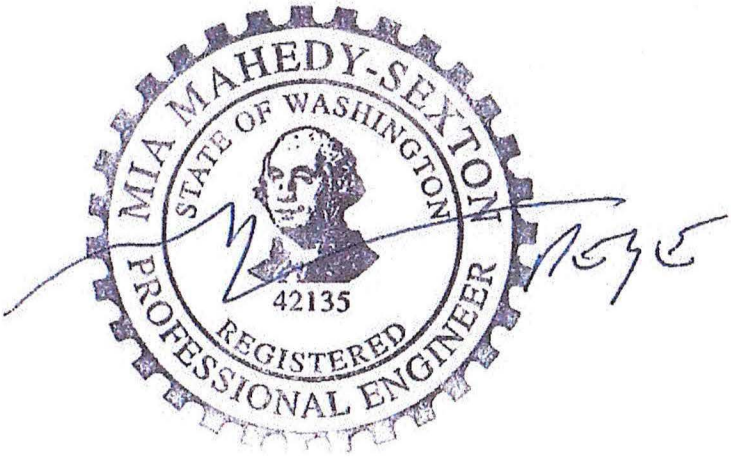
GEOTECHNICAL REPORT with Infiltration testing

19715 Old Highway 99 SW, Rochester, WA

For

H & H NW Companies LLC

18 September 2013



Rapid Soil Solutions LLC

3915 SW Plum Street
Portland, OR 97219
P: 503-816-3689

PROJECT AND SITE DESCRIPTIONS

Introduction

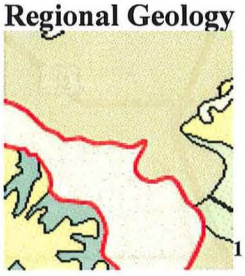
Rapid Soil Solutions (RSS) has prepared this Geotechnical Engineering report to provide bearing capacity, earthwork requirements and infiltration testing for storm water design. Figure 1 shows the site location. Future improvements are parking and drive through lanes for Jack in the Box and a Starbucks are shown on figure 2. The buildings will be wood framed structures.

SITE CONDITIONS

Surface Condition

The site has an old Dairy Queen restaurant and associated parking and some landscaped areas. Figure 2 shows an aerial view of the site when it was functioning establishment.

Regional Geology



[1] Qa –Alluvium deposits, described as Spanaway gravely sandy loam

Field Exploration and subsurface conditions

Two (2) borings were excavated with a hand augur one in the proposed new pond area. The attached site plan Figure 2 shows the location of the two (2) hand Augur holes that were excavated. The soil log was created using the Unified Soil Classification and Visual Manual Procedure (ASTM-D 2488). Hand augur logs are in appendix along with the laboratory data from the soil samples. The soils encountered are consistent with the local geology map shown above. The sieve on the soil sample taken from the future pond area is classified by AASHTO as A-1-b SAND.

Foundation Design

Based on the field exploration and our experience with this soil formation it is our opinion that the foundation should consist of conventional spread footings. Footing excavations should be evaluated by the Engineer to confirm suitable bearing conditions. Observations should also confirm that all loose or soft material, organics, unsuitable fill, prior topsoil zones, and softened sub-grades, if present, have been removed. Localized deepening of footing excavations may be required to penetrate through the upper, softer site soils.

In order to reduce disturbance to the SAND found at the site, we recommend all excavations for footings be accomplished with an excavator or backhoe equipped with a smooth-faced bucket (e.g., no teeth). If the bases of the footing excavations are disturbed by man or equipment, the bases should be compacted to a smooth, unyielding surface with a plate compactor.

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[1] Interactive Washington State geologic map

If construction is undertaken during periods of rain, then we recommend a 2-inch (or greater) layer of compacted, crushed rock be placed over the bases of the excavations to help protect them from disturbance due to the elements and workers.

All concrete footings should be founded at least 2.0 feet below the lowest exterior grade, and 16 inches below the finished floor elevation, whichever is deeper. Interior footings may also be founded at a depth of 16 inches below the finished floor elevation; however.

The bases of all footings should be founded in the very dense SAND that were encountered an average of 1 foot below the existing ground surface. As found in our two hands augur holes.

The new footings should be designed for a maximum allowable bearing pressure of 2,000 pounds per square foot (psf) as per scribed in 2006 IBC code book under section 1804.2 Table 2 Allowable Foundation and Lateral Pressures. When sizing footings for seismic considerations, the allowable bearing pressure may be increased by 1/3 to 2,000 psf. Lateral pressures may be resisted by friction between the bases of the footings and the underlying ground surface. A frictional coefficient of 0.25 may be utilized for lateral sliding.

