SALEM
engineering group, inc.

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February 28, 2018 **Project No. 1-217-1305**

Mr. Jeff Hornacek (209) 405-0617 Phone
Yosemite Mountain Builders, Inc. yosemitebuilder@gmail.com Email
7509 Yosemite Park Way
Yosemite National Park, CA 95389

Subject: **PERCOLATION TESTING FOR PROPOSED ON-SITE SEPTIC DISPOSAL SYSTEM**
SOIL PROFILE LOGS AND PERCOLATION TESTS RESULTS
MARIPOSA COUNTY APN: 006-150-002
YOSEMITE NP, MARIPOSA COUNTY, CALIFORNIA 95389

Dear Mr. Hornacek:

In accordance with your request and authorization, we have excavated and observed three (3) profile test pits and performed three (3) percolation tests to assess the feasibility of a proposed on-site septic system at the subject site. This report documents the services provided and the results of our field studies. The purpose of this investigation was to conduct test pits for soil profiles and percolation testing. This investigation does not include design level on-site septic disposal recommendations. It is our understanding these services will be prepared by others. If desired, SALEM Engineering could perform these services for an additional fee. The County of Mariposa requires evaluation of sewage feasibility as a condition of project approval, which includes soil profiling and percolation testing. The county may require additional testing/observations/inspections at the time planning becomes finalized and prior to granting a construction permit.

PROJECT UNDERSTANDING AND BACKGROUND

The project site consists of approximately 32 acres of undeveloped land located west/southwest of the intersection of Henness Ridge Road and Henness Ridge Drive, and has been given a Mariposa County APN: 006-150-002, located within the community of Yosemite West, within the borders of Yosemite National Park, Mariposa County, California. The site is located in a portion of the northeast ¼ of the southeast ¼ of the northwest ¼ of Section 25, Township 3 South, Range 20 East, Mt. Diablo Base Meridian, (see Figure 1). The project site is located within forested, mountainous terrain. Preliminary planning per email conversation with the client indicates the property will be developed with 2 single-family residences. On-site septic disposal systems will be required for the planned residences.

FIELD SERVICES

On February 1, 2018 and February 2, 2018, SALEM observed the soil conditions within three (3) test pits and conducted three (3) percolation tests under guidance from a representative with Mariposa

County. The excavations were performed by Mr. Jeff Hornacek, with a backhoe using a 2-foot wide bucket to depths ranging from 8 to 8.5 feet below existing ground surface (bgs). The precise locations of the planned septic disposal systems were not known at the time of this investigation. The test pit and percolation tests were performed in areas directed by Mr, Jeff Hornacek. The location of the test pits and percolation tests are indicated on the Site Map, Figure 2. The field investigation was carried out in general accordance with Mariposa County guidelines and practices. The current Site Plan (Figure 2), as well as the test pit logs and percolation tests are included at the end of this report.

SURFACE AND SUBSURFACE CONDITIONS

Surface Conditions

The project site is located immediately west/southwest of the intersection of Henness Ridge Road and Henness Ridge Drive, and has been given a Mariposa County APN: 006-150-002, located within the community of Yosemite West, within the borders of Yosemite National Park, Mariposa County, California. The site is generally bounded by sparsely dense rural residential subdivision to the north and west, undeveloped forested land to the east, and a condominium/multi-family development immediately south with additional single family rural residential/vacation rental, and lodging development further south.

At the time of the field reconnaissance, the site consisted primarily of conifer forest and mountain terrain with various rock outcroppings. The site was noted to be sloping downward in a southwest to northeast direction with elevations varying from 6,050 feet to 5,995 feet above mean sea elevation. The excavated test pits and related percolation testing were conducted in areas that were observed to be generally flat. In addition, as noted on the Site Map provided by the client during the field investigation, a drainage course is slightly evident within the eastern portion of the site. No subsurface water was observed seeping from test-pit sidewalls during the investigation.

Soil/Rock Conditions

The near surface soils encountered generally consisted of a mixture of silty sands with roots and organics and sands that graded into medium to coarse grained sands of decomposed granite. Based on the site exploration, the near surface silty sands extended from the surface to depths ranging between 3 and 4 feet below ground surface. These soils were underlain by highly weathered decomposed granite to the maximum depth of exploration of 8.5 feet. The upper portion of the decomposed granite material encountered could be considered a ‘residual soil’, described as sand. The percent moisture from samples obtained from the percolation test holes ranged from about 4 to 12 percent. A more detailed representation of the stratigraphy at the specific exploration locations is provided on the attached test pit logs.

Groundwater

Evidence of groundwater (mottling, etc.) was generally not observed within the depth of exploration, 8.5 feet bgs. The seasonal drainage shown on the site plan provided by the client is assumed to be attributed to seasonal rainfall, snowmelt, etc. The area of the proposed septic disposal area may require further investigated if groundwater from seasonal drainage is encountered.

PERCOLATION TESTING AND INFILTRATION RATES

On February 1, 2018 and February 2, 2018, three (3) percolation tests were performed under observation of a Mariposa County representative. The percolation tests were performed in the test pit excavations

at depths of about 3.0 and 3.5 feet below ground surface. The percolation testing was conducted in general accordance with guidelines established by the U.S. EPA Method of Septic Tank Practices. The approximate location of the percolation tests and profile test pits are shown on the attached Site Plan, Figure 2.

Three (3) Test Pits were excavated with a backhoe for means of profiling the subsurface stratigraphy and observing bedrock depths, restrictive layers, and the presence of subsurface water. The test pits generally encountered refusal due to slightly weathered granitic bedrock at depths ranging from 8 to a maximum depth of 8.5 feet below existing grade, at which point the test pit encountered practical refusal due to competent bedrock. The percolation tests were constructed within test pits at depths indicated in the following Table. The holes were pre-saturated a minimum of 18 hours and maximum of 24 hours before percolation testing commenced. Percolation rates were measured by filling the test hole with clean water and measuring the water drops at a certain time interval.

The percolation rate data are presented in tabular format at the end of this Report. The difference in the percolation rates are reflected by the varied consistency of soil materials. The test results are shown on the table below.

