April 27, 2016
Project No. TE160115A

BCRA
414 Stewart Street, #200
Seattle, Washington 98101

Attention: Mr. Alan McWain

Subject: Geotechnical Slope Assessment
Colman Park Restoration
South Grand Street & 31st Avenue South Vicinity
Seattle, Washington

Dear Mr. McWain:

Associated Earth Sciences, Inc. (AESI) is pleased to submit this report describing our geotechnical slope assessment concerning the planned restoration of Colman Park in Seattle, Washington. AESI's geotechnical services for this project were completed in general accordance with our proposal dated March 30, 2016, and were authorized by your email on April 1, 2016.

SITE AND PROJECT DESCRIPTION

The project site comprises a portion of an existing municipal park located in the Mount Baker neighborhood of Seattle, as shown on the attached "Vicinity Map" (Figure 1). This park is roughly delineated by South Massachusetts Street on the north, by South Holgate Street on the south, by 31st Avenue South on the west, and by Lake Washington Boulevard on the east. Our specific area of study for this project is a steep, forested hillslope at the westernmost (upper) end of the park, adjacent to 31st Avenue South. The attached "Site and Exploration Plan" (Figure 2) illustrates our study area.

We understand that Colman Park was designed by the Olmstead Brothers Landscape Architects in 1910. They envisioned the upper portion of the park to serve as a view corridor extending outward to Lake Washington and beyond. However, in recent decades, the view corridor has been blocked by colonizing deciduous trees. Park restoration plans call for cutting or removing

these colonizing trees from the hillslope and then planting groundcover, bushes, and lower-growing trees.

PURPOSE AND SCOPE

The purpose of our geotechnical evaluation was to characterize general surface and near-surface conditions at the site in order to derive opinions regarding erosion and landsliding risks and mitigations related to the proposed tree removal. Our scope of work included the following items.

- Performed a visual surface reconnaissance of the subject hillslope and immediate vicinity;
- Reviewed topographic maps, geologic maps, lidar images, and aerial photos pertaining to the site;
- Advanced four hand borings (designated HB-1 through HB-4) at widely spaced locations across the hillslope;
- Analyzed geotechnical data in context with the planned restoration plan; and
- Prepared this written report presenting our conclusions and recommendations.

FIELD EXPLORATION PROCEDURES

We explored surface and near-surface conditions at the site on April 8, 2016. The number, locations, and depths of our explorations were completed within site access and budgetary constraints. Our exploration procedures are described below. 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. Soil contact depths shown on the logs should be regarded as only an approximation; the actual changes between sediment types are often gradational and/or undulating.

The conclusions and recommendations presented in this report are based, in part, on conditions encountered by our explorations completed for this study. Due to the nature of subsurface exploratory work, it is necessary to interpolate and extrapolate soil conditions between and beyond the field explorations. Differing subsurface conditions could be present outside the area of the 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 might not become fully evident until a later time.

Hand Borings

All hand borings were performed by an AESI geotechnical engineer and geologist. Each boring was advanced using a hand auger with a 4-inch-diameter cutting barrel. Materials encountered in the exploration pits were studied and classified in the field by our representatives. Relative soil densities were estimated on the basis of hand auger turning resistance and hand probe tip resistance. Before leaving the site, we backfilled all auger holes with excavated soils and then foot-tamped the surface.

SITE CONDITIONS

The following text sections describe our observations and findings related to current site conditions, including development, vegetation, regional and local topography, regional geology, local soils, and local ground water. Our sources of information include topographic and geologic maps published by the U.S. Geological Survey (USGS).

Regional and Local Topography

Colman Park extends from the topographic crest of Mt. Baker Ridge downward to Lake Washington. This regional hillslope has a vertical relief of about 300 feet over a horizontal distance of about 1500 feet, which corresponds to an overall gradient of approximately 5H:1V (Horizontal:Vertical). The park occupies a large topographic gully feature that has a relatively broad concave shape at the top and becomes more sharply defined near the bottom.

