812 W. Wabash Avenue, Eureka, CA 95501-2138 707-441-8855
Civil Engineering, Environmental Services, Geosciences, Planning & Permitting, Surveying

Reference: 018061

December 19, 2018

Les Ramage
2096 Robb Road
Walnut Creek, CA 94596

Subject: Disposal Field Suitability Investigation Results and Standard Gravity-flow Dispersal System Design Recommendations; 1080 Westhaven Drive, Trinidad; Assessor's Parcel Number 515-071-005

Introduction

This report presents the results of an assessment of soil and groundwater conditions in support of the design of an onsite sewage disposal system. The field investigation was conducted by a Certified Engineering Geologist from SHN on March 21, 2018, during the Humboldt County wet weather testing period.

The scope of SHN's field investigation included soil profiling and sampling of test pits, percolation testing, laboratory textural analysis of soil samples collected from the test locations, and depth-to-groundwater monitoring. SHN conducted the site investigation in general accordance with the standards outlined in the Humboldt County Onsite Wastewater Treatment System (OWTS) Regulations and Technical Manual published by the Department of Health and Human Services and dated November 7, 2017.

Included with this report is SHN's design of a standard gravity-flow dispersal system sized in accordance with the Humboldt County OWTS Technical Manual. The storage and dispersal system is designed to accommodate a maximum daily wastewater flow rate of 525 gallons per day (gpd) to serve up to a four-bedroom single-family residence.

Project Description

The subject parcel comprises a total area of 4.71 acres and contains an existing single-family residence, sewage disposal system, and two shallow water supply wells. One of the wells is being used to supply the existing the residence. The owners are in the process of performing a lot line adjustment with the neighboring parcel to the south, identified as Assessor's parcel number (APN) 515-061-003. Following adjustment of the property boundary, the subject parcel will have a total area of 5.12 acres. A two-way lot split will then be performed creating two separate parcels of at least 2.5 acres each, which will allow for the construction of a new single-family residence. The existing well is being proposed to serve both residences. Dry weather production testing of the well was performed as part of this project. The results of the dry weather well production test are to be submitted separately.

Project Location

The site is located in the unincorporated area of Westhaven on APN 515-071-005 and is situated between Westhaven Drive and U.S. Highway 101 (Figure 1). The parcel is bordered by similarly sized parcels that contain single-family residences. The immediate site vicinity supports relatively sparse rural residential developments on parcels generally ranging from about 2.5 acres to 5 acres or more.

Field and Laboratory Investigation

SHN's field investigation focused on the western half of the parcel and in the general vicinity of the proposed residence to be constructed on the newly created lot. Two exploratory soil test pits were excavated to depths of about 9 feet and 7 feet below ground surface using a mini-excavator operated by Bowman Construction at the locations shown on Figure 2. Soil profile logs are included in Attachment 1.

SHN's evaluation of the soil profile included thickness of soil layers, soil structure, and texture according to United States Department of Agriculture (USDA) classification. Representative bulk soil samples were obtained from each test location at multiple depths based on the soil horizonation. Select samples were analyzed for the percentage of sand, silt, clay, and coarse fragments in SHN's certified soils testing laboratory. Laboratory test results are included in Attachment 2 and at the corresponding depth intervals on the soil profile logs.

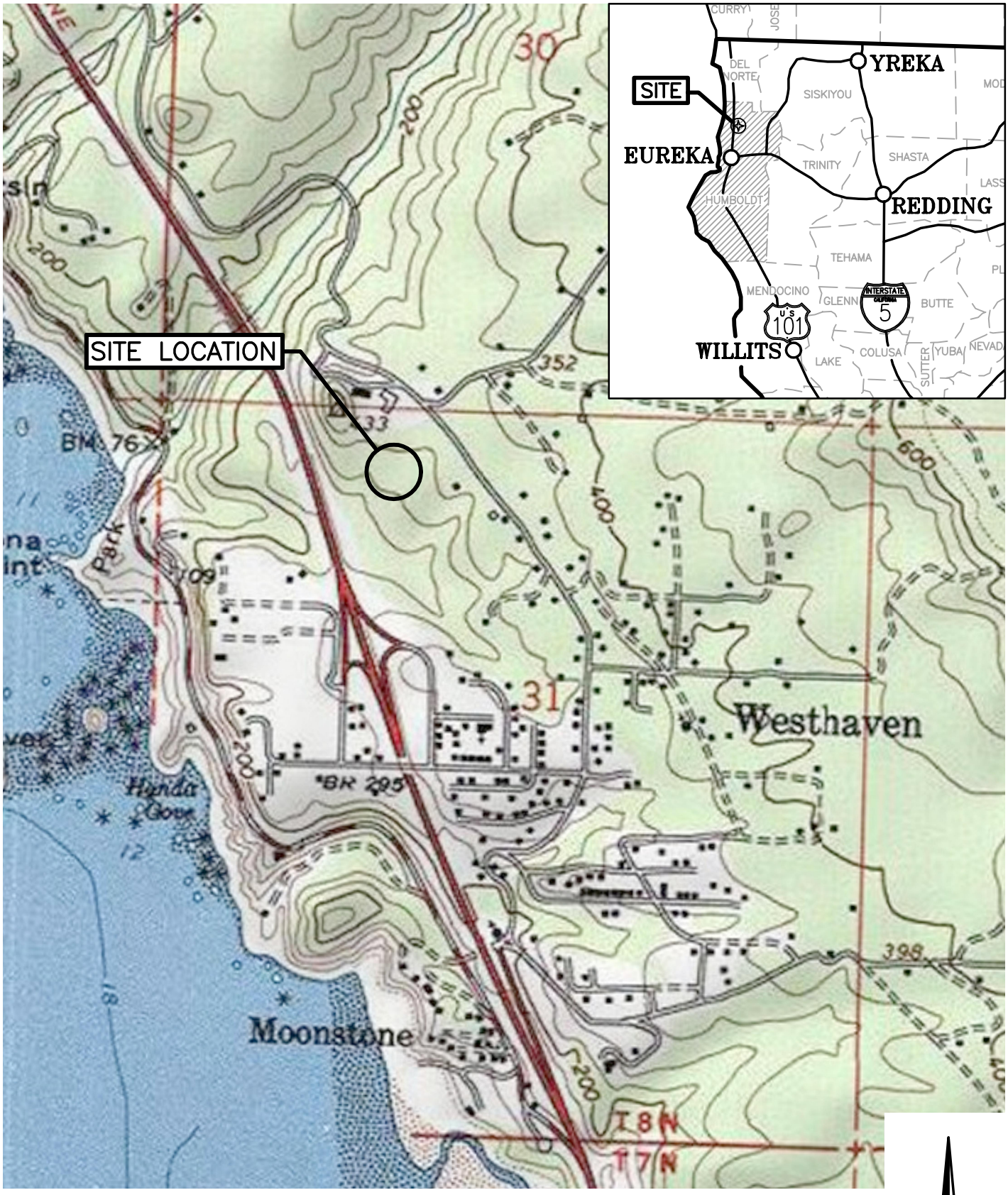
Following soil profiling and sampling, two additional shallow test pits denoted as PP-1 and PP-2, were excavated to conduct percolation testing on the following day. Stabilized percolation rates were established in accordance with the methods outlined in the Humboldt County OWTS Technical Manual. Presoaking of each percolation test pit was performed prior to conducting the tests by completely refilling each percolation pit four times. Percolation tests at PP-1 and PP-2 were conducted at depth intervals of 48 to 60 inches and 24 to 36 inches, respectively.

