

Soil Profile Evaluation



Septic Soil Profile – 525 South Page Road

Page Road and Highway 94
Colorado Springs, Colorado
ProTeX Job No.: 14889



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January 10, 2024

Debbie and Craig Osban

Re: **Soil Profile Evaluation**

Project: **Septic Soil Profile – 525 South Page Road**
Page road and Highway 94
Colorado Springs, Colorado

ProTeX Job No.: 14889

Attention: Debbie and Craig Osban

At your request, ProTeX has completed a soil profile evaluation for the purpose of providing septic design recommendations for the subject project. The accompanying report includes field observations and conclusions and recommendations for the proposed development.

Respectfully submitted,
ProTeX - the PT Xperts, LLC

Rebecca Faulkner
Lab Supervisor



Jones Tembo, PE



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APPENDICES

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Appendix B – Site Information

Site Plan

Appendix C – Soil Profile Logs

Detailed Soil Profile Logs

Appendix D - AASHTO Soil Classification Chart and USDA Textural Soil Triangle

Legends



Executive Summary

Septic systems are recommended by ProTeX based on County Regulations regarding USDA Soil Types, Long-term Acceptance Rates (LTAR) for each soil type, Soil Structure, Soil Grade and any other limiting features observed during the on-site field investigations, such as impermeable soil layers, distances to existing water features, rock content, etc.

TABLE 1		
Depth (ft)	TP 1	TP 2
Topsoil	-	-
.5	Soil Type 2 LTAR=0.60	Soil Type 2 LTAR=0.60
1	Soil Type 2 LTAR=0.60	Soil Type 2 LTAR=0.60
2		
3	Soil Type 1 LTAR=0.80	Soil Type 2 LTAR=0.60
4		Soil Type 1 LTAR=0.80
5		
6		
7		
8		

Our specific recommendation(s), based on the soil data above, include:

- 1) The most limiting soil on site is Soil Type 2, LTAR=0.60. This Soil Type was observed in both TP1 and TP2, at depths of 0 to 2 feet and 0 to 3 feet below the existing site grade, respectively.

- 2) A conventional system is recommended and can be sized to Soil Type 2, LTAR=0.60 at any installation depth up to 4 feet below existing grade.

Please see the table above for a summary of our findings for subsurface soils. For further details, please see **Section 4: Recommendations** of this report.



1.0 INTRODUCTION

1.1 Scope

ProTeX was retained by Debbie and Craig Osban, to evaluate the surface and subsurface soil conditions for the purpose of providing on-site soil data for septic design and construction for an On-Site Wastewater Treatment System (OWTS) and a future Soil Treatment Area (STA). This report contains the findings from the field exploration performed on December 20, 2023. The onsite soil profile evaluation and associated soil testing were conducted in compliance with the Regulations of the El Paso County Board of Health.

1.2 Proposed Site Development

This firm understands that the proposed development will consist of an On-Site Wastewater Treatment System and Soil Treatment Area.

1.3 Terms and Conditions

This report was prepared for Debbie and Craig Osban. The contents of this report may not be relied upon by any other party without the expressed written permission of ProTeX - the PT Xperts, LLC and the written permission of Debbie and Craig Osban. The report presents site conditions at the time of the investigation and for the aforementioned proposed development. The report should be updated prior to construction if a maximum of one year has elapsed from the issued date.

2.0 FIELD OBSERVATIONS

2.1 Field Site Reconnaissance

The site consists of a residential parcel on native land. At the time of the field site visit on December 20, 2023, the following surficial site conditions were observed:

- Vegetation included tall native grasses and mature trees,
- Slopes at the proposed septic location were approximately flat at the proposed septic location,
- Various buildings and fences were observed approximately 40 feet from the proposed septic location. Fences did not appear to be property boundaries.



2.1 Flood Plains

ProTeX reviewed the Federal Emergency Management Agency (FEMA) Flood Maps and determined that the subject site is not within the 100-year flood zone. The map indicates the subject site is located in a regional area that is not printed. The FEMA map reviewed is Map Number 08041C0805G and revision date of December 7, 2018.

