GeoEngineers

July 6, 2009

The Benaroya Company
1100 Olive Way, Suite 1700
Seattle, Washington 98101

Attention: Mark Johnson

Subject: Geotechnical Infiltration Testing
South Hill Facility
1111 39th Avenue SE
Puyallup, Washington
File No. 4565-064-02

INTRODUCTION

This letter report presents the results of our geotechnical infiltration testing at the South Hill Facility located at 1111 39th Avenue SE in Puyallup, Washington. The site location is presented in the attached Vicinity Map, Figure 1.

GeoEngineers previously provided design geotechnical engineering services for additions at the South Hill Facility in a letter dated July 8, 2008. Our current services were requested to evaluate infiltration characteristics at two test pit locations east of Building D (within the northeast corner of the facility). This area is currently a gravel-surfaced parking area with a surrounding turn-around drive aisle. We understand permeable pavement may be utilized as part of the proposed modifications to the existing parking area.

FIELD EXPLORATIONS AND LABORATORY TESTING

FIELD EXPLORATIONS

Subsurface soil conditions were evaluated at the proposed location of the permeable pavement area by observing two test pit explorations and completing infiltration testing at a depth of 1 to 1.5 feet below existing grade. The test pits were excavated adjacent to the infiltration test sites to depths of 7 and 8 feet below grade. The approximate locations of the test pits are shown on the Site Plan, Figure 2. A detailed description of the field exploration program is presented below.

The test pits were excavated using a John 35D mini excavator. The test pits were continuously observed by a senior field technician from our firm who classified the soils encountered, obtained representative soil samples and maintained a detailed log of each test pit. In addition, pertinent information including soil sample depths, stratigraphy, caving, and evidence of groundwater seepage were recorded.

The soils encountered during excavation were visually classified in general accordance with the soil classification system described in Figure 3. The logs of the test pits are presented in Figures 4 and 5. Representative soil samples were obtained from the test pits, logged, sealed in plastic bags and transported to our laboratory. The field classifications were further evaluated in our laboratory.

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Observations of groundwater conditions were made during excavation. The groundwater conditions encountered during excavation are presented on the test pit logs. Groundwater conditions observed during excavation represent a short term condition and may or may not be representative of the long term groundwater conditions at the site

INFILTRATION TESTING

Infiltration testing was completed at a depth of 1 and 1.5 feet below grade, within the weathered glacial deposits encountered immediately below the surficial gravel fill. The EPA Falling Head Percolation test with a reduced soaking period was completed in general accordance with the guidelines stipulated in the King County Surface Water Design Manual. The tests were completed at a depth of 1 to 1½-feet below existing grade by embedding a 6-inch diameter PVC pipe 6-inches into the native soil. Water was placed inside the pipe to a depth of 6-inches and the water level was recorded inside the pipe at 10 minute intervals for one hour. After each measurement, the water level was adjusted to the 6-inch level.

LABORATORY TESTING

Soil samples were collected from the test pits, taken to our laboratory and examined to confirm or modify field classifications, as well as to evaluate engineering properties of the soil. Representative samples were selected for laboratory testing consisting of determination of grain size distribution. Samples were also collected from the test pits, and delivered to Analytical Resources, Inc. to complete testing for the cation exchange capacity (CEC) of the soil.

Soil Classification

All soil samples obtained from the test pits were visually classified in the field and/or in our laboratory using a system based on the Unified Soil Classification System (USCS) and ASTM classification methods. ASTM test method D 2488 was used to visually classify the soil samples, while ASTM D 2487 was used to classify the soils based on laboratory tests results. These classification procedures are incorporated in the test pit logs shown in Figures 4 and 5.

Sieve Analyses

Sieve analyses were performed on four samples in general accordance with ASTM D 422 to determine the sample grain size distribution. The wet sieve analysis method was used to determine the percentage of soil greater than the U.S. No. 200 mesh sieve. The results of the sieve analyses were plotted, classified in general accordance with the Unified Soil Classification System (USCS), and are presented in Figure 6.

