SLOCUM PLAT
Quadrant Homes

TECHNICAL INFORMATION REPORT

November 21, 2012

Prepared by:

John Forba

PACE Engineers, Inc.
11255 Kirkland Way, Suite 300
Kirkland, WA 98033
425.827.2014

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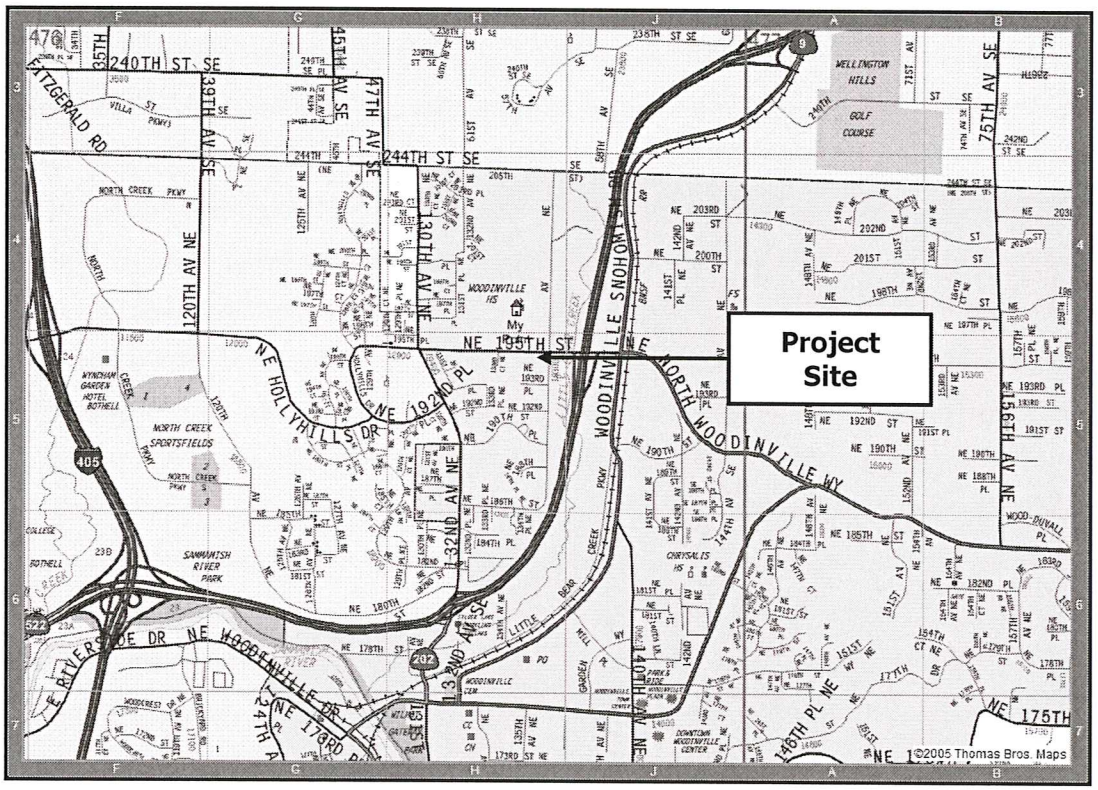
I. PROJECT OVERVIEW

Description of the Slocum Property

The project site is located on an approximately 4.5-acre parcel owned by Quadrant Homes with parcel number 062210-0090 at the intersection of 195th Street NE and 136th Ave. NE in the City of Woodinville, King County, Washington. *See Figure 1. Site Location Map.*

Figure 1: Site Location



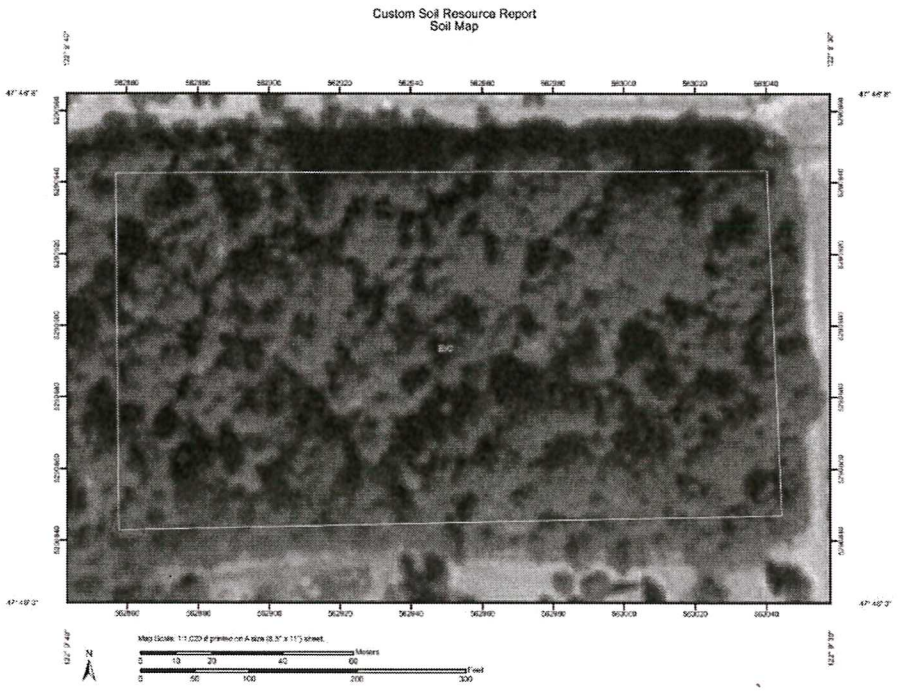
The Slocum property site is fronted by residential properties to the west and south, 195th Street NE on the north, and NE 136th Ave. on the east. The property is accessed from the east along 136th Ave NE. The site is recorded as parcel number 062210-0090 in King County, Washington. The existing 4.5-acre Slocum property is currently not developed and is forested.

The property generally slopes to the southeast. The grade change from the upper northwest corner of the property to the lowest corner of the property at the intersection of 195th Street and 136th Street is approximately 40 feet. The site soils are mapped by NRCS as being comprised of Everett gravelly sandy loam, described as very deep, somewhat excessively drained soils formed in glacial

outwash. Geotechnical exploration pits excavated in April 2011 encountered a mixture of gravelly sandy loam and loamy fine sand surface soils formed from the weathering of the underlying glacial outwash. The glacial outwash extended beyond the depth explored, generally 10 to 15 feet.

See *Appendix B: Geotechnical Engineering Report* and *Figure 2: Soils Map*.

Figure 2: Soils Map



Map Unit Legend

King County Area, Washington (WA633)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
EvC	Everett gravelly sandy loam, 5 to 15 percent slopes	4.5	100.0%
Totals for Area of Interest		**4.5**	**100.0%**

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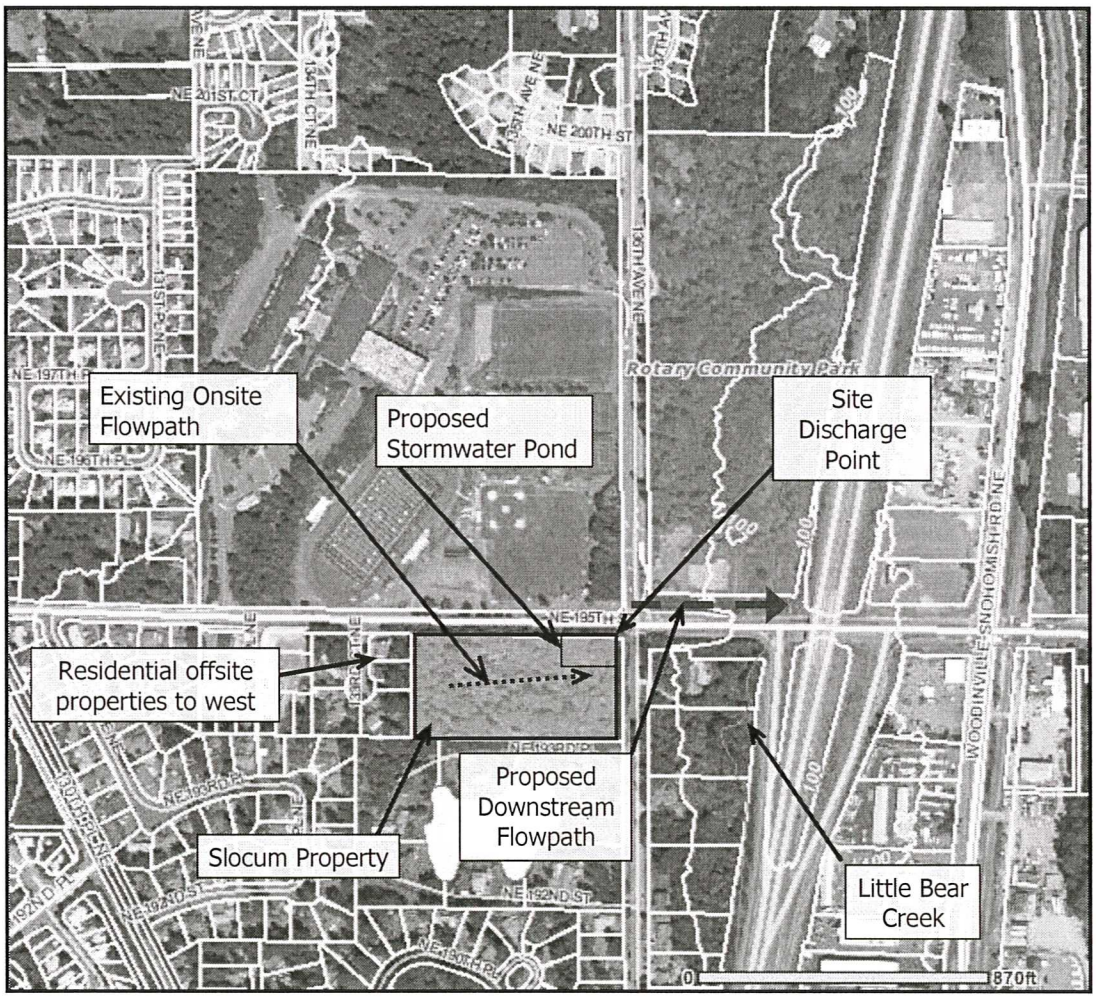
There is currently no existing on-site storm drainage system. The site indicates little in terms of defined surface drainage patterns, likely due to the very well drained soils (Everett) that allow stormwater to infiltrate directly in the ground especially in the upper reaches of the site. At the lower reaches of the site, especially in the NE corner, groundwater is near the surface.

Figure 3: Site Drainage Characteristics



Proposed Slocum Plat

This TIR specifically addresses site development. The residential land development proposal offers a variety of Single Family Detached housing sizes, as well as an innovative Low Impact Design on-site stormwater management system. The neighborhood development area provides for up to 32 traditional single family detached homes. Single family lots may range in size from 40 feet wide and 85 feet deep, up to the typical size of 40 feet wide and 100+ feet deep. Consideration may also be given to large homes on 50 foot wide lots. Homes are expected to be two story; 1500 to 2500 square feet. Standard conventional setbacks per City code are; 10 feet for front, 20 feet to the face of the garage, 5 foot each side and 5 feet on the rear, per WMC.

Construction is scheduled for early summer of 2013 with building construction expected to extend into 2014.

Potential stormwater impacts from the project will be mitigated in accordance with 2009 KCSWDM and City of Woodinville requirements. Stormwater runoff from roof and driveway on each proposed lot will be collected and infiltrated in an on-site infiltrations trench located along the backside in a utility easement that abuts the property line in front of each house. Stormwater runoff from the improvements in the existing R.O.W. in NE 195th Street as well as the new R.O.W. created by the plat will be routed through a pre-settlement and detention system to be located in the northeast corner of the project site. These improvements include new roadway, new sidewalk and a new landscape strip.

For location and design of the proposed storm drainage systems, see TIR Worksheet and the Developed Areas Diagram in *Appendix A: Storm Drainage Calculations*.

II. CONDITIONS AND REQUIREMENTS SUMMARY

Conditions and requirements pertaining to surface water management for this project include the 8 Core Requirements and 5 Special Requirements listed in the 2009 King County Surface Water Design Manual (2009 KCSWDM), and additional requirements provided in the City of Woodinville Surface Water Overview. A summary of the requirements along with a discussion of how the project applicant proposes to meet each requirement for mitigation of project stormwater impacts is as follows:

2009 KCSWDM Core & Special Requirements:

Core Requirement #1 – Discharge at the Natural Location

Although currently the majority of the water infiltrates on site, during major storm events the water does discharge to the east into NE 136th Ave. The proposed storm drainage improvements will connect to the existing off-site storm system located in NE 136th Ave east of the project site, the point of natural discharge.

Core Requirement #2 – Offsite Analysis

A downstream site visit and analysis was conducted on November 12, 2012. This site visit, was used to prepare a description of the downstream system to a distance of ¼ mile and assess potential offsite drainage impacts associated with the project site. No known existing downstream problems were identified within limits of the analysis. See *Appendix D - Portion of Field and Track Renovation, Section III – Offsite Analysis*, and *Figure 4: Downstream Map* for a detailed description of the downstream drainage system.

Core Requirement #3 – Flow Control

Flow control requirements for the onsite right-of-way and off-site frontage right-of-way improvements are proposed to be achieved with a detention pond located in the northeast corner of the development.

The pond was sized for Level II (Conservation) Flow Control. The predevelopment condition considered was forested, with a combination of till and outwash soils depending on saturation of existing soils. The KCSWDM methodology strongly encourages the use of infiltration for outwash soils; however, this is problematic for this site due to potential mounding issues along the existing cut slopes along the property frontage. In designing a traditional detention pond for forested conditions with outwash soils, KCRTS model does not accurately size the pond design due to the miniscule discharge rate. In order to allow the KCRTS model to run correctly, a small amount of infiltration (600 minutes/inch) was used. Since the pond will be lined to prevent infiltration and the potential mounding of water, the small volume shown as infiltrating (980 cf) in the model was added back into the calculated pond volume. This methodology was coordinated with the City Public Works Director during the pre-

design phase. Based on this methodology, the total detention storage required is approximately 18,400 cubic feet with 3.0 feet of live storage depth for water quality treatment.

A portion of the frontage right-of-way does not gravity drain to the detention facility. Therefore, an equivalent area from upstream on NE 195th is proposed to be directed to the pond as an area trade. This methodology was coordinated with the City Public Works Director during the pre-design phase.

Core Requirement #4 – Conveyance System

The existing conveyance system in the intersection of NE 195th Street and 136th Ave. NE was designed to convey stormwater runoff per standards. A portion of this existing mainline system was replaced and upsized to accommodate runoff from the improvements to Woodinville High School constructed in 2012. New conveyance systems constructed as part of the project are designed to comply with Section 1.2.4 of the 2009 KCSWDM.

Core Requirement #5 – Erosion and Sediment Control

A Temporary Erosion and Sediment Control (TESC) plan is included with the site development permit submittal. A C-SWPPP (Construction Surface Water Pollution Prevention Plan) will be prepared and be in effect during construction. See additional discussion in Section VIII – C-SWPPP Analysis and Design and site civil drawings by PACE Engineers, Inc.

Core Requirement #6 – Maintenance and Operations

A Maintenance and Operations Manual per 2009 KCSWDM is to be provided with Final TIR.

Core Requirement #7 – Financial Guarantees and Liability

Site improvement quantities for purposes of calculating permit fees by the City of Woodinville will be submitted with the Final TIR.

Core Requirement #8 – Water Quality

Water quality treatment is proposed for the pollution generating surfaces in accordance with the KCSWDM. This will be achieved with a two cell wetpond, designed as a combined facility within the detention pond. The total required wetpond volume is 3,970 cubic feet with 3 feet of depth.

Stormwater runoff from roof and driveway on each proposed lot will be collected and infiltrated in an on-site infiltrations trench located in a utility easement that abuts the property line in front of each house. This infiltration trench will be designed to meet water quality requirements in accordance with the KCSWDM.

See Section IV for analysis of water quality thresholds and facility details.

Special Requirement #1 – Other Adopted Area-Specific Requirements

There are no other adopted area-specific requirements that affect this site.

Special Requirement #2 – Floodplain/Floodway Delineation

N/A – Project is not within a floodplain.

Special Requirement #3 – Flood Protection Facilities

N/A – Project is not within a floodplain.

Special Requirement #4 – Source Control

The proposed project is subject to source controls in order to prevent rainfall and runoff water from coming into contact with pollutants.

Special Requirement #5 – Oil Control

N/A - The proposed project is not a high use site or subject to spill control requirements per the definitions given in section 1.3.5 of the 2009 KCSWDM.

City of Woodinville Drainage Requirements (Surface Water Overview):

The following is the City of Woodinville Surface Water Overview and the project applicant response to each item for the proposed Phase 1 project.

1. *Project must be in accordance with 2009 King County Surface Water Design Manual (KCSWDM).*
   - Yes, the project is designed in accordance with 2009 KCSWDM.
2. *Review all core and special requirements. Clearly state any exemptions and the justifications that apply to the project. (KCSWDM 1.2 and 1.3)*
   - See review and discussion of 2009 KCSWDM Core and Special Requirements.
3. *Little Bear Creek drainage basin.*
   - Project site is located in the Little Bear Creek drainage basin with site tributary to Little Bear Creek which is tributary to Sammamish River. See Section III – Offsite Analysis
4. *Technical Information Report required. (KCSWDM 2.3.1.1) All exemptions to the requirements that apply to the project must be clearly stated and justified.*
   - See review and discussion of 2009 KCSWDM Core and Special Requirements.
5. *Stormwater runoff must be discharged at the natural location. (KCSWDM 1.2.1) Natural drainage paths must not be altered. Determine location of connection to existing storm drainage system.*
   - Stormwater is discharged at the natural location.

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6. *Offsite analysis must be completed. Proposed project must not create any offsite drainage problems. (KCSWDM 1.2.2)*

   - See Section III - Offsite Analysis.

7. *Any offsite flow must be properly conveyed through project site.*

   - Some offsite flow from the adjacent NE 195th Street will be conveyed through the proposed conveyance system, and treated and detained at the proposed stormwater pond as part of the Quadrant land trade.

8. *Flow control level 2 (Conservation FC Area) required (KCSWDM 1.2.3), if project does not satisfy direct discharge exemption requirements.*

   - Level 2 flow control is provided. See Section IV - Flow Control.

9. *Show that existing conveyance system will not be impacted by proposed project. (KCSWDM 1.2.4)*

   - Peak flows are mitigated via flow control so there will be no impact to existing conveyance system.

10. *Temporary erosion and sedimentation control must be properly installed and maintained during construction. (KCSWDM 1.2.5)*

    - See review of Core Requirement #5.

11. *Proper maintenance access shall be provided for all storm drainage facilities. (KCSWDM 1.2.6)*

    - A gravel access road is provided to the stormwater pond located in north east corner of the project site. See civil plans.

12. *Enhanced basic water quality menu requirement (KCSWDM 1.2.8), if project does not satisfy exemption requirements from Core Requirement No. 8.*

    - Water quality treatment is proposed for the pollution generating surfaces in accordance with the KCSWDM. This will be achieved with a two cell wetpond, designed as a combined facility within the detention pond.

      Stormwater runoff from roof and driveway on each proposed lot will be collected and infiltrated in an on-site infiltration trench located in a utility easement that abuts the property line in front of each house. This infiltration trench will be designed to meet water quality requirements in accordance with the KCSWDM.

      See review of Core Requirement #8.

13. *Roof area must be included in water quality calculations if the roofing material leaches metals. (KCSWDM 1.2.8)*

    - New roof areas are assumed to not leach metals and are not included in assessment of water quality thresholds. Infiltration trenches are sized to

include roof areas. See review of Core Requirement #8 and Section IV for additional discussion.

14. *Review all special requirements (KCSWDM 1.3) and address all those that apply.*
    - See review of 2009 KCSWDM Special Requirements in this Section.
15. *Indicate downspout control method. Infiltration is required if suitable soils are present. If soils will not support infiltration, runoff must be properly dispersed. If infiltration and dispersion are not practical, connection to the storm system may be allowed.*
    - Roof downspouts are designed to be collected and conveyed to the infiltration facility.
16. *Resolve any existing on site drainage problems.*
    - There is no known existing on site drainage problems within current project area.
17. *No illicit discharges in storm system allowed during and after construction.*
    - A C-SWPPP will be in effect during construction which will prohibit illicit discharges.
18. *Minimize clearing and impervious areas.*
    - Clearing and grading will include all areas necessary to construct the new roadway, storm drainage and infiltration systems, and the preparation of lots for the single family homes shown on civil plans.
19. *Outdoor materials must be properly stored and covered.*
    - A C-SWPPP will be in effect during construction. See review of Core Requirement #5.
20. *All waste products must be properly disposed. Vehicles and other equipment must be cleaned in a designated washdown area. Wash water is not allowed to be discharged into the storm system.*
    - A C-SWPPP will be in effect during construction. See review of KCSWDM Core and Special Requirements.
21. *Dumpster areas must be properly contained and covered.*
    - A C-SWPPP will be in effect during construction. See review of KCSWDM Core and Special Requirements.
22. *Provide proper discharge location for any water system or sprinkler system blowoffs.*
    - A C-SWPPP will be in effect during construction. See review of KCSWDM Core and Special Requirements.

23. If project is greater than 1 acre, contact Elaine Worthen (Department of Ecology) at (360) 407-7229. Inquire about Construction Stormwater General Permit. Include Ecology's determination in the TIR.

(http://www.eey.wa.gov/programslwq/stormwater/construction)

- Project disturbed area is more than 1.5 acres. See also review of Core Requirement #5. A Notice of Intent (NOI) and Application for an NPDES General Construction Permit is to be advertised and submitted to WSDOE (Washington State Department of Ecology) for approval. A C-SWPPP (Construction Surface Water Pollution Prevention Plan) will be prepared and be in effect during construction.

III. OFFSITE ANALYSIS

Level 1 Downstream Analysis

Task 1: Define and Map the Study Area

For the purposes of Task 2 below, the study area shall extend 1/4 mile downstream of the proposed project discharge location.

The proposed plat is located on an approximately 4.5-acre parcel located at the intersection of NE 195th St. and 136th Ave NE in the City of Woodinville, King County, Washington.

Drainage from uphill residential properties to the west discharges to the existing stormwater conveyance system located in 133rd CT. NE and subsequently NE 195th Street. The flows then cross 136th Ave and flows through a swale for approximately 300 feet on the south side of NE 195th Street and discharges into Little Bear Creek.

Task 2: Review all Available Information on the Study Area

The references used for completing this downstream analysis include the following:

- King County imap, online G.I.S. services
- Site topographic survey completed by PACE Engineers, Inc.
- Soils Maps - Department of Natural Resources, web soil survey 2.0
- Geotechnical engineering report completed by Associated Earth Sciences Inc. dated November 2012.

Task 3: Field Inspect the Study Area

A field inspection was conducted on November 12, 2012. The temperature was approximately 45 degrees Fahrenheit and it was overcast. One-half to one inch of precipitation had fallen the previous two days.

Task 4: Describe the Drainage System, and its Existing and Predicted Problems.

The proposed stormwater pond will be located at the northeast corner of the project site. From the stormwater pond, stormwater shall flow to an existing catch basin located at the southwest corner of the intersection of NE 195th and 136th Ave. NE (picture 2). At the direction of the City of Woodinville's Public Works Director, the project is proposing to utilize the existing stomwater conveyance system located in the intersection of NE 195th and 136th Ave., as well as an existing swale and outfall to Little Bear Creek. Due to the relatively small post development flows from the detention pond, preliminary calculations have indicated that there is sufficient capacity in the existing conveyance system for flows resulting from the proposed project; a final backwater analysis will be performed prior to final submission of the plan set and drainage report.

The stormwater will then flow north under NE 195th utilizing the existing conveyance system to a catch basin (picture 3) located at the northwest corner of the intersection of NE 195th & 136th Ave NE. Stormwater then crosses 136th Ave NE through a 36" culvert and discharges to a wide swale which flows east along the north side of NE 195th (picture 4). The swale enters an 18" culvert pipe under a gravel access road, through a small ditch and intersects Little Bear Creek just north of a concrete culvert that flows Little Bear Creek under NE 195th.

Little Bear Creek continues for over one mile until it reaches the Sammamish River.