PERCOLATION TEST RESULTS

Test No.	Depth, bgs (feet)	Unfactored* Percolation Rate (min/inch)	Absorption Capacity (gallon/square foot/day)	Soil Type
P-1	3.0	3.1	58.9	SAND with Silt (SP-SM)
P-2	3.5	2.1	86.0	SAND with Silt (SP-SM)
P-3	3.0	2.7	66.6	SAND with Silt (SP-SM)

*Appropriate safety factor not applied

The soil absorption or percolation rates are based on tests conducted with clear water. The percolation rates may vary with time as a result of soil clogging from water impurities. The percolation rates will deteriorate over time due to the soil conditions and a minimum factor of safety should be applied. The percolation rate may become slower if the subgrade soil is wet or saturated due to shallow groundwater or prolonged rainfalls. The civil engineer may elect to use a lower factor of safety for the design; however, more frequent maintenance will be expected. The soils may also become less permeable to impermeable if the soil is compacted.

It should be noted that when performing percolation testing services in relatively small excavations, that the testing may not fully model the actual full scale long term performance of a given site. This is particularly true where percolation test data is to be used in the design of large infiltration system such as may be proposed for the site. The measured percolation rate includes dispersion of the water at the sidewalls of the boring as well as into the underlying soils. The measured percolation rate should be reduced using a Reduction Factor to account for the discharge of water from both the sides and bottom of the borehole (i.e. non-vertical flow).

Subsurface conditions, including percolation rates, can change over time as fine-grained soils migrate. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

LIMITATIONS

The scope of our services did not include a groundwater study and was limited to the performance of percolation testing and soil profile description, and the submitted data only. Our services did not include those associated with septic system design. Neither did services include an Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands.

Any statements, or absence of statements, in this report or on any test-pit logs regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment. The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices. The work conducted through the course of this investigation, including the preparation of this report, has been performed in accordance with the generally accepted standards of geotechnical engineering practice, which existed in the geographic area at the time the report was written. No other warranty, express or implied, is made.

Subsurface conditions, including percolation rates, can change over time as fine-grained soils migrate. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 271-9700.

Respectfully Submitted,
SALEM ENGINEERING GROUP, INC.

Joshua R. Marroquin, EIT
Geotechnical Staff Engineer
Central / Northern California

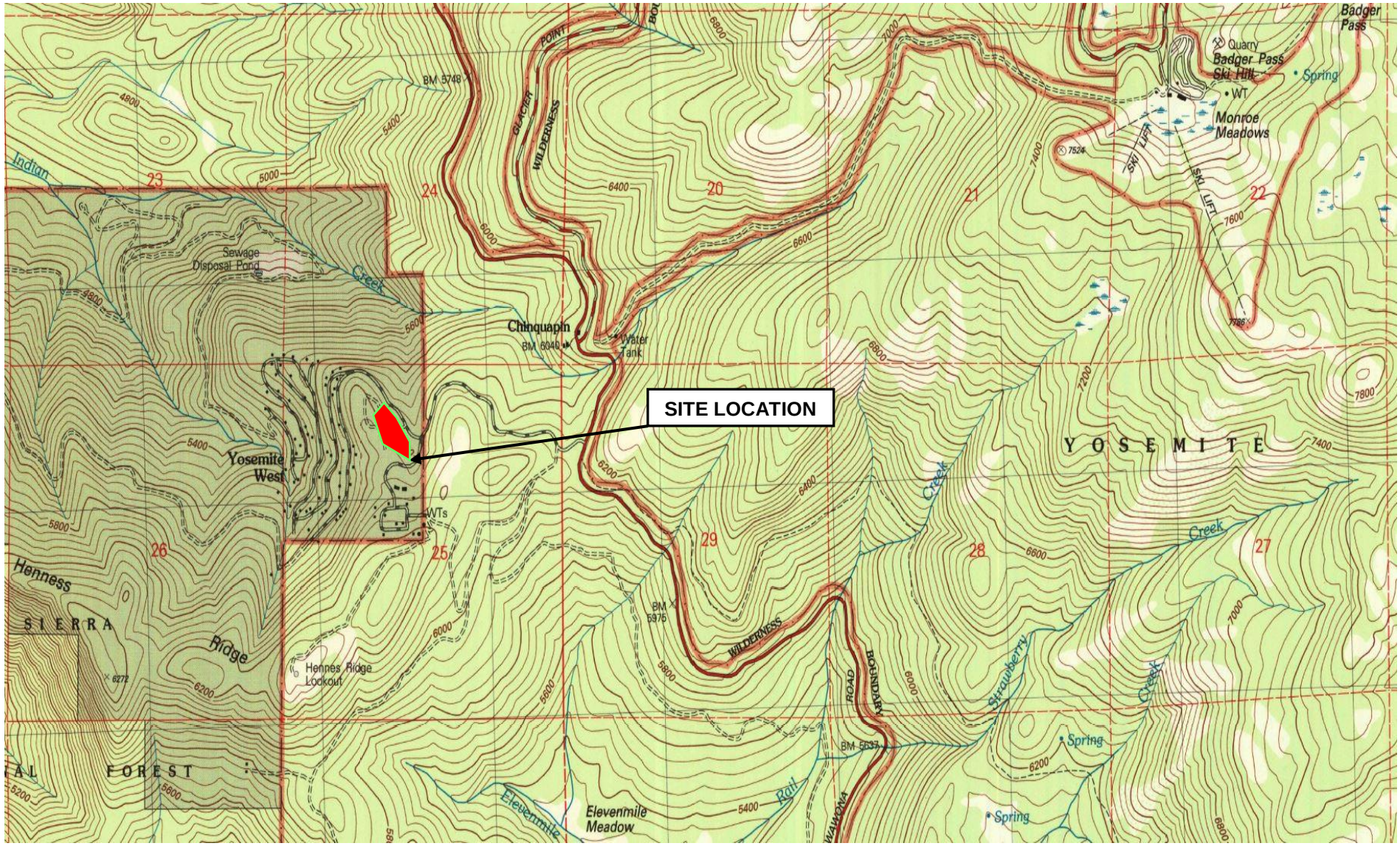
Dean B. Ledgerwood II, CEG
Northern California Geotechnical Manager
CEG 2613



R. Sammy Salem, MS, PE, GE
Principal Managing Engineer
RCE 52762 / RGE 2549



Attachments: Vicinity Map, Figure 1
Site Plan, Figure 2
Test Pit Logs; TP-1 through TP-3
Percolation Test Results; P-1 through P-3
Discussion regarding equivalent rate calculation



Source Image: U.S. Geological Survey, EL Capitan, Calif. 7.5' Quadrangle, 2004 (2007 Edition).