2.2 Field Investigation

A total of two (2) test pits were completed at the site for the purpose of evaluating subsurface conditions:

- 1) The test pits terminated at a nominal depth of approximately 8 feet in both TP1 and TP2.
- 2) Groundwater was not encountered in either TP1 or TP2.
- 3) Rock content does not exceed 35% (by weight and volume) in both test pits. A #10 (2 mm) sieve screen and a 1000 mL graduated cylinder were used to determine rock content for on-site soils. Refer to Appendix A for details.
- 4) Water and cultural features were not present at the time of our field investigation on December 20, 2023.
- 5) The weather was cold and partly cloudy.

At each test pit location, the soils encountered were visually and physically observed, classified and logged. Refer to the site plan in Appendix B for approximate test pit locations.



Figure 1: TP1



Figure 2: TP2



3.0 GENERAL SITE CONDITIONS

3.1 Soil Stratigraphy

Based on field explorations and using the Unified Soil Classification System (USCS), the subsurface profile(s) consist primarily of non-plastic silty sand, extending to the depths explored in both TP1 and TP2. Refer to the table below for a summary of the soil types encountered in the subsurface soil profiles. Refer to the soil profile logs in Appendix C for detailed soil profile descriptions. The laboratory test results are presented in Appendix A. Laboratory tests, using ASTM D1140/D422 methods, were performed to determine USCS soil classification of on-site soils.

Trench Number	Sample Depth (ft)	Approx. Depth Range (inches/feet)	Soil Horizon	Sub horizon	USCS Soil Classification	USDA Soil Texture Classification	AASHTO Soil Type
TP1	-	0-3"	O	-	Topsoil	-	-
	0-1'	3"-1'	A	i	SM	Sandy Loam	Soil Type 2
	-	1'-3'	B	e, w	SM	Sandy Loam	Soil Type 2
	-	3'-8'	C	-	SM	Sand	Soil Type 1
TP2	-	0-2"	O	-	Topsoil	-	-
	-	2"-2'	A	i	SM	Sandy Loam	Soil Type 2
	2-3'	2'-4'	B	i, e, w	SM	Sandy Loam	Soil Type 2



	5-6'	4'-8'	C	-	SM	Sand	Soil Type 1
--	------	-------	---	---	----	------	----------------

Based on field explorations and the U.S. Department of Agriculture (USDA) Textural Soil Classification System, soil characteristics are further identified using percentages of sand, silt and clay content in the soil. See figure below of the USDA Textural Soil Triangle diagram:

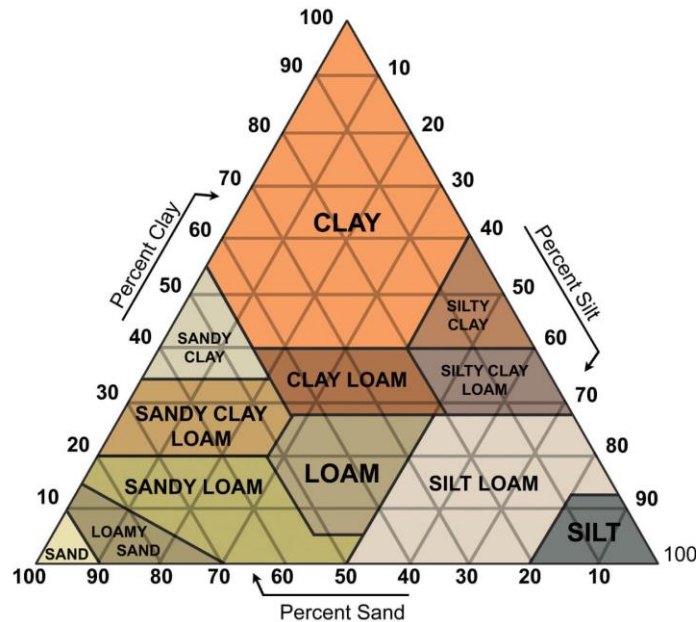


Figure 1: USDA Textural Soil Diagram

3.2 Soil Horizons

Soil horizons are layers of soil whose physical, chemical and biological characteristics differ from the layers above and beneath. In the USDA Soil Texture Classification, horizons are used to define soil types. A soil layer can be further identified by a lowercase letter suffix that tells some trait of the layer, called *sub horizons*. The USDA Soil Taxonomy guidelines are followed for the purpose of this report. See figure below for a typical soil horizon profile. Also, when encountered, Master Soil Horizon ‘E’ (between A and B) designates eluviation or leaching of soil from the layer above.

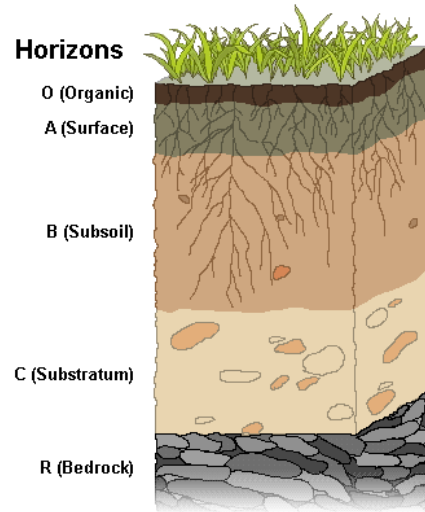


Figure 1: Typical Master Soil Horizon profile

Master Soil Horizons and corresponding sub horizons specifically encountered in our field investigation, are listed in the table below:

Test Pit #	Master Horizon	Sub Horizon	Sub Horizon Description(s)
TP1	O	Topsoil	Topsoil
	A	i	i – undecomposed organic matter
	B	e, w	e – partially decomposed organic matter w – weak horizon
	C	-	No sub horizons identified
TP2	O	Topsoil	Topsoil
	A	i	i – undecomposed organic matter
	B	i, e, w	i – undecomposed organic matter e – partially decomposed organic matter w – weak horizon
	C	-	No sub horizons identified

3.3 Regional Geology

The area between Colorado Springs and Denver contains exposures of Upper Cretaceous through Eocene strata that was deposited as synorogenic sedimentary units which filled the Laramide Denver Basin.



The geology of the Colorado Springs area consists of the Denver Basin Group stratigraphic section and is composed of five units. In ascending order: 1) a basal late Cretaceous unit (Kpv), called the Pikeview Formation of the Denver Basin Group. It is comprised almost exclusively of andesitic debris; 2) the Pulpit Rock Formation (facies) of the Denver Basin Group (TKpr) is comprised almost exclusively of granitic debris that was shed eastward from the rising mountain front of the Rocky Mountains; 3) The Jimmy Camp Formation (facies) unit (TKjc) of the Denver Basin Group is comprised of mixed volcanic and granitic composition; 4) the Black Squirrel Formation (Tbs) is a finer-grained mixed composition unit, south of the Palmer Divide and most likely equivalent to part of its northern counterpart, the Denver Formation, north of the Palmer Divide; and 5) the Dawson Arkose (Tda). This unit can be divided into three (3) younger Eocene units: a) the Larkspur Conglomerate consisting of a coarse arkosic conglomerate; b) Wall Mountain Tuff; and c) The Castle Rock Conglomerate. (Colorado Geological Survey)

3.4 Geological Hazards

The area presents soils that have minor challenges for engineering in respect to on-site wastewater treatment systems and treatment areas due to the presence of permeable soils that may constitute positive flow rates. Due to the nature of the subsoils in this location, there is a risk of expansive soils that may have a low potential to damage subsurface structures. However, proper design, construction and maintenance of septic systems can mitigate, but not eliminate the risk of movement. It is essential that the recommendations referenced in this report are followed to reduce this risk.