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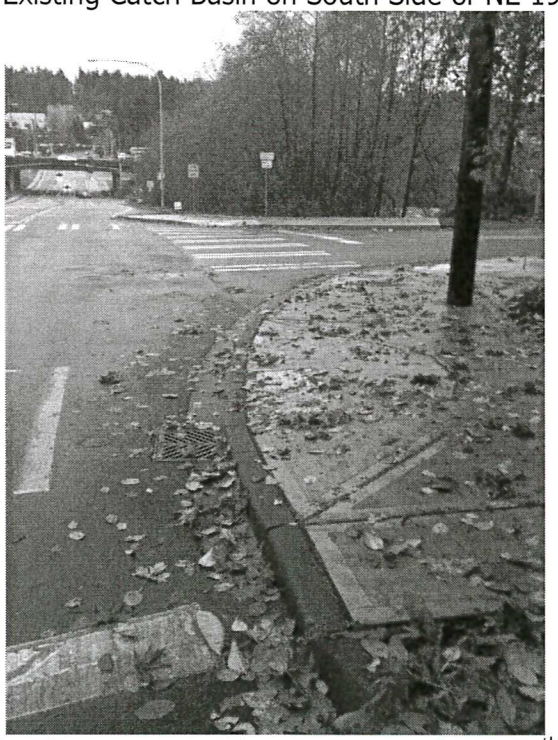
Picture 1: Existing Catch Basin on South Side of NE 195th Street



Picture 2: Existing Catch Basin at Southwest Corner of NE 195th and 136th Ave. NE

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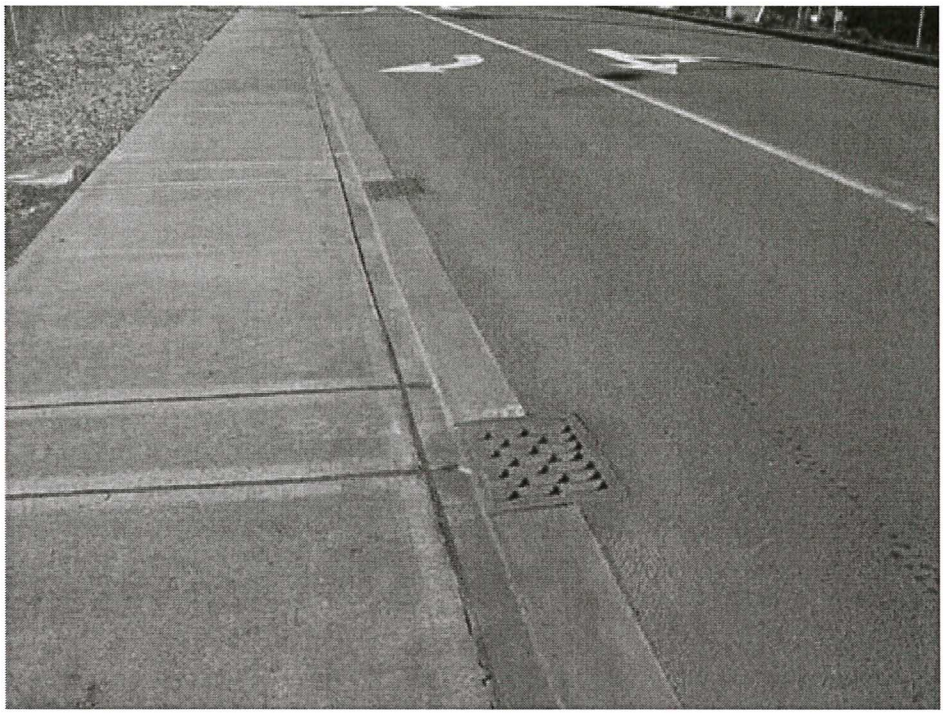

Picture 3: Off-site CB at northwest corner of
NE 195th & 136th Ave NE

Picture 4: Existing Swale on the South Side of NE 195th Street

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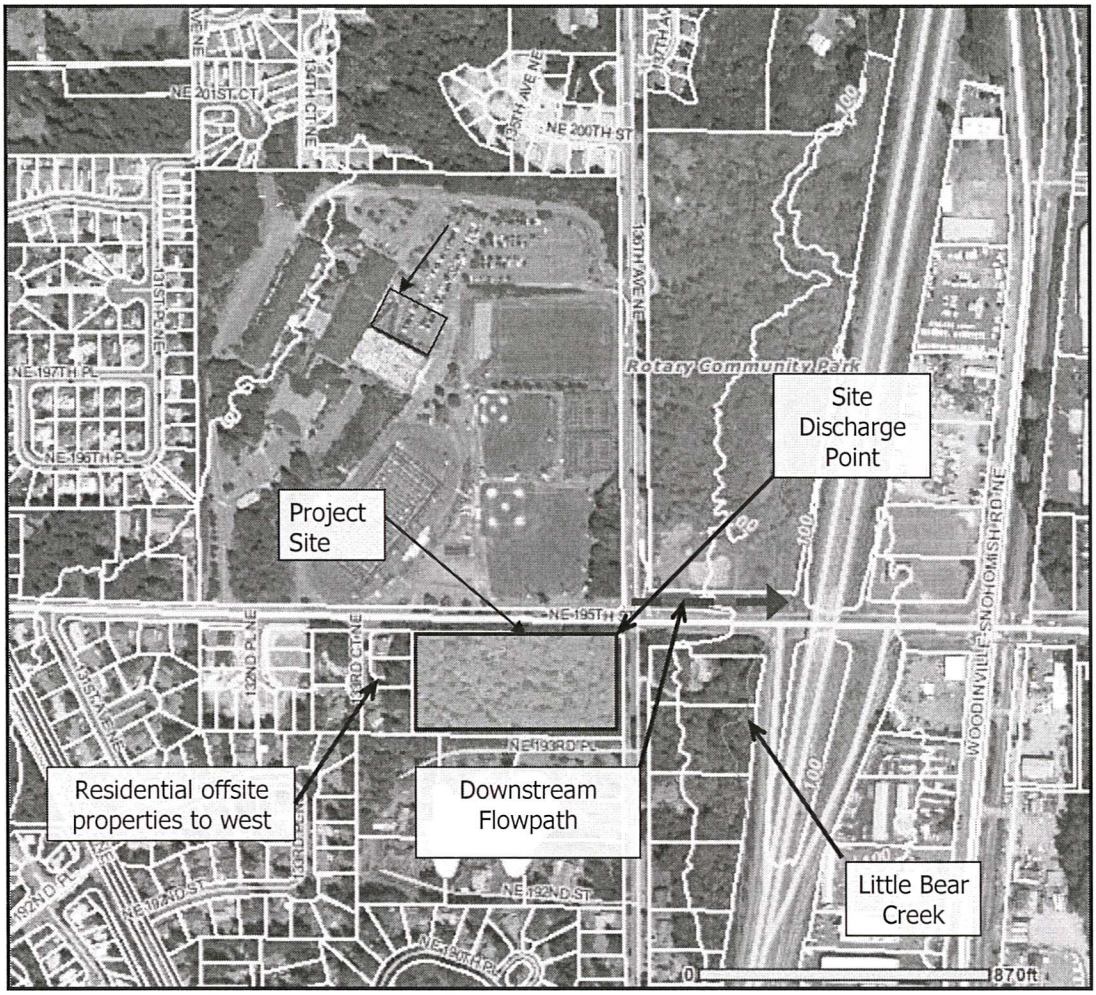
Picture 5: Bear Creek, entrance to concrete culvert under 195th.

Figure 4: Downstream Flow Path Map



Task 5: Mitigation of Existing or Potential Problems

No existing or potential problems were identified during the downstream analysis.

IV. FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

The City of Woodinville has adopted the 2009 King County Surface Water Design Manual (KCSWDM) for hydrologic and conveyance systems analysis and design.

Existing Project Site Hydrology:

The existing project site is located on the 4.5-acre Slocum property and is currently forested. See *Section I – Project Overview* for additional description of the Slocum property existing conditions.

The following table represents existing condition land use assumptions for the total property relative to disturbed area for improvements. The total disturbed area is approximately 100% of the total Slocum property area (4.5 acres).

Table 1. Existing Condition Areas

Land Use	Total Property Existing Condition Area (acres)
Outwash Forest	4.5
Total (acres)	**4.5**

Developed Site Hydrology:

The proposed improvements on project site includes a 15,986 square-foot new roadway, 5,973 square-foot sidewalk, 5,855 square-foot landscape strip, and a stormwater pond. The site is proposed to have 26 lots with single family homes and related infrastructure on it. The proposed improvements off of the project site consist of 7,084 square-feet of new roadway in NE 195th St., a 6,972 square-foot sidewalk along NE 195th St. and a 5,279 square-foot landscape strip. See Developed Areas Diagram in *Appendix A*.

The existing and developed disturbed land use areas for the project are located in Table 2 below.

Table 2. Developed Condition Areas

Land Use	Existing Area (acres)	Developed Area (acres)	Difference (acres)
Outwash Forest	4.5	0.00	(4.5)
Outwash Grass	0.00	1.49	1.49
Impervious non-PGIS	0.00	2.64	2.64
Impervious PGIS	0.00	0.37	.37
Subtotal Impervious	0.00	3.01	3.01
Total (acres)	**4.5**	**4.5**	**0.00**

The increase in impervious surface will be about 3.01 acres.

Flow Control System:

Increased peak flows and flow durations from the project will be mitigated in accordance with 2009 KCSWDM and City of Woodinville requirements.

Stormwater runoff will be routed through a settling basin in the stormwater pond. For location and design of the proposed pond system, see TIR Worksheet and the Developed Areas Diagram in *Appendix A: Storm Drainage Calculations*.

A portion of the frontage right-of-way does not gravity drain to the detention facility. Therefore, an equivalent area from upstream on NE 195th is proposed to be directed to the pond as an area trade.

The KCSWDM methodology strongly encourages the use of infiltration for outwash soils; however, this is problematic for this site due to mounding issues along the existing frontage cut slopes. Therefore predevelopment condition considered was forested, but with a combination of till and outwash soils depending on saturation of existing soils (saturated soils with the water table at the surface were modeled as till). The areas tributary to the stormwater pond system includes the roadway expansion in NE 195th ST., new roadway within the plat, and the new sidewalk and landscape strip both within the plat and along NE 195th ST. The impervious area located on each private lot will be infiltrated in proposed infiltration trenches; therefore none of the roof, driveways, or other impervious area on the property outside of the existing and proposed right-of-ways was included in the sizing of the stormwater pond. As shown in Table 3, the total detained area from the public right-of-ways is just over one acre.

Table 3. Areas Tributary to Proposed Stormwater Pond

Land Use	Pre-Developed Area (acres)	Developed Area (acres)
Till Forest	0.44	0.0
Outwash Forest	0.64	0.0
Till Grass	0.0	0.12
Outwash Grass	0.0	0.13
Impervious non-PGIS	0.0	0.30
Impervious PGIS	0.0	0.53
Subtotal Impervious	0.0	0.83
Total (acres)	**1.08**	**1.08**

The total new impervious area that will bypass the new detention system is 9,444 square feet or 0.22 acres. This area will be compensated by redirecting 9,525 square feet of existing pollution generating impervious area from NE 195th Street. In summary, the total area of pollution generating impervious surface from NE 195th Street that will be routed through the pond is more to the calculated areas associated with the improvements that are being bypassed. A figure delineating the proposed areas gained and bypassed can be found in Appendix A.

The tributary project areas shown in Table 3 were routed through KCRTS to create time series and peaks. The peak flows for these areas are shown in Table 4. Table 4 also shows the increase in pre-developed (forested) to developed flows for the tributary area.

Table 4. KCRTS Peak Flows

Return Period (year)	Pre-Dev (cfs)	Developed (cfs)	Increase in Peak Flows (cfs)
100	0.036	0.427	0.391
25	0.028	0.304	0.276
10	0.021	0.259	0.238
2	0.012	0.216	0.204

The time series were used to create a stormwater pond within KCRTS. This facility was designed to meet the Level 2 sizing requirements per the KCSWDM. The Level 2 flow control standard requires matching the pre-development and post-development flow durations curves for all flows greater than one-half the 2-year flow up to the 50-year flow.

In designing a traditional detention pond for forested conditions with outwash soils, KCRTS model does not accurately size the pond design due to the miniscule discharge rate. In order to allow the KCRTS model to run correctly, a small amount of infiltration (600 minutes/inch) was used. Since the pond will be lined to prevent infiltration and the potential mounding of water, the small volume shown as infiltrating (980 cf) in the model was added back into the calculated pond volume.

A summary of the facility is shown in Table 5.

Table 5. Facility Summary

Facility Type	Stormwater Pond
Pond Section	101' long X 94' wide
Pond Depth	3 feet
Required Volume	18344 cubic feet
Provided Volume	19102 cubic feet
Riser Head	2 feet
Vertical Permeability	0 min/inch

In addition to the stormwater pond, infiltration trenches were sized to infiltrate stormwater from both the roof and the driveway on each lot in the proposed plat. Each lot is approximately 6,000 square feet in size and the maximum impervious surface percentage is 70% per the WMC. Therefore the individual infiltration trenches were sized for a 3,800 square foot roof along with a 400 square foot driveway for a total of 4200 square feet or 0.0964 acres of impervious area.

A summary of the impervious area on each developed lot is shown in Table 6.

Table 6. Developed Lot Impervious Areas

Land Use	Total Property Impervious Area (acres)
Roof	0.0872
Driveway	0.0092
Total (acres)	**0.0964**

Using these site conditions, a time series were used to create an infiltration trench facility within KCRTS. This facility was designed to infiltrate the 100-year storm event.
The design infiltration rate for the facility was calculated at 2 inches/hour (30 min/inch) by the geotechnical engineer, Associated Earth Sciences Inc., per the KCSWDM. See Infiltration Testing in the geotechnical report located in Appendix B for further information.

A summary of the facility is shown in Table 7.

Table 7. Facility Summary

Facility Type	Infiltration Trench with Pit
Trench Depth	5 feet
Trench Width	5 feet
Trench Length	38 feet
Pit Width	8 Feet
Pit Length	8 Feet
Pit Depth	4.75 Feet
Required Volume	373.5 cubic feet
Provided Volume	376.2 cubic feet
Vertical Permeability	30 min/inch

*Note: The required volume includes and assumes the drain rock has 30% voids.

Please see figure 5 for the Infiltration Trench with Pit schematic.

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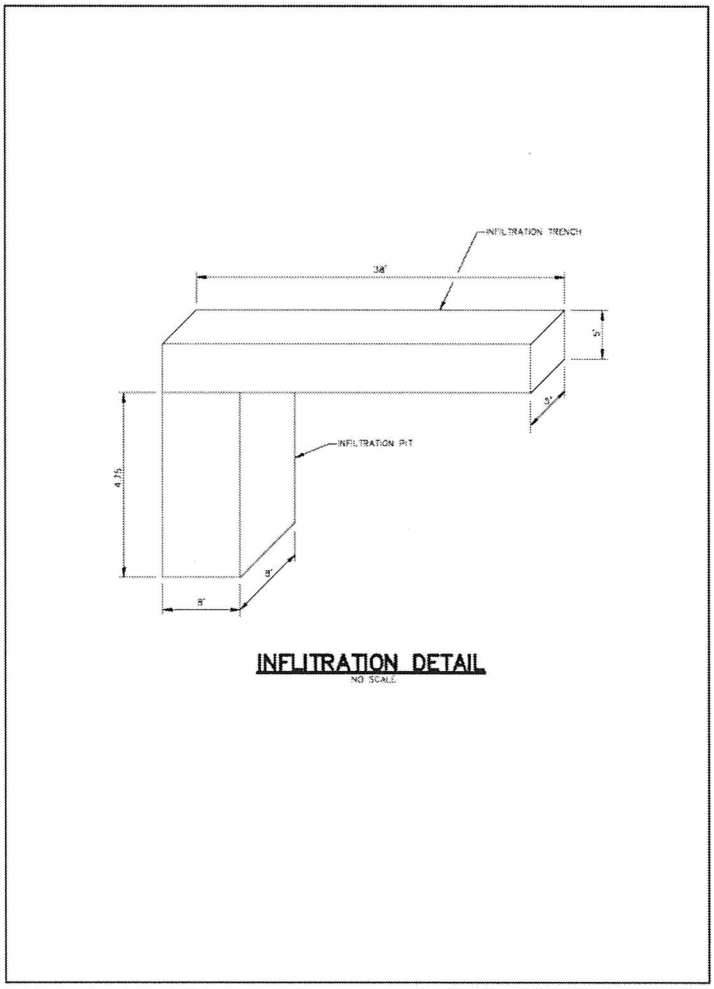
Figure 5: Infiltration Trench with Pit



Water Quality System:

Stormwater Pond

The project will provide water quality treatment. See Table 2 – Developed Condition Areas and Section II - Core Requirement #8.

Pre-treatment for sediment removal will be required and provided prior to stormwater entering the stormwater pond. The goal for sediment removal prior to infiltration per the 2009 KCSWDM is 80% TSS for flows up to and including the WQ design flow rate. Flows above the WQ design flow rate can be routed around or passes through untreated. The pre-settling basin will be used for sediment removal and has been sized per the 2009 KCSWDM.

Water quality treatment is proposed for the pollution generating surfaces in accordance with the KCSWDM. This will be achieved with a two cell wetpond, designed as a combined facility within the detention pond. The total required wetpond volume is 3,970 cubic feet with 3 feet of depth.

Infiltration Trenches

Stormwater runoff from roof and driveway on each proposed lot will be collected and infiltrated in an on-site infiltrations trench located in a utility easement that abuts the property line in front of each house.

The existing soils on site were tested for the potential of stormwater treatment for these trenches. Cation exchange capacity and organic content are indicators of this potential. In KCSWDM the minimum CEC requirement of native soils is 5.0 milliequivalents per 100 grams (meq/100g) for water quality treatment. The site soils were slightly below the minimum averaging 3.4 meq/100g. The KCSWDM specified a minimum organic content of native soils of 0.5% for water quality treatment. The site soils tested contained an averaging 1.3%. Based on the results of this testing, the geotechnical engineer has determined that the site soils are suitable for water quality treatment. Please see the geotechnical report located in Appendix B for further information

V. CONVEYANCE SYSTEM ANALYSIS AND DESIGN

At the direction of the City of Woodinville's Public Works Director, the project is proposing to utilize the existing stomwater conveyance system located in the intersection of NE 195th and 136th Ave., as well as an existing swale and outfall to Little Bear Creek. Due to the relatively small flows out of the detention pond, preliminary calculations have indicated that there is sufficient capacity in the existing conveyance system for flows resulting from the proposed project; however a final backwater analysis will be performed prior to final submission of the plan set and drainage report. New conveyance systems constructed as part of the project are designed to comply with Section 1.2.4 of the 2009 KCSWDM.

VI. SPECIAL REPORTS AND STUDIES

The following reports and special studies have been prepared for this project.

- November 2012 – Geotechnical Engineering Report for Proposed Improvements completed by *Associated Earth Sciences, Inc.*

VII. OTHER PERMITS

- NPDES/NOI – Washington State Department of Ecology

- Clearing & Grading Permit – City of Woodinville
- Site Development Permit– City of Woodinville
- Site Wall/Building Permit – City of Woodinville
- Building Permit – City of Woodinville
- Developer's Extension – Sewer and Water – Woodinville Water District

VIII. C-SWPPP ANALYSIS AND DESIGN

C-SWPPP Overview

The Construction Stormwater Pollution Prevention Plan (C-SWPPP) will be prepared as part of the NPDES stormwater permit requirements for the project.

ESC Plan Analysis and Design

See PACE Engineers design drawings for the Temporary Erosion and Sediment Control (TESC) Plan to be implemented during construction.

IX. BOND QUANTITIES, FACILITY SUMMARIES

Bond Quantities:

A Site Improvement Quantity Worksheet will be prepared as part of the final TIR.

Flow Control and Water Quality Facility Summary Sheet and Sketch:

See *Appendix A.*

X. OPERATIONS AND MAINTENANCE MANUAL

An Operations and Maintenance Manual per 2009 KCSWDM for the project will be prepared for the final TIR.

APPENDIX A

STORMWATER ANALYSIS

Infiltration Trench Sizing

Retention/Detention Facility

Type of Facility:	Gravel Infiltration Trench	
Facility Length:	50.00	ft
Facility Width:	5.00	ft
Facility Area:	250.	sq. ft
Effective Storage Depth:	5.00	ft
Stage 0 Elevation:	0.00	ft
Storage Volume:	375.	cu. ft
Vertical Permeability:	30.00	min/in
Permeable Surfaces:	Bottom	
Riser Head:	5.00	ft
Riser Diameter:	4.00	inches
Top Notch Weir:	None	
Outflow Rating Curve:	None	

Stage (ft)	Elevation (ft)	Storage (cu. ft)	Storage (ac-ft)	Discharge (cfs)	Percolation (cfs)
0.00	0.00	0.	0.000	0.000	0.01
0.10	0.10	8.	0.000	0.000	0.01
0.20	0.20	15.	0.000	0.000	0.01
0.30	0.30	23.	0.001	0.000	0.01
0.40	0.40	30.	0.001	0.000	0.01
0.50	0.50	38.	0.001	0.000	0.01
0.60	0.60	45.	0.001	0.000	0.01
0.70	0.70	53.	0.001	0.000	0.01
0.80	0.80	60.	0.001	0.000	0.01
0.90	0.90	68.	0.002	0.000	0.01
1.00	1.00	75.	0.002	0.000	0.01
1.10	1.10	83.	0.002	0.000	0.01
1.20	1.20	90.	0.002	0.000	0.01
1.30	1.30	98.	0.002	0.000	0.01
1.40	1.40	105.	0.002	0.000	0.01
1.50	1.50	113.	0.003	0.000	0.01
1.60	1.60	120.	0.003	0.000	0.01
1.70	1.70	128.	0.003	0.000	0.01
1.80	1.80	135.	0.003	0.000	0.01
1.90	1.90	143.	0.003	0.000	0.01
2.00	2.00	150.	0.003	0.000	0.01
2.10	2.10	158.	0.004	0.000	0.01
2.20	2.20	165.	0.004	0.000	0.01
2.30	2.30	173.	0.004	0.000	0.01
2.40	2.40	180.	0.004	0.000	0.01
2.50	2.50	188.	0.004	0.000	0.01
2.60	2.60	195.	0.004	0.000	0.01
2.70	2.70	203.	0.005	0.000	0.01
2.80	2.80	210.	0.005	0.000	0.01
2.90	2.90	218.	0.005	0.000	0.01
3.00	3.00	225.	0.005	0.000	0.01
3.10	3.10	233.	0.005	0.000	0.01
3.20	3.20	240.	0.006	0.000	0.01
3.30	3.30	248.	0.006	0.000	0.01
3.40	3.40	255.	0.006	0.000	0.01
3.50	3.50	263.	0.006	0.000	0.01
3.60	3.60	270.	0.006	0.000	0.01
3.70	3.70	278.	0.006	0.000	0.01
3.80	3.80	285.	0.007	0.000	0.01
3.90	3.90	293.	0.007	0.000	0.01
4.00	4.00	300.	0.007	0.000	0.01
4.10	4.10	308.	0.007	0.000	0.01

4.20	4.20	315.	0.007	0.000	0.01
4.30	4.30	323.	0.007	0.000	0.01
4.40	4.40	330.	0.008	0.000	0.01
4.50	4.50	338.	0.008	0.000	0.01
4.60	4.60	345.	0.008	0.000	0.01
4.70	4.70	353.	0.008	0.000	0.01
4.80	4.80	360.	0.008	0.000	0.01
4.90	4.90	368.	0.008	0.000	0.01
5.00	5.00	375.	0.009	0.000	0.01
5.10	5.10	375.	0.009	0.103	0.01
5.20	5.20	375.	0.009	0.188	0.01
5.30	5.30	375.	0.009	0.230	0.01
5.40	5.40	375.	0.009	0.266	0.01
5.50	5.50	375.	0.009	0.297	0.01
5.60	5.60	375.	0.009	0.326	0.01
5.70	5.70	375.	0.009	0.352	0.01
5.80	5.80	375.	0.009	0.376	0.01
5.90	5.90	375.	0.009	0.399	0.01
6.00	6.00	375.	0.009	0.420	0.01
6.10	6.10	375.	0.009	0.441	0.01
6.20	6.20	375.	0.009	0.460	0.01
6.30	6.30	375.	0.009	0.479	0.01
6.40	6.40	375.	0.009	0.497	0.01
6.50	6.50	375.	0.009	0.515	0.01
6.60	6.60	375.	0.009	0.532	0.01
6.70	6.70	375.	0.009	0.548	0.01
6.80	6.80	375.	0.009	0.564	0.01
6.90	6.90	375.	0.009	0.579	0.01
7.00	7.00	375.	0.009	0.594	0.01

Hyd	Inflow	Outflow Target	Outflow Calc	Peak Stage	Peak Elev	Storage (Cu-Ft)	Storage (Ac-Ft)
1	0.05	*******	0.03	5.03	5.03	375.	0.009
2	0.04	*******	0.00	2.37	2.37	177.	0.004
3	0.03	*******	0.00	2.06	2.06	155.	0.004
4	0.03	*******	0.00	2.07	2.07	155.	0.004
5	0.02	*******	0.00	4.08	4.08	306.	0.007
6	0.02	*******	0.00	0.71	0.71	53.	0.001
7	0.02	*******	0.00	3.02	3.02	226.	0.005
8	0.02	*******	0.00	0.52	0.52	39.	0.001

Route Time Series through Facility
Inflow Time Series File:single lot developed time series.tsf
Outflow Time Series File:revisedtrenchout

Inflow/Outflow Analysis
Peak Inflow Discharge: 0.046 CFS at 6:00 on Jan 9 in Year 8
Peak Outflow Discharge: 0.000 CFS at 11:00 on Jan 9 in Year 8
Peak Reservoir Stage: 5.03 Ft
Peak Reservoir Elev: 5.03 Ft
Peak Reservoir Storage: 375. Cu-Ft
: 0.009 Ac-Ft

Flow Frequency Analysis
Time Series File:revisedtrenchout.tsf
Project Location:Sea-Tac

---Annual Peak Flow Rates--- Flow Rate (CFS)	Rank	Time of Peak	-----Flow Frequency Analysis------- - - Peaks - - (CFS)	(ft)	Rank	Return Period	Prob
0.000	4	2/09/01 19:00	0.000	4.98	1	100.00	0.990
0.000	7	10/01/01 0:00	0.000	4.08	2	25.00	0.960

0.000	6	2/28/03	6:00	0.000	3.23	3	10.00	0.900
0.000	8	10/01/03	0:00	0.000	3.02	4	5.00	0.800
0.000	5	10/28/04	21:00	0.000	1.70	5	3.00	0.667
0.000	2	1/18/06	22:00	0.000	1.08	6	2.00	0.500
0.000	3	11/24/06	7:00	0.000	0.00	7	1.30	0.231
0.000	1	1/09/08	11:00	0.000	0.00	8	1.10	0.091
Computed Peaks				0.000	4.68		50.00	0.980

Flow Duration from Time Series File:revisedtrenchout.tsf

Cutoff CFS	Count	Frequency %	CDF %	Exceedence_Probability %	
0.000	61320	100.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
0.000	0	0.000	100.000	0.000	0.000E+00
99999.99	0	0.000	100.000	0.000	0.000E+00
99999.99	0	0.000	100.000	0.000	0.000E+00

Discharge Volume

Discharge Volume from Time Series
revisedtrenchout.tsf
between 10/01/00 00:00 and 10/30/00 23:59
0. Cu-Ft or 0.000 Ac-Ft in 30.0 days

Stormwater Pond Sizing

EXHIBIT 10
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Retention/Detention Facility

Type of Facility:	Infiltration Pond	
Side Slope:	2.00	H:1V
Pond Bottom Length:	70.00	ft
Pond Bottom Width:	70.00	ft
Pond Bottom Area:	4900.	sq. ft
Top Area at 1 ft. FB:	7396.	sq. ft
	0.170	acres
Effective Storage Depth:	3.00	ft
Stage 0 Elevation:	0.00	ft
Storage Volume:	17364.	cu. ft → plus 980 ft³ from below = 18,344 ft³
	0.399	ac-ft
Vertical Permeability:	600.00	min/in → 2.4" per day = 0.2' per day
Permeable Surfaces:	Bottom	
Riser Head:	2.50	ft
Riser Diameter:	18.00	inches
Number of orifices:	2	

4900 ft² × .2 ft = 980 ft³

Orifice #	Height (ft)	Diameter (in)	Full Head Discharge (CFS)	Pipe Diameter (in)
1	0.00	0.40	0.007	
2	2.00	1.00	0.019	4.0

Top Notch Weir: None
Outflow Rating Curve: None

Stage (ft)	Elevation (ft)	Storage (cu. ft)	Storage (ac-ft)	Discharge (cfs)	Percolation (cfs)	Surf Area (sq. ft)
0.00	0.00	2521.	0.058	0.000	0.00	5184.
0.01	0.01	2573.	0.059	0.000	0.01	5190.
0.02	0.02	2625.	0.060	0.001	0.01	5196.
0.03	0.03	2676.	0.061	0.001	0.01	5201.
0.13	0.13	3200.	0.073	0.002	0.01	5259.
0.23	0.23	3728.	0.086	0.002	0.01	5317.
0.33	0.33	4263.	0.098	0.003	0.01	5376.
0.43	0.43	4804.	0.110	0.003	0.01	5435.
0.53	0.53	5350.	0.123	0.003	0.01	5494.
0.63	0.63	5902.	0.135	0.003	0.01	5553.
0.73	0.73	6461.	0.148	0.004	0.01	5613.
0.83	0.83	7025.	0.161	0.004	0.01	5673.
0.93	0.93	7595.	0.174	0.004	0.01	5734.
1.03	1.03	8172.	0.188	0.004	0.01	5794.
1.13	1.13	8754.	0.201	0.005	0.01	5855.
1.23	1.23	9343.	0.214	0.005	0.01	5917.
1.33	1.33	9937.	0.228	0.005	0.01	5978.
1.43	1.43	10538.	0.242	0.005	0.01	6040.
1.53	1.53	11145.	0.256	0.005	0.01	6103.
1.63	1.63	11759.	0.270	0.006	0.01	6165.
1.73	1.73	12379.	0.284	0.006	0.01	6228.
1.83	1.83	13005.	0.299	0.006	0.01	6292.
1.93	1.93	13637.	0.313	0.006	0.01	6355.
2.00	2.00	14083.	0.323	0.006	0.01	6400.
2.01	2.01	14147.	0.325	0.006	0.01	6406.
2.02	2.02	14211.	0.326	0.007	0.01	6413.
2.03	2.03	14276.	0.328	0.008	0.01	6419.
2.04	2.04	14340.	0.329	0.009	0.01	6426.
2.05	2.05	14404.	0.331	0.011	0.01	6432.
2.06	2.06	14468.	0.332	0.013	0.01	6438.
2.07	2.07	14533.	0.334	0.014	0.01	6445.
2.08	2.08	14597.	0.335	0.014	0.01	6451.