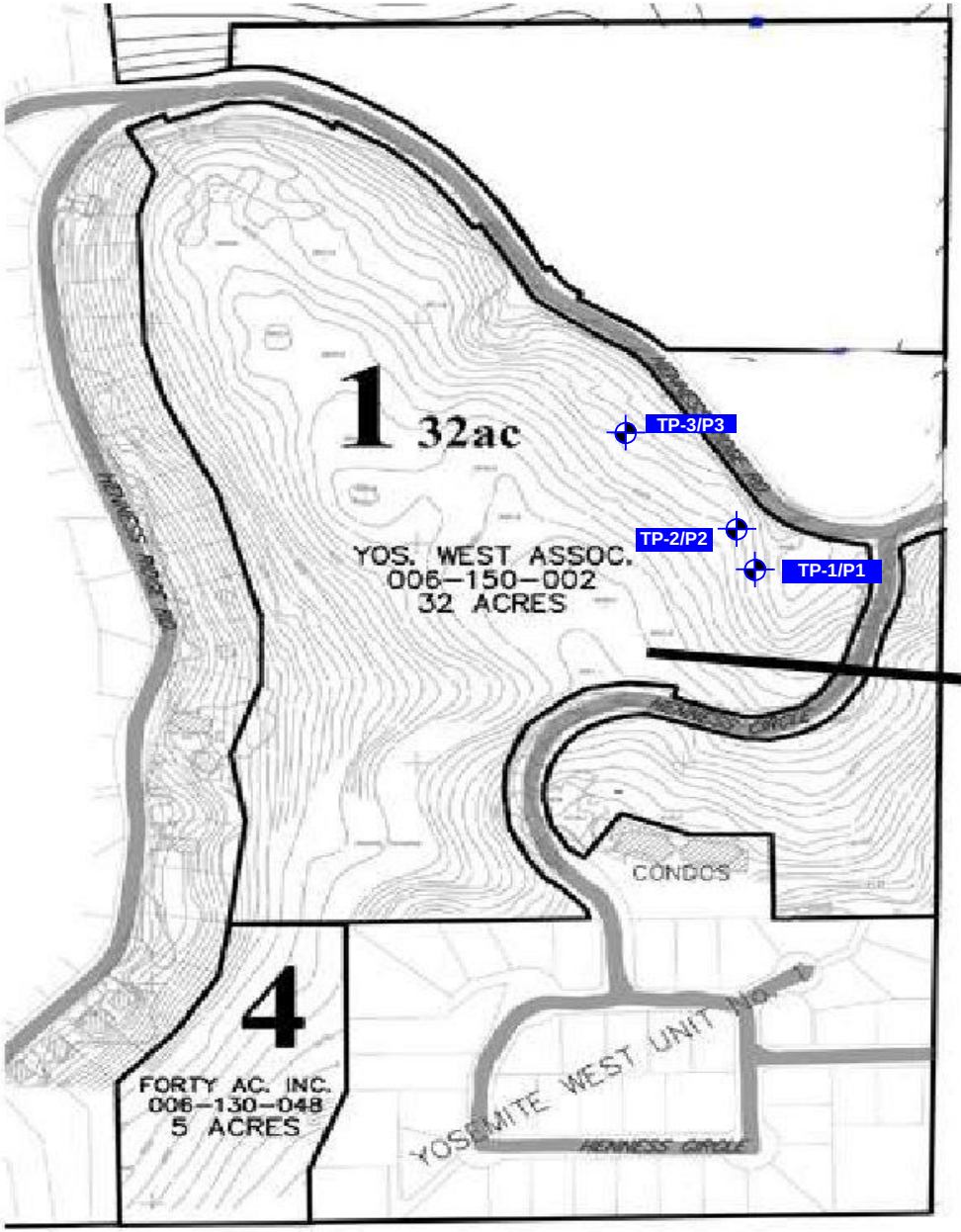
VICINITY MAP

LIMITED GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed Septic Feasibility Study
W / SW of Henness Ridge Road & Henness Ridge Drive
Yosemite West, California

SCALE:	DATE:
NOT TO SCALE	02/2018
DRAWN BY:	APPROVED BY:
AW	JRM
PROJECT NO.	FIGURE NO.
1-217-1305	1

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Yosemite West Associates
32 Acre Parcel Map
Yosemite West, CA







SITE PLAN

LIMITED GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed Septic Feasibility Study
W/SW of Henness Ridge Road & Henness Ridge Drive
Yosemite West, California

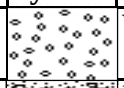
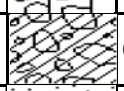
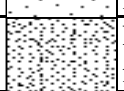
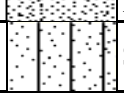
SCALE: NOT TO SCALE	DATE: 02/19/2018
DRAWN BY: AW	APPROVED BY: JRM
PROJECT NO. 1-217-1305	FIGURE NO. 2

LEGEND:
TP-1/P1 Test Pit & Perc. Location

All Locations Approximate

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Unified Soil Classification System

Major Divisions			Letter	Symbol	Description
Coarse-grained Soils More than ½ retained on the No. 200 Sieve	**Gravels** More than ½ coarse fraction retained on the No. 4 sieve	Clean Gravels	GW		Well-graded gravels and gravel-sand mixtures, little or no fines.
			GP		Poorly-graded gravels and gravel-sand mixtures, little or no fines.
		Gravels With Fines	GM		Silty gravels, gravel-sand-silt mixtures.
			GC		Clayey gravels, gravel-sand-clay mixtures.
	Sands More than ½ passing through the No. 200 sieve	Clean Sands	SW		Well-graded sands and gravelly sands, little or no fines.
			SP		Poorly-graded sands and gravelly sands, little or no fines.
		Sands With Fines	SM		Silty sands, sand-silt mixtures
			SC		Clayey sands, sandy-clay mixtures.
Fine-grained Soils More than ½ passing through the No. 200 Sieve	**Silts and Clays** Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL		Organic clays of medium to high plasticity.
	Silts and Clays Liquid Limit greater than 50%		MH		Inorganic silts, micaceous or diatomaceous fines sands or silts, elastic silts.
			CH		Inorganic clays of high plasticity, fat clays.
			OH		Organic clays of medium to high plasticity.
Highly Organic Soils			PT		Peat, muck, and other highly organic soils.