Excavations

Excavations can be accomplished with conventional excavating equipment. All excavations for footings and subgrades in the fine-grained silt should be performed by an excavator or backhoe equipped with a smooth-faced bucket (no teeth).

Because of safety considerations and the nature of temporary excavations, the Contractor should be made responsible for maintaining safe temporary cut slopes and supports for utility trenches, etc. We recommend that the Contractor incorporate all pertinent safety codes during construction, including the latest OSHA revised excavation requirements, and based on soil conditions and groundwater evidenced in cuts made during construction.

Structural Fills

Depending upon finished building pad elevations, structural fills may be required to raise the site grades. Additionally, fill may be required for the backfilling of the proposed new foundation walls. Native or imported material may be used for fill, provided the soil is free of organics, cobbles larger than 6 inches in maximum diameter, or other deleterious matter; is of low plasticity; and, is at the proper water content. Fills should be placed on level benches in thin lifts and compacted to a dry density of at least 92% of its Maximum Dry Density (MDD) as determined by the Modified Proctor Test (ASTM D-1557).

For any over-excavation completed in the area of footings or slabs, the backfill material shall consist of free-draining, well-graded, crushed aggregate base with a maximum particle size of ¾ inch. The rock shall not contain more than 5% fines (material passing the No. 200 sieve, as tested by ASTM D-1140). The rock shall be compacted to a dry density of at least 92% of its MDD.
A minimum of three days prior to the placement of any fill, please supply Engineer with a 30-pound sample (approximately a full 5-gallon bucket) of any soil or baserock to be used as fill (including native and import materials) for testing and approval. **Compaction testing is required every 1.5ft of fill.**

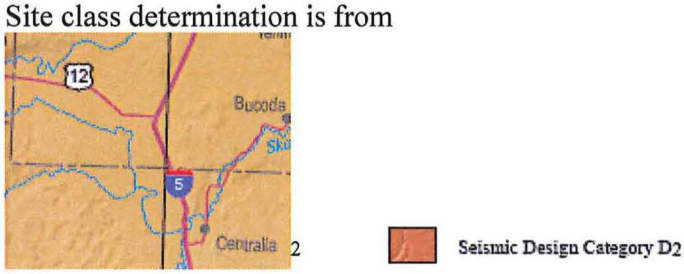
Settlement

Based on our knowledge of the project scope, and for footings designed as described in the preceding paragraphs, maximum settlement should not exceed 1 inch. Differential settlement should be on the order of 50 to 75% of the maximum settlement over 50 feet. Our settlement estimate assumes that no disturbance to the foundation soils would be permitted during excavation and construction, and that footings are prepared as described in the preceding paragraphs.

Seismic Design Criteria

The seismic design criteria for this project found herein is based on the *International Building Code* (**IBC**) 2009, Section 1615 and from the USGS Earthquake Hazards Program. A summary of IBC seismic design criterion below:

Site class determination is from



	Short Period		1 Second
Maximum Credible Earthquake Spectral Acceleration	Ss = 0.93g		S1 = 0.38 g
Site Class		D	
Site Coefficient	Fa = 1.13		Fv = 1.64
Adjusted Spectral Acceleration	Sms = 1.05		Sm1 =0.62
Design Spectral Response Acceleration Perimeters	Sds = 0.70		Sd1= 0.42

Pavement Section

Since the sub-grade is SAND and if the project is constructed in the dry season geo-textile fabric can be eliminated. A typical section of 8" total rock and 3" AC is proposed to meet typical vehicle loadings over the duration of the restaurants life span. It is advisable to call the geotechnical engineer to proof roll the native sub-grade before rock is installed. Any soft spots will be located that will ensure the pavement lasts for its' projected life span.

Demolition of existing structures

As noted the site has an existing restaurant on it. Removal of the structure to firm and non-yielding sub-grade shall be verified by the engineer. Backfilling to final sub-grade shall be accomplished as noted above for site fills. Please allow for scheduling 24 hours notice for site

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Seismic Design Category Maps for Residential Construction in Washington

by Recep Cakir and Timothy J. Walsh

2 November 2007 WDNR

inspection and 2 days for proctor generation and compaction. Testing of the backfill material quicker than 2 days additional costs are incurred to rush the proctor.