Cation Exchange Capacity

One sample from each test pit was submitted to Analytical Resources Incorporated to evaluate the CEC of the soil. The results of the analyses indicate a CEC of 11.6 milliequivalents per 100 grams (meq/100g) for the sample collected at a depth of 1 foot in test pit TP-1, and 6.5 meq/100g for the sample collected at a depth of 3 feet in test pit TP-3. Both the King County Surface Water Design Manual and the Stormwater Management Manual for Western Washington recommend a minimum CEC of 5 meq/100g. Detailed results of the tests are provided in the attachment.

SUBSURFACE CONDITIONS

SOIL CONDITIONS

Subsurface soil conditions encountered in the current and previous explorations consist of a varied thickness of fill overlying glacial deposits. The fill consists of surficial crushed rock in the current test pits and is underlain by medium dense silty sand with gravel (weathered glacial deposits). As summarized in our previous report, glacial deposits are encountered at relatively shallow depths within the site area. The predominant geologic units at the site are Steilacoom Gravel and Vashon Till.

GROUNDWATER CONDITIONS

Groundwater seepage was not observed in either of the test pits. Slight mottling was observed in TP-1 at about 6 feet below grade. Mottling can be an indicator of seasonal high groundwater. Previous explorations and monitoring wells completed at the site indicate the depth to groundwater at the site varied from 10 to 30 feet below the ground surface. We expect groundwater to fluctuate with changes in precipitation and season.

CONCLUSIONS AND RECOMMENDATIONS

INFILTRATION CONSIDERATIONS

Methods utilized to evaluate the infiltration rate include the criteria outlined in the King County Surface Water Design Manual (KCSWDM) and the results of the EPA Falling Head Percolation test completed in the field, and the results of the grain size analyses and methods recommended in the Stormwater Management Manual for Western Washington. A summary of these evaluation methods is provided below.

INFILTRATION RATE – KCSWDM AND FALLING HEAD PERCOLATION TEST

Falling head percolation tests (EPA 1980 method) were conducted within the proposed permeable pavement area in accordance with the KCSWDM. The tests were performed at a depth of 1 to 1½ feet below grade, at the contact between the existing gravel surfacing and underlying silty sand. The average measured infiltration ($I_{measured}$) rate is listed below.

- $I_{measured}$ = 5.5 inches/hour

Actual long-term infiltration rates are typically much less than the rates measured by small-scale falling head percolation test methods. In lieu of large-scale testing and analytical models, correction factors are applied to the measured infiltration rate from the small-scale test to account for uncertainties in testing, infiltration receptor geometry, and long-term reductions in permeability due to biological activity and accumulation of fines (plugging). The KCSWDM recommends the following equation to establish design infiltration rates:

$$I_{design} = I_{measured} \times F_{testing} \times F_{geometry} \times F_{plugging}$$

The "F" factors represent coefficients to account for the testing method, the geometry of the infiltration site, and the potential for plugging. Using the criteria outlined in the KCSWDM, we selected the following correction factors for determining the design infiltration rate:

$F_{testing}$ = 0.3 (correction factor for EPA falling head test procedure)

$F_{geometry}$ = 1.05 (assuming 5 feet to the wet-season water table and a 20-foot wide pavement width)

$F_{plugging}$ = 0.8 (recommended value for loamy sands)

The corresponding recommended design infiltration rate is:

- I_{design} = 1.4 inches/hour

INFILTRATION RATE – STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON

Recommended infiltration rates can also be determined using the procedures outlined in *Stormwater Management in Western Washington,* by Washington State Department of Ecology, February 2005. Based on the results of our laboratory sieve tests, subsurface soils located beneath the proposed permeable pavement are classified as "Loamy Sand" in accordance with the USDA Textural Triangle. The *Stormwater Management Manual for Western Washington* assigns a short-term infiltration rate for "Loamy Sand" of 2 inches per hour. The design manual recommends a Correction Factor of 4. Therefore, a long-term infiltration rate of 0.5 inches per hour is recommended. A minimum separation of 5 feet is typically required between the base of the infiltration system and the seasonally high water mark. Based on the observed soil conditions in the test pit explorations, a 5-foot separation will be present if the proposed pavement is constructed near existing site grade.