Consistency Classification

Granular Soils			***Cohesive Soils***		
Description - Blows Per Foot (Corrected)			Description - Blows Per Foot (Corrected)		
	MCS	SPT		MCS	SPT
Very loose	<5	<4	Very soft	<3	<2
Loose	5 – 15	4 – 10	Soft	3 – 5	2 – 4
Medium dense	16 – 40	11 – 30	Firm	6 – 10	5 – 8
Dense	41 – 65	31 – 50	Stiff	11 – 20	9 – 15
Very dense	>65	>50	Very Stiff	21 – 40	16 – 30
			Hard	>40	>30

MCS = Modified California Sampler

SPT = Standard Penetration Test Sampler

Test Pit No. TP-1

Project: Proposed Septic Feasibility Study on 32 Acre Property
Project No: 1-217-1305
Client: Yosemite Mountain Builders
Figure No.: A-1
Location: SW of Henness Ridge Rd. & Henness Ridge Dr., Yosemite West, CA
Logged By: JH
Grnd. Surf. Elev. (Ft. MSL) N/A
Depth to Water> **Initial:** None
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND (SM) Dark brown; moist; fine to medium-grained.							
		Grades as above; tan; with some organics (Roots)	--	12.1	Bag		--		
		SAND with Silt (SP-SM) Tan-gray; moist; fine to medium-grained.							
			--	4.3	Bag		--		
5		Grades as above; with decomposed granite.							
		End of Backhoe Pit							
10									

Excavation Method: 24 Inch Excavator Bucket
Excavation Date: 02/02/2018
Equipment: Backhoe
Pit Size: 2' x 8' x 8.5'
Operator: Client
Sheet: 1 of 1

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Test Pit No. TP-2

Project: Proposed Septic Feasibility Study on 32 Acre Property
Project No: 1-217-1305
Client: Yosemite Mountain Builders
Figure No.: A-2
Location: SW of Henness Ridge Rd. & Henness Ridge Dr., Yosemite West, CA
Logged By: JH
Grnd. Surf. Elev. (Ft. MSL) N/A
Depth to Water> **Initial:** None
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND (SM) Dark brown; moist; fine to medium-grained.							
		Grades as above; tan; with some organics (Roots)	--	10.7	Bag		--		
		Silty SAND/SAND (SM/SP) Tan-gray; moist; fine to medium-grained.							
5			--	7.4	Bag		--		
		Grades as above; with decomposed granite.							
		End of Backhoe pit							
10									

Excavation Method: 24 Inch Excavator Bucket
Excavation Date: 02/02/2018
Equipment: Backhoe
Pit Size: 2' x 8' x 8'
Operator: Client
Sheet: 1 of 1

SALEM

Test Pit No. TP-3

Project: Proposed Septic Feasibility Study on 32 Acre Property
Project No: 1-217-1305
Client: Yosemite Mountain Builders
Figure No.: A-3
Location: SW of Henness Ridge Rd. & Henness Ridge Dr., Yosemite West, CA
Logged By: JH
Grnd. Surf. Elev. (Ft. MSL) N/A
Depth to Water> **Initial:** None
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND (SM) Dark brown; moist; fine to medium-grained.							
		Grades as above; tan; with some organics (Roots)	--	8.7	Bag		--		
		SAND with Silt (SP-SM) Tan-gray; moist; fine to medium-grained.							
5			--	6.4	Bag		--		
		Grades as above; with decomposed granite.							
		End of Backhoe Pit							
10									

Excavation Method: 24 Inch Excavator Bucket
Excavation Date: 02/02/2018
Equipment: Backhoe
Pit Size: 2' x 8' x 8'
Operator: Client
Sheet: 1 of 1

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Percolation Test Worksheet

Project: Septic Feasibility Study
SW of Henness R. Rd & Hennes R. Dr.
Yosemite West, CA

Job No.: 1-217-1305
Date Drilled: 2/1/2018
Soil Classification: SAND with Silt (SP-SM)

Vol. in 1" Wtr Col. (in^3): 28.3

Hole Dia.: 6 in.
Pipe Dia.: 3 in.
Gravel pack porosity: 0.4
Gravel Correc Factor: 0.6
Pipe stickup: 0.5 ft ##

Test Hole No.: P-1
Tested By: JH
Drilled Hole Depth: 3 ft.