Geology and Soil Conditions

Soil test pit logs with detailed descriptions of texture, consistency, structure, moisture condition, and color are included in Attachment 1. The subject parcel and general site vicinity is underlain by late Pleistocene age marine terrace deposits. The terrace deposits form a broad, low relief surface known informally as the "Westhaven terrace." The site lies about 340 feet in elevation above sea-level and slopes very gently to the west-southwest at an average gradient of less than five percent.

Marine terrace deposits encountered within the proposed primary disposal field and 100% replacement area consist predominantly of loam and sandy loam grading downward to loamy sand. The sand fraction is generally fine to medium with lesser amounts of coarse sand and fine rounded gravel. The sandy terrace deposits are capped by a thin veneer of wind-blown fine sand and silt-rich topsoil that forms a well-developed A-horizon common to marine terraces.

Soil horizonation is well developed consisting of a distinct A-horizon and pedogenic B-horizon, with unweathered parent material below a depth of about 5 feet. The upper A-horizon is dark brown to brown, very friable with very fine to medium granular structure, and non-sticky and non-plastic wet consistency. The sandy loam and loamy sand B-horizons are generally dark yellowish brown to yellowish



SOURCE: ESRI

1"=1000'±

SHN Consulting Engineers & Geologists, Inc.	Les Ramage Disposal System Design 1080 Westhaven Drive, Trinidad, California	Site Location Map SHN 018061
	December 2018 | 018061-SITE-LCTN	Figure 1

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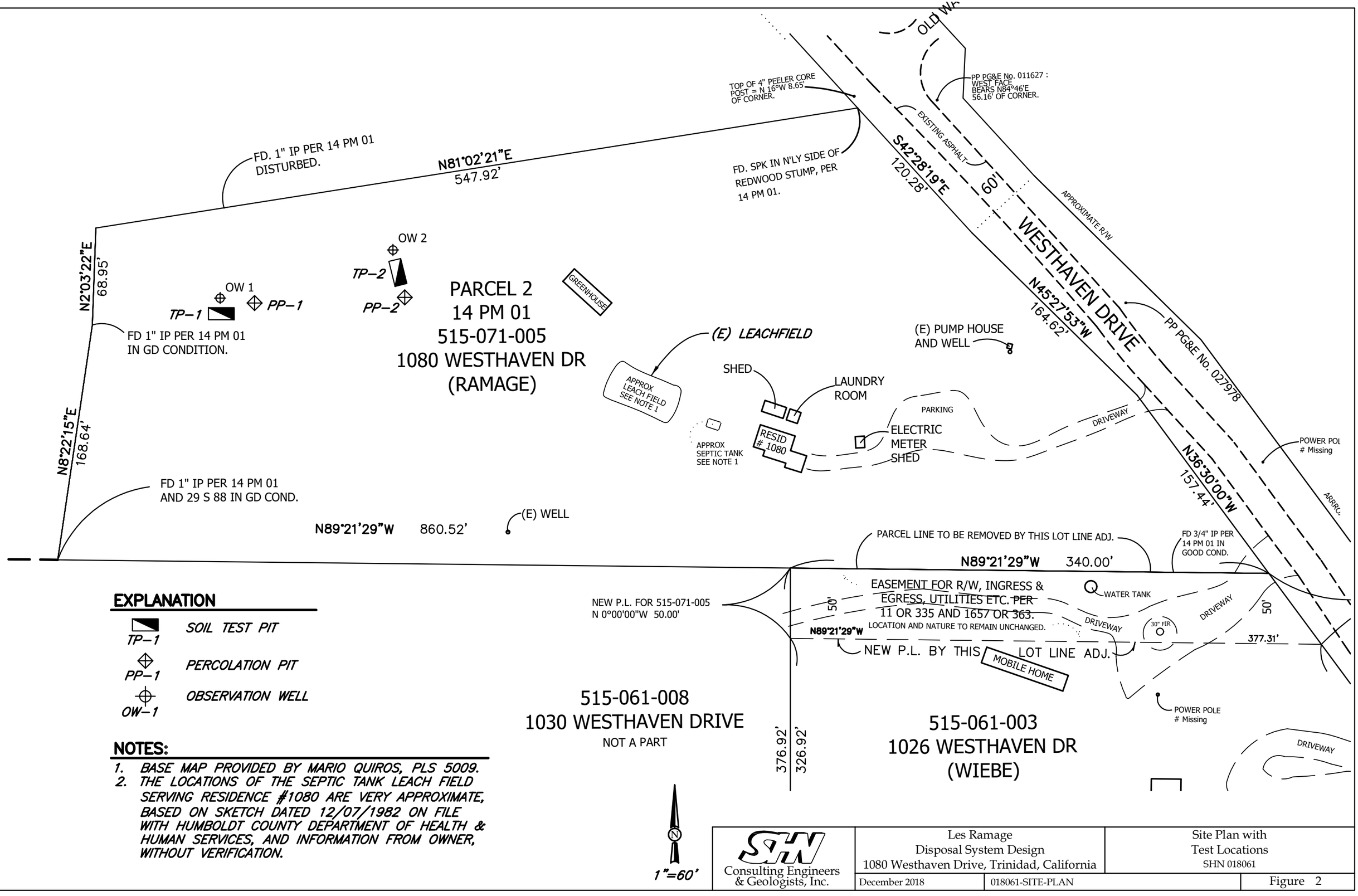

EXPLANATION

- TP–1 — SOIL TEST PIT
- PP–1 — PERCOLATION PIT
- OW–1 — OBSERVATION WELL

NOTES:

1. BASE MAP PROVIDED BY MARIO QUIROS, PLS 5009.
2. THE LOCATIONS OF THE SEPTIC TANK LEACH FIELD SERVING RESIDENCE #1080 ARE VERY APPROXIMATE, BASED ON SKETCH DATED 12/07/1982 ON FILE WITH HUMBOLDT COUNTY DEPARTMENT OF HEALTH & HUMAN SERVICES, AND INFORMATION FROM OWNER, WITHOUT VERIFICATION.