PERMEABLE PAVEMENT CONSIDERATIONS

The recommended infiltration rates presented above are suitable for the subgrade infiltration rate where the permeable pavement aggregate base is placed directly over weathered glacial deposits. After preliminary grading, the existing subgrade should be evaluated to confirm the exposed conditions are as assumed during design. The existing subgrade should not be compacted, and any accumulation of fine material from erosion should be removed. The surface should be scarified if warranted, and a non-woven geotextile is recommended to prevent soil fines from migrating up and into the aggregate base. We recommend Mirafi 160N or equal for this purpose. Open-graded aggregate base (the storage bed) is placed over the geotextile followed by a choker course for fine grading.

Permeable paving systems are typically designed with aggregate storage to augment infiltration for subgrade conditions with relatively low infiltration rates. Directing surface flows to permeable paving surfaces from adjacent areas for stormwater disposal is not recommended. If design constraints require that surface flow be introduced from adjacent areas, measures must be taken to ensure that sediment is not directed to the system and that additional flows will not exceed the infiltration capability.

Porous asphalt is typically used for light to medium duty applications and can be used for heavy traffic areas if a polymer additive is added to increase bonding strength. Portland cement permeable concrete can be used in light to heavy load applications. Permeable pavements are relatively new to the region when considering the typical design life of pavement surfaces. It has been our experience that permeable asphalt can experience raveling in areas of excessive vehicle turning or in high traffic areas. Detailed design guidelines are provided in the *Low Impact Development, Technical Guidance Manual for Puget Sound*, dated January 2005 by the Puget Sound Action Team.

LIMITATIONS

We have prepared this report for the exclusive use of The Benaroya Company and their authorized representatives in the evaluation of infiltration rates at the South Hill Facility.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the fields of geotechnical engineering and hydrogeology in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Appendix B titled Report Limitations and Guidelines for Use for additional information pertaining to use of this report.

We appreciate the opportunity to provide services for the South Hill Facility. Please contact us if you have any questions or if you need additional information.

Sincerely,

GeoEngineers, Inc.