Presoaking Date: 2/1/2018
Test Date: 2/2/2018

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Grvl Pack Corr. Rate (min/in)	6" Dia. x 6" Water Equiv. MPI:	Avg. Ht. of Water Column** (in.)	Wetted Surf. Area of Column (in^2)	Absorp. Rate (gpd/ft^2)
03:18	03:19	2.0	Y	00:01	0.75	0.87	1.44	1	0.7	1.3	2.7	14.3	297	67.6
03:19	03:20	2.0	N	00:01	0.87	0.98	1.32	1	0.8	1.4	2.7	12.9	271	67.9
03:20	03:21	2.0	N	00:01	0.98	1.08	1.20	1	0.8	1.5	2.7	11.6	248	67.6
03:21	03:22	2.0	N	00:01	1.08	1.18	1.20	1	0.8	1.5	2.4	10.4	225	74.4
03:22	03:23	2.0	Y	00:01	0.75	0.86	1.32	1	0.8	1.4	2.9	14.3	299	61.7
03:23	03:24	2.0	N	00:01	0.86	0.96	1.20	1	0.8	1.5	3.0	13.1	275	61.0
03:24	03:25	2.0	N	00:01	0.96	1.05	1.08	1	0.9	1.7	3.0	11.9	253	59.5
03:25	03:26	2.0	N	00:01	1.05	1.14	1.08	1	0.9	1.7	2.8	10.9	233	64.7
03:26	03:27	2.0	Y	00:01	0.75	0.86	1.32	1	0.8	1.4	2.9	14.3	299	61.7
03:27	03:28	2.0	N	00:01	0.86	0.96	1.20	1	0.8	1.5	3.0	13.1	275	61.0
03:28	03:29	2.0	N	00:01	0.96	1.05	1.08	1	0.9	1.7	3.0	11.9	253	59.5
03:29	03:30	2.0	N	00:01	1.05	1.14	1.08	1	0.9	1.7	2.8	10.9	233	64.7
03:30	03:31	2.0	Y	00:01	0.75	0.86	1.32	1	0.8	1.4	2.9	14.3	299	61.7
03:31	03:32	2.0	N	00:01	0.86	0.96	1.20	1	0.8	1.5	3.0	13.1	275	61.0
03:32	03:33	2.0	N	00:01	0.96	1.05	1.08	1	0.9	1.7	3.0	11.9	253	59.5
03:33	03:34	2.0	N	00:01	1.05	1.13	0.96	1	1.0	1.9	3.1	10.9	234	57.2
03:34	03:35	2.0	N	00:01	1.13	1.21	0.96	1	1.0	1.9	2.9	10.0	216	62.0
03:35	03:37	2.0	Y	00:02	0.75	0.95	2.40	2	0.8	1.5	3.1	13.8	288	58.1
03:37	03:39	2.0	N	00:02	0.95	1.13	2.16	2	0.9	1.7	2.9	11.5	245	61.4
03:39	03:41	2.0	N	00:02	1.13	1.29	1.92	2	1.0	1.9	2.8	9.5	207	64.7
03:41	03:43	2.0	Y	00:02	0.75	0.95	2.40	2	0.8	1.5	3.1	13.8	288	58.1
03:43	03:45	2.0	N	00:02	0.95	1.13	2.16	2	0.9	1.7	2.9	11.5	245	61.4
03:45	03:47	2.0	N	00:02	1.13	1.29	1.92	2	1.0	1.9	2.8	9.5	207	64.7
03:47	03:49	2.0	Y	00:02	0.75	0.95	2.40	2	0.8	1.5	3.1	13.8	288	58.1
03:49	03:51	2.0	N	00:02	0.95	1.13	2.16	2	0.9	1.7	2.9	11.5	245	61.4
03:51	03:53	2.0	N	00:02	1.13	1.29	1.92	2	1.0	1.9	2.8	9.5	207	64.7
03:53	03:55	2.0	Y	00:02	0.95	1.05	1.20	2	1.7	3.0	5.5	12.0	254	32.9
03:55	03:57	2.0	N	00:02	1.05	1.14	1.08	2	1.9	3.4	5.6	10.9	233	32.4
03:57	03:59	2.0	N	00:02	1.14	1.22	0.96	2	2.1	3.8	5.7	9.8	214	31.3
03:59	04:01	2.0	N	00:02	1.22	1.30	0.96	2	2.1	3.8	5.3	8.9	196	34.2
04:01	04:03	2.0	Y	00:02	1.00	1.18	2.16	2	0.9	1.7	2.8	10.9	234	64.4
04:03	04:05	2.0	N	00:02	1.18	1.34	1.92	2	1.0	1.9	2.6	8.9	196	68.5
04:05	04:07	2.0	N	00:02	1.34	1.50	1.92	2	1.0	1.9	2.1	7.0	159	84.0
04:07	04:08	2.0	Y	00:01	1.00	1.09	1.08	1	0.9	1.7	2.9	11.5	244	61.7
04:08	04:09	2.0	N	00:01	1.09	1.17	0.96	1	1.0	1.9	3.0	10.4	225	59.5
04:09	04:10	2.0	N	00:01	1.17	1.25	0.96	1	1.0	1.9	2.8	9.5	207	64.7
04:10	04:11	2.0	N	00:01	1.25	1.33	0.96	1	1.0	1.9	2.5	8.5	189	71.0
04:11	04:12	2.0	Y	00:01	0.90	1.00	1.20	1	0.8	1.5	2.9	12.6	266	63.0
04:12	04:13	2.0	N	00:01	1.00	1.08	0.96	1	1.0	1.9	3.3	11.5	245	54.6
04:13	04:14	2.0	N	00:01	1.08	1.16	0.96	1	1.0	1.9	3.1	10.6	227	59.0
04:14	04:15	2.0	N	00:01	1.16	1.24	0.96	1	1.0	1.9	2.8	9.6	209	64.0
04:15	04:16	2.0	N	00:01	1.24	1.32	0.96	1	1.0	1.9	2.6	8.6	191	70.1
04:16	04:17	2.0	Y	00:01	1.00	1.08	0.96	1	1.0	1.9	3.3	11.5	245	54.6
04:17	04:18	2.0	N	00:01	1.08	1.16	0.96	1	1.0	1.9	3.1	10.6	227	59.0
04:18	04:19	2.0	N	00:01	1.16	1.24	0.96	1	1.0	1.9	2.8	9.6	209	64.0
04:19	04:20	2.0	Y	00:01	0.95	1.03	0.96	1	1.0	1.9	3.4	12.1	257	52.2
04:20	04:21	2.0	N	00:01	1.03	1.11	0.96	1	1.0	1.9	3.2	11.2	239	56.2
04:21	04:22	2.0	N	00:01	1.11	1.19	0.96	1	1.0	1.9	3.0	10.2	221	60.8
04:22	04:23	2.0	N	00:01	1.19	1.27	0.96	1	1.0	1.9	2.7	9.2	202	66.2
												Absorption Rate*		58.9
												6" Dia. Borehole with 6" of Water Equivalent MPI(1):		**3.1**

from top of pipe to top of gravel

(+ or - from grade)

** Top of water to base of hole (below approximately 2" of gravel)

* last 4 readings

Note:

SALEM engineering group, inc.