Our geotechnical evaluation encompassed the uppermost portion of Colman Park, extending from the 31st Avenue South sidewalk (at an elevation of about 275 feet) downward to a community pea patch (at an elevation of about 200 feet). Local site grades across this study area are steepest at the top and gradually become more moderate near the bottom. We estimated to the maximum gradient to be on the order of 1.5H:1V and the average gradient to be about 3H:1V. Site Photographs 3A and 3B (Figure 3) depict typical topographic conditions at the upper part of the site. Locally steeper cut slopes ranging up to 3 or 4 feet high, with near-vertical inclinations, are present along the uphill side of the trails and footpath.

Existing Development

The project site is undeveloped except for concrete stairways at the northern and southern ends, and a gravel pedestrian trail that curves around the eastern (lower) side. There is also a narrow footpath traversing through the middle of the site in a roughly north-south direction, as approximately shown on Figure 2. Both concrete stairways appear to be quite old but are in generally good condition; we did not observe any significant cracking or deformation that might be related to slope movements.

A municipal sidewalk and raised curb extend around the western (upper) edge of the site, adjacent to 31st Avenue South. These concrete features, which are shown in Site Photographs 4A and 4B (Figure 4), appear to be in very good condition. We did not observe any cracking, warping, settlement of the sidewalk or curb, nor any other evidence of soil movement along the top of the hillslope. A 6-inch-diameter plastic pipe is visible immediately behind the curb in several locations, but we could not determine the purpose of this pipe.

Existing Vegetation

The project site is heavily vegetated with a variety of trees and undergrowth. Existing undergrowth includes tall bushes, saplings, ferns, low grasses, and some berry vines. This undergrowth tends to exist in patches, with small clearings between. Most of the trees consist of solitary or clump maples and other deciduous species, with trunks ranging from about 3 to 18 inches in diameter. However, we did observe several mature evergreen trees with trunks measuring several feet in diameter.

We gave particular attention to the shape and orientation of the tree trunks, because this can provide information about the behavior of hillslope soils. Most tree trunks appear to be fairly straight or, in the case of clump maples, curved outward. Some trunks exhibit a downslope curvature, which typically results from "soil creep" (a very slow, downslope migration of surficial soils). We did not observe a consistent occurrence of upslope-leaning trunks, which often indicates "slumping" (a relatively sudden rotational failure of the deeper soils).

Regional Geology

The 2005 USGS document titled *The Geologic Map of Seattle – A Progress Report* depicts several geological units in the Colman Park vicinity. The topographically and stratigraphically highest unit is a *glacial lodgement till* deposit that forms a cap over the crest of Mt. Baker Ridge and wraps around the upper edge of the park. Lodgement till typically comprises a very dense, unsorted mixture of silts, sands, gravels, and cobbles. Thicknesses can range from a few feet to several tens of feet. As a historical note, the 1962 USGS document titled *Preliminary Geologic Map of Seattle and Vicinity, Washington* shows glacial lodgement till extending the entire vertical range of Colman Park.

Although not indicated on either geologic map, *recessional outwash* commonly mantles lodgement till. Recessional outwash is glacially deposited (but not glacially overridden) and typically consists of loose to medium dense sands, gravelly sands, and/or silty sands. Thicknesses usually range from only a few feet up to about 10 feet.

According to the 2005 geologic map, the lodgement till is underlain by glacial *advance outwash*. This glacially overridden deposit typically consists of dense to very dense sands, sandy gravels, or gravelly sands. Thicknesses can range from several tens of feet to several hundred feet. The

geologic map shows that advance outwash is exposed across the upper portion of Colman Park, such that it encompasses the entire project site.

Below the advance outwash deposit, the 2005 geologic map shows a pre-Olympia fine-grained glacial soil consisting of hard, laminated to massive silt and clay with some sandy interbeds. Thicknesses can range from a few feet to several tens of feet. The geologic map shows these silts and clays exposed across the middle portion of Colman Park, closely downslope from the project site.

Two additional pre-Olympia glacial deposits are mapped across the lower portion of Colman Park. These older deposits consist of hard or dense, randomly sorted mixtures of gravel, sand, silt, and clay.