Debra C. Overbay, PE
Senior Engineer

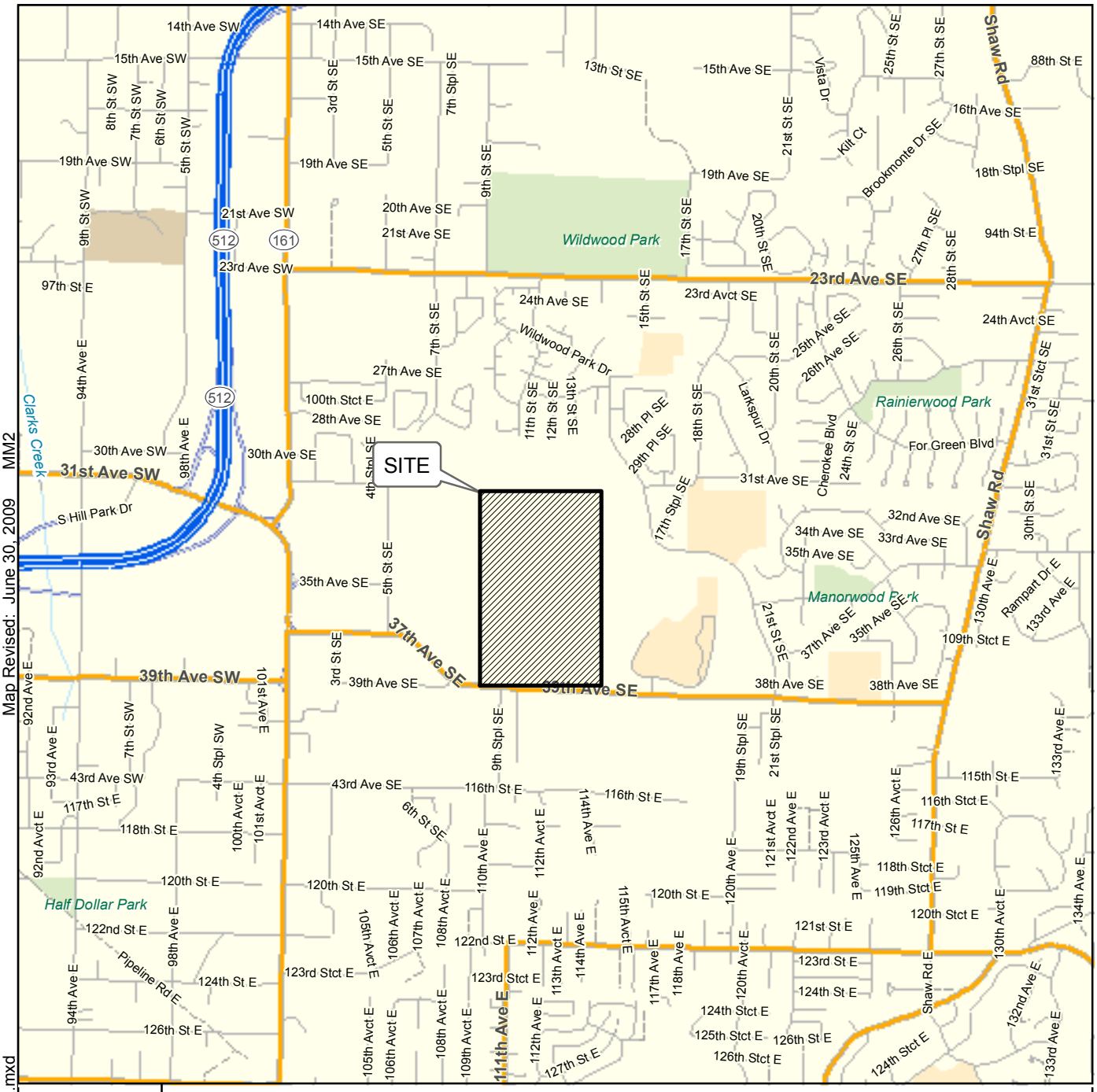
Gordon M. Denby, PE
Senior Principal

GMD:DCO:ta
EVER:\P:\4\4565064\02\Final\456506402Ltr.doc

Attachments:

	Figure 1	Vicinity Map
	Figure 2	Site Plan
	Figure 3	Key to Exploration Logs
	Figures 4–5	Log of Test Pits
	Figure 6	Sieve Analysis Results
	Appendix A	Cation Exchange Tests
	Appendix B	Report Limitations and Guidelines for Use

Disclaimer: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.