2.18	2.18	15246.	0.350	0.018	0.01	6516.
2.28	2.28	15901.	0.365	0.021	0.01	6580.
2.38	2.38	16562.	0.380	0.023	0.01	6646.
2.48	2.48	17230.	0.396	0.026	0.01	6711.
2.50	2.50	17364.	0.399	0.026	0.01	6724.
2.60	2.60	18040.	0.414	0.490	0.01	6790.
2.70	2.70	18722.	0.430	1.340	0.01	6856.
2.80	2.80	19411.	0.446	2.430	0.01	6922.
2.90	2.90	20106.	0.462	3.730	0.01	6989.
3.00	3.00	20809.	0.478	5.200	0.01	7056.
3.10	3.10	21518.	0.494	6.630	0.01	7123.
3.20	3.20	22233.	0.510	7.160	0.01	7191.
3.30	3.30	22956.	0.527	7.650	0.01	7259.
3.40	3.40	23685.	0.544	8.110	0.01	7327.
3.50	3.50	24421.	0.561	8.550	0.01	7396.
3.60	3.60	25164.	0.578	8.970	0.01	7465.
3.70	3.70	25914.	0.595	9.370	0.01	7534.
3.80	3.80	26671.	0.612	9.750	0.01	7604.
3.90	3.90	27435.	0.630	10.110	0.01	7674.
4.00	4.00	28206.	0.648	10.470	0.01	7744.
4.10	4.10	28984.	0.665	10.810	0.01	7815.
4.20	4.20	29769.	0.683	11.140	0.01	7885.
4.30	4.30	30561.	0.702	11.470	0.01	7957.
4.40	4.40	31360.	0.720	11.780	0.01	8028.
4.50	4.50	32167.	0.738	12.090	0.01	8100.

Hyd	Inflow	Outflow Target	Outflow Calc	Peak Stage	Peak Elev	Storage (Cu-Ft)	Storage (Ac-Ft)
1	0.43	*******	0.02	2.40	2.40	16701.	0.383
2	0.30	*******	0.00	1.08	1.08	8489.	0.195
3	0.26	*******	0.01	2.09	2.09	14652.	0.336
4	0.25	*******	0.00	0.68	0.68	6185.	0.142
5	0.23	*******	0.01	1.56	1.56	11350.	0.261
6	0.22	*******	0.02	2.23	2.23	15588.	0.358
7	0.21	*******	0.00	0.60	0.60	5760.	0.132
8	0.18	*******	0.00	0.88	0.88	7309.	0.168

Route Time Series through Facility
Inflow Time Series File:devslocum.tsf
Outflow Time Series File:rdout

Inflow/Outflow Analysis
Peak Inflow Discharge: 0.426 CFS at 6:00 on Jan 9 in Year 8
Peak Outflow Discharge: 0.024 CFS at 16:00 on Jan 9 in Year 8
Peak Reservoir Stage: 2.40 Ft
Peak Reservoir Elev: 2.40 Ft
Peak Reservoir Storage: 16701. Cu-Ft
: 0.383 Ac-Ft

Flow Frequency Analysis
Time Series File:rdout.tsf
Project Location:Sea-Tac

---Annual Peak Flow Rates--- Flow Rate (CFS)	Rank	Time of Peak	-----Flow Frequency Analysis------- - - Peaks - - (CFS)	(ft)	Rank	Return Period	Prob
0.020	2	2/09/01 21:00	0.024	2.40	1	100.00	0.990
0.004	8	12/28/01 18:00	0.020	2.23	2	25.00	0.960
0.014	3	3/06/03 23:00	0.014	2.09	3	10.00	0.900
0.004	7	8/26/04 7:00	0.006	1.82	4	5.00	0.800
0.005	6	1/05/05 16:00	0.005	1.56	5	3.00	0.667
0.005	5	1/19/06 1:00	0.005	1.16	6	2.00	0.500

0.006	4	11/24/06 10:00	0.004	0.92	7	1.30	0.231
0.024	1	1/09/08 16:00	0.004	0.88	8	1.10	0.091
Computed Peaks			0.022	2.34		50.00	0.980

Flow Duration from Time Series File:rdout.tsf

Cutoff CFS	Count	Frequency %	CDF %	Exceedence_Probability %	
0.000	48719	79.450	79.450	20.550	0.205E+00
0.001	468	0.763	80.214	19.786	0.198E+00
0.001	2311	3.769	83.982	16.018	0.160E+00
0.002	1897	3.094	87.076	12.924	0.129E+00
0.002	2949	4.809	91.885	8.115	0.811E-01
0.003	631	1.029	92.914	7.086	0.709E-01
0.003	2173	3.544	96.458	3.542	0.354E-01
0.004	186	0.303	96.761	3.239	0.324E-01
0.004	950	1.549	98.311	1.689	0.169E-01
0.005	132	0.215	98.526	1.474	0.147E-01
0.005	601	0.980	99.506	0.494	0.494E-02
0.006	240	0.391	99.897	0.103	0.103E-02
0.007	1	0.002	99.899	0.101	0.101E-02
0.007	2	0.003	99.902	0.098	0.978E-03
0.008	1	0.002	99.904	0.096	0.962E-03
0.008	1	0.002	99.905	0.095	0.946E-03
0.009	2	0.003	99.909	0.091	0.913E-03
0.009	3	0.005	99.914	0.086	0.864E-03
0.010	1	0.002	99.915	0.085	0.848E-03
0.010	0	0.000	99.915	0.085	0.848E-03
0.011	1	0.002	99.917	0.083	0.832E-03
0.011	1	0.002	99.918	0.082	0.815E-03
0.012	1	0.002	99.920	0.080	0.799E-03
0.012	2	0.003	99.923	0.077	0.766E-03
0.013	2	0.003	99.927	0.073	0.734E-03
0.013	1	0.002	99.928	0.072	0.718E-03
0.014	1	0.002	99.930	0.070	0.701E-03
0.014	12	0.020	99.949	0.051	0.506E-03
0.015	2	0.003	99.953	0.047	0.473E-03
0.015	3	0.005	99.958	0.042	0.424E-03
0.016	2	0.003	99.961	0.039	0.391E-03
0.016	4	0.007	99.967	0.033	0.326E-03
0.017	3	0.005	99.972	0.028	0.277E-03
0.018	2	0.003	99.976	0.024	0.245E-03
0.018	4	0.007	99.982	0.018	0.179E-03
0.019	5	0.008	99.990	0.010	0.978E-04

PROPOSED KING COUNTY SURFACE WATER DESIGN MAUAL WETPOND CALCULATIONS

Cover categories are based on existing U.S. Department of Agriculture soil survey data or site specific data where available.

Vr = (0.9Ai + 0.25Atg + 0.10Atf + 0.01Ao) x (R/12) (6-12)

where,

Vr	=	volume of runoff from mean annual storm (cubic feet)
Ai	=	area of impervious surface (sq ft)
Atg	=	area of till soil covered with grass (sq ft)
Atf	=	area of till soil covered with forest (sq ft)
Ao	=	area of outwash soil covered with grass or forest (sq ft)
R/12	=	rainfall from mean annual storm (feet)

Calculate wetpool volume Vb. Use the results of the previous steps to calculate the required wetpool volume according to the following equation:

Vb =f x Vr (6-13)

where,

Vb	=	wetpool volume (cu ft)
f	=	volume factor from Step 1
Vr	=	runoff volume (cubic feet) from Step 1

Determine wetpool dimensions. Determine the wetpool dimensions satisfying the design criteria outlined below.
A simple way to check the volume of each wetpool cell is to use the following equation:

Vb = (6-14)

where,

V	=	wetpool volume (cu ft)
h	=	wetpool depth (ft)
A1	=	water quality design surface area of wetpool (sq ft)
A2	=	bottom area of wetpool (sq ft).

Vr = (0.9Ai + 0.25Atg + 0.10Atf + 0.01Ao) x (R/12)

Ai	=	36006.696	Sq. Ft.	0.83	acres
Atg	=	5279.472	Sq. Ft.	0.12	acres
Atf	=	0	Sq. Ft.	0	acres
Ao	=	5837.04	Sq. Ft.	0.134	acres
R	=	0.47	Inches	R/12 =	0.0392

Vr = 1323.217038

Vb/Vr = 3 For Basic Wetpond
Vb/Vr = 4.5 For Large Wetpond

Use Large Wetpond with Vb/Vr = 3

.75Vr	**=**	**992**	**Cu. Ft. Req'd for Infiltration presettling Cell**
Vb	**=**	**3970**	**Cu. Ft. Water Quality Volume**

EXHIBIT 10
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APPENDIX B

GEOTECHNICAL REPORT

November 20, 2012
Project No. KE110151A

Quadrant Corporation
14725 SE 36th Street, Suite 100
Bellevue, Washington 98006

Attention: Mr. Pete Lymberis

Subject: Subsurface Exploration and Infiltration Testing
Slocum Property
NE 195th Street and 136th Avenue NE
Woodinville, Washington

Dear Mr. Lymberis:

Associated Earth Sciences, Inc. (AESI) is pleased to present this letter-report providing the results of recent subsurface exploration and in-situ infiltration testing at the above-referenced site. Our understanding of the project is based on the explorations and testing completed for this study; concurrent completion of a "Subsurface Exploration, Geologic Hazards, and Preliminary Geotechnical Engineering Report" dated November 19, 2012, and conversations with you and the project civil engineering firm PACE Engineers, Inc. (PACE).

The location of the site is shown on the "Vicinity Map," Figure 1. The locations of the existing site features and the approximate locations of the explorations accomplished for this study are presented on the "Site and Exploration Plan," Figure 2. Previous explorations completed by AESI for a geotechnical study are also shown on Figure 2. Logs of the subsurface explorations, infiltration testing data, and laboratory testing data are also attached. The conclusions and recommendations contained in this letter-report should be reviewed and modified, or verified, if the project changes from its current configuration.

PURPOSE AND SCOPE

The purpose of this study was to provide subsurface data and field infiltration testing services for evaluating feasibility of on-lot infiltration systems. This letter-report is intended to provide the project team with additional information on which to base the design of the infiltration systems. Our study included site reconnaissance, a review of available geologic literature, excavating exploration pits and infiltration test pits, conducting two infiltration tests and one pit drain test, installation of one shallow well point, and performing mechanical grain size

analyses. This letter-report summarizes our current field/laboratory work and offers preliminary recommendations based on our present understanding of the project.

AUTHORIZATION

Written authorization to proceed with this study was granted by Mr. Pete Lymberis with Quadrant Corporation (Quadrant). Our study was accomplished in general accordance with our proposal dated November 9, 2012. This letter-report has been prepared for the exclusive use of Quadrant and its agents for specific application to this project. Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted hydrogeology and geotechnical engineering practices in effect in this area at the time our letter-report was prepared. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the owner. No other warranty, express or implied, is made.

PROJECT AND SITE DESCRIPTION

The project site is located on a glaciated upland, within a portion of the northeast quarter of the southwest quarter of Section 3, Township 26 North, Range 5 East, W.M., in Woodinville, Washington. The project site consists of a rectangular-shaped parcel of approximately 4.5 acres located at the southwest corner of the intersection of NE 195th Street and 136th Avenue NE. The property is currently vacant and vegetated by mixed coniferous/ deciduous forest with moderately thick to thick underbrush. The site is bound to the south and west by developed residential properties.

The topography of the site generally slopes gently down toward the east-southeast at gradients of less than 10 percent. A shallow depression, possibly a glacial kettle, is located in the central portion of the site. This depression is approximately 8 to 10 feet deep. The topography steepens to an inclination of approximately 50 to 75 percent along its north, east, and south property margins, sloping down toward NE 195th Street, 136th Avenue NE, and developed residential properties, respectively. The steepened inclinations along the north and east site margins are interpreted to be cut slopes associated with construction of the adjacent roads. The steepened inclination along the south property margin is interpreted to be a cut slope resulting from mining activities associated with a borrow pit reported to have formerly been located on the developed residential parcels to the south. A small lake occupies the lower-lying portion of the former borrow pit approximately 125 feet south of the site. The cut slopes along the north, east, and west site margins range from approximately 8 to 25 feet in height.

Development Proposal

It is our understanding that project plans include subdividing the site into 23 residential lots. Access into the development would be provided by a new road entering the property off of 136th Avenue NE on the east side of the site. Retaining walls will be constructed along the steep slopes located along the north and south margins of the site. Retaining walls will also be used to grade out the pond area located at the northeast corner of the site.

Current development plans also propose on-site infiltration of stormwater on individual lots. Each home will have a trench system that allows stormwater to infiltrate from the impervious surfaces on the lots such as roof and driveway. Stormwater from the roadway would be directed to a detention pond constructed on the northeast corner of the site. Cuts for the detention pond on the eastern portion of the site would be on the order of 25 to 30 feet.

SUBSURFACE EXPLORATION

Our field study included excavating a series of exploration pits, infiltration test pits, and one infiltration test pit drain, and installation of one shallow well point to gain subsurface information about the site. The exploration pits were excavated using a Caterpillar 312C track-mounted excavator owned and operated by Northwest Excavating and Trucking of Snohomish, Washington under subcontract to our firm. The various types of sediments, as well as the depths where characteristics of the sediments changed, are indicated on the exploration logs presented in Appendix A. The depths indicated on the logs where conditions changed may represent gradational variations between sediment types. Our explorations were approximately located in the field by measuring from known site features visible on an aerial photograph of the site.

The conclusions and recommendations presented in this letter-report are based, in part, on the conditions encountered in the explorations completed for this and previous studies. The number, locations, and depths of the explorations were completed within site and budgetary constraints. Because of the nature of exploratory work below ground, interpolation of subsurface conditions between the field explorations is necessary. Differing subsurface conditions may be present outside of the area of the field explorations due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations between the field explorations may not become fully evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this letter-report and make appropriate changes.

Exploration Pits and Infiltration Test Pits

A total of fourteen exploration pits, two infiltration test pits, and one infiltration test pit drain were excavated for our study using a Caterpillar 312C track-mounted excavator owned and operated by Northwest Excavating and Trucking of Snohomish, Washington. EP-1 through EP-8 were completed on April 19, 2011; EP-9 and IT-1 were completed on August 26, 2011; and EP-10 through EP-14, IT-2, and PD-1 were completed on November 13 and 14, 2012. The pits permitted direct, visual observation of subsurface conditions. Materials encountered in the explorations were studied and classified in the field by an engineering geologist or hydrogeologist from our firm. Selected samples were then transported to our laboratory for further visual classification and testing, as necessary.

Well Point

One hand-driven well point, identified as P-1, was installed to provide information on depth to ground water. The hand-driven well point was located on the eastern portion of the project, and advanced to a depth of 8.6 feet below ground surface.

The well point was constructed using 1.25-inch-diameter, steel casing and well screen, and completed aboveground with a threaded cap. The lower 2.5 feet of P-1 consisted of machine-perforated screen with a threaded end cap to allow the entry of water into the well point. Well point P-1 was developed using tubing and a check valve to move water through the screen and improve the hydraulic connection with the surrounding aquifer material. The well was purged for 10 minutes. The turbidity level was reduced but the discharge was still light brown in color.

Infiltration Testing

Infiltration testing locations were selected in consultation with the design team in order to obtain representative infiltration rates for on-lot infiltration systems. Large-ring infiltration tests were completed at the locations noted on Figure 2 as IT-1 and IT-2. A pit drain infiltration test was completed at the location noted as PD-1 on Figure 2. Infiltration testing is discussed in more detail later in this letter-report.

SUBSURFACE CONDITIONS

Subsurface conditions at the project site were inferred from AESI's subsurface exploration and testing accomplished for this study, our explorations, and to a limited extent, on exploration logs completed on the nearby Woodinville High School site, our visual reconnaissance of the site, and review of selected geologic literature.

The on-site native sediments are mapped as Vashon recessional outwash and Vashon advance outwash on the regional geologic map titled *Composite Geologic Map of the Sno-King Area, Central Puget Lowland, Washington* prepared by Booth, Cox, Troost, and Shimel for the Seattle-Area Geologic Mapping Program, University of Washington (2004). Our interpretation of the sediments encountered at the subject site is in general agreement with the regional geologic map.

As shown on the exploration logs included in Appendix A, natural sediments encountered at the site generally include a thin layer of topsoil overlying native Vashon recessional and advance outwash sediments. A pre-Vashon unit was interpreted to be present at depth in some of the explorations. The following section presents more detailed subsurface information organized from the shallowest (youngest) to the deepest (oldest) sediment types encountered during this study.

The following section presents more detailed subsurface information organized from the youngest to the oldest sediment types.

Stratigraphy

Forest Duff

A surficial, organic forest duff layer was encountered at all exploration pit locations. The forest duff layer was approximately 0.5 to 1 foot thick. Due to the high organic content and varied fines, these materials are not considered suitable for stormwater infiltration.

Glacial Outwash

As discussed above, the site soils on the regional geology map are mapped as Vashon advance outwash. Sediments encountered directly below the forest duff layer in all explorations consisted of sand with interbedded silt layers and variable gravel content. The apparent density of the sediments was variable, ranging from loose to dense. Where caving of the exploration pit sidewalls occurred or the material was easier to excavate, the sediments were interpreted to be Vashon recessional outwash. Where little to no caving of the pit sidewalls occurred or where the material was somewhat more difficult to excavate, the sediments were interpreted to be Vashon advance outwash.

Because of their similar gradation and often subtle density differences, it is often difficult to distinguish between the recessional and advance outwash deposits. As described above, criteria used to distinguish between these sediment types for this study include digging action during excavation of the exploration pits and whether or not any caving of the pit sidewalls was observed. Our interpretation of the origin of the sediments encountered in our explorations

should be considered tentative and could be more accurately assessed from boring logs with blow count data.

Vashon recessional and advance outwash are described in more detail below.

Vashon Recessional Outwash

Sediments encountered directly below the forest duff layer at the locations of exploration pits EP-3 through EP-5, EP-7, EP-8, EP10 through EP-14, IT-1, IT-2, and PD-1 generally consisted of loose to medium dense, reddish tan, reddish brown, and brown sand with variable silt and gravel content.

We interpret these sediments to be representative of Vashon recessional outwash. The Vashon recessional outwash consists of sediments that were deposited by meltwater streams that emanated from the retreating glacial ice during the latter portion of the Vashon Stade of the Fraser Glaciation, approximately 12,500 to 15,000 years ago. The reduced density and reddish tan to reddish brown coloration observed within approximately 2 to 4 feet of the ground surface is interpreted to be due to weathering. The weathered soil horizon also typically contained abundant roots. At the locations encountered, the recessional outwash extended to depths ranging from approximately 2.5 to 10 feet, and was underlain by Vashon advance outwash. The Vashon recessional outwash deposits are suitable for infiltration of stormwater.

Vashon Advance Outwash

Sediments encountered directly below the ground surface at the locations of exploration pits EP-1 and EP-2, EP-6, and EP-9, and beneath the recessional outwash in other explorations, generally consisted of medium dense to dense sand and stiff to very stiff silt with variable gravel content. The advance outwash was highly stratified and the sand/silt layers were interbedded. At the locations of EP-6, EP-11, and IT-2, the advance outwash extended to depths ranging from 16 to 18 feet, and was underlain by pre-Vashon sediments. At the remainder of explorations where the advance outwash was encountered, it extended beyond the maximum depths explored of approximately 9 to 18.5 feet.

We interpret these sediments to be representative of the Vashon advance outwash. The Vashon advance outwash consists of sediments that were deposited by meltwater streams that emanated from the advancing glacial ice during the Vashon Stade of the Fraser Glaciation, approximately 12,500 to 15,000 years ago. The high relative density characteristic of the Vashon advance outwash is due to its consolidation by the glacial ice that overrode these sediments subsequent to their deposition. Where comprised of relatively permeable sand, the Vashon advance outwash deposits are suitable for infiltration of stormwater, and were the target receptor for the infiltration testing, as discussed later in this letter-report. Where comprised of primarily silt,

infiltration opportunities may be limited. Infiltration is discussed in more detail later in this letter-report.

Pre-Vashon Sediments

Sediments interpreted to be representative of pre-Vashon deposits were encountered at depth beneath the advance outwash deposits in exploration pits EP-6, EP-11, and IT-2, and continued beyond the maximum depth explored. These sediments were comprised of gray laminated silt or oxidized or somewhat cemented sand with few silt, trace gravel and trace boulders. The occurrence of the pre-Vashon deposits beneath the site is consistent with site conditions on the nearby Woodinville High School, located to the north of the subject site.
The pre-Vashon sediments were deposited prior to the advance of the Vashon glacier, and have been compacted by the weight of an ice sheet.

Laboratory Analysis

Laboratory analyses were conducted on selected samples collected from our explorations to evaluate the suitability of the soil for in-situ water quality treatment. The analyses conducted included cation exchange capacity (CEC), organic content, and mechanical sieve analysis. The test results are summarized in Table B-1 in Appendix B. The laboratory reports are also included in Appendix B. It is should be noted that the CEC and organic content is performed by a subcontracted laboratory. Results from the November 13-14, 2012 subsurface exploration were not yet available at the time this letter-report was prepared. The results will be summarized in an addendum when they are available.

Cation Exchange Capacity

Cation exchange capacity is an indicator of stormwater pre-treatment potential of the existing site soils, and is important to the civil engineer in designing the stormwater management system for the site. The City of Woodinville uses the 2009 *King County Surface Water Design Manual* (KCSWDM). The KCSWDM CEC requirements for stormwater treatment in the native soil are described in Section 5.4, page 5-62. A minimum CEC of 5.0 milliequivalents per 100 grams (meq/100g) is specified. Currently results for CEC are available for four outwash samples; all had a measurable CEC that was slightly below the specified minimum of 5.0 meq/100g. The average CEC content was 3.4 meq/100g. CEC data is summarized in Table B-1 and the laboratory data sheets are attached.

Organic Content

The KCSWDM organic content requirements for stormwater treatment in the native soil are described in Section 5.4, page 5-62. A minimum organic content of 0.5 percent is specified. Currently results for organic content testing are available for four outwash samples. Organic

content exceeded the minimum requirement of 0.5 percent for native soils. The average organic content was 1.3 percent. Organic content data is summarized in Table B-1 and the laboratory data sheets are attached.

Grain Size

We completed 20 mechanical grain size analysis tests in accordance with *American Society for Testing and Materials* (ASTM):D 422. The grain size distributions were compared to the water quality treatment criteria in the KCSWDM as described in Section 5.4, page 5-62, which considers only the sediment passing through (or is finer than) the No. 4 sieve size. The sediments were also classified according to the United States Department of Agriculture (USDA) Textural Classification system. The USDA Textural Classification system considers only the sediment passing through (or is finer than) the No. 10 sieve size. For both the KCSWDM and the USDA comparisons, either the fraction retained on the No. 4 or No. 10 sieve size, respectively, is subtracted prior to determining the remaining percentages for comparison.