3.5 Excavation and Workability

Based on the soil borings, it is anticipated that conventional excavation equipment may be utilized to depths of approximately 8 feet below existing site grade. However, this generalized assessment is not intended to be the sole basis for contractors preparing earthwork bids. Cemented soils, cobbles, boulders, and weathered/broken bedrock may make excavation more difficult than expected. In addition, the relative ease/efficiency of excavation is heavily dependent on operator skill and the type of equipment assigned to the project. Thus, prospective earthwork contractors bidding on this project need to assess site excavation conditions for themselves. Trench shoring, benching, or laying back of



excavations greater than 3 feet in depth may be required to satisfy government safety regulations for personnel safety.

4.0 **RECOMMENDATIONS**

The recommendations contained herein are based on the findings of the field investigation results and local experience.

4.1 **On-Site Soil Summary**

Based on our field investigation(s):

- 1) The soil types located on site consist of **Soil Type 4, LTAR 0.20**. See table below.

TABLE 1		
Depth (ft)	TP 1	TP 2
Topsoil	-	-
.5	Soil Type 2 LTAR=0.60	Soil Type 2 LTAR=0.60
1	Soil Type 2 LTAR=0.60	
2	Soil Type 1 LTAR=0.80	Soil Type 2 LTAR=0.60
3		Soil Type 1 LTAR=0.80
4		Soil Type 1 LTAR=0.80
5		Soil Type 1 LTAR=0.80
6		
7		
8		

- 2) Groundwater was not encountered at the time of our field investigation.
- 3) Redoximorphic features (evidence of groundwater or seasonal saturation of soils) were not encountered in TP1 or TP2.
- 4) A limiting layer that could potentially restrict flow rates of groundwater through the subsurface soils was not encountered at the time of our field investigation on December 20, 2023.
- 5) Soils on site do not exceed 35% rock content (by weight and volume).

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4.2 On-Site Wastewater Treatment System (OWTS) and Soil Treatment Area (STA)

The most limiting soil observed on site is a Soil Type 2, LTAR=0.60 observed at 0 to 2 feet in TP1 and 0 to 3 feet in TP2. Therefore, a conventional system is recommended at any installation depth up to 4 feet below existing grade.

Soil properties can vary throughout the subject site and if soil conditions found during excavation deviate from the soil conditions stated in this septic soil profile report, a ProTeX representative should be notified to re-evaluate the subsurface conditions.

5.0 CLOSURE

5.1 Geotechnical Risk

Risk is an aspect of any geotechnical or soil profile evaluation. Geotechnical and soil profile evaluations are based on limited subsurface investigation. We never have a complete knowledge of the subsurface conditions. Our analysis is tempered with engineering judgement and experience. Thus, recommendations provided in any geotechnical evaluation is not considered risk free. Following the recommendations in this report will minimize the risk associated with the site conditions. It is also imperative that the homeowner understands the risks and that there is a requirement on their part to monitor and maintain the construction of the structures during construction and after construction.

5.2 Limitations

The recommendations contained in this report are based on the assumption that the subsurface conditions do not deviate appreciably from those disclosed by the test holes. Should unusual material or conditions be encountered during construction, the ProTeX geotechnical engineer should be notified to make the necessary supplemental recommendations. This report is issued with the understanding that it is the responsibility of the owner to see that its provisions are carried out or brought to the attention of those concerned.

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The scope of services for this project does not include any environmental assessment of the site or identification of contaminated or hazardous materials or conditions.