Percolation Test Worksheet

Project:	Septic Feasibility Study SW of Henness R. Rd & Hennes R. Dr. Yosemite West, CA	**Job No.:**	1-217-1305	**Vol. in 1" Wtr Col. (in^3):**	28.3
		Date Drilled:	2/1/2018		
		Soil Classification:	SAND with Silt (SP-SM)	Hole Dia.:	6 in.
				Pipe Dia.:	3 in.
Test Hole No.:	P-2	**Presoaking Date:**	2/1/2018	Gravel pack porosity:	0.4
Tested By:	JH	**Test Date:**	2/2/2018	Gravel Correc Factor:	0.6
Drilled Hole Depth:	3.5 ft.			Pipe stickup:	0.5 ft ##

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill- Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Grvl Pack Corr. Rate (min/in)	6" Dia. x 6" Water Equiv. MPI:	Avg. Ht. of Water Column** (in.)	Wetted Surf. Area of Column (in^2)	Absorp. Rate (gpd/ft^2)
03:18	03:19	2.0	Y	00:01	0.80	0.99	2.28	1	0.4	0.8	1.6	13.3	278	114.4
03:19	03:20	2.0	N	00:01	0.99	1.15	1.92	1	0.5	0.9	1.6	11.2	239	112.3
03:20	03:21	2.0	N	00:01	1.15	1.30	1.80	1	0.6	1.0	1.5	9.3	204	123.4
03:21	03:22	2.0	N	00:01	1.30	1.41	1.32	1	0.8	1.4	1.7	7.7	174	105.8
03:22	03:23	2.0	Y	00:01	0.75	0.92	2.04	1	0.5	0.9	1.8	14.0	292	97.6
03:23	03:24	2.0	N	00:01	0.92	1.08	1.92	1	0.5	0.9	1.7	12.0	254	105.3
03:24	03:25	2.0	N	00:01	1.08	1.21	1.56	1	0.6	1.2	1.8	10.3	222	98.2
03:25	03:26	2.0	N	00:01	1.21	1.31	1.20	1	0.8	1.5	2.1	8.9	196	85.6
03:26	03:27	2.0	Y	00:01	0.75	0.92	2.04	1	0.5	0.9	1.8	14.0	292	97.6
03:27	03:28	2.0	N	00:01	0.92	1.04	1.44	1	0.7	1.3	2.3	12.2	259	77.6
03:28	03:29	2.0	N	00:01	1.04	1.16	1.44	1	0.7	1.3	2.1	10.8	232	86.7
03:29	03:30	2.0	N	00:01	1.16	1.28	1.44	1	0.7	1.3	1.8	9.4	205	98.2
03:30	03:31	2.0	Y	00:01	0.80	0.95	1.80	1	0.6	1.0	2.0	13.5	283	88.9
03:31	03:32	2.0	N	00:01	0.95	1.07	1.44	1	0.7	1.3	2.3	11.9	252	79.7
03:32	03:33	2.0	N	00:01	1.07	1.18	1.32	1	0.8	1.4	2.2	10.5	226	81.5
03:33	03:34	2.0	N	00:01	1.18	1.28	1.20	1	0.8	1.5	2.2	9.2	202	82.7
03:34	03:35	2.0	N	00:01	1.28	1.40	1.44	1	0.7	1.3	1.6	7.9	178	113.2
03:35	03:36	2.0	Y	00:01	0.80	0.90	1.20	1	0.8	1.5	3.1	13.8	288	58.1
03:36	03:37	2.0	N	00:01	0.90	1.01	1.32	1	0.8	1.4	2.6	12.5	265	69.6
03:37	03:38	2.0	N	00:01	1.01	1.11	1.20	1	0.8	1.5	2.6	11.3	241	69.5
03:38	03:39	2.0	N	00:01	1.11	1.21	1.20	1	0.8	1.5	2.3	10.1	218	76.7
03:39	03:41	2.0	Y	00:02	1.00	1.21	2.52	2	0.8	1.4	2.4	10.7	231	76.2
03:41	03:43	2.0	N	00:02	1.21	1.41	2.40	2	0.8	1.5	2.0	8.3	184	90.9
03:43	03:45	2.0	Y	00:02	0.90	1.12	2.64	2	0.8	1.4	2.5	11.9	252	73.1
03:45	03:47	2.0	N	00:02	1.12	1.32	2.40	2	0.8	1.5	2.2	9.4	205	81.8
03:47	03:49	2.0	N	00:02	1.32	1.52	2.40	2	0.8	1.5	1.7	7.0	159	105.0
03:49	03:51	2.0	Y	00:02	0.90	1.11	2.52	2	0.8	1.4	2.6	11.9	253	69.4
03:51	03:53	2.0	N	00:02	1.11	1.31	2.40	2	0.8	1.5	2.2	9.5	207	80.9
03:53	03:55	2.0	N	00:02	1.31	1.51	2.40	2	0.8	1.5	1.7	7.1	162	103.6
03:55	03:57	2.0	Y	00:02	0.80	1.03	2.76	2	0.7	1.3	2.6	13.0	274	70.4
03:57	03:59	2.0	N	00:02	1.03	1.23	2.40	2	0.8	1.5	2.4	10.4	225	74.4
03:59	04:01	2.0	N	00:02	1.23	1.43	2.40	2	0.8	1.5	1.9	8.0	180	93.2
04:01	04:03	2.0	N	00:02	1.43	1.63	2.40	2	0.8	1.5	1.4	5.6	135	124.5
04:03	04:04	2.0	Y	00:01	1.00	1.11	1.32	1	0.8	1.4	2.4	11.3	242	76.1
04:04	04:05	2.0	N	00:01	1.11	1.21	1.20	1	0.8	1.5	2.3	10.1	218	76.7
04:05	04:06	2.0	N	00:01	1.21	1.31	1.20	1	0.8	1.5	2.1	8.9	196	85.6
04:06	04:07	2.0	Y	00:01	1.00	1.12	1.44	1	0.7	1.3	2.2	11.3	241	83.4
04:07	04:08	2.0	N	00:01	1.12	1.22	1.20	1	0.8	1.5	2.3	10.0	216	77.5
04:08	04:09	2.0	N	00:01	1.22	1.32	1.20	1	0.8	1.5	2.1	8.8	193	86.6
04:09	04:10	2.0	Y	00:01	0.90	1.02	1.44	1	0.7	1.3	2.4	12.5	264	76.3
04:10	04:11	2.0	N	00:01	1.02	1.12	1.20	1	0.8	1.5	2.6	11.2	239	70.2
04:11	04:12	2.0	N	00:01	1.12	1.22	1.20	1	0.8	1.5	2.3	10.0	216	77.5
04:12	04:13	2.0	Y	00:01	1.00	1.11	1.32	1	0.8	1.4	2.4	11.3	242	76.1
04:13	04:14	2.0	N	00:01	1.11	1.31	2.40	1	0.4	0.8	1.1	9.5	207	161.9
04:14	04:15	2.0	N	00:01	1.31	1.41	1.20	1	0.8	1.5	1.9	7.7	173	96.8
04:15	04:16	2.0	Y	00:01	1.41	1.51	1.20	1	0.8	1.5	1.6	6.5	150	111.4

Absorption Rate*	86.0
6" Dia. Borehole with 6" of Water Equivalent MPI(1):	**2.1**

from top of pipe to top of gravel

(+ or - from grade)

** Top of water to base of hole (below approximately 2" of gravel)

* last 4 readings

Note:

SALEM engineering group, inc.