SHN Consulting Engineers & Geologists, Inc.

Les Ramage Disposal System Design 1080 Westhaven Drive, Trinidad, California		Site Plan with Test Locations SHN 018061
December 2018	018061-SITE-PLAN	Figure 2

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brown, friable to firm with weak to moderate medium subangular blocky structure, and slightly sticky to slightly plastic wet consistency. The unweathered parent material consists of yellowish brown sandy loam to loamy sand and is firm with granular structure, and non-sticky to slightly sticky and non-plastic to slightly plastic wet consistency. A thin veneer of loamy topsoil fill was encountered at the location of test pit TP-1 to depth of about 18 inches.

Laboratory Textural Analysis

Laboratory textural analysis work sheets prepared by SHN's materials testing laboratory are included as Attachment 2 and shown on the soil profile logs at the corresponding sampling depths. Table 1 summarizes the laboratory textural analyses results of the bulk soil samples collected from the test pits.

Table 1. Laboratory Soil Textural Analysis Results

Test Hole No.	Depth (inches)	Sand (percent)	Silt (percent)	Clay (percent)	Combined Fines (percent)	Coarse Fragments by Volume (percent)	Soil Suitability Percolation Chart
TP-1	20-46	50.5	39.3	10.2	49.5	6.8	Zone 2
TP-1	48-60	52.0	31.1	16.9	48	5.1	Zone 2
TP-2	0-20	39.2	42.2	18.6	60.8	14.8	Zone 2
TP-2	20-36	56.4	36.1	7.5	43.6	15.8	Zone 2
TP-2	36-72	75.2	19.3	5.5	24.8	2.2	Zone 2

Percolation Test Data

The soil percolation test sheet is included as Attachment 3. Table 2 presents the results of the percolation testing, reported in minutes per inch. Percolation testing was performed at the depth interval of 30-42 inches in PP-1 and 48-60 inches in PP-2. The test depth intervals were chosen to represent the approximate lower depths of the proposed dispersal trench sidewalls, assuming trench depths of 60 inches.

Table 2. Soil Percolation Rates

Test Hole No.	Depth (inches)	Soil Percolation Suitability Chart	Stabilized Percolation Rate (minutes per inch)
PP-1	48-60	Sandy Loam	7
PP-2	24-36	Sandy Loam	9

For design purposes, a soil application rate of 0.554 gallons per day per square foot (gpd/ft^2) was used to size both the primary disposal field and 100% replacement area. The application rate is based on the slowest measured percolation rate of 9 minutes per inch, and in accordance with Section 2.3.1, Table 2 of the Humboldt County OWTS Technical Manuel.

Groundwater

No groundwater or soil mottling was observed to a depth of at least 8.4 feet below the ground surface during the field investigation and monitoring period at the location observation well OW-1. Shallow groundwater conditions, however, are present at the location of observation well OW-2, which is located approximately 5 feet lower in elevation as compared to OW-1. Free groundwater was observed flowing from the test pit wall in TP-2 at a depth of 4 feet on the day of the field investigation. Groundwater depths ranging from 3.9 feet to 4.4 feet below ground surface were measured in OW-2 between March 23 and April 29. The observation well data sheet is included as Attachment 4.

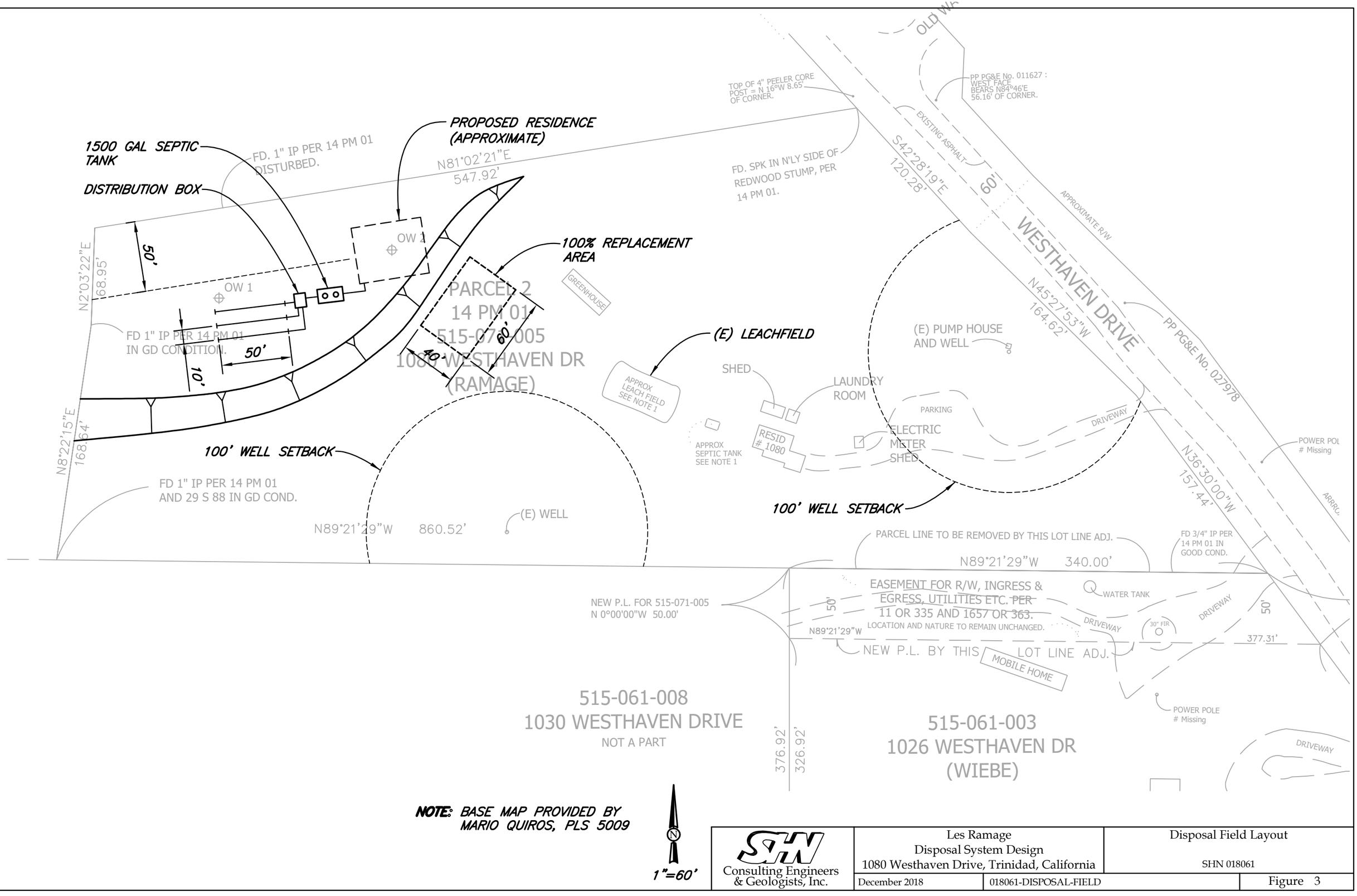
Subsurface Disposal Field Recommendations