Infiltration testing
Using the Thurston County storm water manual as a guide RSS performed 2 infiltration tests in the hand augur holes with the stem left in. The detail soil logs are attached. The infiltration sheets details the field rates. Figure 2 shows the locations of the test holes. Adjacent to HA#2, RSS excavated a hand augur to 7ft which would be 3ft below a 4foot deep pond. RSS did not encounter ground water.

Drainage
The Contractor should be made responsible for temporary drainage of surface water and groundwater as necessary to prevent standing water and/or erosion at the working surface.

Water should not be allowed to "pond" or collect anywhere on the site. The ground surface around the structure should be sloped to create a minimum gradient of 2% away from the building foundations for a distance of at least 5 feet. Surface water should be directed away from all buildings into drainage swales or into a storm drainage system. "Trapped" planting areas should not be created next to any buildings without providing means for drainage.

Footing drains should be installed around the building perimeter to help intercept any water migrating towards the building subgrade. The footing drain and any slab drains shall remain independent of surface water drain systems (e.g. downspouts, etc.).

Limitations
This report has been prepared for the exclusive use of the addressee, and their architects and engineers for aiding in the design and construction of the proposed development. It is the addressee's responsibility to provide this report to the appropriate design professionals, building officials and contractors to ensure correct implementation of the recommendations.

The opinions, comments and conclusions presented in this report were based upon information derived from our literature review, field investigation and laboratory testing. Conditions between, or beyond, my exploratory test pits may vary from those encountered. Unanticipated soil conditions and seasonal soil moisture variations are commonly encountered and cannot be fully determined by merely taking soil samples. Such variations may result in changes to our recommendations and may require that additional expenditures be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