From the KCSWDM, Section 5.4, page 5-62:

> ***Soil Properties Required for Groundwater Protection Outside of Groundwater Protection Areas***
> *For infiltration facilities located outside of* ***groundwater protection areas****, acceptable groundwater protection is provided by the soil if the first two feet or more of the soil beneath the infiltration facility has a cation exchange capacity greater than 5 and an organic content[10] greater than 0.5%, AND meets* ***one of the following*** *criteria:*
> *a) The soil has a measured infiltration rate less than or equal to 9 inches per hour[11] or is logged as one of the classes from the* ***USDA Textural Triangle*** *(Figure 5.4.1.A, p. 5-63), excluding sand and loamy sand (Note: soil texture classes other than sand and loamy sand may be assumed to have an infiltration rate of less than or equal to 9 inches per hour without doing field testing to measure rates.), OR*
> *b) The soil is composed of less than 25% gravel by weight with at least 75% of the soil passing the #4 sieve. The portion passing the #4 sieve must meet one of the following gradations:*
> - *At least 50% must pass the #40 sieve and at least 2% must pass the #100 sieve, or*
> - *At least 25% must pass the #40 sieve and at least 5% must pass the #200 sieve.*

Based on the KCSWDM criteria, the grain size of the majority of tested sediments meet the water quality protection criteria. Based on the USDA Textural Triangle, the majority of tested sediments are generally classified as sand to loamy sand to sandy loam, as shown in Table B-1. The grain size analysis test results are included as attachments to this letter-report.

GROUND WATER CONDITIONS

Ground water seepage was not encountered in any of the exploration pits excavated for our study with the exception of EP-9, the lowest elevation exploration. A well point (P-1) was completed at this location, and the water level in P-1 was measured by hand with an electronic tape periodically between August 2011 and November 2012. The water depth below ground surface ranged from 6.5 to 8 feet, corresponding to elevations 115.5 and 117 feet. The water elevation in P-1 also corresponds to lateral seepage on the slope face and associated hydrophytic vegetation immediately east of well point P-1.

No ground water was encountered in the remaining explorations, with exploration depths ranging from 10.5 to 18.5 feet. Locally, the water level measured in well point P-1 is interpreted to represent a regional water table. The water elevations in well point P-1 are similar to the approximate elevation of open water in the lake south of the site.

It should be noted that fluctuations in the level of the ground water may occur due to the time of the year, variations in amount of precipitation, on- and off-site land usage, and other factors.

FIELD INFILTRATION TESTING RESULTS

Two large-ring infiltration tests and one pit drain infiltration test were completed on the site, noted on Figure 2 as IT-1, IT-2, and PD-1, respectively. The large-ring method was selected because the KCSWDM states that *"Large single ring and PIT tests have been shown to more closely match actual full-scale facility performance than smaller test methods."* Our experience has also demonstrated that smaller-scale test methods do not account for ground water mounding and lateral dispersion effects, and are of a scale that is too small to provide reliable design information for most infiltration facilities that concentrate stormwater (such as vaults and infiltration ponds).

AESI performed IT-1 on August 23, 2011 and IT-2 and PD-1 on November 13-14, 2012. Northwest Excavating and Trucking provided the large-ring infiltrometer, hoses, and flow meter for the infiltration testing. All infiltration test data was recorded by hand in the field, and infiltration rate calculations were completed based on the field data. The water source for the testing was a 4,000-gallon water truck. The water for testing was de-chlorinated prior to discharge into the infiltration tests.

Large-Ring Testing

IT-1 and IT-2 were conducted in Vashon advance outwash as modified Pilot Infiltration Tests (PITs) using a large-diameter infiltrometer (6-foot-diameter steel ring). The ring was seated

and tamped in place in an excavation with a relatively flat bottom. Water was introduced into the testing area using fire hose attached to a digital propeller flow meter/totalizer, and brought to a relatively constant depth or head within the ring. The flow meter was equipped with a diffuser to minimize turbulence and scouring of the test base during testing. The water level (head) within the infiltrometer was measured with an electronic water level meter. No water was present in the pits prior to testing.

Water was allowed to rise in the pit until the water level reached approximately 6 to 12 inches above the bottom of the pit in tests IT-1 and IT-2, respectively. A low head can minimize sidewall caving and the effects of horizontal infiltration during testing. After the water level reached the target level, the flow was reduced in order to maintain a constant water level (constant head). Readings of the water level, instantaneous flow rate, and total flow volume were recorded at approximately 15-minute intervals. The constant head rate was calculated using the average flow rate per time step, the test cell dimensions, and accounting for the change in storage within the pit. The inflow continued for about 6 hours for each PIT-style test. The total volume used during testing was 1,520 and 700 gallons for tests IT-1 and IT-2, respectively.

After discontinuing water flow, the falling water levels were measured with a water level meter with 0.01-foot divisions until little to no standing water was present. Upon completion of the infiltration tests, infiltration pits IT-1 and IT-2 were overexcavated to depths of 18 feet each to: 1) document the types of soils the water infiltrated through, and 2) identify any soil layers that would restrict the downward flow of infiltrating water. Details are contained on the infiltration pit logs attached to this letter-report (Appendix A).

IT-1 has a constant head field infiltration rate of 12 inches per hour (in/hr) and a falling head rate of 10 in/hr; however, these rates likely represent lateral infiltration rates. During over-excavation of IT-1, it was noted that infiltration test water was pooled on a sandy silt layer approximately 1 foot below the test depth. Once the sandy silt layer was penetrated, water was observed to flow back into the excavation at a depth of about 15 feet.

IT-2 had a constant head field infiltration rate of 5 in/hr and a falling head rate of about 3.5 in/hr. During overexcavation, no seepage or low-permeability layers were observed.

The field-measured infiltration rate in IT-1 was 12 in/hr. Based on a safety factor of 3.5, the recommended design infiltration rate at the location of infiltration test IT-1 is approximately 3.4 in/hr. The field-measured infiltration rate in IT-2 was 5 in/hr. Based on a safety factor of 3.5, the recommended design infiltration rate at the location of infiltration test IT-2 is approximately 1.4 in/hr. The design rate takes into effect the scale of the test, site variability, the depth to perching horizon, and plugging factors.

Pit Drain Test

PD-1 was conducted as a pit drain test in Vashon advance outwash, where the lower portion of the pit was backfilled with free-draining aggregate and the testing water level was maintained relatively high compared to a large-ring infiltration test. Water was introduced into the pit drain through an electronic flow meter with instantaneous flow rate and total flow volume readouts. The water level in the pit was measured with a water level meter with 0.01-foot divisions. No water was present in the pit prior to testing.

Water was allowed to rise in the pit until the water level reached a maximum head of approximately 7.4 feet above the bottom of the pit. Readings of the water level, instantaneous flow rate, and total flow volume were recorded at approximately 15-minute intervals. The inflow continued for about 4 hours for pit drain test PD-1. The total volume used during testing was about 6,070 gallons (the total test water supply). After discontinuing water flow, the falling water levels were measured with a water level meter with 0.01-foot divisions until little to no standing water was present. Nearly all of the water had infiltrated through the pit in 45 minutes. Because PD-1 was completed as a pit drain, no overexcavation occurred.

An inflow rate of about 30 gallons per minute (gpm) was achieved for the last 2.5 hours of the inflow phase of the test and a specific capacity of 4.1 gallons per minute per foot (gpm/foot) was estimated. Specific capacity is the flow capacity per foot of head change and can be estimated by dividing the flow rate by the change in water level elevation under steady state conditions. The falling head rate was about 10 in/hr for the last approximate 6-inch head drop.

CONCLUSIONS AND RECOMMENDATIONS

Our exploration and testing indicates that, from a hydrogeologic and geotechnical standpoint, the parcel is suitable for distributed or limited stormwater infiltration in most areas; however, site-specific exploration and testing will be required at the locations of each infiltration facility due to high variability in subsurface conditions.

On-Lot Infiltration Systems

For on-lot infiltration facilities, a minimum of 3 feet of receptor horizon is required to be present beneath the base of the facility and above either a perching layer or the seasonal high ground water table. The seasonal high ground water elevation is about elevation 117 feet based on periodic measurements in well point P-1.

The site grading plan will remove 4 to 10 feet of native material to construct Lots 1 to 4, and Lot 22 and Lot 23. Because of the grading, the amount of outwash remaining above the seasonal high water table elevation is less, limiting opportunities for deep trenches to access

permeable sand layers. We assume the on-lot infiltration systems will consist of individual infiltration trenches that are 2 to 3 feet in width, 5 to 7 feet in depth below proposed lot grade along most of the trench length, with the exception of one portion of the trench, which would be completed with a pit drain to a depth of about 15 feet below proposed lot grade. Proposed lot grades and either site-specific or nearby explorations are summarized in Table 1.

The recent exploration and testing completed in November 13-14 was focused on Lots 1 to 4 and Lot 22 and Lot 23 to determine feasibility of full infiltration. Based on explorations completed, it is our opinion that there are sufficient permeable layers of sand to accommodate full infiltration of the on-lot runoff.

For the remaining lots, the proposed grading plan would remove less than about 4 feet of native sediment. It is our opinion that full infiltration of these lots is feasible. Additional exploration and testing would be required for design. For planning purposes, a trench sizing rate of 1 to 2 in/hr could be used.

Table 1
Proposed Lots 1 through 4, Lot 22 and Lot 23
Exploration Data and Preliminary Design Infiltration Rate

Lot No.	Nearby or Site-Specific Exploration, Total Depth and Bottom Elevation	Proposed Lot Elevation (feet) and Base of Trench	Exploration Extended Below Base of Trench Base	Preliminary Design Infiltration Rate
1	IT-2, 18 ft bgs; el. 129 ft	135.0 and 129	No, IT-2 completed at about 5 feet below proposed lot elevation	1.4 in/hr
2	EP-6, 16 ft; el. 117 ft EP-11, 18 ft; el. 127 ft	137.0 and 132	Yes, to about 5 feet below	1.4 in/hr
3	PD-1, 16 ft; el. 133 ft	136.0 and 131	Yes, to about 2 feet below	2 in/hr or 4 gpm/ft
4	EP-5, 15 ft; el. 130 ft PD-1, 16 ft; el. 133 ft EP-12, 17 ft; el. 130 ft	142.5 and 137.5	Yes, to about 7 feet below	2 in/hr
22	EP-10, 18.5 ft; el. 130.5 ft EP-13, 16 ft; el. 130 ft	143.5 and 138.5	Yes, to about 8 feet below	1 in/hr
23	EP-10, 18.5 ft; el. 130.5 ft	138.0 and 133	Yes, to about 3 feet below	1 in/hr

ft – feet
bgs – below ground surface
el. – elevation
in/hr – inches per hour
gpm/ft – gallons per minute per foot

Our recommendations below for Lots 1 through 4, Lot 22, and Lot 23 take into account the variability of the advance outwash. Based on our field infiltration testing program and incorporating appropriate factors of safety based on the 2009 KCSWDM, the design infiltration rates presented in Table 1 can be used for preliminary trench sizing purposes provided:

1) final infiltration trench design remains consistent with the preliminary design of a trench aligned east-west along the front of Lots 3 through 23 farthest from the slopes on the north and south sides of the parcel, and north-south on the western side of Lots 1 and 2,

2) after site grading activities and construction of the trench system, a minimum of 3 feet of the cleaner Vashon advance outwash remains present beneath the trench base or is intersected by the pit drain, and

3) our recommendations are predicated on AESI personnel being present during excavation of the facility(s) to confirm that the permeable material tested has been exposed.

If a higher infiltration rate is necessary to fit the infiltration facilities on the lots, additional investigation could include lot-by-lot infiltration testing, pit drain testing, or deepening the trench where feasible.

Care must be taken during construction not to contaminate the receptor soils with stormwater and silt. Therefore, construction should be staged to occur only after the majority of earthwork is completed. The stormwater facilities must not be used to infiltrate stormwater during construction. All construction site stormwater must be directed to a temporary sediment and water quality detention facility. Prior to bringing the stormwater facilities online, the site must be stabilized, with all roadways paved, and all swales and planted areas fully vegetated. Water entering the infiltration facilities must be clean and clear, and contain no visible turbidity.

Once design plans are prepared, we recommend that a copy be provided to AESI for review to verify that the plans comply with the recommendations in this letter-report, or provide additional recommendations, if necessary.

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CLOSURE

We appreciate the opportunity to be of continued service to you on this project. Should you have any questions regarding this letter-report or other geotechnical/hydrogeologic aspects of the project, please call us at your earliest convenience.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

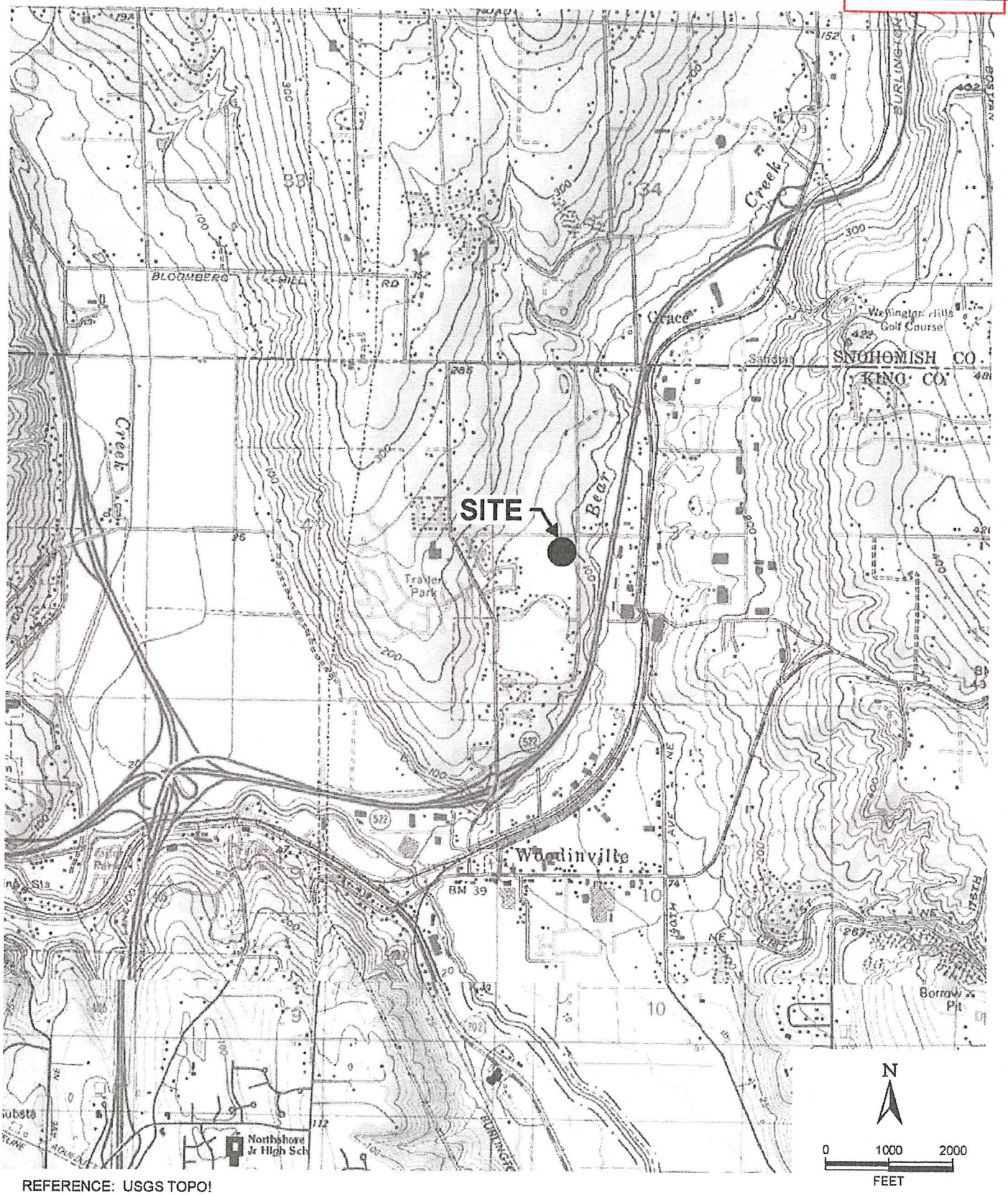
MATTHEW A. MILLER
STATE OF WASHINGTON
30284
REGISTERED
PROFESSIONAL ENGINEER
11-20-12

Jennifer H. Saltonstall, L.G., L.Hg.
Associate Geologist/Hydrogeologist

Matthew A. Miller, P.E.
Principal Engineer

Attachments:
Figure 1: Vicinity Map
Figure 2: Site and Exploration Plan
Appendix A: Exploration Logs
Appendix B: Laboratory Testing Results

EXHIBIT 10
PAGE 48 OF 98



REFERENCE: USGS TOPO!

110151 Slocum Property \ 110151 Vicinity 11-12.cdr

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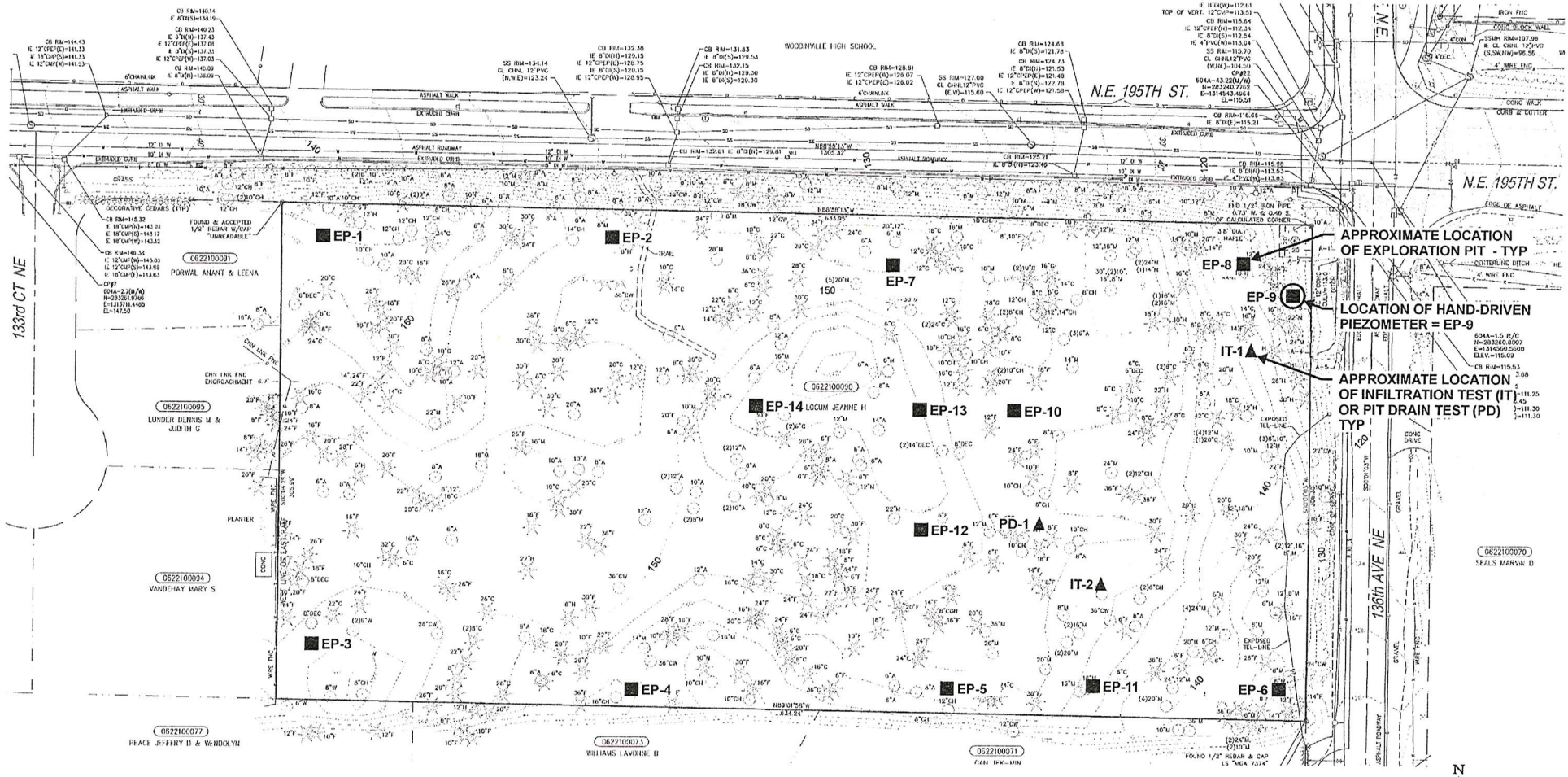
VICINITY MAP
SLOCUM PROPERTY
WOODINVILLE, WASHINGTON

FIGURE 1
DATE 11/12
PROJ. NO. KE110151A



COMPLETION NOTES:
EP-1 THROUGH EP-8 COMPLETED APRIL 2011.
EP-9/P-1 AND IT-1 WERE COMPLETED AUGUST 2011.
EP-10 THROUGH EP-14, IT-2, AND PD-1 COMPLETED NOVEMBER 2012.

REFERENCE: PACE

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SITE AND EXPLORATION PLAN

SLOCUM PROPERTY
WOODINVILLE, WASHINGTON

FIGURE 2
DATE 11/12
PROJ. NO. KE110151A

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110151 Slocum Property \ 110151 A Site and Expl 11-12.cdr

APPENDIX A

Exploration Logs

Coarse-Grained Soils - More than 50%[1] Retained on No. 200 Sieve	Gravels - More than 50%[1] of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines[5]	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≥15% Fines[5]	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50%[1] or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines[5]	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≥15% Fines[5]	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50%[1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

	Density	SPT[2] blows/foot
Coarse-Grained Soils	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50
	Consistency	**SPT[2] blows/foot**
Fine-Grained Soils	Very Soft	0 to 2
	Soft	2 to 4
	Medium Stiff	4 to 8
	Stiff	8 to 15
	Very Stiff	15 to 30
	Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

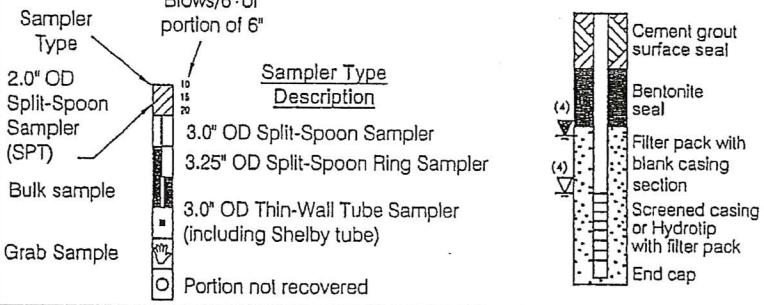
[3] Estimated Percentage

Component	Percentage by Weight
Trace	<5
Few	5 to 10
Little	15 to 25
With	- Non-primary coarse constituents: ≥ 15% - Fines content between 5% and 15%

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols



(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of ground water
ATD = At time of drilling
Static water level (date)
(5) Combined USCS symbols used for fines between 5% and 15%

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

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EXPLORATION LOG KEY

FIGURE A1

blocksllog_key.dwg LAYOUT: Layout2

LOG OF EXPLORATION PIT NO. EP-1

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION — Approximate Elev. 162 feet
	Forest Duff
	Vashon Advance Outwash
1	Loose to medium dense, moist, reddish brown, fine SAND, little silt (SP/SM); becomes reddish tan
2	below ~2 feet; abundant roots 0 to 2 1/2 feet.
3	Medium dense to dense, moist, tan, fine SAND, few silt (SP); trace gravel, large boulder present at
4	5 to 7 feet.
5	
6	
7	
8	Medium dense to dense, moist, grayish tan, SAND, with gravel, trace silt (SW).
9	
10	
11	Medium dense to dense, very moist, grayish tan, silty fine SAND and fine sandy SILT (SM/ML) with
12	lenses of clean, fine SAND; contains interbeds of clean fine to medium SAND below approximately
13	14 feet.
14	
15	
16	
17	
18	Bottom of exploration pit at depth 17 feet No ground water seepage. No caving.
19	
20	

KCTP3 110151A.GPJ November 16, 2012

Slocum Property
Woodinville, WA

Logged by: TJP
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Project No. KE110151A

4/19/11

LOG OF EXPLORATION PIT NO. EP-2

EXHIBIT 10
PAGE 53 OF 98

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION — Approximate Elev. 153 feet
	Forest Duff
	Vashon Advance Outwash
1	Loose to medium dense, moist, reddish tan, fine SAND, little silt, few gravel (SP/SM); abundant roots.
2	
3	Medium dense to dense, moist, tan, fine SAND, few silt (SP); contains interbeds of stiff to very stiff, very moist silt from 4 to 6 1/2 feet; becomes grayish tan with silt (SM) below 6 1/2 feet.
4	
5	
6	
7	
8	
9	
10	
11	
12	Contains SILT lenses at ~12 to 13 feet.
13	Becomes gravelly grayish brown below 13 feet.
14	
15	Little gravel below 15 feet.
16	
17	Bottom of exploration pit at depth 16.5 feet No ground water seepage. No caving.
18	
19	
20	

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LOG OF EXPLORATION PIT NO. EP-3

EXHIBIT 10
PAGE 54 OF 98

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION — Approximate Elev. 153 feet
	Forest Duff
1	**Vashon Recessional Outwash**
2	Loose to medium dense, moist, brown to reddish brown, silty fine SAND, little gravel (SM); abundant roots.
3	
4	Medium dense, moist, gray to grayish tan, SAND, with gravel, trace silt (SW); contains lenses of stiff, mottled tan, SILT below 7 feet.
5	
6	
7	
8	**Vashon Advance Outwash**
9	
10	Medium dense to dense, moist, grayish tan, fine SAND, little gravel, few silt (SP); contains pockets of dense, silty SAND, with gravel (SM) above 12 feet.
11	
12	
13	
14	
15	
16	Bottom of exploration pit at depth 15 feet No ground water seepage. Moderate caving 0 to 8 feet.
17	
18	
19	
20	