Based on soil and groundwater conditions, a standard gravity-flow dispersal system designed and constructed in accordance with Humboldt County Division of Environmental Health standards is suitable for the proposed primary disposal field site, to be located in the vicinity of TP-1 and OW-1. The designated replacement area located in the vicinity of TP-2 and OW-2 is to consist of a low-pressure pipe-distribution system due to the presence of relatively shallow groundwater conditions.

The primary disposal field is sized to accommodate daily wastewater flows of up to 525 gpd and will require an area of 50 feet by 25 feet plus a 10-foot setback. The 100% replacement will require an area of 40 feet by 40 feet plus a 10-foot setback to remain undisturbed and unencumbered by structures or parking. A layout of the proposed disposal field and 100% replacement area relative to existing site features is shown on Figure 3. Specifications for the system, including the size of the septic tank, the number of trenches required, the length, width, and depth of the trenches are included in Attachment 5. Also contained in Attachment 5 are the calculations made to determine the size of the disposal system.

Based on the slowest field-determined percolation rate of 9 minutes per inch and a corresponding soil application rate of 0.554 gpd/ft^2, a total dispersal trench length of 150 feet is required. We recommend that the proposed residence and new 1,500-gallon septic tank be located at the highest elevation of the site in order to allow effluent to gravity flow to a distribution box and be delivered to three separate 50-foot-long trenches located as shown on Figure 3. The trenches are to be excavated level along the bottom and to a typical width of 18 inches and depth of 60 inches. Trenches are to be spaced 10 feet apart, from center to center. Each trench is to contain 42 inches of clean drain rock below the 3-inch perforated pipe. An additional 6 inches of drain rock shall be placed around and on top of the drain pipe. The drain rock shall be covered with filter fabric and the remaining open trench backfilled with 12 inches of the excavated loamy topsoil to match existing grade. The top of the trenches should be mounded with additional loamy topsoil to shed surface runoff and to account for future settlement. A typical trench cross-section diagram is included as Attachment 6 for reference.

Construction of the disposal system should be performed by a qualified contractor in accordance with the specifications and recommendations contained within this report.



Consulting Engineers & Geologists, Inc.	Les Ramage Disposal System Design 1080 Westhaven Drive, Trinidad, California	Disposal Field Layout SHN 018061
	December 2018 | 018061-DISPOSAL-FIELD	Figure 3

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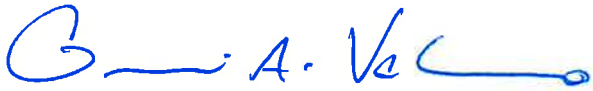
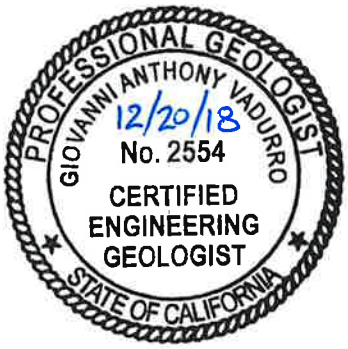
Please call me at 707-441-8855 if you have any comments or concerns.

Sincerely,

SHN





Giovanni A. Vadurro, CEG 2554
Engineering Geologist

GAV:lms
Attachments:
1. Soil Profile Logs
2. Laboratory Textural Analysis Results
3. Percolation Test Data
4. Observation Well Data Sheet
5. Disposal Field Design Calculations and System Specifications
6. Typical Trench Cross-Section Diagram

References

Esri and others. (May 26, 2016). Topographic Map of the Ramage Parcel, APN 515-071-005, Trinidad, CA. NR: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

Humboldt County Department of Health and Human Services. (2017). *Humboldt County Onsite Wastewater Treatment System (OWTS) Regulations and Technical Manual*. Environmental Health Department, Eureka, CA.

Humboldt County Planning and Building Department. (2015). Humboldt County GIS Portal, accessed at: http://gis.co.humboldt.ca.us/Freeance/Client/PublicAccess1/index.html?appconfig=podgis4

Quiros, Mario, PLS. (NR). Base Map of 1080 Westhaven Drive, Trinidad, CA. Trinidad, CA:Quiros.

Soil Profile Logs 1

Consulting Engineers & Geologists, Inc.