N
W E
S

2,000 0 2,000

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Maps 2005

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

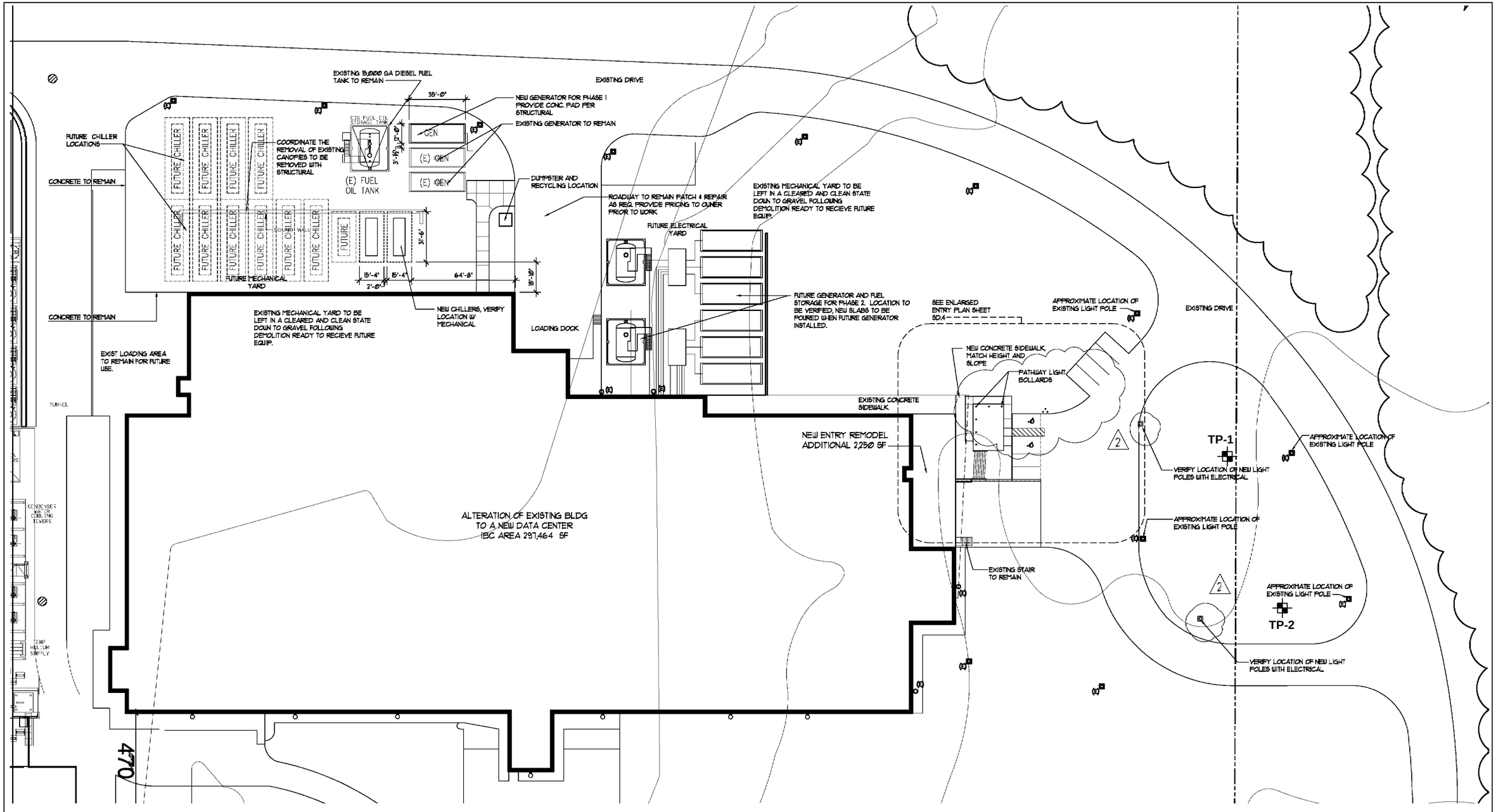
Vicinity Map

South Hill Facility
Puyallup, Washington

GeoEngineers

Figure 1

Office: EVT Path: P:\14565064\GIS\0456506402_F1.mxd Map Revised: June 30, 2009 MM2



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Notes

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: PDF of drawing "SD-3", Construction Drawings Submittal, by pkjb, dated 6/5/09.

Legend

TP-1 Test Pit by GeoEngineers

N W E S

60 0 60

FEET

Site Plan

South Hill Facility
Puyallup, Washington

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Figure 2

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	CC	Cement Concrete
	AC	Asphalt Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

Measured groundwater level in exploration, well, or piezometer

Groundwater observed at time of exploration

Perched water observed at time of exploration

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Material Description Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

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FIGURE 3

Date Excavated: 6/12/2009 Logged By: EAW

Equipment: John Deere 35D Total Depth (ft) 8.0

Elevation (feet) / Depth (feet)	SAMPLE: Testing Sample / Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
0			GP		Surficial 1¼-inch-minus crushed rock with 6 to 8 inch quarry spalls (medium dense, dry to moist) (fill)		
1	1		SM		Brown silty fine to coarse sand with gravel and organic matter (tree branches 1 to 6-inch in diameter, roots) (medium dense, moist)	13	SA, %F=16
2							
3							
4							
5							
6	2		SP-SM		Brown fine to coarse sand with silt and gravel (loose to medium dense, moist)	6	SA, %F=9
7							
8	3				Test pit completed at 8 feet No groundwater seepage observed No caving observed		

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

Log of Test Pit TP-1

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Project: South Hill Facility
Project Location: Puyallup, Washington
Project Number: 4565-064-02

Figure 4
Sheet 1 of 1

Date Excavated: 6/12/2009 Logged By: EAW

Equipment: John Deere 35D Total Depth (ft) 7.0

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
					GP		1¼-inch-minus crushed rock with 6 to 8 inch quarry spalls (dense, dry) (fill)		
	1				SM		Dark brown silty fine to coarse sand (medium dense, moist)		
	2	X			SP-SM		Orange brown fine to coarse sand with silt and gravel (medium dense, moist)	13	SA, %F=12
	3	X			SM		Brown silty fine to coarse sand with gravel (medium dense, moist)	11	SA, %F=14
	4				GP		Yellowish brown fine to coarse gravel with sand and trace silt (medium dense, moist)		
	5	X							
	6	X			SP		Yellow brown fine to coarse sand with gravel and trace silt (medium dense, moist)		
	7						Test pit completed at 7 feet No groundwater seepage observed No caving observed		

