and Time:

Percolation Test Number: P-2a

Test Depth Interval: 36"-42"

Hole Diameter: 12"

Hole Depth: 6"

Saturation Period:

Start Time: 12:27 PM

End Time: 1:40 PM

Reading Number	Start Time	Stop Time	Interval (minutes)	Drop (inches)	Rate (MPI)	Comments
1	1:40	1:58	18	0.50	36	
2	1:58	2:16	18	0.50	36	
3	2:16	2:31	15	0.50	30	
4	2:31	2:46	15	0.50	30	
5	2:46	3:01	15	0.50	30	
6	3:01	3:16	15	0.50	30	
7						
8						

Stabilized Percolation Rate: 30 MPI

Percolation Test Number: P-2b

Test Depth Interval: 27"-33"

Hole Diameter:

Hole Depth: 6"

Saturation Period:

Start Time: 12:26 PM

End Time: 1:42 PM

Reading Number	Start Time	Stop Time	Interval (minutes)	Drop (inches)	Rate (MPI)	Comments
1	1:42	1:59	17	4.75	4	
2	2:00	2:18	18	4.25	4	
3	2:18	2:33	15	3.25	5	
4	2:33	2:48	15	3.00	5	
5	2:48	3:03	15	3.00	5	
6	3:03	3:18	15	3.00	5	
7						
8						

Stabilized Percolation Rate: 5 MPI

Percolation Test Data

Project Name Silva, Dennis
A.P. No: 210-012-019

Hole Location: McClellan Rock
Date: 4/4/2018

Presoak Method: **4 Complete Refillings**
 12 Hour Continuous Presoaking
 X **Presoak Not Required (Wet Weather Testing)**

Start Date and Time:

End Date and Time:

Percolation Test Number: P-3a

Test Depth Interval: 48"-54"

Hole Diameter: 12" **Hole Depth:** 6"

Saturation Period:

Start Time: 12:39 PM

End Time: 2:28 PM

Reading Number	Start Time	Stop Time	Interval (minutes)	Drop (inches)	Rate (MPI)	Comments
1	2:28	2:38	10	5.50	2	
2	2:43	2:53	10	5.50	2	
3	2:58	3:10	12	5.50	2	
4	3:13	3:24	11	5.00	2	
5	3:27	3:38	11	5.00	2	
6	3:45	3:56	11	5.00	2	
7						
8						

Stabilized Percolation Rate: **2 MPI**

Percolation Test Number: P-3b

Test Depth Interval: 34"-40"

Hole Diameter: **Hole Depth:** 6"

Saturation Period:

Start Time: 12:41 PM

End Time: 2:29 PM

Reading Number	Start Time	Stop Time	Interval (minutes)	Drop (inches)	Rate (MPI)	Comments
1	2:29	2:44	15	0.50	30	
2	2:44	2:59	15	1.00	15	
3	2:59	3:14	15	1.00	15	
4	3:14	3:29	15	1.00	15	
5	3:29	3:44	15	1.00	15	
6	3:44	3:59	15	1.00	15	
7						
8						

Stabilized Percolation Rate: **15 MPI**