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Project No. KE110151A

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LOG OF EXPLORATION PIT NO. EP-4

EXHIBIT 10
PAGE 55 OF 98

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION — Approximate Elev. 144 feet
	Forest Duff
1	**Vashon Recessional Outwash**
2	Loose to medium dense, moist, reddish tan, fine SAND, little silt, few gravel (SM/SP); abundant roots.
3	**Vashon Advance Outwash**
4	Medium dense to dense, moist, grayish tan, fine SAND, little silt, few gravel (SM); contains lenses of clean, fine SAND and very stiff, laminated SILT.
5	
6	
7	
8	Medium dense to dense, moist, gray, fine SAND, trace silt (SP); contains interbeds of fine sandy silt below 10 feet; few gravel.
9	
10	
11	
12	
13	
14	
15	
16	Bottom of exploration pit at depth 15 feet No ground water seepage. Moderate caving 7 to 10 feet.
17	
18	
19	
20	

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LOG OF EXPLORATION PIT NO. EP-5

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This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION — Approximate Elev. 145 feet
	Forest Duff
1	**Vashon Recessional Outwash**
2	Loose to medium dense, moist, reddish tan, fine SAND, little silt, few gravel (SP/SM); abundant roots.
3	Medium dense, moist, tan, fine SAND, little silt, few gravel (SP/SM); trace silt below 4 feet; contains lenses and interbeds of silt below 7 1/2 feet; contains scattered roots.
4	
5	
6	
7	
8	
9	
10	**Vashon Advance Outwash**
11	Medium dense to dense, moist, grayish tan, fine SAND, little gravel, trace silt (SP); contains lenses of very moist, silty SAND and fine sandy SILT.
12	
13	
14	
15	
16	Bottom of exploration pit at depth 15 feet No ground water seepage. Minor caving above 10 feet.
17	
18	
19	
20	

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LOG OF EXPLORATION PIT NO. EP-6

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This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION — Approximate Elev. 133 feet
	Forest Duff
1	**Vashon Advance Outwash**
	Loose to medium dense, moist, tan, fine SAND, little silt (SP/SM); abundant roots.
2	
3	Medium dense to dense, moist, tan, fine SAND, little silt (SP/SM); contains lenses and interbeds of stiff to very stiff, SILT and fine SAND, with few silt below 6 1/2 feet; becomes silty and very moist below 12 feet.
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	**Pre-Vashon ?**
15	Stiff to very stiff, very moist, grayish tan, SILT; laminated (ML).
16	
17	Bottom of exploration pit at depth 16 feet No ground water seepage. No caving.
18	
19	
20	

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Project No. KE110151A

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LOG OF EXPLORATION PIT NO. EP-7

EXHIBIT 10
PAGE 58 OF 98

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION — Approximate Elev. 152 feet
	Forest Duff
	Vashon Recessional Outwash
1	Loose to medium dense, moist, reddish tan, fine SAND, little silt (SP/SM); abundant roots.
2	
3	Medium dense, moist, grayish tan, fine SAND, few silt (SP); little silt below 4 feet (SP/SM).
4	
5	
6	Medium dense, very moist, brown, silty SAND, with gravel (SM); contains thin lenses of SAND, with little silt; scattered roots above 7 feet.
7	**Vashon Advance Outwash**
8	Medium dense to dense, moist, grayish tan, fine SAND, little gravel, trace silt (SP).
9	
10	
11	
12	
13	Stiff to very stiff, very moist, gray-tan, SILT (ML).
14	Medium dense to dense, moist, gray, SAND, with gravel, trace silt (SW).
15	
16	
17	Bottom of exploration pit at depth 16 feet No ground water seepage. Moderate caving 7 to 12 feet.
18	
19	
20	

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LOG OF EXPLORATION PIT NO. EP-8

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION — Approximate Elev. 134 feet
	Forest Duff
1	**Vashon Recessional Outwash** Loose, moist, reddish brown, fine SAND, little gravel, little silt (SP/SM); abundant roots.
2	
3	
4	**Vashon Advance Outwash** Medium dense to dense, very moist, tan, silty fine SAND and fine sandy SILT, with little gravel (SM/ML); contains thin lenses of clean sand; becomes mottled at 6 to 7 feet.
5	
6	
7	
8	
9	
10	
11	Medium dense to dense, moist, gray, fine SAND, trace silt, trace gravel (SP); becomes well graded below 15 feet (SW).
12	
13	
14	
15	
16	
17	Bottom of exploration pit at depth 16 feet No ground water seepage. Moderate caving below 10 feet.
18	
19	
20	

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LOG OF EXPLORATION PIT NO. EP-9

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. **DESCRIPTION** El. ~124.7'
1	**Forest Duff**
2	**Vashon Advance Outwash** Medium dense, damp, brown to oxidized brown, fine to medium SAND, trace silt, abundant roots.
3	
4	Medium dense, damp, brown to oxidized brown, fine to medium SAND, trace silt, occasional roots.
5	Medium stiff to stiff, moist, gray to gray brown, sandy SILT, faintly layered; probe 2-1/2 inches.
6	
7	Medium stiff to stiff, moist to wet, dark mottled brown, sandy SILT.
8	Medium dense to dense, wet, brown, fine to medium SAND, trace silt.
9	
10	Bottom of exploration pit at depth 9 feet Rapid ground water seepage at 7.5 feet. Moderate caving 0 to 4 feet, minor caving at 6 feet. Drivepoint installed, water level at 7.3 feet below ground surface.
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

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8/26/11

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LOG OF EXPLORATION PIT NO. EP-10

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Depth (ft)	DESCRIPTION (El. ~149')
	Forest Duff
1	Loose, moist, dark brown, silty fine to medium SAND, few fine to coarse gravel; abundant roots, abundant organics (SM).
	Vashon Recessional Outwash
2	Loose to medium dense, slightly moist, brown, fine to medium SAND, few fine to coarse gravel, few silt; few roots (SP).
3	Becomes grayish brown.
4	Medium dense to dense, slightly moist, grayish brown, fine to medium SAND, trace gravel, trace silt (SP).
5	
6	
7	**Vashon Advance Outwash**
8	Very stiff, slightly moist, brown with faint orange mottling, SILT; finely laminated (ML).
9	
10	
11	Medium dense to dense, slightly moist, grayish brown, fine to medium SAND, few fine to coarse gravel, trace silt; stratified (SP).
12	
13	Increased gravel content to little.
14	Very stiff, slightly moist, brown, SILT; finely laminated (ML).
15	Medium dense, slightly moist, grayish brown, fine to coarse SAND, few fine to coarse gravel, trace silt (SW).
16	Grades to fine to medium SAND (SP).
17	Medium dense to dense and stiff, slightly moist, grayish brown, finely interbedded (1/4 to 1/2 inch), very fine to fine SAND, with silt, and SILT (SM/ML).
18	Medium dense to dense, slightly moist, grayish brown, fine to medium SAND, trace to little gravel, trace silt (SP).
19	Bottom of exploration pit at depth 18.5 feet No ground water seepage. No caving.
20	

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Slocum Property
Woodinville, WA

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Project No. KE110151A

11/14/12

LOG OF EXPLORATION PIT NO. EP-11

EXHIBIT 10
PAGE 62 OF 98

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Depth (ft)	DESCRIPTION (El. ~145')
	Forest Duff
1	Loose, moist, dark brown, fine to medium SAND, few fine to coarse gravel, few silt; abundant organics, abundant roots (SM).
	Vashon Recessional Outwash
2	Loose to medium dense, slightly moist, brown, fine to medium SAND, few fine to coarse gravel, few silt (SP).
3	Becomes grayish brown.
4	
5	
6	
7	**Vashon Advance Outwash**
8	Medium dense to dense, slightly moist, grayish brown to tan, fine SAND, few to little silt (SP/SM).
9	
10	
11	
12	Medium dense to dense, slightly moist, grayish brown to tan, interbeds (1/2 to 2 inches), fine SAND, and SILT.
13	
14	
15	Medium dense to dense, slightly moist, grayish brown, fine SAND, trace silt (SP).
	Pre-Vashon ?
16	Medium dense to dense and stiff, slightly moist, grayish brown to brown, thinly bedded (1/8 to 1/4 inch), very fine to fine SAND and SILT (SP/ML).
17	Stiff, moist, brown to reddish brown, thinly bedded (1/16 to 1/8 inch) SILT (ML).
18	Dense, moist, brown to reddish brown, fine to medium SAND, few silt, trace gravel, trace coarse sand (SP); boulder at 18 feet.
19	Bottom of exploration pit at depth 18 feet No ground water seepage. No caving.
20	

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Slocum Property
Woodinville, WA

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Project No. KE110151A

11/14/12

LOG OF EXPLORATION PIT NO. EP-12

EXHIBIT 10
PAGE 63 OF 98

This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION (El. ~147')
1	**Forest Duff** Loose, moist, dark brown, silty fine to medium SAND, few fine to coarse gravel; abundant roots, abundant organics (SM).
2	**Vashon Recessional Outwash** Loose to medium dense, slightly moist, brown, fine to medium SAND, few fine to coarse gravel, few to trace silt (SP).
3	Becomes grayish brown at 1 foot.
4	
5	
6	
7	**Vashon Advance Outwash** Medium dense to dense, slightly moist, grayish brown, fine SAND, trace gravel, trace silt (SP).
8	
9	
10	
11	Medium dense to dense and stiff, slightly moist, grayish brown with orange mottling, thinly bedded (1/4 inch), very fine to fine SAND, with silt and SILT, with sand (SM/ML).
12	
13	
14	Very stiff, slightly moist, grayish brown, finely laminated SILT, with thin (<1/8 inch) interbeds very fine SAND, with silt; micaceous (ML/SM).
15	As above but 1 inch orangish brown and lavender gray, SILT and fine SAND, with silt (ML/SM); thinly bedded to laminated.
16	As above, orangish brown to brown.
17	
18	Bottom of exploration pit at depth 17 feet No ground water seepage. No caving.
19	
20	

KCTP3 110151A.GPJ November 16, 2012

Slocum Property
Woodinville, WA

Logged by: LBK
Approved by: JHS

Associated Earth Sciences, Inc.

Project No. KE110151A

11/14/12

LOG OF EXPLORATION PIT NO. EP-13

EXHIBIT 10
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This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplfication of actual conditions encountered.

Depth (ft)	DESCRIPTION (El. ~146')
1	**Forest Duff** Loose, moist, dark brown, silty fine to medium SAND, few fine to coarse gravel; abundant roots, abundant organics (SM).
2	**Vashon Recessional Outwash** Loose to medium dense, slightly moist, brown, fine to medium SAND, few fine to coarse gravel, trace silt (SP).
3	
4	
5	
6	
7	
8	**Vashon Advance Outwash** Medium dense to dense and stiff, slightly moist, brown with orange mottling, fine to medium SAND, few to little silt interbedded with brown, SILT, with sand; thinly bedded (1/8 to 1/4 inch) layers (SP/SM).
9	
10	Medium dense to dense and stiff, slightly moist, grayish brown to light tan, thinly bedded (1/8 to 1/4 inch) very fine to fine SAND and SILT (SP/ML).
11	Medium dense to dense, fine to medium SAND, few to little silt, trace gravel, trace coarse sand; stratified (SP/SM).
12	
13	Very stiff, slightly moist, grayish brown, SILT; finely laminated; discontinuous across pit wall (ML).
14	
15	Medium dense to dense, slightly moist, grayish brown, fine to medium SAND, trace silt (SP).
16	
17	Bottom of exploration pit at depth 16 feet No ground water seepage. Minor caving 3 to 10 feet.
18	
19	
20	

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LOG OF EXPLORATION PIT NO. EP-14

EXHIBIT 10
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This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION (El. ~145')
1	**Forest Duff** Loose, moist, dark brown, silty fine SAND, trace gravel; abundant roots, abundant organics (SM).
2	**Vashon Recessional Outwash** Loose to medium dense, slightly moist, brown, fine SAND, few silt, trace gravel; few roots (SP).
3	Medium dense, slightly moist, grayish brown with orange mottling, fine to medium SAND, few fine to coarse gravel, few silt; stratified (SW/SM).
4	
5	**Vashon Advance Outwash** Medium dense to dense, slightly moist, grayish brown, fine SAND, trace to little silt; stratified, with discontinuous layer (2 inch) of silt; finely laminated (SP/SM).
6	
7	
8	
9	
10	Medium dense to dense, slightly moist, grayish brown, fine to coarse SAND, few fine to coarse gravel, trace silt (SW).
11	Bottom of exploration pit at depth 10.5 feet No ground water seepage. Minor caving 3 to 6 feet.
12	
13	
14	
15	
16	
17	
18	
19	
20	

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LOG OF EXPLORATION PIT NO. IT-1

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This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION (El. ~136')
1	**Forest Duff** Loose, slightly moist, dark brown, fine to medium SAND, few silt, abundant roots.
2	**Vashon Recessional Outwash** Medium dense, moist, tan brown, fine to medium SAND, trace to few gravel, trace silt, abundant roots; massive (SP).
3	
4	Medium dense, moist, gray brown, fine to medium SAND, few gravel, trace cobbles and large gravel, trace silt; massive (SP).
5	
6	
7	**Vashon Advance Outwash** Medium dense to dense, moist, gray brown, fine to medium SAND, few gravel, trace silt; stratified (SP).
8	
9	
10	
11	
12	Medium dense to dense, moist, gray brown, fine to medium SAND, trace to few gravel, trace silt (SP).
13	Layer of medium dense to dense, moist, gray, SILT and very fine SAND; discontinuous (ML/SP).
14	Medium dense to dense, moist to very moist, gray, fine SAND, with silt, interbedded with very moist, gray, medium SAND (SM/SP).
15	Medium dense to dense, moist to very moist, gray, medium SAND, with silt interbeds (SP/ML).
16	
17	
18	Medium dense to dense, moist, gray, medium SAND, with thin silt interbeds (SP/ML).
19	Bottom of exploration pit at depth 18 feet Seepage from infiltration test water 14 to 14.5 feet. Heavy caving 0 to 8 feet, moderate caving 8 to 18 feet. Infiltration test at 13-13.5 feet.
20	

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Slocum Property
Woodinville, WA

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Approved by: JHS

Associated Earth Sciences, Inc.

Project No. KE110151A

8/26/11

LOG OF EXPLORATION PIT NO. IT-2

EXHIBIT 10
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This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION (El. ~ 147')
1	**Forest Duff** Loose, moist, dark brown, silty fine to medium SAND, few fine to coarse gravel; abundant roots, abundant organics (SM).
2	**Vashon Recessional Outwash** Loose to medium dense, slightly moist, brown, fine to medium SAND, few fine to coarse gravel, few silt; few roots (SP).
3	Medium dense, slightly moist, grayish brown, fine to medium SAND, few fine to coarse gravel, few silt; weakly stratified (SP).
4	
5	**Vashon Advance Outwash** Medium dense to dense, slightly moist, grayish brown, interbedded fine to medium SAND, few to trace gravel, trace silt and fine SAND, trace silt (SP).
6	
7	
8	
9	
10	
11	As above, with interbeds of tan, SILT, with fine sand.
12	
13	
14	Medium dense to dense, slightly moist, grayish brown, fine SAND, few gravel, trace silt; weakly stratified (SP).
15	
16	As above, with discontinuous layers (4 to 6 inch) of SILT, scattered weathered gravel (SP/ML).
17	**Pre-Vashon** Dense, slightly moist, orangish brown, fine to coarse SAND, with gravel, few silt; somewhat cemented (SW).
18	Bottom of exploration pit at depth 18 feet No ground water seepage. Caving 12 to 16 feet. Infiltration test at 17 feet.
19	
20	

KCTP3 110151A.GPJ November 16, 2012

Slocum Property
Woodinville, WA

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Project No. KE110151A

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LOG OF EXPLORATION PIT NO. PD-1

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This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.

Depth (ft)	DESCRIPTION (El. ~ 149')
1	**Forest Duff** Loose, moist, dark brown, silty fine to medium SAND, few fine to coarse gravel; abundant roots, abundant organics (SM).
2	**Vashon Recessional Outwash** Loose to medium dense, slightly moist, brown with orange mottling, fine to medium SAND, few fine to coarse gravel, few silt (SP).
3	Medium dense, slightly moist, grayish brown, fine to medium SAND, few fine to coarse gravel, few silt; weakly stratified (SP).
4	
5	
6	
7	
8	**Vashon Advance Outwash** Medium dense to dense, slightly moist, grayish brown, very fine to fine SAND, little to few silt; fine laminae (SP/SM).
9	
10	
11	Medium dense to dense and stiff, slightly moist, light gray to grayish brown, thinly interbedded (1/3 to 1/2 inch) very fine to fine SAND and SILT (SP/ML).
12	
13	Medium dense to dense, slightly moist, grayish brown, fine to medium SAND, few to trace fine gravel, trace silt (SP).
14	
15	
16	Dense, slightly moist, grayish brown to brown, fine to medium SAND, few fine to coarse gravel, trace silt; weakly cemented (SP).
17	Bottom of exploration pit at depth 16 feet Pit from 0 to 11 feet = 4x10 feet / Pit from 11 feet to bottom = 3x8 feet No ground water seepage. Minor caving 10 to 16 feet. **Completed as Pit Drain:** +2 to 16 feet = Piezometer 0 to 7 feet = Native fill 7 feet = Plastic sheet 7 to 16 feet = Pea gravel
18	
19	
20	

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Slocum Property
Woodinville, WA

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Associated Earth Sciences, Inc.

Project No. KE110151A

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APPENDIX B

Laboratory Testing Results

Table B-1
Summary of Laboratory Testing

AESI Pit and Depth	CEC	% OM	Sieve Results - KC Req. #8								Of weight passing #10, % sand (retained #270)	USDA Class
			Of weight passing #4, Percent Passing				75% passes #4	50% pass #40 + 2% on #100	25% pass #40 + 5% on #200	KC SWDM 2009		
			#4	#40	#100	#200						
EP-1 at 2.5-3.5 ft	NT	NT	99	86.2	18.5	8.6	Yes	Yes	Yes	Meets grain size criteria	94	sand
EP-2 at 3-4 ft	3.0	1.2	100	80.7	25.9	12.9	Yes	Yes	Yes	Meets grain size criteria	91	sand
EP-3 at 3-4 ft	NT	NT	83.6	19	1.9	1.2	Yes	No	No	Does not meet grain size criteria	99	sand
EP-4 at 3-4 ft	3.8	1.5	94.2	84.1	37.9	20.8	Yes	Yes	Yes	Meets grain size criteria	83	loamy sand/ sandy loam
EP-5 at 3-4 ft	3.8	1.4	96	85.8	34.5	16.3	Yes	Yes	Yes	Meets grain size criteria	89	sand/ loamy sand
EP-7 at 3-4 ft	2.9	1.2	94.7	80.9	13.8	5.0	Yes	Yes	Yes	Meets grain size criteria	97	sand
EP-8 at 3-4 ft	NT	NT	72.4	41.1	10.8	7.0	No	No	Yes	Nearly meets grain size criteria	93	sand
EP-10 at 15 ft	pending		85.8	42.6	7.4	2.3	Yes	No	No	Nearly meets grain size criteria	99	sand
EP-10 at 18 ft	pending		77.2	56.3	10.3	4.3	Yes	Yes	No	Meets grain size criteria	97	sand
EP-11 at 13 ft	pending		100	98.8	88.8	80.8	Yes	Yes	Yes	Meets grain size criteria	23	Too fine-grained
EP-11 at 17.5 ft	pending		98.8	69.9	21.5	11.5	Yes	Yes	Yes	Meets grain size criteria	90	sand
EP-12 at 16 ft	pending		100	99.2	94.3	77.7	Yes	Yes	Yes	Meets grain size criteria	27	Too fine-grained

EP-13 at 13 ft	pending		99.1	45.0	21.0	17.4	Yes	No	Yes	Meets grain size criteria	84	loamy sand/ sandy loam
EP-13 at 15 ft	pending		100	29.1	3.2	1.4	Yes	No	No	Does not meet grain size criteria	99	sand
EP-14 at 3 ft	pending		87.2	63.1	25.8	12.7	Yes	Yes	Yes	Meets grain size criteria	88	sand/ loamy sand
EP-14 at 5 ft	pending		90.1	92.9	34.3	19.6	Yes	Yes	Yes	Meets grain size criteria	82	loamy sand/ sandy loam
IT-1 at 14.5 ft	NT	NT	99.7	96.5	38.3	24.3	Yes	Yes	Yes	Meets grain size criteria	83	loamy sand/ sandy loam
IT-2 at 14 ft	pending		92.1	84.2	13.1	4.2	Yes	Yes	No	Meets grain size criteria	97	sand
IT-2 at 17 ft	pending		61.1	54.7	21.9	11.9	No	Yes	Yes	Does not meet grain size criteria	88	sand/ loamy sand
PD-1 at 16 ft	pending		91.2	53.4	3.9	0.8	Yes	Yes	No	Meets grain size criteria	99	sand

EP - exploration pit
IT – infiltration test pit
CEC – cation exchange capacity
OM – organic matter content, percent by weight
meq/100g – milliequivalents per 100 grams
KC Req. #8 - King County Core Requirement #8 for in-situ water quality treatment, KCSWDM page 5-62
USDA – U.S. Department of Agriculture soil textural classification
NT – not tested

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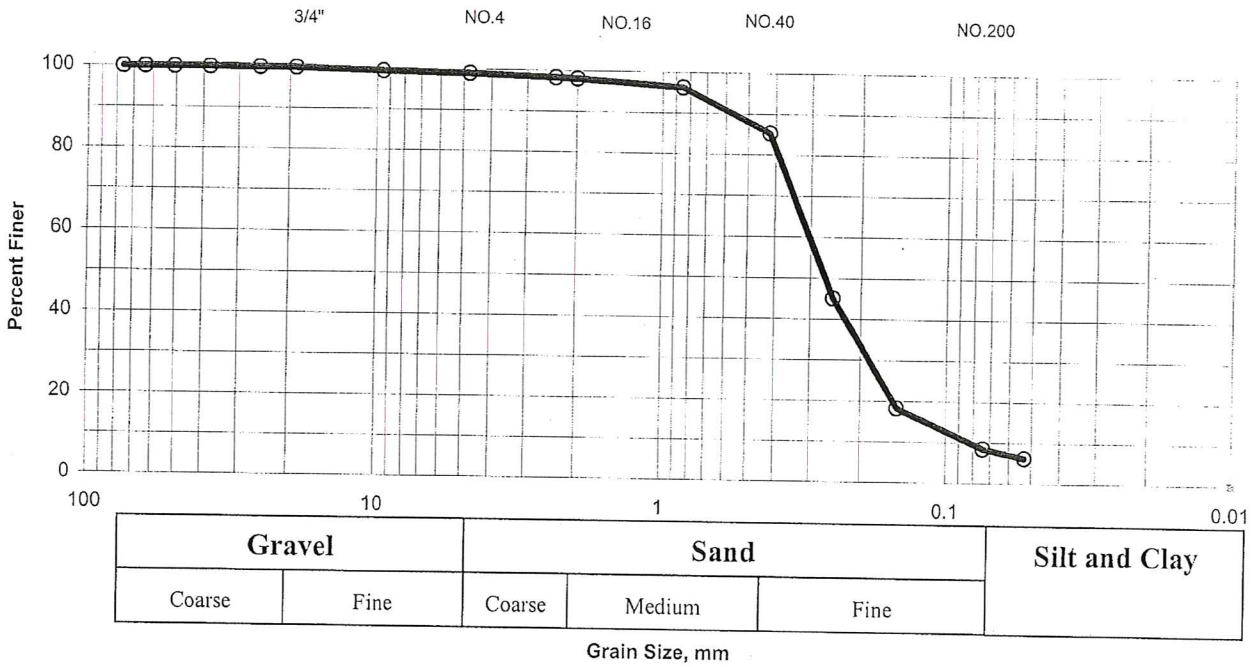
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
4/25/2011	Slocum Property	KE110151A		Sand few silt trace gravel
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	Onsite	EP-1	2.5- 3.5'	

Wt. of moisture wet sample + Tare	347.95	Total Sample Tare	331.84
Wt. of moisture dry Sample + Tare	325.6	Total Sample wt + tare	773.83
Wt. of Tare	94.85	Total Sample Wt	442.0
Wt. of moisture Dry Sample	230.75	Total Sample Dry Wt	403.0
Moisture %	10%		

Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Specification Requirements	
					Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51	2.28	0.6	99.4	-	-
#4	4.76	3.83	1.0	99.0	-	-
#8	2.38	6.82	1.7	98.3	-	-
#10	2	7.66	1.9	98.1	-	-
#20	0.85	14.78	3.7	96.3	-	-
#40	0.42	59.01	14.6	85.4	-	-
#60	0.25	221.45	55.0	45.0	-	-
#100	0.149	329.22	81.7	18.3	-	-
#200	0.074	368.6	91.5	8.5	-	-
#270	0.053	377.7	93.7	6.3	-	-

US STANDARD SIEVE NOS.