Percolation Test Worksheet

Project: Septic Feasibility Study
SW of Henness R. Rd & Hennes R. Dr.
Yosemite West, CA

Job No.: 1-217-1305
Date Drilled: 2/1/2018
Soil Classification: SAND with Silt (SP-SM)

Vol. in 1" Wtr Col. (in^3): 28.3

Hole Dia.: 6 in.
Pipe Dia.: 3 in.
Gravel pack porosity: 0.4
Gravel Correc Factor: 0.6
Pipe stickup: 0.5 ft ##

Test Hole No.: P-3
Tested By: JH
Drilled Hole Depth: 3 ft.

Presoaking Date: 2/1/2018
Test Date: 2/2/2018

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Grvl Pack Corr. Rate (min/in)	6" Dia. x 6" Water Equiv. MPI:	Avg. Ht. of Water Column** (in.)	Wetted Surf. Area of Column (in^2)	Absorp. Rate (gpd/ft^2)
03:18	03:19	2.0	Y	00:01	0.80	0.96	1.92	1	0.5	0.9	1.9	13.4	282	95.2
03:19	03:20	2.0	N	00:01	0.96	1.09	1.56	1	0.6	1.2	2.1	11.7	249	87.5
03:20	03:21	2.0	N	00:01	1.09	1.22	1.56	1	0.6	1.2	1.8	10.1	219	99.3
03:21	03:22	2.0	N	00:01	1.22	1.34	1.44	1	0.7	1.3	1.7	8.6	191	105.2
03:22	03:23	2.0	Y	00:01	0.75	0.89	1.68	1	0.6	1.1	2.3	14.2	295	79.4
03:23	03:24	2.0	N	00:01	0.89	1.02	1.56	1	0.6	1.2	2.2	12.5	265	82.3
03:24	03:25	2.0	N	00:01	1.02	1.15	1.56	1	0.6	1.2	1.9	11.0	235	92.6
03:25	03:26	2.0	N	00:01	1.15	1.27	1.44	1	0.7	1.3	1.9	9.5	207	97.1
03:26	03:27	2.0	Y	00:01	0.80	0.92	1.44	1	0.7	1.3	2.6	13.7	286	70.3
03:27	03:28	2.0	N	00:01	0.92	1.04	1.44	1	0.7	1.3	2.3	12.2	259	77.6
03:28	03:29	2.0	N	00:01	1.04	1.15	1.32	1	0.8	1.4	2.3	10.9	233	79.1
03:29	03:30	2.0	N	00:01	1.15	1.25	1.20	1	0.8	1.5	2.2	9.6	209	80.1
03:30	03:31	2.0	Y	00:01	0.90	1.02	1.44	1	0.7	1.3	2.4	12.5	264	76.3
03:31	03:32	2.0	N	00:01	1.02	1.13	1.32	1	0.8	1.4	2.3	11.1	238	77.6
03:32	03:33	2.0	N	00:01	1.13	1.23	1.20	1	0.8	1.5	2.3	9.8	214	78.4
03:33	03:34	2.0	N	00:01	1.23	1.32	1.08	1	0.9	1.7	2.3	8.7	192	78.4
03:34	03:35	2.0	Y	00:01	1.00	1.10	1.20	1	0.8	1.5	2.6	11.4	243	68.9
03:35	03:36	2.0	N	00:01	1.10	1.19	1.08	1	0.9	1.7	2.6	10.3	222	68.0
03:36	03:37	2.0	N	00:01	1.19	1.27	0.96	1	1.0	1.9	2.7	9.2	202	66.2
03:37	03:38	2.0	Y	00:01	1.00	1.11	1.32	1	0.8	1.4	2.4	11.3	242	76.1
03:38	03:39	2.0	N	00:01	1.11	1.19	0.96	1	1.0	1.9	3.0	10.2	221	60.8
03:39	03:40	2.0	N	00:01	1.19	1.27	0.96	1	1.0	1.9	2.7	9.2	202	66.2
03:40	03:41	2.0	N	00:01	1.27	1.35	0.96	1	1.0	1.9	2.5	8.3	184	72.7
03:41	03:43	2.0	Y	00:02	0.90	1.11	2.52	2	0.8	1.4	2.6	11.9	253	69.4
03:43	03:45	2.0	N	00:02	1.11	1.28	2.04	2	1.0	1.8	2.7	9.7	210	67.7
03:45	03:47	2.0	N	00:02	1.28	1.44	1.92	2	1.0	1.9	2.3	7.7	173	77.4
03:47	03:49	2.0	Y	00:02	0.90	1.12	2.64	2	0.8	1.4	2.5	11.9	252	73.1
03:49	03:51	2.0	N	00:02	1.12	1.28	1.92	2	1.0	1.9	2.8	9.6	209	64.0
03:51	03:53	2.0	N	00:02	1.28	1.44	1.92	2	1.0	1.9	2.3	7.7	173	77.4
03:53	03:55	2.0	Y	00:02	0.90	1.12	2.64	2	0.8	1.4	2.5	11.9	252	73.1
03:55	03:57	2.0	N	00:02	1.12	1.28	1.92	2	1.0	1.9	2.8	9.6	209	64.0
03:57	03:59	2.0	N	00:02	1.28	1.44	1.92	2	1.0	1.9	2.3	7.7	173	77.4
03:59	04:01	2.0	Y	00:02	0.85	1.09	2.88	2	0.7	1.3	2.3	12.4	261	76.9
04:01	04:03	2.0	N	00:02	1.09	1.25	1.92	2	1.0	1.9	2.9	10.0	216	62.0
04:03	04:05	2.0	N	00:02	1.25	1.41	1.92	2	1.0	1.9	2.4	8.0	180	74.5
04:05	04:07	2.0	N	00:02	1.41	1.18	-2.76	2	-0.7	-1.3	-1.8	8.5	188	-102.6
04:07	04:09	2.0	N	00:02	1.18	1.34	1.92	2	1.0	1.9	2.6	8.9	196	68.5
04:09	04:11	2.0	N	00:02	1.34	1.50	1.92	2	1.0	1.9	2.1	7.0	159	84.0
04:11	04:12	2.0	Y	00:01	1.00	1.10	1.20	1	0.8	1.5	2.6	11.4	243	68.9
04:12	04:13	2.0	N	00:01	1.10	1.18	0.96	1	1.0	1.9	3.0	10.3	223	60.1
04:13	04:14	2.0	N	00:01	1.18	1.26	0.96	1	1.0	1.9	2.7	9.4	205	65.5
04:14	04:15	2.0	Y	00:01	1.00	1.09	1.08	1	0.9	1.7	2.9	11.5	244	61.7
04:15	04:16	2.0	Y	00:01	1.00	1.17	2.04	1	0.5	0.9	1.5	11.0	235	121.1
04:16	04:17	2.0	N	00:01	1.17	1.25	0.96	1	1.0	1.9	2.8	9.5	207	64.7
04:17	04:18	2.0	N	00:01	1.25	1.33	0.96	1	1.0	1.9	2.5	8.5	189	71.0
04:18	04:19	2.0	Y	00:01	1.00	1.11	1.32	1	0.8	1.4	2.4	11.3	242	76.1
04:19	04:20	2.0	N	00:01	1.11	1.19	0.96	1	1.0	1.9	3.0	10.2	221	60.8
04:20	04:21	2.0	N	00:01	1.19	1.27	0.96	1	1.0	1.9	2.7	9.2	202	66.2
04:21	04:22	2.0	N	00:01	1.27	1.35	0.96	1	1.0	1.9	2.5	8.3	184	72.7
												Absorption Rate*		66.6
												6" Dia. Borehole with 6" of Water Equivalent MPI(1):		**2.7**