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

Log of Test Pit TP-2

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Project: South Hill Facility
Project Location: Puyallup, Washington
Project Number: 4565-064-02

Figure 5
Sheet 1 of 1

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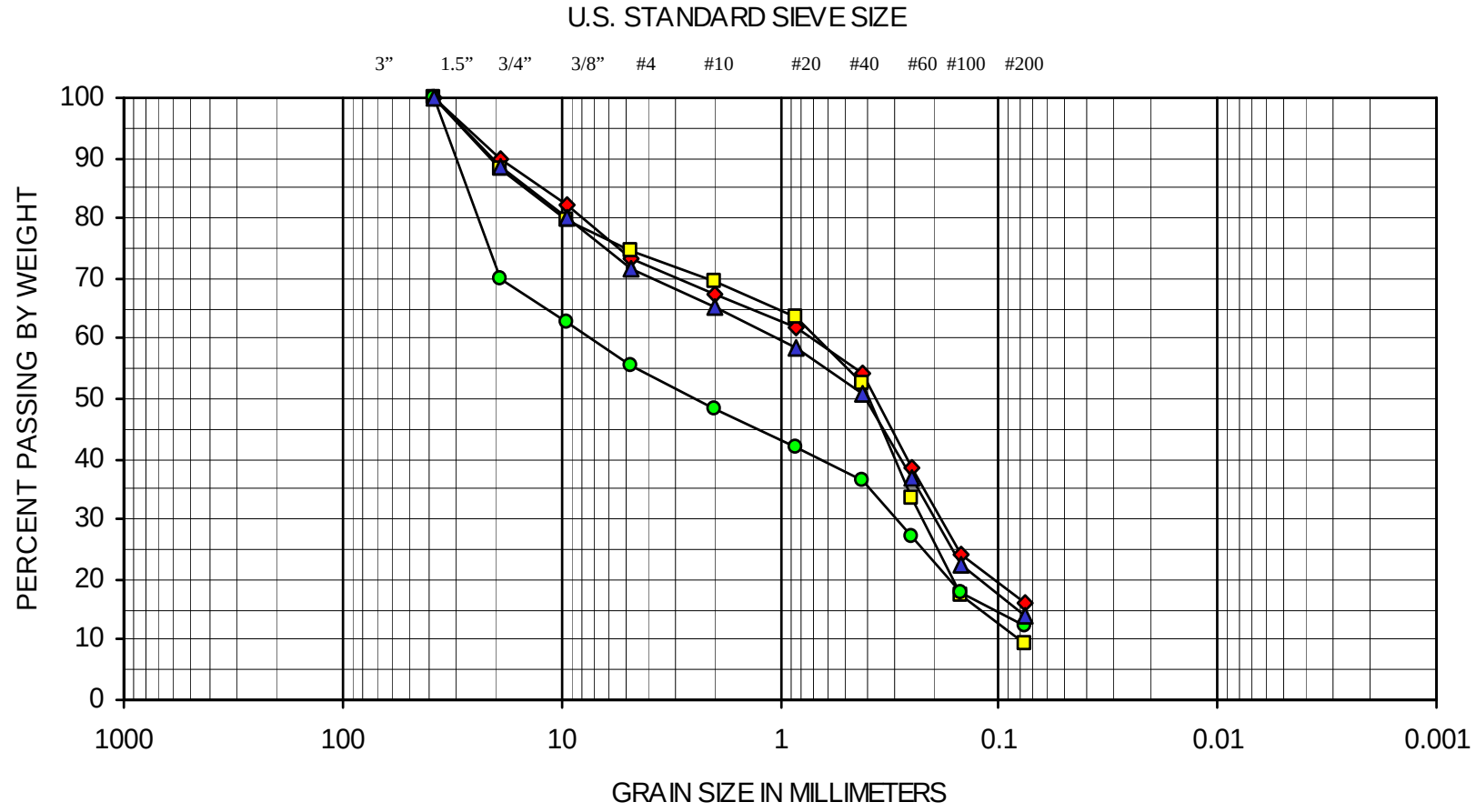
FIGURE 6