812 West Wabash, Eureka, CA 95501 ph. (707) 441-8855 fax. (707) 441-8877

PROJECT NAME: Ramage Lot-line Adjusment

PROJECT NUMBER: 018061

LOCATION: Proposed Primary Disposal Field

DATE EXCAVATED: 3/21/18

APN: 515-071-005

TOTAL DEPTH OF HOLE: 8.4 Feet

EXCAVATION METHOD: Mini-Excavator (Bowman Construction)

SAMPLER TYPE: Bulk

LOGGED BY: G. Vadurro, CEG 2554

TEST PIT NUMBER

TP-1

DEPTH (ft)	GROUNDWATER LEVEL	DATE	BULK SAMPLE	TUBE SAMPLE	FIELD CLASSIFICATION BASED ON U.S.D.A. CLASSIFICATION SYSTEM TEXTURE, CONSISTENCY, STRUCTURE, MOISTURE, COLOR, REMARKS	Laboratory Data: Coarse Fragments % By Volume	Laboratory Data: % Fines	Laboratory Data: Bulk Density (g/cc)	Laboratory Data: Percolation Suitability Zone	Perc Rate (MPI)	WATER MONITOR CONSTRUCTION	WATER MONITOR DETAILS	REMARKS
0					LOAM, firm, non-sticky and non-plastic, fine granular structure; moist, brown to dark yellowish brown, abrupt and smooth lower boundary (FILL).							1-1/2" solid PVC 0-3' BGS with bentonite seal from 0-2' BGS.	Fill layer
-1													
-2			▨		LOAM, friable, non-sticky and non-plastic, weak to moderate medium subangular blocky structure; moist, brown (7.5YR 4/4), few coarse roots, abundant charcoal, clear and smooth lower boundary.	7	50		2				A-horizon % Sand = 50.5 % Silt = 39.3 % Clay = 10.2
-3												1-1/2" screened PVC 3-8' BGS with sand pack from 2-8' BGS.	
-4			▨		SANDY LOAM, friable, fine to medium sand, slightly sticky and slightly plastic, moderate to strong medium to coarse subangular blocky structure; moist, strong brown (7.5YR 4/6), gradual and smooth lower boundary.	5	48		2				B-horizon % Sand = 52.0 % Silt = 31.1 % Clay = 16.9
-5					SANDY LOAM grading to LOAMY SAND, firm, fine to medium sand, non-sticky and slightly plastic, coarse granular structure; moist, yellowish brown (10YR 5/6).					7			
-6													
-7													
-8	▽	3/21 (dry)											
-9					Test pit completed to 8.4 feet; no groundwater or soil mottling observed.								
-10													

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

Consulting Engineers & Geologists, Inc.

812 West Wabash, Eureka, CA 95501 ph. (707) 441-8855 fax. (707) 441-8877

PROJECT NAME: Ramage Lot-line Adjusment

PROJECT NUMBER: 018061

LOCATION: Proposed 100% Replacement Area

DATE EXCAVATED: 3/21/18

APN: 515-071-005

TOTAL DEPTH OF HOLE: 6.5 Feet

EXCAVATION METHOD: Mini-Excavator (Bowman Construction)

SAMPLER TYPE: Bulk

LOGGED BY: G. Vadurro, CEG 2554

TEST PIT NUMBER

TP-2

DEPTH (ft)	GROUNDWATER LEVEL	DATE	BULK SAMPLE	TUBE SAMPLE	FIELD CLASSIFICATION BASED ON U.S.D.A. CLASSIFICATION SYSTEM TEXTURE, CONSISTENCY, STRUCTURE, MOISTURE, COLOR, REMARKS	Laboratory Data: Coarse Fragments % By Volume	Laboratory Data: % Fines	Laboratory Data: Bulk Density (g/cc)	Laboratory Data: Percolation Suitability Zone	Perc Rate (MPI)	WATER MONITOR CONSTRUCTION	WATER MONITOR DETAILS	REMARKS
0					LOAM, very friable, non-sticky and non-plastic, fine to medium granular structure; moist, brown (7.5YR3/3). abundant fine roots, clear and wavy lower boundary.	15	61		2			1-1/2" solid PVC 0-3.5' BGS with bentonite seal from 0-2' BGS.	A-horizon % Sand = 39.2 % Silt = 42.2 % Clay = 18.6
-1													
-2					SANDY LOAM, firm, fine to medium sand, slightly sticky and slightly plastic, moderate medium to coarse subangular blocky structure; very weak fine clay films on pore faces; moist, yellowish brown (10YR 5/6), clear and smooth lower boundary.	16	44		2				B-horizon % Sand = 56.4 % Silt = 36.1 % Clay = 7.5
-3					LOAMY SAND, firm, fine to medium sand, less than about 10% fine rounded gravel; slightly sticky and slightly plastic, weak fine to medium subangular blocky structure; moist, dark yellowish brown (10YR 4/6), gradual and smooth lower boundary.	2	25		2	9		1-1/2" screened PVC 3.5-6.5' BGS with sand pack from 2-6.5' BGS.	% Sand = 75.2 % Silt = 19.3 % Clay = 5.5
-4	▼	3/23											
	▼	3/21											
	▼	4/15											
	▼	4/29											
-5													
-6													
	▽	9/23 (dry)											
-7					Test pit completed to 6.5 feet; groundwater encountered at 4 feet.								
-8													
-9													
-10													

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

Laboratory Textural Analysis Results

2

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: 018061

April 2, 2018

Les Ramage
2096 Robb Road
Walnut Creek, CA 94596

SOIL PERCOLATION SUITABILITY / TEXTURAL ANALYSIS RESULTS

Job Name: Ramage **Sampled By: GAV**
Date Sampled: 03/21/18 **Date Tested: 03/28/18**
Date Received: 03/21/18 **AP Number: Not Provided**

Sample ID	Depth	% Sand	% Clay	% Silt	% Coarse Fragments by Volume	Zone	Bulk Density
TP-1	20-46"	50.5	10.2	39.3	6.8	2	*
	Material: **Loam**						
TP-1	48-60"	52.0	16.9	31.1	5.1	2	*
	Material: **Sandy Loam**						
TP-2	0-20"	39.2	18.6	42.2	14.8	2	*
	Material: **Loam**						
TP-2	20-36"	56.4	7.5	36.1	15.8	2	*
	Material: **Sandy Loam**						
TP-2	36-72"	75.2	5.5	19.3	2.2	2	*
	Material: **Loamy Sand**						

* = 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.