The findings of this report are considered valid as of the present date. However, changes in the conditions of the site can occur with the passage of time, whether due to natural events or to human activities on this or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

Appendix A



ProTeX the PT Xperts LLC
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Soils Summary

Client: Debbie and Craig Osban
 Project Name: Page Rd and Hwy 94
 Job Name: 525 S Page Rd
 Material: Geo - Septic (Onsite)
 Material Supplier: _____
 Sample Location: TP1 (0-1')

ProTeX Job No: 14889
 ProTeX Lab No: 2400024 - Denver
 Date Received: 1/3/2024
 Sampled By: Rebecca Faulkner
 Date Sampled: 12/20/2023
 Submitted By: Rebecca Faulkner

ASTM D4318	
Plasticity Index	
Liquid Limit	NV
Plastic Limit	NP
Plasticity Index	NP

Expansion Index, (EI)	Potential Expansion	Expansion Index
0 - 20	Very Low	
21 - 51	Low	
52 - 90	Medium	
91 - 130	High	
> 130	Very High	

Percent Swell of Soil	
% Swell	NV
Notes:	

pH and Resistivity	
pH Reading:	NA
Resistivity (ohms-cm)	NA

Moisture Density (Proctor)	
Max. Dry Density	NV
Opt. Moisture %	NV
Corr. Max. Dry Density	NV
Corr. Opt. Moisture %	NV
% Rock	NV

Class: Silty sand
 Symbol: SM

* = out of specification

ASTM D1140 / D422			
Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	100		
#10	99		
#40	83		
#100	50		
#200	34		

Remarks: % rock by mass: 1% % rock by volume: 0%

Reviewed By: *Rebecca Faulkner*
 Rebecca Faulkner



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Soils Summary

Client: Debbie and Craig Osban
 Project Name: Page Rd and Hwy 94
 Job Name: 525 S Page Rd
 Material: Geo - Septic (Onsite)
 Material Supplier: _____
 Sample Location: TP2 (2-3')

ProTeX Job No: 14889
 ProTeX Lab No: 2400025 - Denver
 Date Received: 1/3/2024
 Sampled By: Rebecca Faulkner
 Date Sampled: 12/20/2023
 Submitted By: Rebecca Faulkner

ASTM D4318	
Plasticity Index	
Liquid Limit	NV
Plastic Limit	NP
Plasticity Index	NP

Expansion Index, (EI)	Potential Expansion	Expansion Index EI = NA
0 - 20	Very Low	
21 - 51	Low	
52 - 90	Medium	
91 - 130	High	
> 130	Very High	

Percent Swell of Soil	
% Swell	NV
Notes:	

pH and Resistivity	
pH Reading:	NA
Resistivity (ohms-cm)	NA

Moisture Density (Proctor)	
Max. Dry Density	NV
Opt. Moisture %	NV
Corr. Max. Dry Density	NV
Corr. Opt. Moisture %	NV
% Rock	NV

Class: Silty sand
 Symbol: SM

* = out of specification

ASTM D1140 / D422			
Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	100		
#10	99		
#40	75		
#100	42		
#200	27		

Remarks: % rock by mass: 1% % rock by volume: 0%

Reviewed By: *Rebecca Faulkner*
 Rebecca Faulkner



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Soils Summary

Client: Debbie and Craig Osban
 Project Name: Page Rd and Hwy 94
 Job Name: 525 S Page Rd
 Material: Geo - Septic (Onsite)
 Material Supplier: _____
 Sample Location: TP2 (5-6')

ProTeX Job No: 14889
 ProTeX Lab No: 2400026 - Denver
 Date Received: 1/3/2024
 Sampled By: Rebecca Faulkner
 Date Sampled: 12/20/2023
 Submitted By: Rebecca Faulkner

ASTM D4318	
Plasticity Index	
Liquid Limit	NV
Plastic Limit	NP
Plasticity Index	NP

Expansion Index, (EI)	Potential Expansion	Expansion Index EI = NA
0 - 20	Very Low	
21 - 51	Low	
52 - 90	Medium	
91 - 130	High	
> 130	Very High	

Percent Swell of Soil	
% Swell	NV
Notes:	

pH and Resistivity	
pH Reading:	NA
Resistivity (ohms-cm)	NA

Moisture Density (Proctor)	
Max. Dry Density	NV
Opt. Moisture %	NV
Corr. Max. Dry Density	NV
Corr. Opt. Moisture %	NV
% Rock	NV