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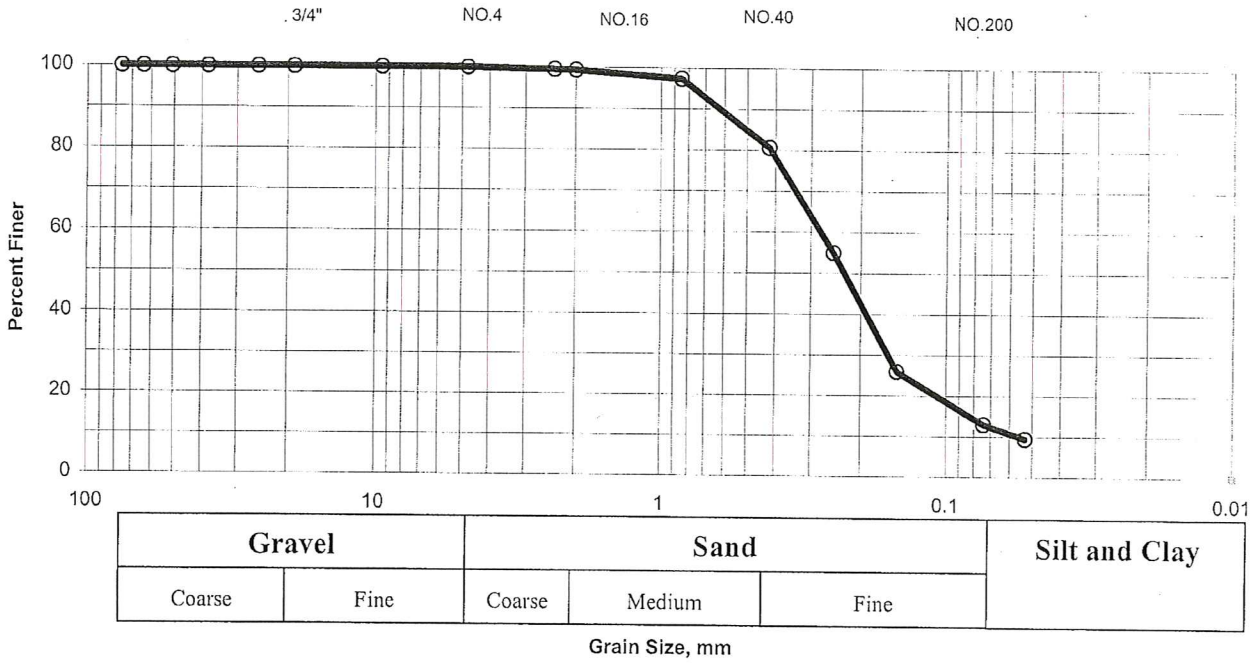
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
4/25/2011	Slocum Property	KE110151A		Sand few silt
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	Onsite	EP-2	3-4'	

Wt. of moisture wet sample + Tare	328.09	Total Sample Tare	521.14
Wt. of moisture dry Sample + Tare	314.25	Total Sample wt + tare	952.69
Wt. of Tare	101.87	Total Sample Wt	431.6
Wt. of moisture Dry Sample	212.38	Total Sample Dry Wt	405.1
Moisture %	7%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51		0.0	100.0	-	-
#4	4.76		0.0	100.0	-	-
#8	2.38	1.84	0.5	99.5	-	-
#10	2	2.51	0.6	99.4	-	-
#20	0.85	10.56	2.6	97.4	-	-
#40	0.42	78.22	19.3	80.7	-	-
#60	0.25	182.21	45.0	55.0	-	-
#100	0.149	300.1	74.1	25.9	-	-
#200	0.074	352.8	87.1	12.9	-	-
#270	0.053	367.09	90.6	9.4	-	-



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GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
4/25/2011	Slocum Property	KE110151A		Sand little gravel trace silt
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	Onsite	EP-3	3-4'	

Wt. of moisture wet sample + Tare	429.38	Total Sample Tare	519.85
Wt. of moisture dry Sample + Tare	416.18	Total Sample wt + tare	1505.4
Wt. of Tare	99.25	Total Sample Wt	985.6
Wt. of moisture Dry Sample	316.93	Total Sample Dry Wt	946.1
Moisture %	4%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19	12.07	1.3	98.7	-	-
3/8	9.51	67.96	7.2	92.8	-	-
#4	4.76	155.05	16.4	83.6	-	-
#8	2.38	252.66	26.7	73.3	-	-
#10	2	276.07	29.2	70.8	-	-
#20	0.85	457.27	48.3	51.7	-	-
#40	0.42	796.04	84.1	15.9	-	-
#60	0.25	901	95.2	4.8	-	-
#100	0.149	931.02	98.4	1.6	-	-
#200	0.074	936.76	99.0	1.0	-	-
#270	0.053	937.47	99.1	0.9	-	-

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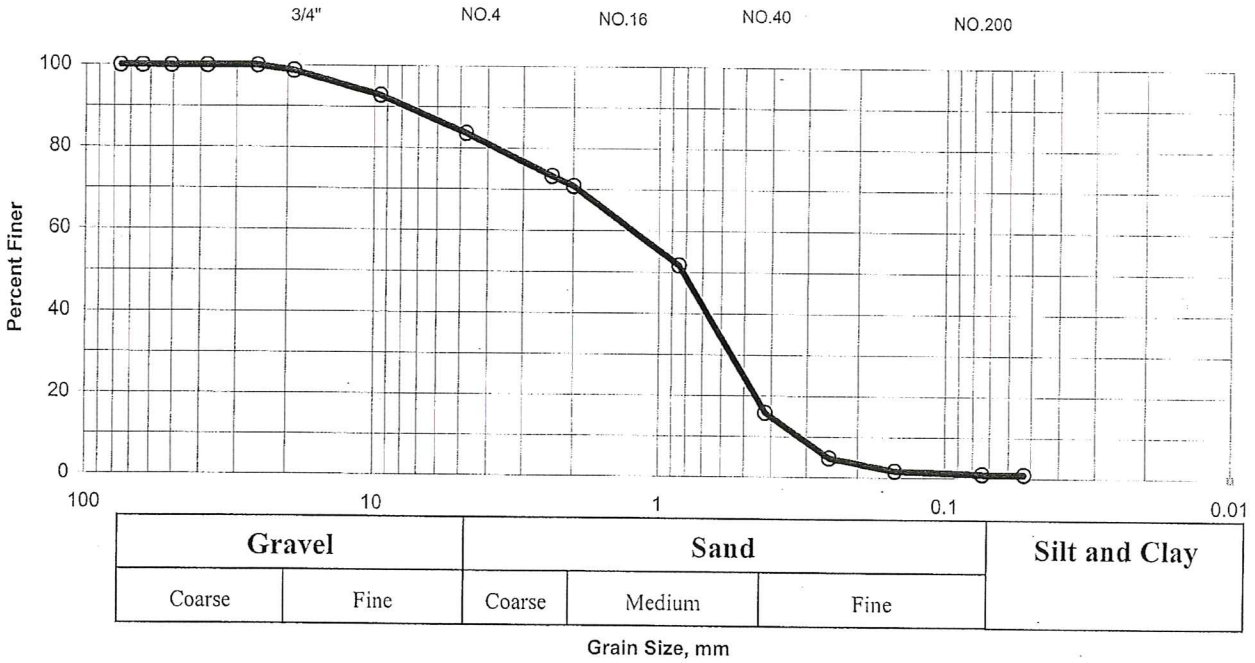

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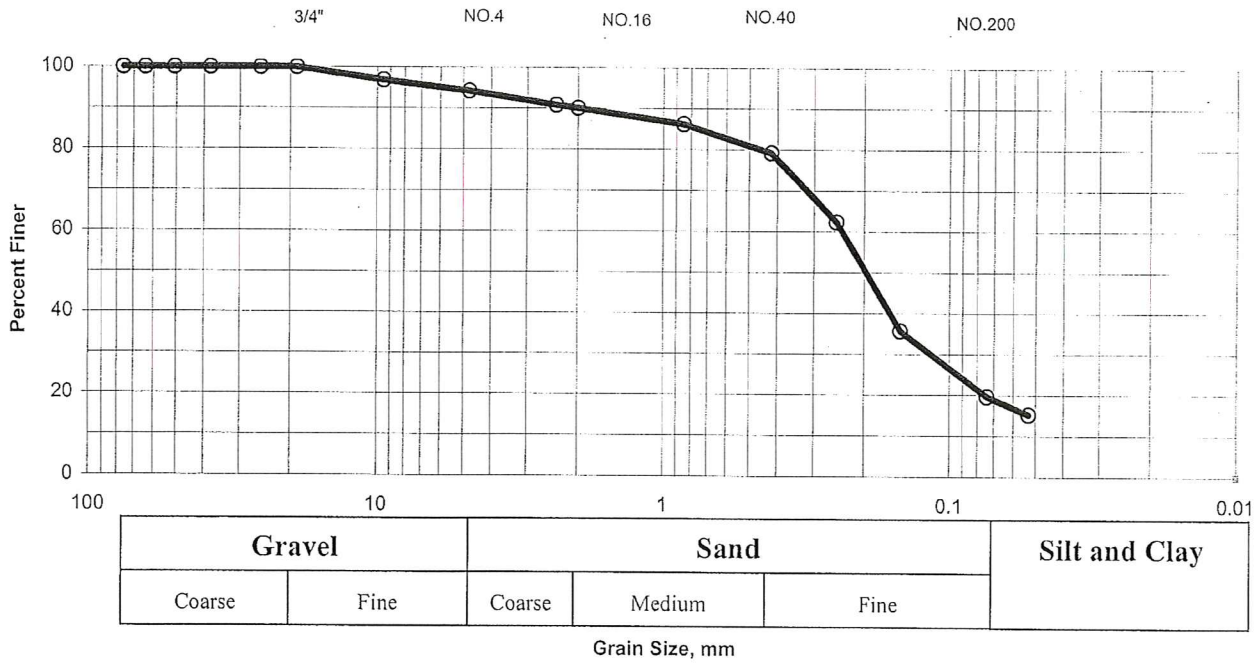
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
4/25/2011	Slocum Property	KE110151A		Sand few silt trace gravel
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	Onsite	EP-4	3-4'	

Wt. of moisture wet sample + Tare	237.86	Total Sample Tare	395.71
Wt. of moisture dry Sample + Tare	224.47	Total Sample wt + tare	745.01
Wt. of Tare	101.86	Total Sample Wt	349.3
Wt. of moisture Dry Sample	122.61	Total Sample Dry Wt	314.9
Moisture %	11%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51	9.77	3.1	96.9	-	-
#4	4.76	18.2	5.8	94.2	-	-
#8	2.38	28.86	9.2	90.8	-	-
#10	2	31.25	9.9	90.1	-	-
#20	0.85	43.45	13.8	86.2	-	-
#40	0.42	65.52	20.8	79.2	-	-
#60	0.25	118.42	37.6	62.4	-	-
#100	0.149	202.47	64.3	35.7	-	-
#200	0.074	253.07	80.4	19.6	-	-
#270	0.053	267.17	84.8	15.2	-	-



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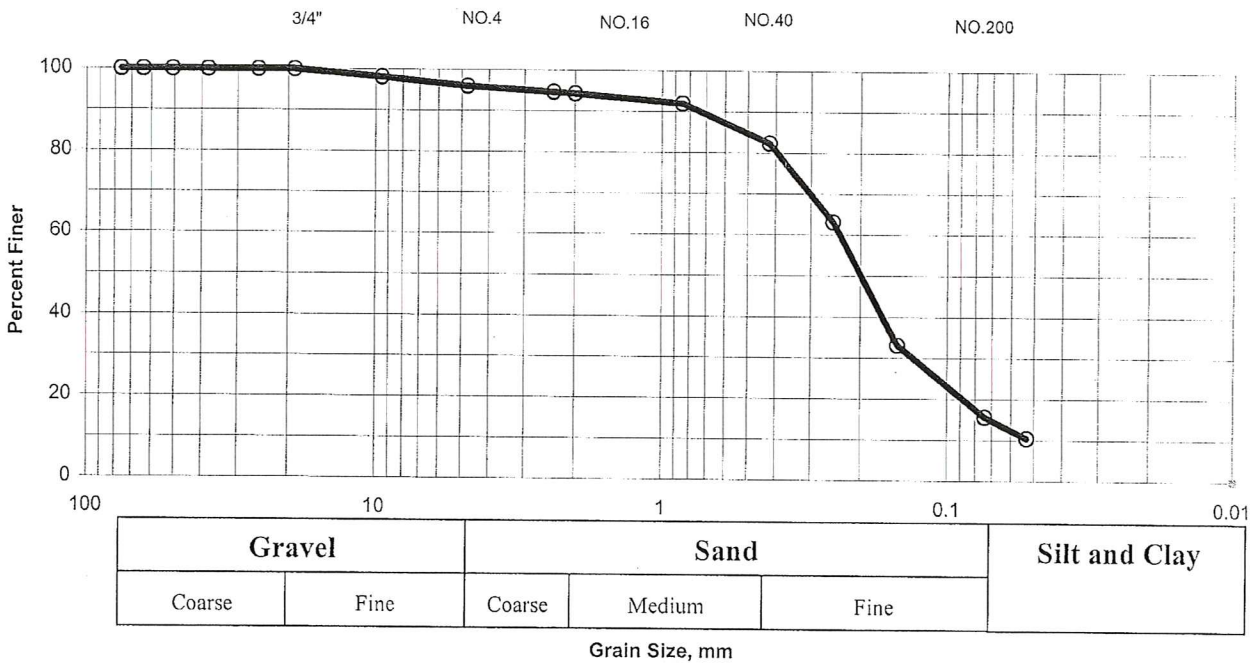
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
4/25/2011	Slocum Property	KE110151A		Sand few silt trace gravel
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	Onsite	EP-5	3-4'	

Wt. of moisture wet sample + Tare	262.88	Total Sample Tare	331.8
Wt. of moisture dry Sample + Tare	246.5	Total Sample wt + tare	724.28
Wt. of Tare	101.83	Total Sample Wt	392.5
Wt. of moisture Dry Sample	144.67	Total Sample Dry Wt	352.6
Moisture %	11%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51	6.6	1.9	98.1	-	-
#4	4.76	14.05	4.0	96.0	-	-
#8	2.38	18.85	5.3	94.7	-	-
#10	2	20.12	5.7	94.3	-	-
#20	0.85	28.16	8.0	92.0	-	-
#40	0.42	62.09	17.6	82.4	-	-
#60	0.25	129.86	36.8	63.2	-	-
#100	0.149	235.83	66.9	33.1	-	-
#200	0.074	297.43	84.4	15.6	-	-
#270	0.053	315.8	89.6	10.4	-	-



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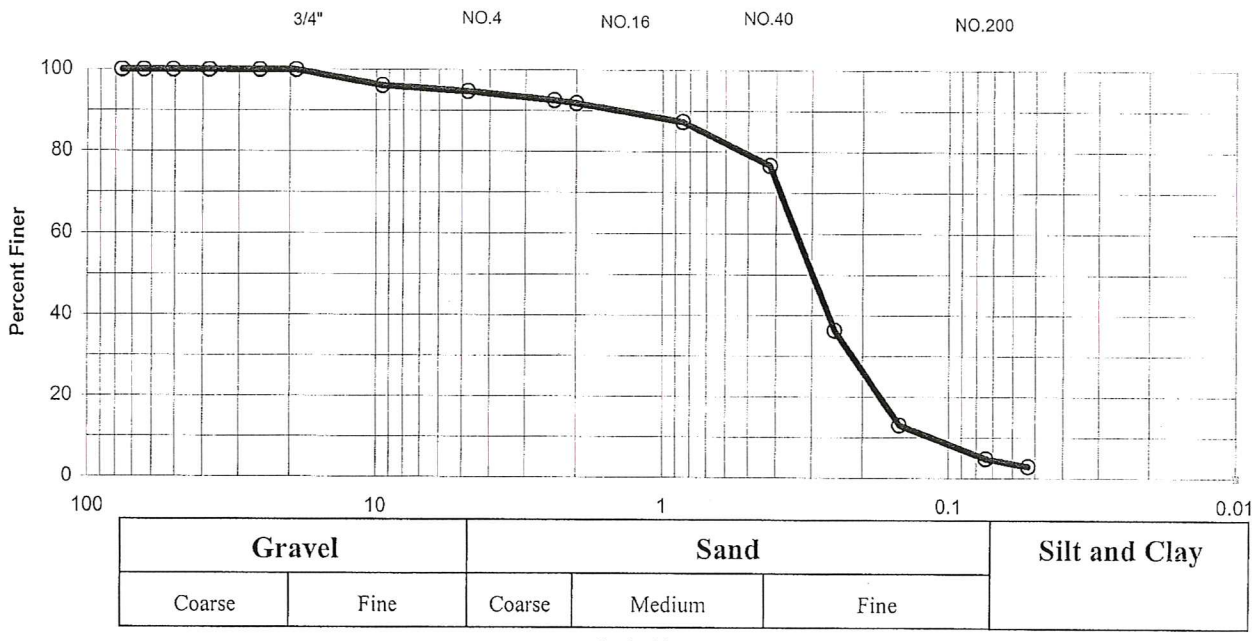
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
4/25/2011	Slocum Property	KE110151A		Sand trace gravel trace silt
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	Onsite	EP-7	3-4'	

Wt. of moisture wet sample + Tare	250.3	Total Sample Tare	519.67
Wt. of moisture dry Sample + Tare	240.52	Total Sample wt + tare	842.08
Wt. of Tare	94.88	Total Sample Wt	322.4
Wt. of moisture Dry Sample	145.64	Total Sample Dry Wt	302.1
Moisture %	7%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51	11.68	3.9	96.1	-	-
#4	4.76	15.92	5.3	94.7	-	-
#8	2.38	22.47	7.4	92.6	-	-
#10	2	24.5	8.1	91.9	-	-
#20	0.85	38.32	12.7	87.3	-	-
#40	0.42	70.55	23.4	76.6	-	-
#60	0.25	192.38	63.7	36.3	-	-
#100	0.149	262.69	86.9	13.1	-	-
#200	0.074	287.66	95.2	4.8	-	-
#270	0.053	293.42	97.1	2.9	-	-

US STANDARD SIEVE NOS.



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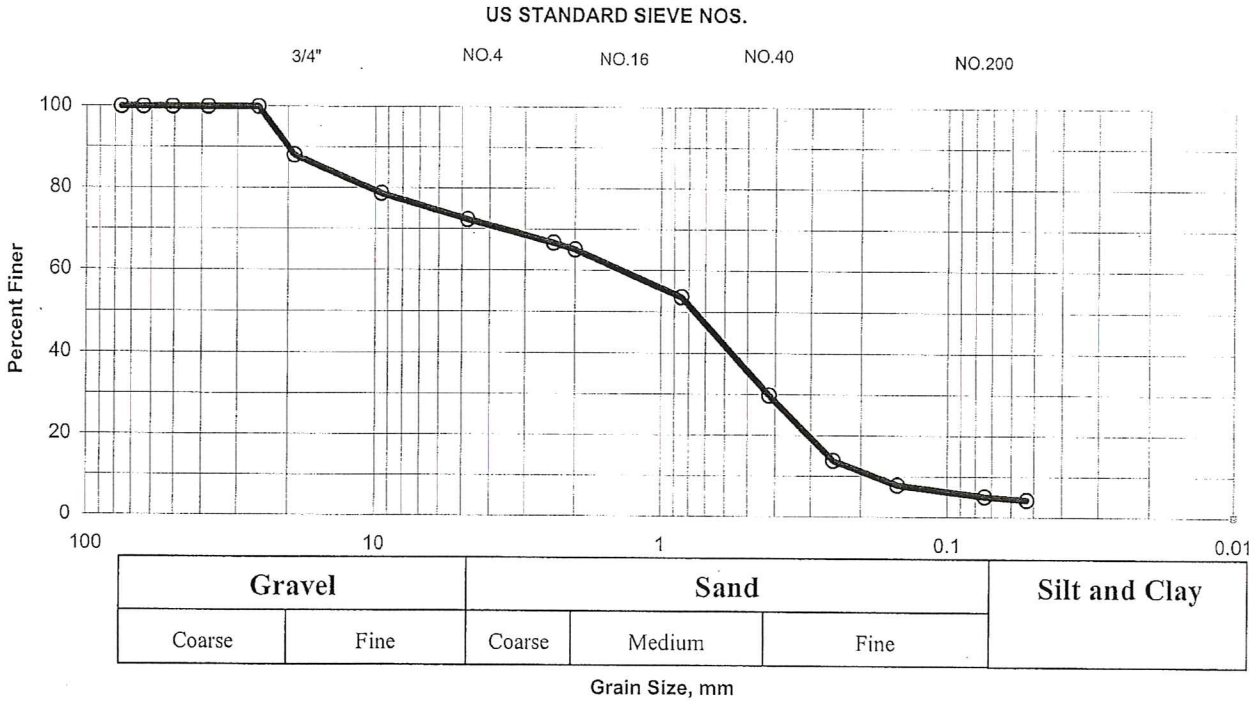
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
4/25/2011	Slocum Property	KE110151A		Sand with gravel trace silt
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	Onsite	EP-8	3-4'	

Wt. of moisture wet sample + Tare	326.71	Total Sample Tare	518.34
Wt. of moisture dry Sample + Tare	302.94	Total Sample wt + tare	921.04
Wt. of Tare	99.25	Total Sample Wt	402.7
Wt. of moisture Dry Sample	203.69	Total Sample Dry Wt	360.6
Moisture %	12%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19	43.09	11.9	88.1	-	-
3/8	9.51	76.68	21.3	78.7	-	-
#4	4.76	99.48	27.6	72.4	-	-
#8	2.38	119.81	33.2	66.8	-	-
#10	2	125.8	34.9	65.1	-	-
#20	0.85	167.46	46.4	53.6	-	-
#40	0.42	253.28	70.2	29.8	-	-
#60	0.25	310.74	86.2	13.8	-	-
#100	0.149	332.45	92.2	7.8	-	-
#200	0.074	342.3	94.9	5.1	-	-
#270	0.053	345.24	95.7	4.3	-	-



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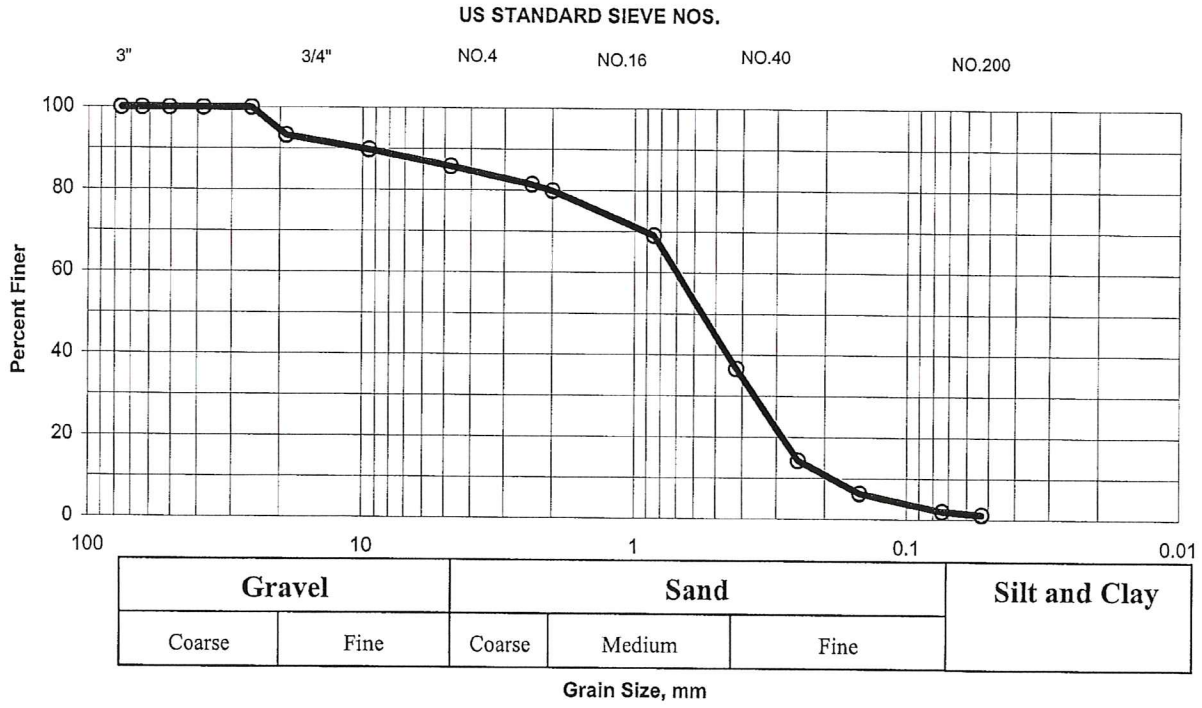
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Sand few gravel trace silt**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**EP-10**	**15'**	

Wt. of moisture wet sample + Tare	476.26	Total Sample Tare	331.77
Wt. of moisture dry Sample + Tare	453.88	Total Sample wt + tare	1093.56
Wt. of Tare	101.19	Total Sample Wt	761.8
Wt. of moisture Dry Sample	352.69	Total Sample Dry Wt	716.3
Moisture %	6%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19	48.73	6.8	93.2	-	-
3/8	9.51	72.97	10.2	89.8	-	-
#4	4.76	101.89	14.2	85.8	-	-
#8	2.38	133.27	18.6	81.4	-	-
#10	2	143.79	20.1	79.9	-	-
#20	0.85	220.96	30.8	69.2	-	-
#40	0.42	454.54	63.5	36.5	-	-
#60	0.25	614.03	85.7	14.3	-	-
#100	0.149	670.75	93.6	6.4	-	-
#200	0.074	702.2	98.0	2.0	-	-
#270	0.053	708.09	98.8	1.2	-	-