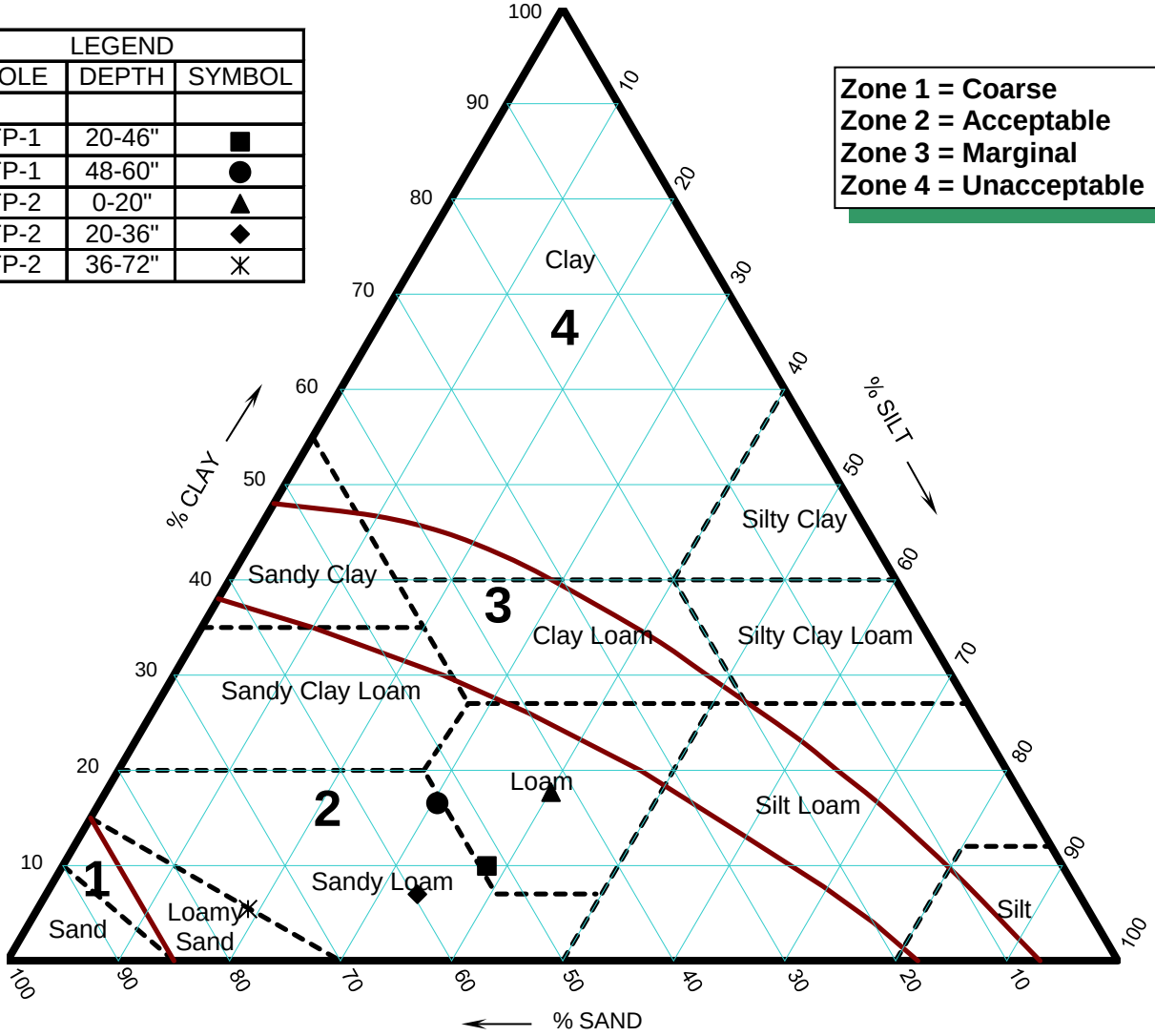
Zone 3 - Soils in this zone are expected to provide good filtration of effluent, but their ability to accept effluentat at a suitable rate is questionable. These soils require wet-weather percolation tests to verify their suitability for effluent disposal by conventional leachfield methods.

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	20-46"	■
TP-1	48-60"	●
TP-2	0-20"	▲
TP-2	20-36"	◆
TP-2	36-72"	✳

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: 018061 **DATE:** 03/28/18

JOB NAME: Ramage **APN:** Not Provided

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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

SOIL TEXTURE ANALYSIS WORKSHEET (RWQCB)

Job Name:	**Ramage**	**Job Number:**	**018061**
Performed By:	**ESP**	**Date:**	**03/28/18**
Checked By:	**NAN**	**AP Number:**	**Not Provided**
Project Manager:	**GAV**		

Lab Sample Number	18-139	18-140	18-141	18-142	18-143
Job Sample Number					
Hole #	TP-1	TP-1	TP-2	TP-2	TP-2
Depth	20-46"	48-60"	0-20"	20-36"	36-72"
A. Oven Dry Weight, gm	59.6	65.6	65.0	67.7	74.1
B. Starting time (hr:min:sec)	10:35:00	10:38:00	10:41:00	10:44:00	10:47:00
C. Temperature @ 40 sec	68.0	68.0	68.0	68.0	67.5
D. 1st Hydrometer Reading @ 40 sec	36	38	46	36	25
E. Composite correction (gm/L)	6.5	6.5	6.5	6.5	6.6
F. True Density @ 40 sec (gm/L) D-E	29.5	31.5	39.5	29.5	18.4
G. Temperature @ 2 hrs.	66.0	66.0	66.0	66.0	66.0
H. 2nd Hydrometer Reading @ 2 hrs.	13	18	19	12	11
I. Composite correction (gm/L)	6.9	6.9	6.9	6.9	6.9
J. True Density @ 2 hrs. (gm/L)	6.1	11.1	12.1	5.1	4.1
K. % Sand = 100-[(F/A)x100]	50.5	52.0	39.2	56.4	75.2
L. % Clay = (J/A)x100	10.2	16.9	18.6	7.5	5.5
M. % Silt = 100-(L+K)	39.3	31.1	42.2	36.1	19.3
N. Combined % Silt & % Clay = (L+M)	49.5	48.0	60.8	43.6	24.8
Soil Bulk Density, gm/cc	*	*	*	*	*
USDA Texture	**Loam**	**Sandy Loam**	**Loam**	**Sandy Loam**	**Loamy Sand**
Soil Percolation Suitability Chart Zone	**2**	**2**	**2**	**2**	**2**
1. Total Sample Weight, gm	589.4	571.6	614.9	608.0	835.6
2. Weight > 2mm Coarse Fragment, gm	68.3	50.7	146.5	153.6	32.9
3. % Coarse Fragment by Weight	11.6	8.9	23.8	25.3	3.9
4. % Coarse Fragment by Volume	6.8	5.1	14.8	15.8	2.2
5. % Coarse Adjustment	**1.4**	**1.0**	**3.0**	**3.2**	**0.4**