Class: Silty sand

Symbol: SM

* = out of specification

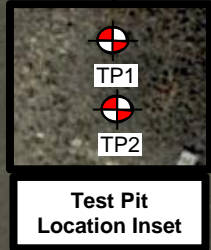
ASTM D1140 / D422			
Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	100		
#10	99		
#40	84		
#100	51		
#200	30		

Remarks: % rock by mass: 1% % rock by volume: 0%

Reviewed By: *Rebecca Faulkner*
 Rebecca Faulkner

Appendix B

Page Road



Legend:



Approximate Test Pit Location



Site Plan

Scale: N.T.S.

Drawn by: RBF

Date: 1/3/2024

Septic Soil Profile – 525 South Page Road

Page Road and Highway 94
Colorado Springs, Colorado



ProTeX Job No.: 14889

Appendix C



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PROJECT INFORMATION

Client: Debbie and Greg Osban	City/County: Colorado Springs / El Paso
Project: Septic Soil Profile – 525 South Page Road	Job #: 14889
Job: 525 South Page Road	Date: 1/3/2024
Cross Streets: Page Road and Highway 94	Latitude: 38° 49 '28" N
Excavator: TB 230 / ProTeX	Longitude: 104° 29' 27" W

Scope of Work: To evaluate the surface and subsurface soil conditions for the purpose of providing on-site soil data for septic design and construction for an On-Site Wastewater Treatment System and a future Soil Treatment Area.

SOIL PROFILE - TEST PIT #1

Depth Below Grade	Sample Depth (ft)	USDA Soil Texture	USDA Soil Structure	USDA Soil Structure Grade	Soil Type	Redoximorphic Features present (Y/N)	Color of Soil
0-3"	-	Topsoil	-	-	-	-	-
3"-1'	0-1'	Sandy Loam (Horizon A)	Blocky – sub angular	Moderate (2)	Soil Type 2 LTAR=0.60	No	Brown
1'-3'	-	Sandy Loam (Horizon B)	Blocky – sub angular	Moderate (2)	Soil Type 2 LTAR=0.60	No	Tan
3'-8'	-	Sand	Granular – single grain	Structureless (0)	Soil Type 1 LTAR=0.80	No	tan

ADDITIONAL SOIL DATA

Total Depth of Test Pit = 8.0'	Groundwater Encountered? No	If so, what depth?
Rock Content (%) = <35% (by mass and volume)	Limiting Layer(s)? No	If so, what depth?
Is Dawson Arkose soils present? No	Fracturing and/or Jointed? No	If so, what depth?
	Is Dawson Arkose a limiting layer? No	

Comments: The most limiting soil on site is Soil Type 2, LTAR=0.60. Based on these conditions, a conventional system can be sized to Soil Type 2 LTAR=0.60 at any installation depth up to 4 feet.



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PROJECT INFORMATION

Client: Debbie and Greg Osban	City/County: Colorado Springs / El Paso
Project: Septic Soil Profile – 525 South Page Road	Job #: 14889
Job: 525 South Page Road	Date: 1/3/2024
Cross Streets: Page Road and Highway 94	Latitude: 38° 49 '28" N
Excavator: TB 230 / ProTeX	Longitude: 104° 29' 27" W

Scope of Work: To evaluate the surface and subsurface soil conditions for the purpose of providing on-site soil data for septic design and construction for an On-Site Wastewater Treatment System and a future Soil Treatment Area.