APPENDIX

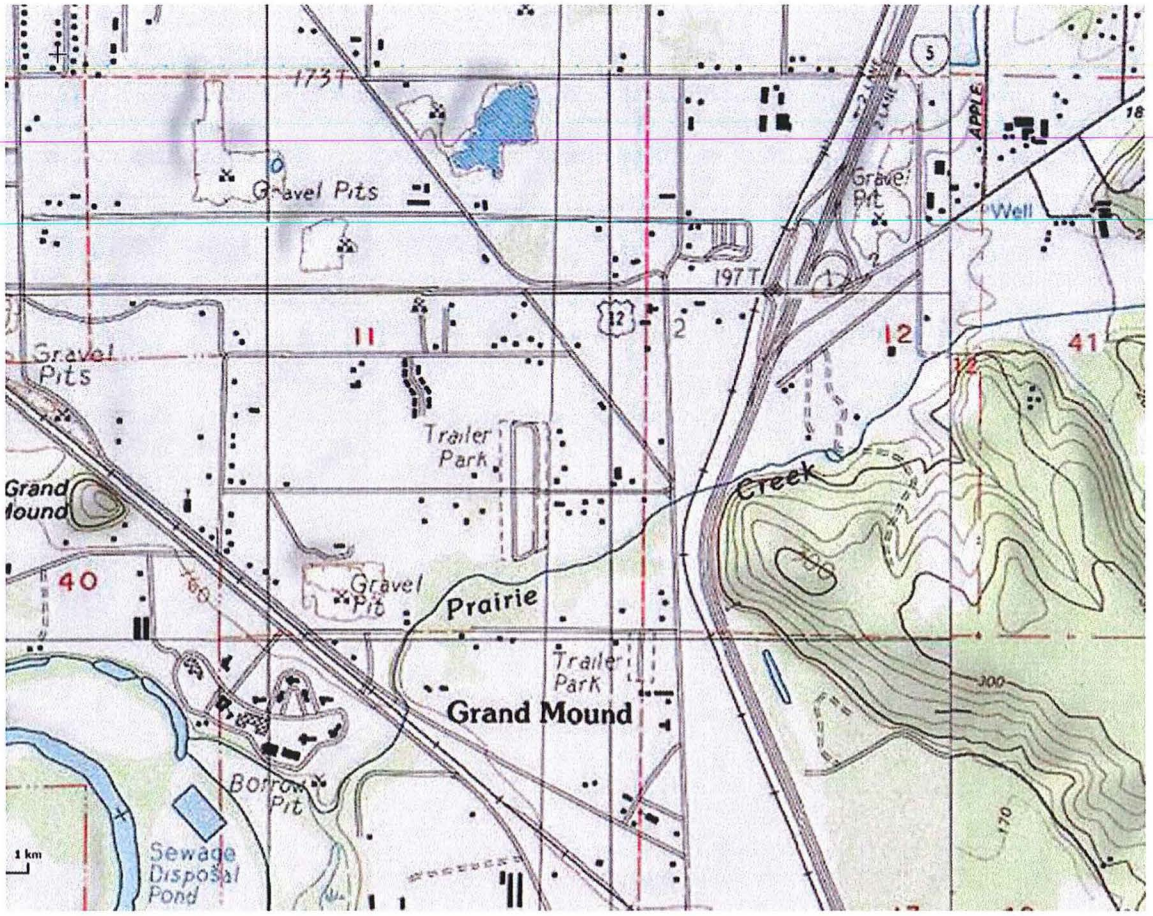
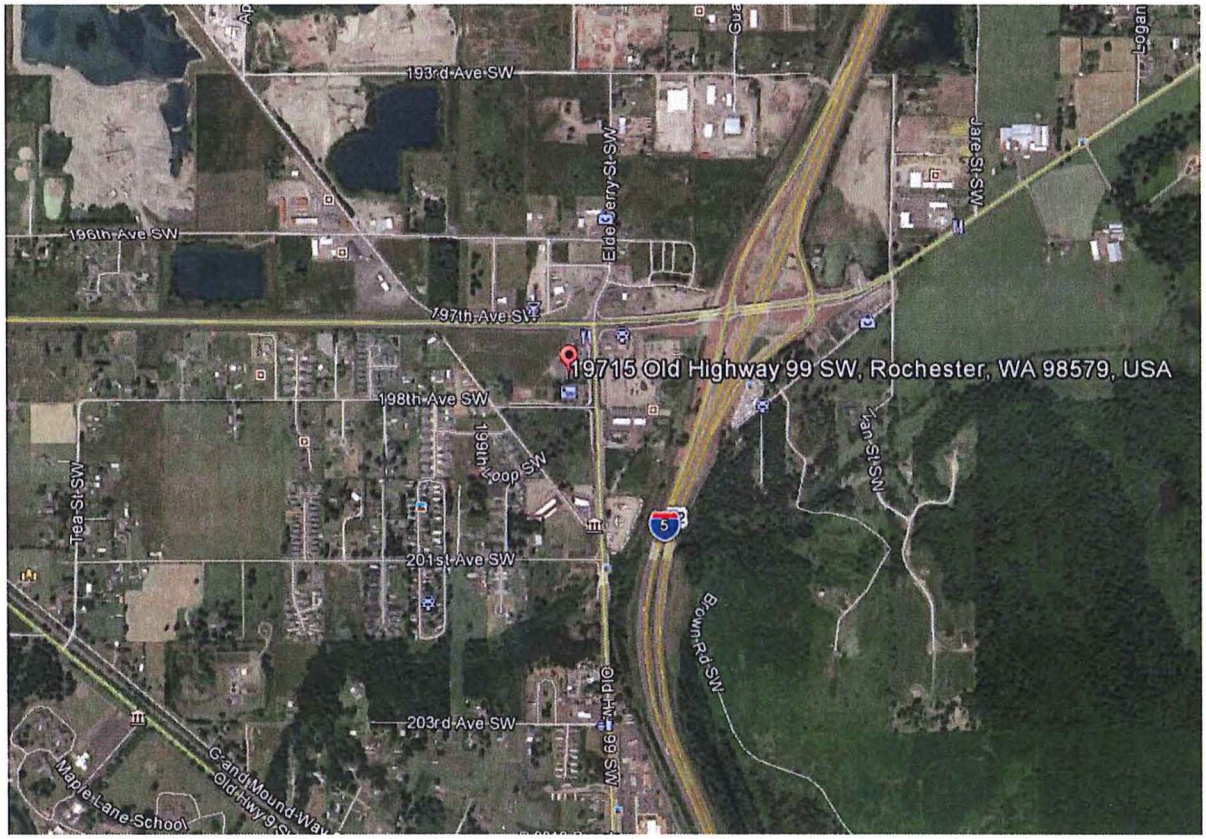