Percolation Test Data 3

812 W. Wabash Avenue, Eureka, CA 95501-213 707-441-8855
Civil Engineering, Environmental Services, Geosciences, Planning & Permitting, Surveying

SOILS PERCOLATION TEST DATA SHEET

CLIENT	Ramage	**DATE**	3/21/2018
JOB REF.	18061	**APN**	515-071-005
TEST PIT No.	PP-1	TESTED BY	G. Vadurro
DEPTH TESTED	48-60"	DTW	>8.4 feet
PRE-SOAK	4 complete refillings		

Reading No.	Start Time	Stop Time	Interval (Minutes)	Water Level Drop (Inches)	Percolation Rate (Minutes per Inch)
1	11:45	12:00	15:00	3	5
2	12:00	12:15	15:00	2 3/4	5
3	12:15	12:30	15:00	2 1/2	6
4	12:30	12:45	15:00	2 1/2	6
5	12:45	13:00	15:00	2 1/4	7
6	13:00	13:15	15:00	2 1/4	7
				STABILIZED PERCOLATION RATE =	**7 MPI**

TEST PIT No.	PP-2	TESTED BY	G. Vadurro
DEPTH TESTED	24-36"	DTW	4 feet
PRE-SOAK	4 complete refillings		

Reading No.	Start Time	Stop Time	Interval (Minutes)	Water Level Drop (Inches)	Percolation Rate (Minutes per Inch)
1	11:55	12:10	15:00	2 1/4	7
2	12:10	12:25	15:00	2	8
3	12:25	12:40	15:00	2	8
4	12:40	12:55	15:00	2	8
5	12:55	13:10	15:00	1 3/4	9
6	13:10	13:25	15:00	1 3/4	9
				STABILIZED PERCOLATION RATE =	**9 MPI**

Observation Well Data Sheet 4

Observation Well Data

			Project #: 018061 - Les Ramage						APN: 515-071-005					
Observation Well ID			**OW-1**		**OW-2**		**OW-3**							
Total well depth (ft)			10.00		8.00									
Height of top of casing above ground (ft)			2.00		1.50									
Well depth below ground surface (ft)			8.00		6.50									
DATE	**PRECIPITATION**		**TIME**											
(dd/mm/yr)	**Daily**	**Total**	**(am/pm)**	**Reading**	**Depth bgs**	**Reading**	**Depth bgs**	**Reading**	**Depth bgs**	**Reading**	**Depth bgs**	**Reading**	**Depth bgs**	**Reading**	**Depth bgs**
3/21/2018	0.45"	26.8"	pm	ND	dry	5.50	4.00								
3/23/2018	0.62"	28.5"	pm	ND	dry	5.40	3.90								
4/15/2018	0.35"	34.3"	pm	ND	dry	5.70	4.20								
4/29/2018	0.01	35.4"	am	ND	dry	5.90	4.40								
9/23/2018	0.0"	36.8"	pm	ND	dry	ND	dry								

Reading = measured reading of groundwater relative to the top of well casing in feet.

Depth bgs = depth to groundwater below the ground surface in feet.

ND = non-detection of groundwater (dry well).

Disposal Field Design Calculations and System Specifications

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812 W. Wabash Avenue, Eureka, CA 95501-2138 707-441-8855
Civil Engineering, Environmental Services, Geosciences, Planning & Permitting, Surveying

Sewage Disposal System Design Specifications

Reference:	018061
Date	December 2018
Client:	Les Ramage
Location:	1080 Westhaven Drive, Trinidad; APN 515-071-005
Subject:	Standard Gravity-flow Dispersal System Design

Setbacks for Primary Dispersal Field & 100% Reserve Area:
Perennial Stream: >100 feet
Ephemeral Stream: >50 feet
Springs: >50 feet
Wells: >100 feet
County Road right-of-way: >10 feet
Property Line: >50 feet
Foundation of Building: >10 feet
Slope Breaks in excess of 30%: >25 feet

Dispersal Field Design Criteria:
Depth to seasonal high groundwater: >8.4 feet below ground surface based on direct observation
USDA Soil Classification: Loam (Zone 2), Sandy Loam (Zone 2), and Loamy Sand (Zone 2)
Measured Percolation Rate: 7 to 9 minutes per inch (MPI)
Daily Wastewater Flow Rate: 525 gallons per day (gpd) for a four-bedroom residence

Summary of Disposal System Specifications:
The disposal field is to be constructed with gravel-filled dispersal trenches containing a total of **160 feet of 3-inch HDPE perforated drain pipe**
Primary Dispersal Field Dimensions = **30 ft x 50 ft**
100% Replacement Area Dimensions = **40 ft x 40 ft for shallow low-pressure pipe-distribution system**
Number of Primary Dispersal Field Trenches = **3**
Trench Length (L) = **50 ft**
Trench Depth (D) = **60 inches**
Trench Width (W) = **18 inches**
Trench Spacing = **10 ft, center to center**
Depth of clean drain rock below the perforated pipe = **42 inches**
Septic tank:

- **1,500 gallon pre-cast dual-compartment concrete septic tank (shall be water tight).**

Distribution Box:

- **Concrete or HDPE distribution box with a minimum of four (4) knockouts (shall be water tight).**

Delivery pipe from 1,500 gallon septic tank to distribution box:

- **HDPE solid 3-inch Triple-wall pipe with welded bell ends and reducer from 4-inch tank outlet (removable effluent filter at septic tank outlet required).**

Delivery pipe from distribution box to each drain pipe:

- **HDPE solid 3-inch Triple-wall pipe with welded bell ends.**

Drain pipe:

- **HDPE perforated 3-inch Triple-wall Channel Flow (2-Hole) drain pipe with welded bell ends.**

<u>Disposal Field Design Calculations</u>:

1) Daily wastewater flow rate in gallons per day (gpd):
   = **525 gpd**
2) Stabilized percolation rate in minutes per inch (MPI):
   7 MPI measured in PP-1 and 9 MPI measured in PP-2
   Rate of 10 MPI used to size both the Primary and 100% Replacement Area fields
3) Total square footage of absorption area required based on measured percolation rate of 10 MPI
   Soil application rate = 0.554 gpd/ft^2 (from Table 2 of the OWTS Technical Manual):
   = Daily flow rate / Soil application rate
   = 525 gpd / 0.554 gpd/ft^2
   = **948 ft^2**
4) Total lineal feet of dispersal trench required using 42 inches of gravel below the drain pipe:
   = Total square footage of absorption area/useable square footage of trench sidewall per lineal foot
   = 948 ft^2 / 7 ft^2 per lineal foot
   = 135 ft minimum
   Use 150-feet of dispersal trench; distribute effluent flow into 3 dispersal trenches with lengths of 50 feet each
5) Dispersal Field and Piping Installation Specifications:
   a) Excavate three (3) dispersal field trenches 50 feet in length, 60 inches deep, and 18 inches wide.
   b) Trenches are to be spaced apart 10 feet (center-to-center) and are to be excavated level along the trench bottom.
   c) The trench bottoms and sidewalls are to be raked clean of smeared soil material. All excess loose soil shall be removed prior to installation of the gravel and drain pipe.
   d) Each trench is to contain 42 inches of clean #3 (3/4-inch to <2 inches) drain rock below the 3-inch perforated pipe and 6 inches of drain rock covering the pipe.
   e) Drain rock is to be covered with filter fabric and the upper 12-inches of open trench backfilled with native topsoil; additional topsoil is to be placed and mounded on top of the trenches to shed surface runoff and to account for future settlement. All topsoil backfill is to be tamped lightly with hand tools.
   f) One (1) distribution box is required to promote even distribution of effluent to the drain pipes; the distribution box is to be set level and bedded in pea gravel or sand such than no settlement will occur.

g) All piping and pipe connections are to be bedded in pea gravel or sand such that no settlement will occur.

h) Finished grading around the dispersal field shall be maintained to divert surface runoff away from the mounded backfill. Seed and mulch the exposed areas immediately after construction to control erosion. Avoid deep-rooted vegetation on the top of the dispersal field to minimize the possibility of root penetration into the drain pipes and leaching trenches.

Typical Trench Cross-Section Diagram

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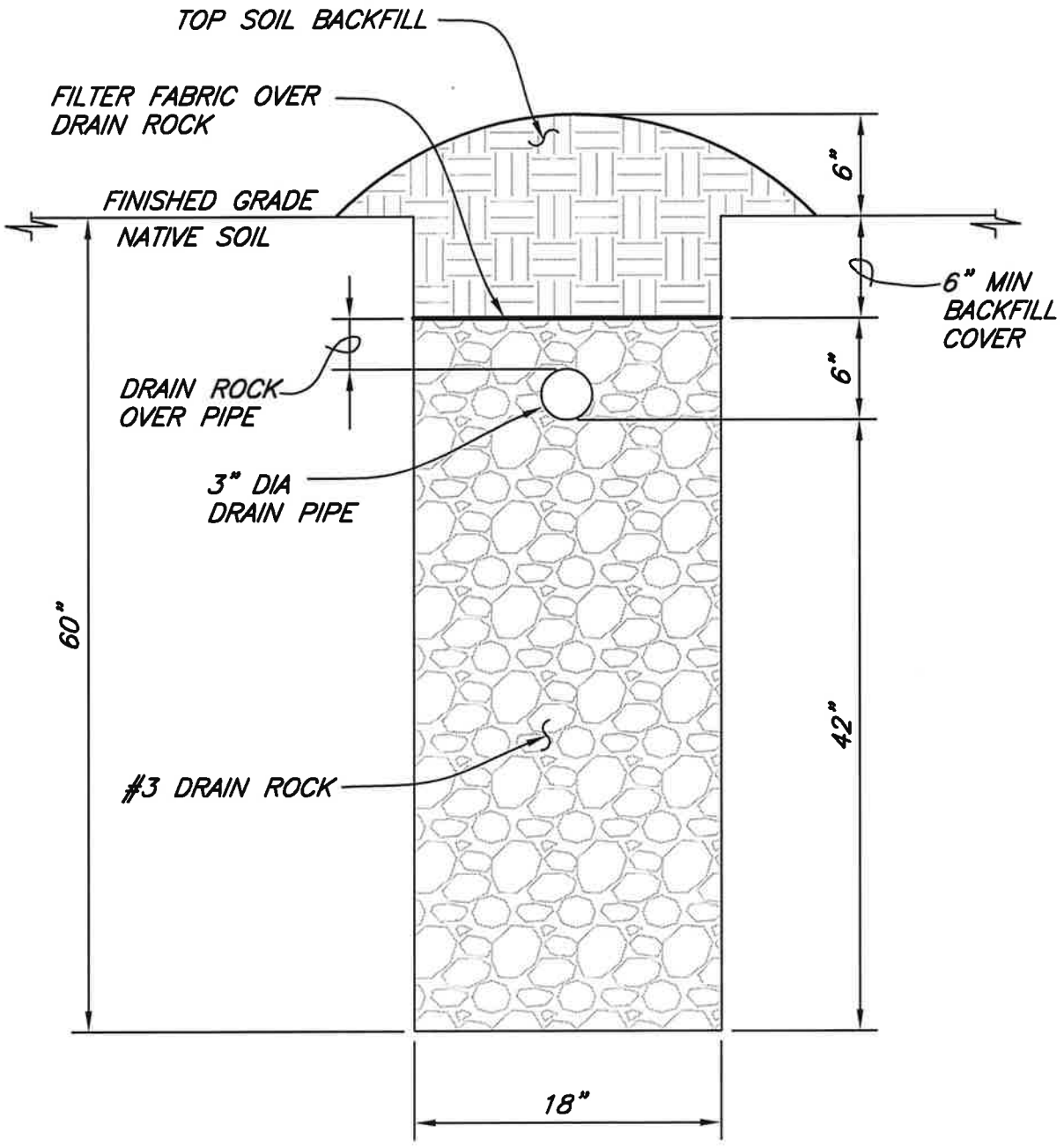

NOT TO SCALE

SHN Consulting Engineers & Geologists, Inc.	Les Ramage Disposal Field Design Trinidad, California	Typical Trench Cross Section SHN 018061
	December 2018 | 018061-TRENCH	Figure 6