SOIL PROFILE - TEST PIT #2

Depth Below Grade	Sample Depth (ft)	USDA Soil Texture	USDA Soil Structure	USDA Soil Structure Grade	Soil Type	Redoximorphic Features present (Y/N)	Color of Soil
0-3"	-	Topsoil	-	-	-	-	-
3"-2'	-	Sandy Loam (Horizon A)	Blocky – sub angular	Moderate (2)	Soil Type 2 LTAR=0.60	No	Brown
2'-4'	2-3'	Sandy Loam (Horizon B)	Blocky – sub angular	Moderate (2)	Soil Type 2 LTAR=0.60	No	Tan
4'-8'	5-6'	Sand	Granular – single grain	Structureless (0)	Soil Type 1 LTAR=0.80	No	tan

ADDITIONAL SOIL DATA

Total Depth of Test Pit = 8.0'	Groundwater Encountered? No	If so, what depth?
Rock Content (%) = <35% (by volume and mass)	Limiting Layer(s)? No	If so, what depth?
Is Dawson Arkose soils present? No	Fracturing and/or Jointed? No	If so, what depth?
	Is Dawson Arkose a limiting layer? No	

Comments: The most limiting soil on site is Soil Type 2, LTAR=0.60. Based on these conditions, a conventional system can be sized to Soil Type 2 LTAR = 0.60 at any installation depth up to 4 feet.

Appendix D

Key To Soil Symbols and Classifications

Common Strata Symbols

	High plasticity clay (CH -- C)		Well graded gravel with clay (GW-GC -- 830)
	Inorganic silts and clays (CH-MH -- MC)		Well graded gravel with silt (GW-GM -- 83Z)
	Low plasticity clay (CL -- O)		Well graded gravel/clayey gravel (GW-GP -- 83G)
	Low-high plasticity clays (CL-CH -- CO)		Well graded gravel and sand (GW-SW -- 83D)
	Silty low plasticity clay (CL-ML -- CZ)		Elastic silt (MH -- M)
	Fill (FILL -- F)		Silt (ML -- Z)
	Clayey gravel (GC -- O8)		High plasticity organic clays (OH -- 5)
	Clayey sand and gravel (GC-SC -- D08)		Low plasticity organic silts (OL -- 4)
	Silty gravel (GM -- Z8)		Basalt (or generic rock) (ROCK --)
	Silty clayey gravel (GM-GC -- Z08)		Clayey sand (SC -- D0)
	Silty sand and gravel (GM-SM -- O8)		Silty sand (SM -- 0)
	Poorly graded gravel (GP -- G)		Poorly graded clayey silty sand (SC-SM -- :Z0)
	Poorly graded gravel with clay (GP-GC -- DG03)		Poorly graded silty fine sand (SM-ML -- :Z)
	Poorly graded gravel with silt (GP-GM -- DGZ3)		Poorly graded sand (SP -- :)
	Poorly graded gravel and sand (GP-SP -- :G)		Poorly graded sand with clay (SP-SC -- :R)
	Well graded gravel (GW -- 83)		Poorly graded sand with silt (SP-SM -- :=)
	Well graded sand (SW -- D)		Well graded sand with gravel (SW -- D9)
	Well graded sand with clay (SW-SC -- DR)		Silty sand with gravel (SM -- 09)
	Well graded sand with silt (SW-SM -- D=)		Clayey sand with gravel (SC -- D09)

Relative Density of Cohesionless Soils (blows/ft)

Very Loose	0 to 4
Loose	5 to 10
Medium	11 to 30
Dense	31 to 50
Very Dense	over 50

Relative Degree of Plasticity (PI)

Non-Plastic	0
Low	1 to 7
Low-Medium	8 to 14
Medium	15 to 21
Medium-High	22 to 28
High	29 to 35
Very High	Over 35

Relative Proportions (%)

Trace	5 to 10
Some	10 to 15
With	15 to 35
And	35 to 50

Particle Size Identification (Diameter)

Boulder	8.0" or Larger
Cobbles	3.0" to 8.0"
Coarse Gravel	0.75" to 3.0"
Fine Gravel	5.0 mm to 3.0"
Coarse Sand	2.0 mm to 5.0 mm
Medium Sand	0.4 mm to 2.0 mm
Fine Sand	0.07 mm to 0.4 mm
Silt	0.002 mm to 0.07 mm
Clay	Less Than 0.002

PLASTICITY CHART