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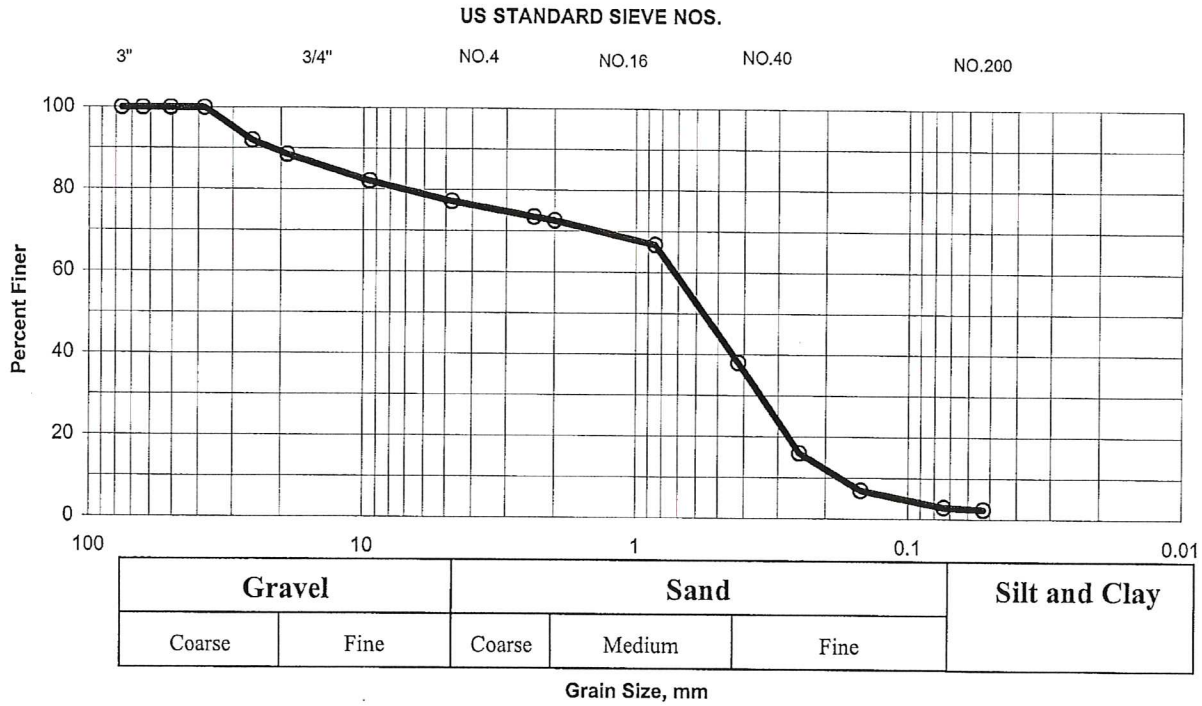
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Sand little gravel trace silt**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**EP-10**	**18'**	

Wt. of moisture wet sample + Tare	486.1	Total Sample Tare	296.61
Wt. of moisture dry Sample + Tare	474.28	Total Sample wt + tare	1169.82
Wt. of Tare	98.39	Total Sample Wt	873.2
Wt. of moisture Dry Sample	375.89	Total Sample Dry Wt	846.6
Moisture %	3%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4	68.16	8.1	91.9	-	-
3/4	19	96.82	11.4	88.6	-	-
3/8	9.51	151.78	17.9	82.1	-	-
#4	4.76	192.88	22.8	77.2	-	-
#8	2.38	224.19	26.5	73.5	-	-
#10	2	231.63	27.4	72.6	-	-
#20	0.85	281.63	33.3	66.7	-	-
#40	0.42	525.32	62.1	37.9	-	-
#60	0.25	711.44	84.0	16.0	-	-
#100	0.149	787.82	93.1	6.9	-	-
#200	0.074	821.89	97.1	2.9	-	-
#270	0.053	826.32	97.6	2.4	-	-



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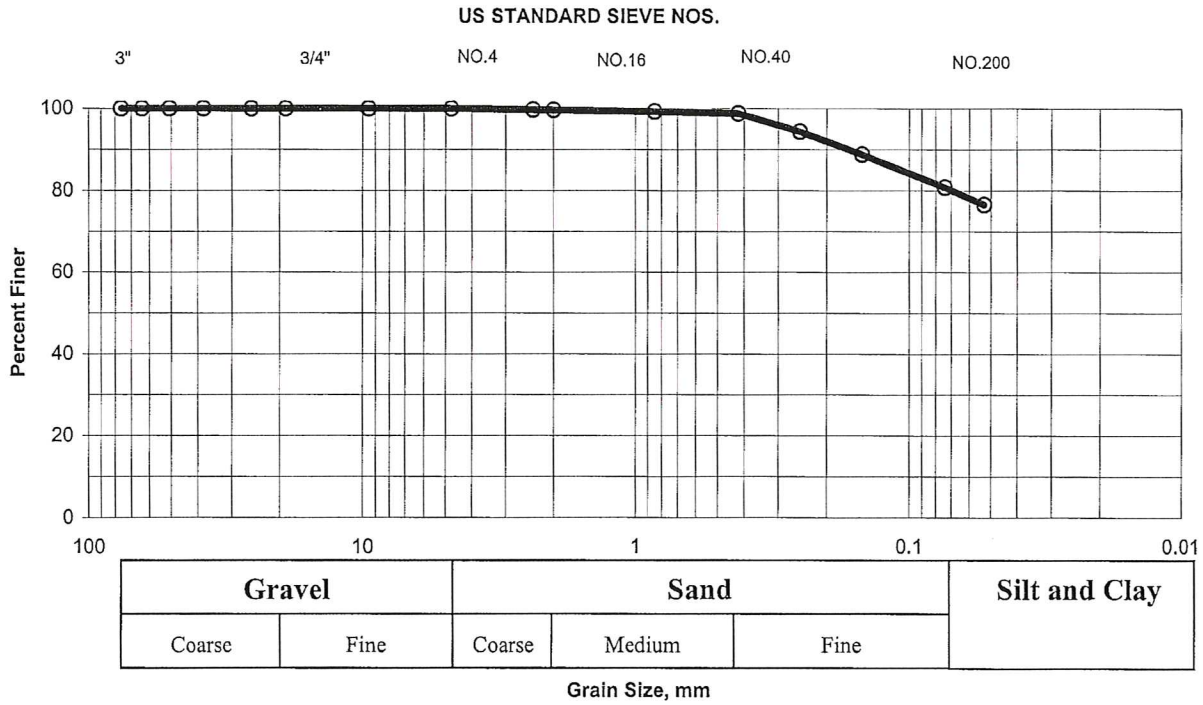
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Silt little sand**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**EP-11**	**13'**	

Wt. of moisture wet sample + Tare	364.34	Total Sample Tare	395.43
Wt. of moisture dry Sample + Tare	324.9	Total Sample wt + tare	1061.62
Wt. of Tare	100.99	Total Sample Wt	666.2
Wt. of moisture Dry Sample	223.91	Total Sample Dry Wt	566.4
Moisture %	18%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51		0.0	100.0	-	-
#4	4.76		0.0	100.0	-	-
#8	2.38	1.6	0.3	99.7	-	-
#10	2	2.16	0.4	99.6	-	-
#20	0.85	4.2	0.7	99.3	-	-
#40	0.42	6.68	1.2	98.8	-	-
#60	0.25	31.79	5.6	94.4	-	-
#100	0.149	63.29	11.2	88.8	-	-
#200	0.074	108.66	19.2	80.8	-	-
#270	0.053	132.68	23.4	76.6	-	-



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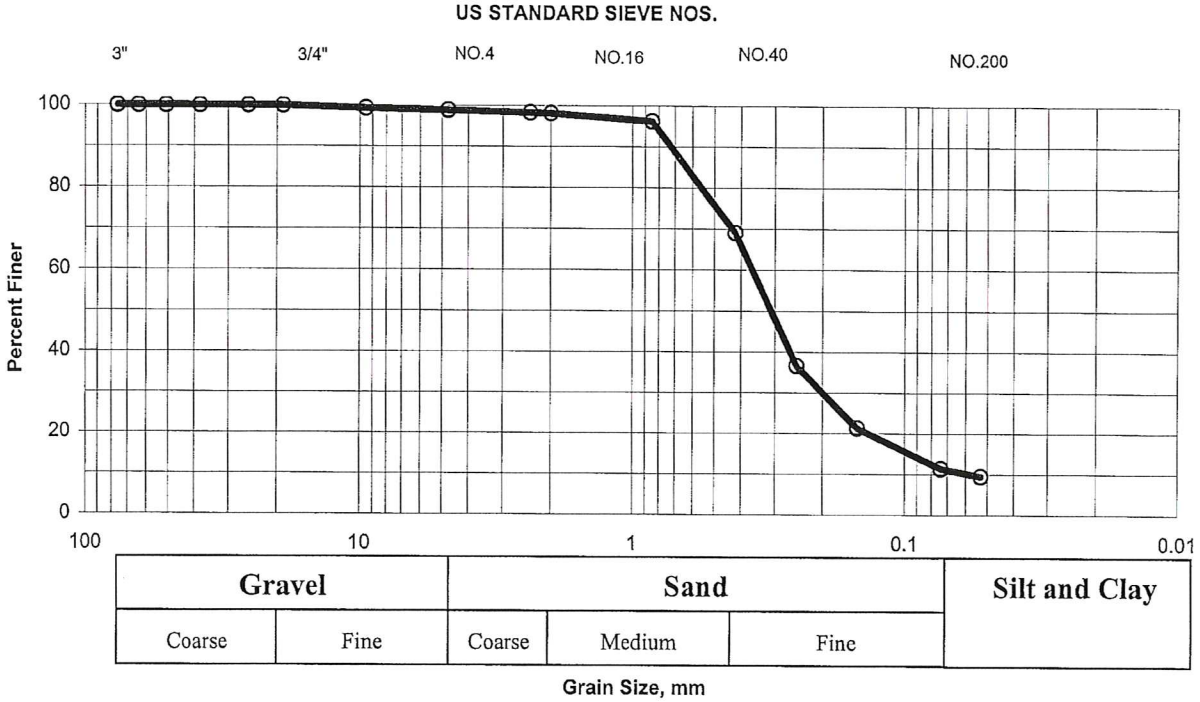
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Sand few silt trace gravel**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**EP-11**	**17.5'**	

Wt. of moisture wet sample + Tare	333.06	Total Sample Tare	296.19
Wt. of moisture dry Sample + Tare	318.62	Total Sample wt + tare	804.44
Wt. of Tare	101.12	Total Sample Wt	508.3
Wt. of moisture Dry Sample	217.5	Total Sample Dry Wt	476.6
Moisture %	7%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51	3.02	0.6	99.4	-	-
#4	4.76	5.46	1.1	98.9	-	-
#8	2.38	7.96	1.7	98.3	-	-
#10	2	8.86	1.9	98.1	-	-
#20	0.85	17.94	3.8	96.2	-	-
#40	0.42	147.47	30.9	69.1	-	-
#60	0.25	302.11	63.4	36.6	-	-
#100	0.149	375.09	78.7	21.3	-	-
#200	0.074	422.34	88.6	11.4	-	-
#270	0.053	431.36	90.5	9.5	-	-



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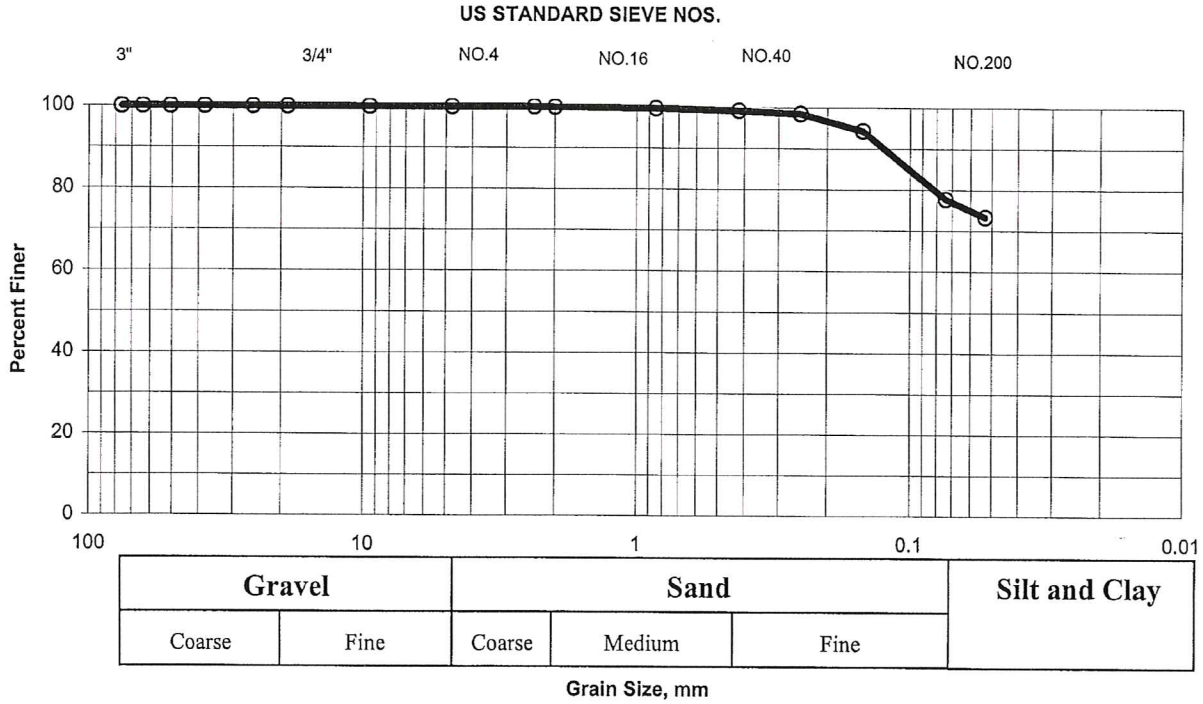
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Silt with sand**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**EP-12**	**16'**	

Wt. of moisture wet sample + Tare	440.99	Total Sample Tare	408.61
Wt. of moisture dry Sample + Tare	374.45	Total Sample wt + tare	1188.26
Wt. of Tare	101.03	Total Sample Wt	779.7
Wt. of moisture Dry Sample	273.42	Total Sample Dry Wt	627.0
Moisture %	24%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51		0.0	100.0	-	-
#4	4.76		0.0	100.0	-	-
#8	2.38		0.0	100.0	-	-
#10	2	0.3	0.0	100.0	-	-
#20	0.85	1.8	0.3	99.7	-	-
#40	0.42	4.99	0.8	99.2	-	-
#60	0.25	9.87	1.6	98.4	-	-
#100	0.149	35.63	5.7	94.3	-	-
#200	0.074	139.89	22.3	77.7	-	-
#270	0.053	167.22	26.7	73.3	-	-



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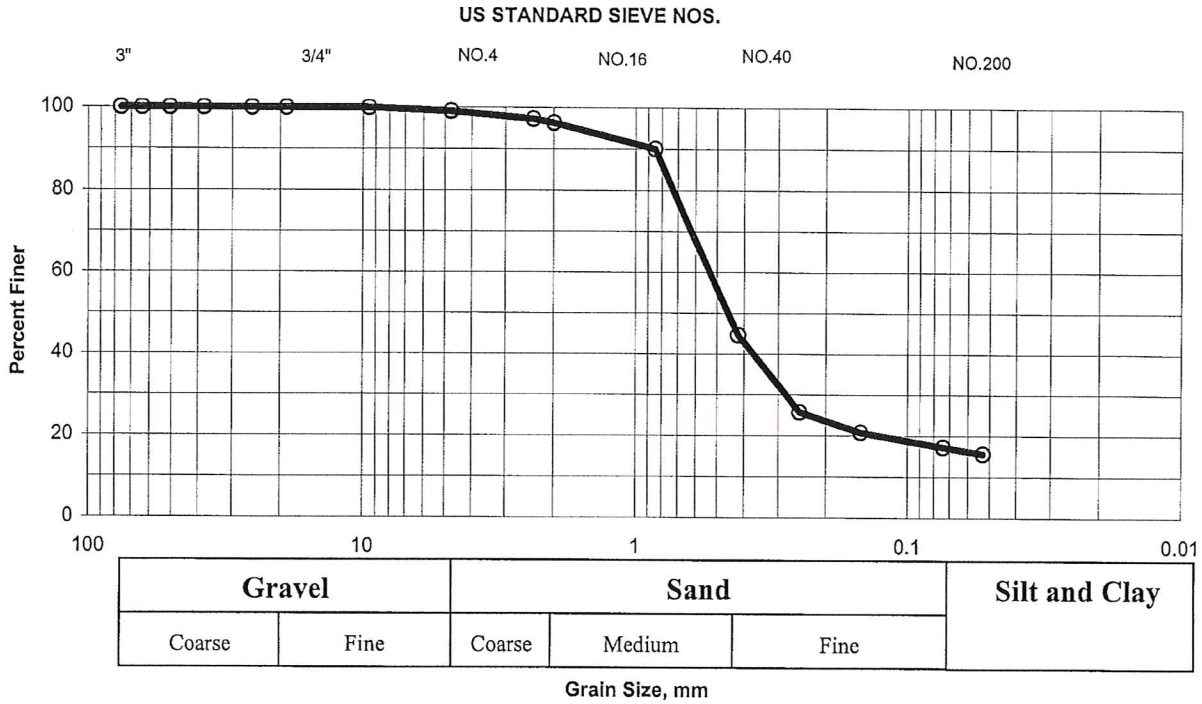
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Sand trace gravel little silt**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**EP-13**	**13'**	

Wt. of moisture wet sample + Tare	408.4	Total Sample Tare	391.15
Wt. of moisture dry Sample + Tare	387.85	Total Sample wt + tare	1111.71
Wt. of Tare	97.62	Total Sample Wt	720.6
Wt. of moisture Dry Sample	290.23	Total Sample Dry Wt	672.9
Moisture %	7%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51		0.0	100.0	-	-
#4	4.76	5.94	0.9	99.1	-	-
#8	2.38	18.66	2.8	97.2	-	-
#10	2	25.02	3.7	96.3	-	-
#20	0.85	66.78	9.9	90.1	-	-
#40	0.42	372.55	55.4	44.6	-	-
#60	0.25	499.8	74.3	25.7	-	-
#100	0.149	533.03	79.2	20.8	-	-
#200	0.074	556.66	82.7	17.3	-	-
#270	0.053	567.82	84.4	15.6	-	-



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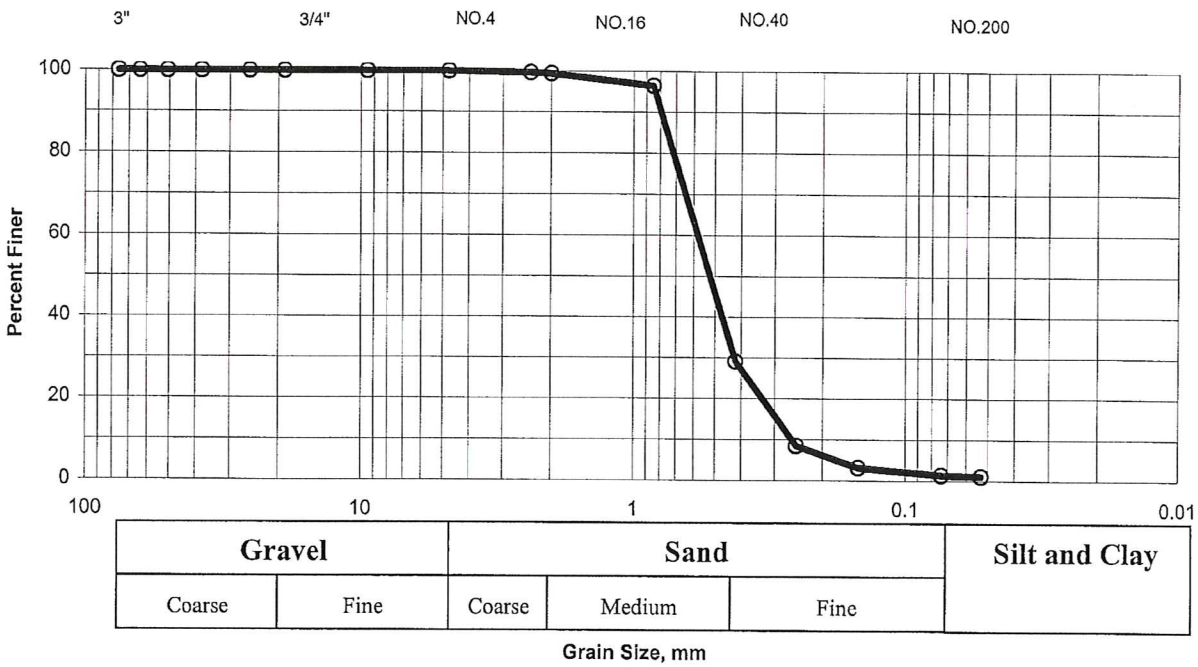
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Sand trace silt**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**EP-13**	**15'**	

Wt. of moisture wet sample + Tare	478.1	Total Sample Tare	509.67
Wt. of moisture dry Sample + Tare	464.51	Total Sample wt + tare	1282.99
Wt. of Tare	100.66	Total Sample Wt	773.3
Wt. of moisture Dry Sample	363.85	Total Sample Dry Wt	745.5
Moisture %	4%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51		0.0	100.0	-	-
#4	4.76		0.0	100.0	-	-
#8	2.38	2.51	0.3	99.7	-	-
#10	2	4.47	0.6	99.4	-	-
#20	0.85	26.43	3.5	96.5	-	-
#40	0.42	528.85	70.9	29.1	-	-
#60	0.25	682.03	91.5	8.5	-	-
#100	0.149	721.68	96.8	3.2	-	-
#200	0.074	734.88	98.6	1.4	-	-
#270	0.053	736.97	98.9	1.1	-	-



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GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Sand few gravel few silt**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**EP-14**	**3'**	

Wt. of moisture wet sample + Tare	413.47	Total Sample Tare	343.35
Wt. of moisture dry Sample + Tare	395.2	Total Sample wt + tare	1040.36
Wt. of Tare	100.77	Total Sample Wt	697.0
Wt. of moisture Dry Sample	294.43	Total Sample Dry Wt	656.3
Moisture %	6%		

Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Specification Requirements Minimum	Specification Requirements Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51	37.23	5.7	94.3	-	-
#4	4.76	84.27	12.8	87.2	-	-
#8	2.38	137.72	21.0	79.0	-	-
#10	2	150.73	23.0	77.0	-	-
#20	0.85	209.42	31.9	68.1	-	-
#40	0.42	295.11	45.0	55.0	-	-
#60	0.25	414.46	63.2	36.8	-	-
#100	0.149	508.92	77.5	22.5	-	-
#200	0.074	583.76	88.9	11.1	-	-
#270	0.053	596.92	91.0	9.0	-	-

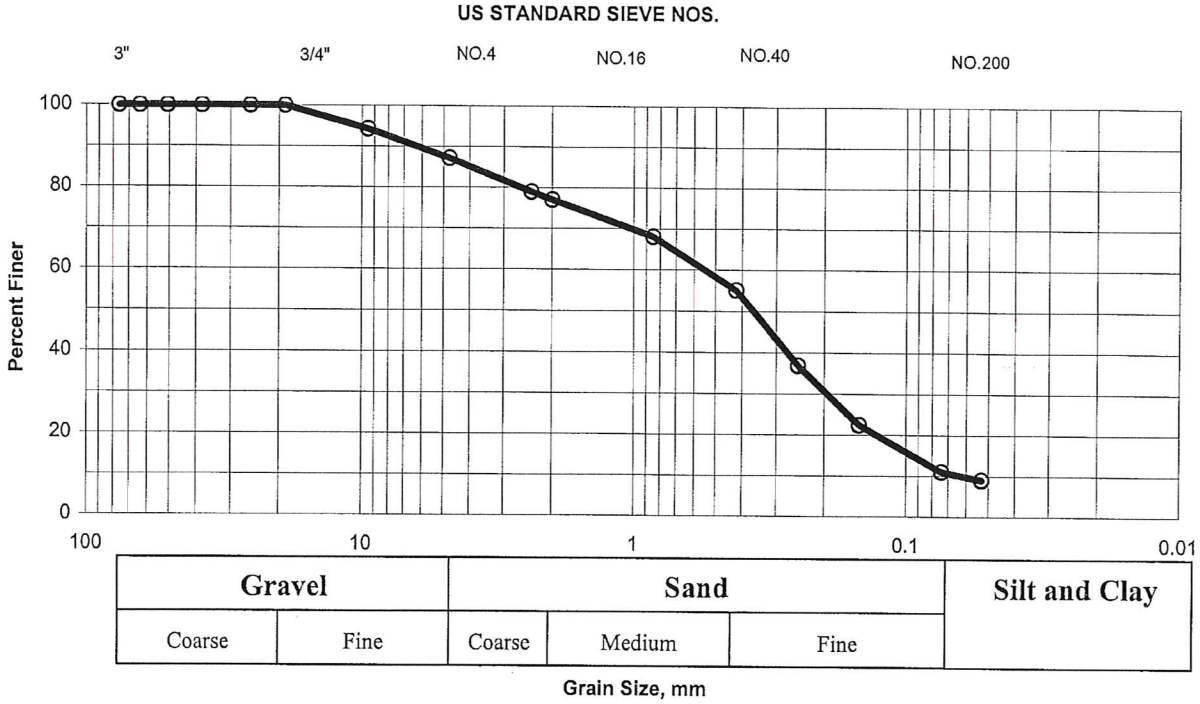

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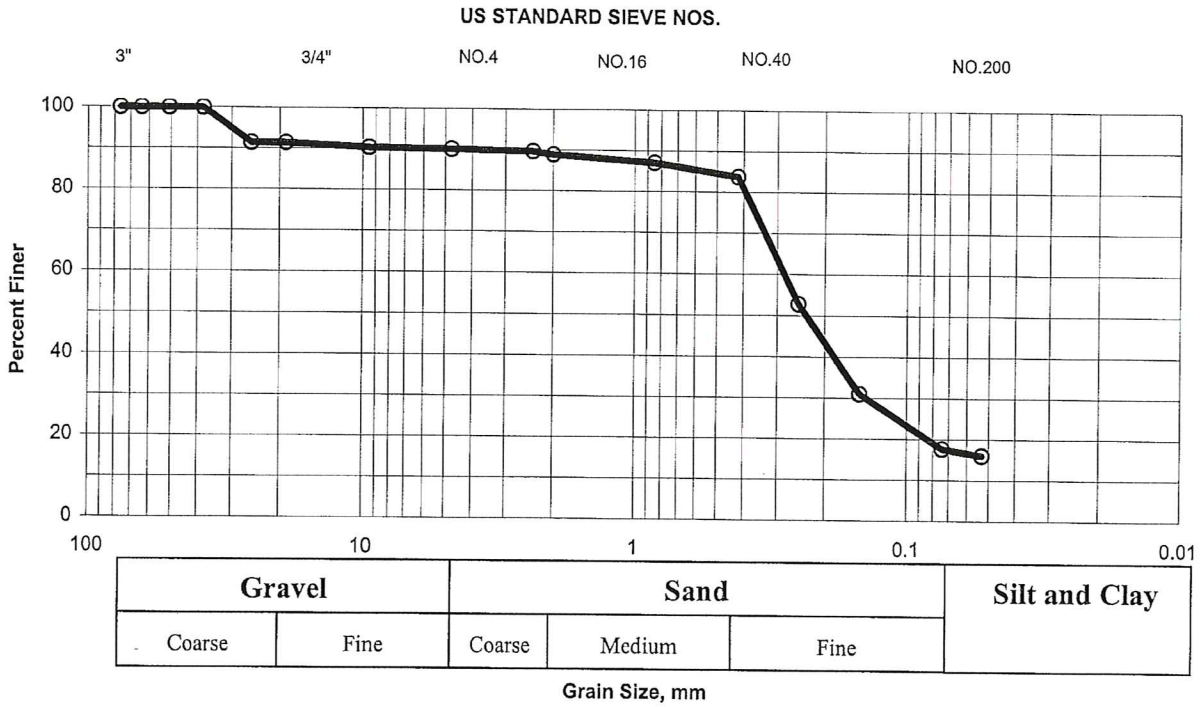
EXHIBIT 10
PAGE 87 OF 98

GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Sand little silt few gravel**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**EP-14**	**5'**	

Wt. of moisture wet sample + Tare	377.66	Total Sample Tare	325.85
Wt. of moisture dry Sample + Tare	361.03	Total Sample wt + tare	1020.36
Wt. of Tare	99.81	Total Sample Wt	694.5
Wt. of moisture Dry Sample	261.22	Total Sample Dry Wt	652.9
Moisture %	6%		

Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Specification Requirements	
					Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4	56.27	8.6	91.4	-	-
3/4	19	56.27	8.6	91.4	-	-
3/8	9.51	62.73	9.6	90.4	-	-
#4	4.76	64.68	9.9	90.1	-	-
#8	2.38	67.89	10.4	89.6	-	-
#10	2	72.3	11.1	88.9	-	-
#20	0.85	84.54	12.9	87.1	-	-
#40	0.42	106.55	16.3	83.7	-	-
#60	0.25	308.54	47.3	52.7	-	-
#100	0.149	450.98	69.1	30.9	-	-
#200	0.074	537.89	82.4	17.6	-	-
#270	0.053	548.64	84.0	16.0	-	-



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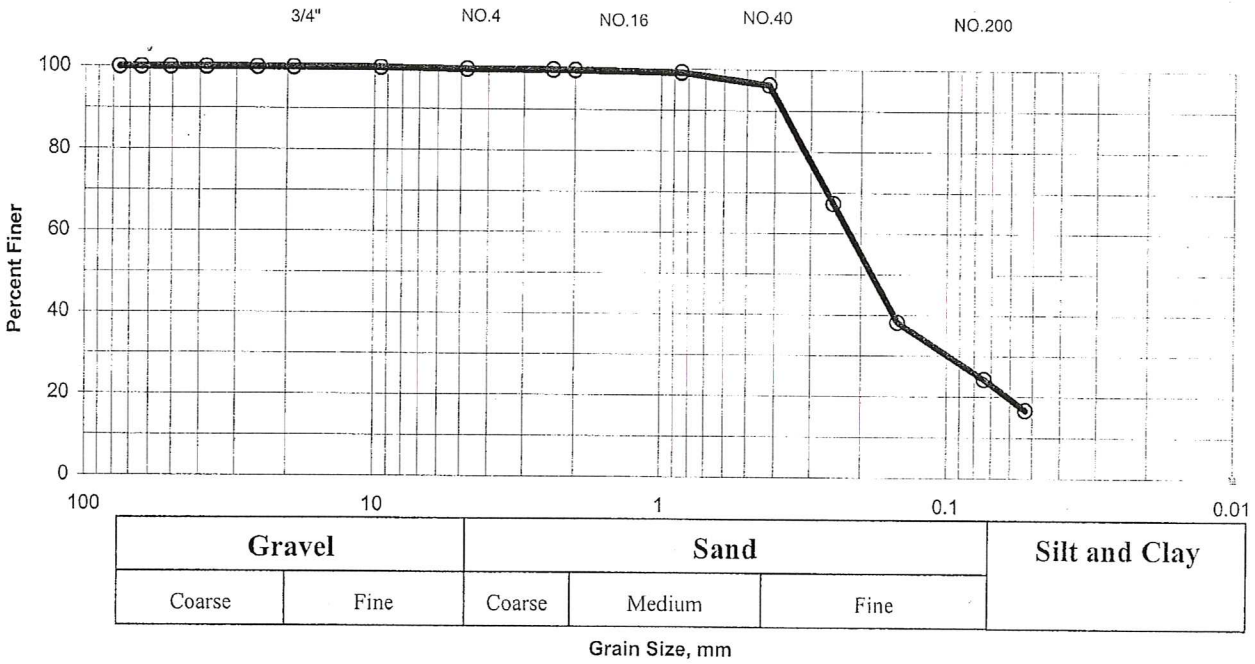
GRAIN SIZE ANALYSIS - MECHANICAL

Date	Project	Project No.		Soil Description
8/26/2011	Slocum Property	KE110151A		Sand little silt trace gravel
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
JC	Onsite	IT-1	14.5'	

Wt. of moisture wet sample + Tare	526.46	Total Sample Tare	519.2
Wt. of moisture dry Sample + Tare	447.54	Total Sample wt + tare	1070.32
Wt. of Tare	99.87	Total Sample Wt	551.1
Wt. of moisture Dry Sample	347.67	Total Sample Dry Wt	449.2
Moisture %	23%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51		0.0	100.0	-	-
#4	4.76	1.19	0.3	99.7	-	-
#8	2.38	1.8	0.4	99.6	-	-
#10	2	2.13	0.5	99.5	-	-
#20	0.85	3.77	0.8	99.2	-	-
#40	0.42	16.88	3.8	96.2	-	-
#60	0.25	146.6	32.6	67.4	-	-
#100	0.149	277.58	61.8	38.2	-	-
#200	0.074	340.23	75.7	24.3	-	-
#270	0.053	373.95	83.3	16.7	-	-

US STANDARD SIEVE NOS.



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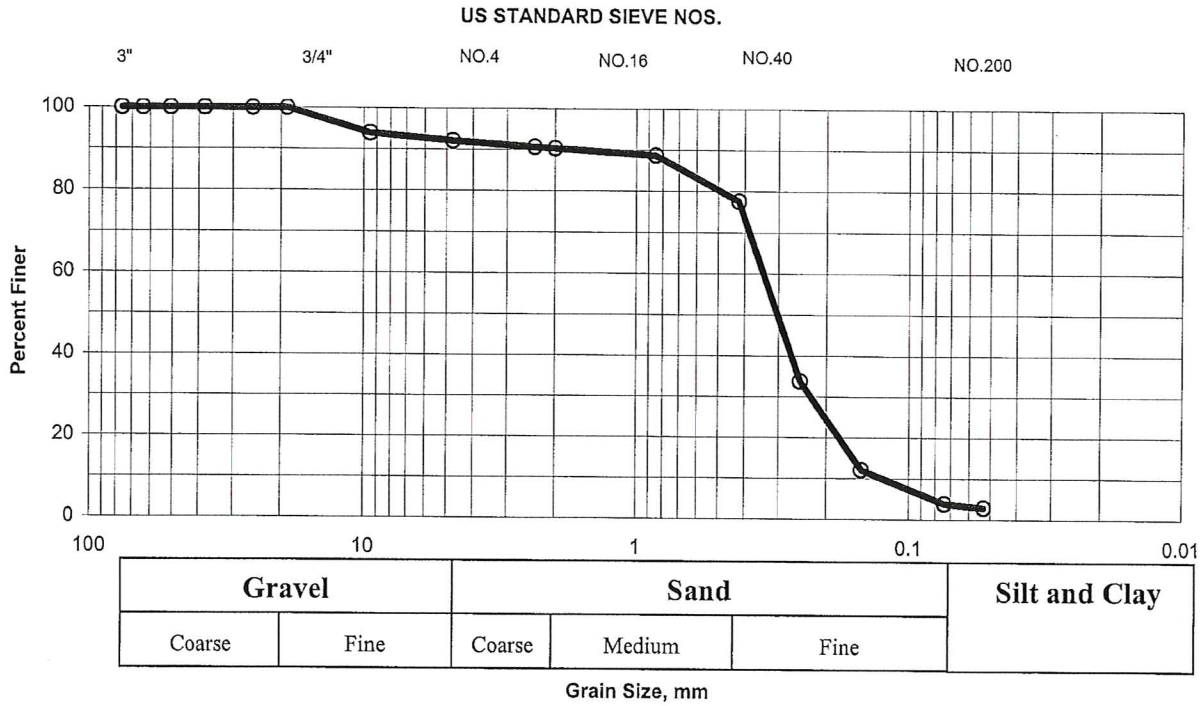
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	Slocum Property	KE110151A		Sand few gravel trace silt
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	Onsite	IT-2	14'	

Wt. of moisture wet sample + Tare	402.31	Total Sample Tare	394.14
Wt. of moisture dry Sample + Tare	390.8	Total Sample wt + tare	1009.82
Wt. of Tare	101.78	Total Sample Wt	615.7
Wt. of moisture Dry Sample	289.02	Total Sample Dry Wt	592.1
Moisture %	4%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51	35.92	6.1	93.9	-	-
#4	4.76	47.07	7.9	92.1	-	-
#8	2.38	55.72	9.4	90.6	-	-
#10	2	57.46	9.7	90.3	-	-
#20	0.85	66.9	11.3	88.7	-	-
#40	0.42	132.93	22.5	77.5	-	-
#60	0.25	392.26	66.2	33.8	-	-
#100	0.149	520.77	88.0	12.0	-	-
#200	0.074	569.11	96.1	3.9	-	-
#270	0.053	574.92	97.1	2.9	-	-



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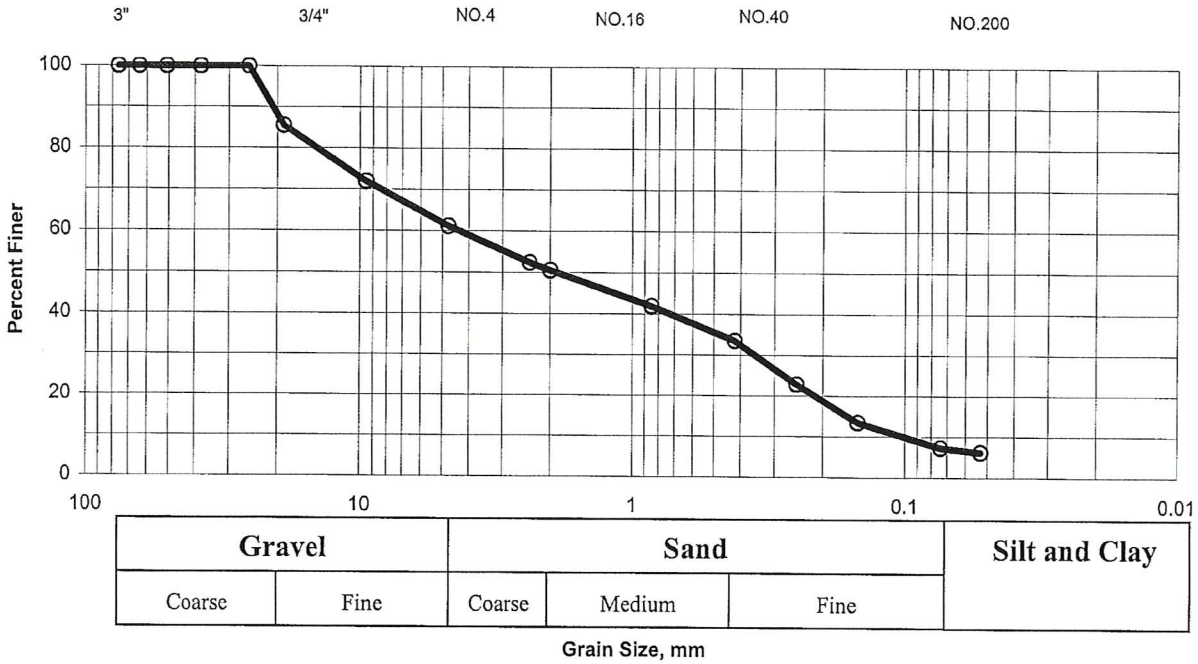
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Sand with gravel few silt**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**IT-2**	**17'**	

Wt. of moisture wet sample + Tare	624.97	Total Sample Tare	296.24
Wt. of moisture dry Sample + Tare	602.79	Total Sample wt + tare	1131.17
Wt. of Tare	99.2	Total Sample Wt	834.9
Wt. of moisture Dry Sample	503.59	Total Sample Dry Wt	799.7
Moisture %	4%		

					Specification Requirements	
Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19	116.1	14.5	85.5	-	-
3/8	9.51	224.16	28.0	72.0	-	-
#4	4.76	310.74	38.9	61.1	-	-
#8	2.38	381.46	47.7	52.3	-	-
#10	2	395.77	49.5	50.5	-	-
#20	0.85	465.32	58.2	41.8	-	-
#40	0.42	532.03	66.5	33.5	-	-
#60	0.25	617.27	77.2	22.8	-	-
#100	0.149	692.45	86.6	13.4	-	-
#200	0.074	741.7	92.7	7.3	-	-
#270	0.053	750.77	93.9	6.1	-	-

US STANDARD SIEVE NOS.



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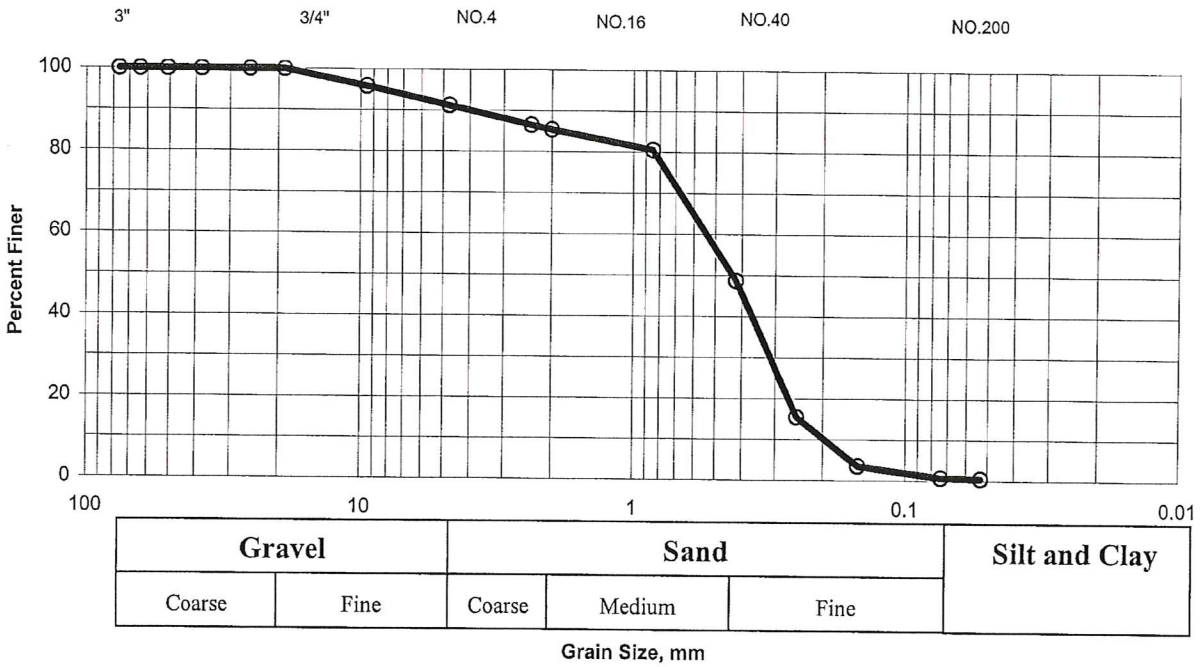
GRAIN SIZE ANALYSIS - MECHANICAL

Date Sampled	Project	Project No.		Soil Description
11/14/2012	**Slocum Property**	**KE110151A**		**Sand few gravel trace silt**
Tested By	Location	EB/EP No	Depth	Intended Use / Specification
MS	**Onsite**	**PD-1**	**16'**	

Wt. of moisture wet sample + Tare	507.99	Total Sample Tare	313.42
Wt. of moisture dry Sample + Tare	494.57	Total Sample wt + tare	1096.22
Wt. of Tare	100.01	Total Sample Wt	782.8
Wt. of moisture Dry Sample	394.56	Total Sample Dry Wt	757.1
Moisture %	3%		

Sieve No.	Diam. (mm)	Wt. Retained (g)	% Retained	% Passing	Specification Requirements	
					Minimum	Maximum
3	76.1		0.0	100.0	-	-
2.5	64		0.0	100.0	-	-
2	50.8		0.0	100.0	-	-
1.5	38.1		0.0	100.0	-	-
1	25.4		0.0	100.0	-	-
3/4	19		0.0	100.0	-	-
3/8	9.51	31.46	4.2	95.8	-	-
#4	4.76	66.64	8.8	91.2	-	-
#8	2.38	102.24	13.5	86.5	-	-
#10	2	110.14	14.5	85.5	-	-
#20	0.85	146.93	19.4	80.6	-	-
#40	0.42	388.58	51.3	48.7	-	-
#60	0.25	639.96	84.5	15.5	-	-
#100	0.149	730.02	96.4	3.6	-	-
#200	0.074	751.47	99.3	0.7	-	-
#270	0.053	753.26	99.5	0.5	-	-

US STANDARD SIEVE NOS.



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AMTEST LABORATORIES
13600 NE 126th PL, Suite C, Kirkland, WA 98034
Ph (425) 885-1664 Fx (425) 820-0245
www.amtestlab.com

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Chain of Custody No. 5000

Client Name & Address:	Invoice To:
AESI 911 5th Ave, Ste 100 Kirkland, WA 98033	Same as client info
Contact Person: Jenny Saltonstall	Invoice Contact: Jenny Saltonstall
Phone No: 425-827-7701	PO Number: KE110151A
Fax No: 425-827-5424	Invoice Ph/Fax: 425-827-7701
E-mail: jsaltonstall@aesgeo.com	Invoice E-mail: jsaltonstall@aesgeo.com
Report Delivery: (Choose all that apply) (Mail) / Fax / (Email) / (Posted Online)	Data posted to online account: (YES) / NO Web Login ID:
Special Instructions:	
Requested TAT: **(Rush must be pre-approved by lab)** Standard RUSH (5 Day / 3 Day / 48 HR / 24 HR)	Temperature upon Receipt:

Project Name: Slocum Property
Project Number: KE110151A

AmTest ID	Client ID (35 characters max)	Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested: Cation Exchange Capacity	Analysis Requested: Organic Matter ASTM D 2974	QA/QC
	EP-2 @3-4'	4/19/2011		SOIL		X	X	
	EP-4 @3-4'	4/19/2011		SOIL		X	X	
	EP-5 @3-4'	4/19/2011		SOIL		X	X	
	EP-7 @3-4'	4/19/2011		SOIL		X	X	

Collected/Relinquished By: Timothy J. Peterson	Date 4/26/11	Time 1:50 PM	Received By:	Date 4/26/11	Time 1:50
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time

COMMENTS:

AM TEST LABORATORIES

13600 NE 126th PL, Suite C, Kirkland, WA 98034
Ph (425) 885-1664 Fx (425) 820-0245
www.amtestlab.com

EXHIBIT 10
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Chain of Custody No. 5000

Client Name & Address:	Invoice To:
AESI 911 5th Ave, Ste 100 Kirkland, WA 98033	Same as client info
Contact Person: Jenny Saltonstall	Invoice Contact: Jenny Saltonstall
Phone No: 425-827-7701	PO Number: KE110151A
Fax No: 425-827-5424	Invoice Ph/Fax: 425-827-7701
E-mail: jsaltonstall@aesgeo.com	Invoice E-mail: jsaltonstall@aesgeo.com
Report Delivery: (Choose all that apply) (Mail) / Fax / (Email) / (Posted Online)	Data posted to online account: (YES) / NO Web Login ID:
Special Instructions:	
Requested TAT: **(Rush must be pre-approved by lab)** Standard RUSH (5 Day / 3 Day / 48 HR / 24 HR)	Temperature upon Receipt:

Project Name: Slocum Property
Project Number: KE110151A

AmTest ID	Client ID (35 characters max)	Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested: Cation Exchange Capacity	Analysis Requested: Organic Matter ASTM D 2974	Analysis Requested	Analysis Requested	Analysis Requested	Analysis Requested	Analysis Requested	Analysis Requested	Analysis Requested	QA/QC
6044	EP-2 @3-4'	4/19/2011		SOIL		X	X								
45	EP-4 @3-4'	4/19/2011		SOIL		X	X								
46	EP-5 @3-4'	4/19/2011		SOIL		X	X								
47	EP-7 @3-4'	4/19/2011		SOIL		X	X								

Collected/Relinquished By:	Date	Time	Received By:	Date	Time
Jonathan J. Peterson	4/26/11	1:50 PM	R Lake	4/26/11	1:50
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time

COMMENTS:

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AMTEST
LABORATORIES

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664

Professional Analytical Services

Apr 30 2011
AESI
911 5th Ave, Suite 100
Kirkland, WA 98033
Attention: Jenny Saltonstall

MAY 04 2011

Dear Jenny Saltonstall:

Enclosed please find the analytical data for your Slocum Property project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
EP-2 @3-4'	Soil	11-A006044	CEC-s, OM ASTM
EP-4 @3-4'	Soil	11-A006045	CEC-s, OM ASTM
EP-5 @3-4'	Soil	11-A006046	CEC-s, OM ASTM
EP-7 @3-4'	Soil	11-A006047	CEC-s, OM ASTM

Your samples were received on Tuesday, April 26, 2011. At the time of receipt, the samples were logged in and properly maintained prior to the subsequent analysis.

The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

Kathy Fugiel
President

Project #: KE110151A
PO Number: KE110151A

BACT = Bacteriological
CONV = Conventionals
TC=Total Coliforms

MET = Metals
ORG = Organics

NUT=Nutrients
DEM=Demand

MIN=Minerals
APC=Aerobic Plate Count

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Professional Analytical Services

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ANALYSIS REPORT

AESI
911 5th Ave, Suite 100
Kirkland, WA 98033
Attention: Jenny Saltonstall
Project Name: Slocum Property
Project #: KE110151A
PO Number: KE110151A
All results reported on an as received basis.

Date Received: 04/26/11
Date Reported: 4/30/11

MAY 0 4 2011

AMTEST Identification Number 11-A006044
Client Identification EP-2 @3-4'
Sampling Date 04/19/11

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Cation Exchange Capacity	3.0	meq/100g		0.5	SW-846 9081	HL	04/29/11
Organic Matter	1.2	%			ASTM D 2974	NLN	04/29/11

AMTEST Identification Number 11-A006045
Client Identification EP-4 @3-4'
Sampling Date 04/19/11

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Cation Exchange Capacity	3.8	meq/100g		0.5	SW-846 9081	HL	04/29/11
Organic Matter	1.5	%			ASTM D 2974	NLN	04/29/11

AMTEST Identification Number 11-A006046
Client Identification EP-5 @3-4'
Sampling Date 04/19/11

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Cation Exchange Capacity	3.8	meq/100g		0.5	SW-846 9081	HL	04/29/11
Organic Matter	1.4	%			ASTM D 2974	NLN	04/29/11

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AMTEST Identification Number 11-A006047
Client Identification EP-7 @3-4'
Sampling Date 04/19/11

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Cation Exchange Capacity	2.9	meq/100g		0.5	SW-846 9081	HL	04/29/11
Organic Matter	1.2	%			ASTM D 2974	NLN	04/29/11

Kathy Fugiel
President

AMTEST
LABORATORIES

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QC Summary for sample numbers: 11-A006044 to 11-A006047

DUPLICATES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	DUP VALUE	RPD
11-A006047	Cation Exchange Capacity	meq/100g	2.9	2.9	0.00
11-A006046	Organic Matter	%	1.4	1.5	6.9

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Cation Exchange Capacity	meq/100g	10.	9.8	98.0 %

BLANKS

ANALYTE	UNITS	RESULT
Cation Exchange Capacity	meq/100g	< 0.5

Am Test Inc.
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Kirkland, WA 98034
(425) 885-1664

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Professional Analytical Services

EXHIBIT 10
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Sample Acceptance/Compliance Check Form

Client: AESI COC # 5000 Batch Number 1172242

Project Name: Slocum Property Date Received: 4/26/11 Received By: Lynn Lake

Samples received at AmTest by: Client

Number of Coolers/Boxes Received: N/A

Temperature at time of receipt: Not Requested degrees C

	YES	NO	N/A
Were the Custody Seals intact?	☐	☐	☑
Was a Chain-of-Custody provided?	☑	☐	☐
Was the Chain-of-Custody filled out properly?	☑	☐	☐
Did the sample containers arrive intact and in good condition?	☑	☐	☐
Did the sample container labels agree with the custody papers?	☑	☐	☐
Were the correct sample containers used?	☑	☐	☐
Were the containers supplied by AmTest?	☑	☐	☐
Are the samples within specified holding times?	☑	☐	☐
Were bubbles absent from any 40 mL VOA vials?	☐	☐	☑
Was a Trip Blank received?	☐	☐	☑
Was the client contacted about any sample or COC problems?	☐	☐	☑
Are the samples FDA regulated?	☐	☐	☑
Were the coolers/boxes decontaminated with a 10% Bleach solution?	☐	☐	☑

Explain any discrepancies or problems with the samples (include sample numbers):

NOTE: This form is used for all samples received by AmTest. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by method/SOP.

Client: AESI COC # 5000 Batch Number 1172242

Project Name: Slocum Property Date Received: 4/26/11 Received By: Lynn Lake