from top of pipe to top of gravel

(+ or - from grade)

** Top of water to base of hole (below approximately 2" of gravel)

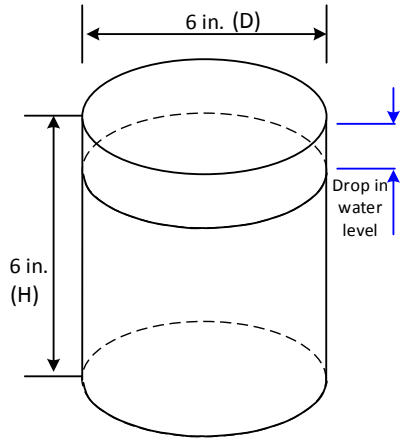
* last 4 readings

Note:

SALEM engineering group, inc.

NOTES ON FALL OF WATER RATE DURING PERCOLATION TESTING AND CONVERTING MEASURED ABSORPTION CAPACITY TO PERCOLATION RATE

Based on EPA 1980 Design Manual: Onsite Wastewater Treatment and Disposal, Caltrans test method 750, and industry practice, the percolation test for septic systems has commonly been conducted in a 6-inch diameter test hole filled with 6 inches of water. The test result is the time it takes water to fall 1 inch in this test hole (minutes per inch, or mpi). This result is not only dependent of the time it takes for the soil to absorb the water, but is also proportional to the wetted surface area over which the absorption takes place. If the wetted surface area doubles (say, by measuring the time it takes water to fall from 13 inches to 12 inches in the test hole), the water will appear to fall faster compared to watching it fall from 6 to 5 inches. The majority of this difference is not a result changing head pressure, but results from different seepage face areas – that is, the more seepage face, the faster the rate of fall in an otherwise homogenous soil. Therefore, unless percolation tests are conducted in a 6-inch diameter boring and measuring the rate of fall (mpi) from approximately 6 to 5 inches, the *measured* percolation rate (in mpi) must be corrected to an *equivalent* percolation rate that can then be compared to the various tables of percolation rate vs. allowable loading rates used by regulatory agencies. See below for the basis for this correction.



Percolation Test Wetted Surface Area
(Bottom and sides of 6 in. diameter test hole filled with 6 in. of water)

$A_{sides} = (\pi * \overset{D}{6} * \overset{H}{6})/144 = 0.786\ ft^2$

$A_{bottom} = \pi r^2/144 = 0.196\ ft^2$

$A_{total} = 0.982\ ft^2$

Volume of water per linear inch of water fall in borehole:

$$\text{Vol/in.} = \frac{\pi r^2}{1728\ in^3/ft^3} = 0.0164\ ft^3/\text{in}$$

Percolation Rate (min. per inch) converted to Absorption Capacity (gal/ft²/day):
(valid for 6 in. diameter boring with 6 in. of water)

$$\underline{\text{Perc Rate}}\quad \frac{in}{1\ min} \times \frac{0.0164\ ft^3}{1\ in} \times \frac{1}{0.982\ ft^2} \times \frac{60\ min}{hr} \times \frac{24\ hr}{day} \times \frac{7.4815\ gal}{ft^3} = 180\ \text{gal/ft}^2\text{/day}\quad \underline{\text{Absorp. Capacity (Q)}}$$

When your perc test uses a boring or hand-excavated hole to measure the fall of water that <u>is not</u> 6 in. diameter filled with 6 in. of water, you need to calculate an *equivalent* perc rate (mpi):

Calculate the observed absorption rate based on measured hole size wetted surface area and the volume of water absorbed through that wetted surface area over a time period (vol/area/time), then:

To convert that measured absorption capacity (Q in gpd/ft²) to *equivalent* minutes per inch (mpi) perc rate: 180/Q = mpi

To convert *equivalent* perc rate (mpi) [or a perc rate measured in a 6" dia. hole filled with 6" of water] to absorption capacity (Q): 180/mpi = Q