SIEVE ANALYSIS RESULTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	EXPLORATION NUMBER	DEPTH (ft)	SOIL CLASSIFICATION
◆	TP-1, S-1	1	Silty fine to coarse sand with gravel (SM)
■	TP-1, S-2	6	Fine to coarse sand with silt and gravel (SP-SM)
●	TP-2, S-1	2	Fine to coarse sand with silt and gravel (SP-SM)
▲	TP-2, S-2	3	Silty fine to coarse sand with gravel (SM)

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APPENDIX A
CATION EXCHANGE TESTS

SAMPLE RESULTS-CONVENTIONALS
PC58-GEOENGINEERS

ANALYTICAL RESOURCES INCORPORATED

Matrix: Soil
Data Release Authorized:
Reported: 06/22/09

Project: SO. HILL BUS CTR. BLGD D (BE
Event: 4565-064-02
Date Sampled: 06/12/09
Date Received: 06/12/09

Client ID: #1
ARI ID: 09-13646 PC58A

Analyte	Date	Method	Units	RL	Sample
Total Solids	06/15/09 061509#1	EPA 160.3	Percent	0.01	84.80
Cation Exchange Capacity	06/15/09 061509#1	1N NH4OAc	meq/100 g	0.03	11.59

RL Analytical reporting limit
U Undetected at reported detection limit

SAMPLE RESULTS-CONVENTIONALS
PC58-GEOENGINEERS

ANALYTICAL RESOURCES INCORPORATED

Matrix: Soil
Data Release Authorized:
Reported: 06/22/09

Project: SO. HILL BUS CTR. BLGD D (BE
Event: 4565-064-02
Date Sampled: 06/12/09
Date Received: 06/12/09

Client ID: #2
ARI ID: 09-13647 PC58B

Analyte	Date	Method	Units	RL	Sample
Total Solids	06/15/09 061509#1	EPA 160.3	Percent	0.01	88.20
Cation Exchange Capacity	06/15/09 061509#1	1N NH4OAc	meq/100 g	0.03	6.48

RL Analytical reporting limit
U Undetected at reported detection limit

METHOD BLANK RESULTS-CONVENTIONALS
PC58-GEOENGINEERS

ANALYTICAL RESOURCES INCORPORATED

Matrix: Soil
Data Release Authorized:
Reported: 06/22/09

Project: SO. HILL BUS CTR. BLGD D (BE
Event: 4565-064-02
Date Sampled: NA
Date Received: NA

Analyte	Date	Units	Blank
Total Solids	06/15/09	Percent	< 0.01 U
Cation Exchange Capacity	06/15/09	meq/100 g	< 0.03 U

REPLICATE RESULTS-CONVENTIONALS
PC58-GEOENGINEERS

ANALYTICAL RESOURCES INCORPORATED

Matrix: Soil
Data Release Authorized:
Reported: 06/22/09

Project: SO. HILL BUS CTR. BLGD D (BE
Event: 4565-064-02
Date Sampled: 06/12/09
Date Received: 06/12/09

Analyte	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: PC58A Client ID: #1					
Total Solids	06/15/09	Percent	84.80	81.40 84.60	2.3%
ARI ID: PC58B Client ID: #2					
Cation Exchange Capacity	06/15/09	meq/100 g	6.48	6.72	3.6%

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APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report has been prepared for the exclusive use of The Benaroya Company and their authorized agents. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

This report has been prepared for infiltration evaluation in the northeast corner of the South Hill Facility located in Puyallup, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org .

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

MOST GEOTECHNICAL AND GEOLOGIC FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

GEOTECHNICAL ENGINEERING REPORT RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT COULD BE SUBJECT TO MISINTERPRETATION

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

DO NOT REDRAW THE EXPLORATION LOGS

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a

geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

CONTRACTORS ARE RESPONSIBLE FOR SITE SAFETY ON THEIR OWN CONSTRUCTION PROJECTS

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

READ THESE PROVISIONS CLOSELY

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

GEOTECHNICAL, GEOLOGIC AND ENVIRONMENTAL REPORTS SHOULD NOT BE INTERCHANGED

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

BIOLOGICAL POLLUTANTS

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention, or assessment of the presence of biological pollutants in or around any structure. Accordingly, this report includes no interpretations, recommendations, findings, or conclusions for the purpose of detecting, preventing, assessing, or abating biological pollutants. The term "biological pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.