Figure 1 – Site location



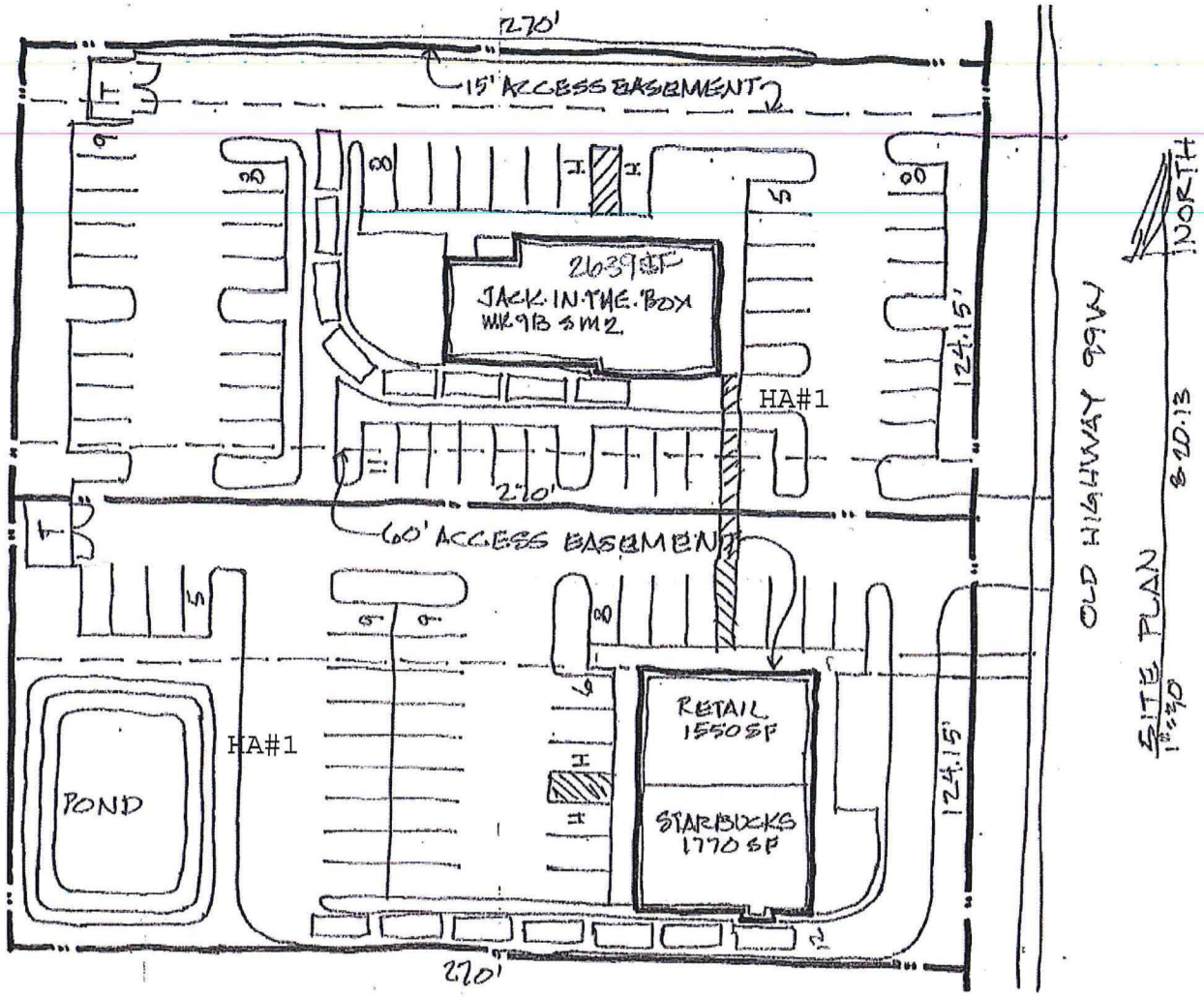
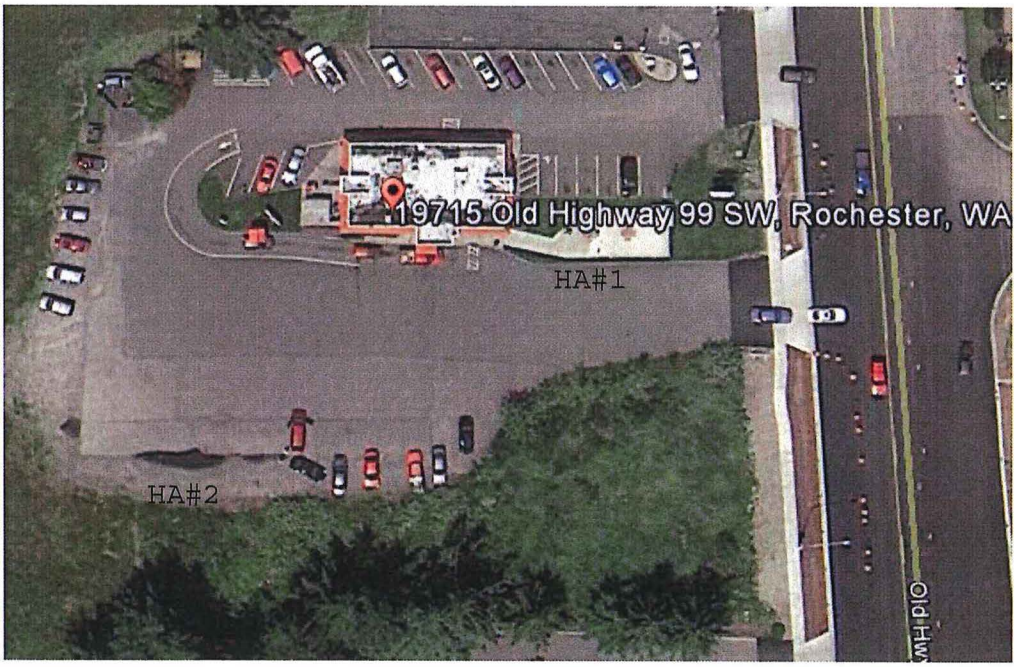


Figure 2- Site plan with testing locations



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RAPID SOIL SOLUTIONS
3915 SW PLUM STREET
PORTLAND, OR 97219-6018

PROJECT: QC
LOCATION:
SAMPLE SOURCE: SEE BELOW

JOB NO: 13-4281
WORK ORDER NO:
DATE SAMPLED: 9/12/13

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

				Silt or	SAND							GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse	Fine				Coarse						
Location & Depth	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"	6"	Lab #

PERCENT PASSING BY WEIGHT

HA-2				8.5	12	30	46	56	64	66	67	70	73	75	78	82	87	100	100	100	100	100	6942
HA-1																							6942

BORING	DEPTH	MC%
HA-2		13.1
HA-1		6.8

REVIEWED BY _____ DE/js

Infilration Test Results

Address: 19715 old highway 99 SW Rochester, WA 9/11/2013
By: Mia Mahedy-Sexton, PE GE

Purpose: Storm water design Encased hand augur

HA #1 Depth =2ft

#1		#2		#3	
Time	Measurement	Time	Measurement	Time	Measurement
10:52	12	11:00	12	11:13	12
11:00	0	11:13	0	11:29	0
Rate					**45in/hr**

HA #2 Depth =4ft

#1		#2		#3	
Time	Measurement	Time	Measurement	Time	Measurement
11:35	12	11:40	12	11:57	12
11:40	0	11:57	0	12:17	0
Rate					**36in/hr**

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#1

19715 Old Highway 99 SW
H & H NW Companies, LLC

Logged by: Mia Mahedy-Sexton, PE
Elevation: 175
Date: 9/11/13
Depth: 2ft
Groundwater: N/A

Description	Graphic Log	Depth	Sample Type	SPT N-Value	MC (%)	Atterburg limits
Top Soil		0				
Dry, medium grained dark brown SAND		1				
Hand Augur completed at depth of 2ft, infilration test in augur hole		2			6.8	
		3				
		4				
		5				
		6				
		7				

Rapid Soil Solutions

Plate A-1

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Users\Costco\Desktop\MIA WORK\2013\Reports\Geotech\Rochester WA\HA1.log Date: 9/18/2013

#2

19715 Old Highway 99 SW
H & H NW Companies, LLC

Logged by: Mia Mahedy-Sexton, PE
Elevation: 175
Date: 9/11/13
Depth: 4ft
Groundwater: N/A

Description	Graphic Log	Depth	Sample Type	SPT N-Value	MC (%)	Atterburg limits
Top Soil		0				
Dry, medium grained dark brown SAND		1				
		2				
		3				
		4				
Hand Augur completed at depth of 4ft, infilration test in augur hole					13.1	
		5				
		6				
		7				

Rapid Soil Solutions

Plate A-1

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Users\CostcoIDesktop\MIA WORK\2013\Reports\Geotech\Rochester WA\H\A2.log Date: 9/18/2013