It should be noted that the geologic map shows "landslide material" mantling all of the above-described soils throughout Colman Park, but no details are given. We infer that this material likely comprises a relatively thin layer of sands, silts, and gravels derived from the glacial lodgement till and/or glacial advance outwash deposits exposed in the uppermost portion of the park. Such material is often called *colluvium* when the specific source or depositional mechanism is not clearly known.

Local Soil Deposits

All four of our exploratory hand borings disclosed fairly uniform near-surface soil conditions at the project site, but the observed soils were not necessarily consistent with the above-referenced geology map. Our soil observations are described on the stratigraphic logs contained in Appendix A and are summarized in the paragraphs below. We infer that variations between the observed soils and the mapped soils might simply reflect the great difference in scale; our hand borings revealed surficial soils within a depth of only about 3 to 5 feet, whereas the geologic map generally focuses on soil deposits having a greater thickness.

Colluvium/Topsoil: In all hand borings, we observed 1 to 2 feet of loose, moist, dark brown, silty, fine sand and sandy silt, with some organics and roots. This surficial layer likely represents a combination of colluvium (soil that migrates downslope from higher locations) and topsoil (organic-rich soil that develops on the ground surface).

Recessional Outwash: All hand borings disclosed a layer of loose to medium dense, silty, fine sand below the colluvium/topsoil layer. The thickness ranged from about 1½ to 3½ feet. Based on the density, texture, and stratigraphic position, this sand layer appears to be recessional outwash, which often gets deposited over other glacially overridden soils.

Weathered Glacial Soil: Below the recessional outwash deposit, at depths ranging from about 2½ to 5½ feet below ground surface, our hand borings revealed medium dense to dense, mottled, silty sands with some gravel. We interpret these soils to be the upper, weathered

portion of either a lodgement till or advance outwash deposit. Due to the higher density and gravel content, it was difficult to penetrate more than about 6 inches into this deposit with our hand auger and hand probe.

Surface Water and Ground Water

During our site reconnaissance, we looked for runnels, channels, and other indicators of surface water erosion. There were no obvious indications of such erosion, although it should be noted that the heavy vegetative undergrowth obscured the ground surface in many areas. We also observed that the presence of a raised concrete curb along the eastern (downslope) edge of the 31st Avenue sidewalk likely prevents surface water from flowing directly onto the hillslope over most of the sidewalk span.

We encountered slow ground water seepage in hand boring HB-2 at a depth of approximately 3 feet below surface grades. In all other hand borings, the observed soils were merely moist rather than wet or saturated. However, these observations apply only to local conditions at the time of exploration; more seepage zones might be present during the winter months or immediately after periods of heavy precipitation.

GEOTECHNICAL CONCLUSIONS

In our opinion, based on our surface and near-surface observations, the proposed park restoration is feasible from a geotechnical standpoint. If proper mitigation measures are taken, we do not foresee a significant risk of erosion, sloughing, slumping, or other soil movements on the subject hillslope resulting from removal of the existing deciduous trees. This overall conclusion is supported by the following findings and considerations.

- Published geologic maps show that the subject site and immediate vicinity is underlain by dense to very dense glacial soils consisting of lodgement till over advance outwash over various older sediments. All of these glacially overridden soils possess a high shear strength and are inherently resistant to deep-seated sloughing and slumping.
- Our on-site hand borings disclosed a thin layer of colluvium and topsoil mantling the subject hillslope, underlain by a slightly thicker layer of recessional outwash. The sandy composition of these surficial soils makes them moderately well-drained and, therefore, less prone to surface erosion than other less-permeable soil types.
- The presence of small but very steep cut slopes along the uphill side of the trails and footpath indicates that the shallow on-site soils possess a moderately high degree of cohesion and erosion resistance.
- Our on-site hand borings confirmed the presence of medium dense to dense sandy soils below the hillslope, at depths ranging from about 2½ to 5½ feet below ground surface.

These sandy soils appear to correspond to the aforementioned glacially overridden deposits.

- The age and orientation of the on-site trees do not indicate that any slumping or sloughing has occurred in recent decades.
- The deciduous trees that are being proposed for removal tend to have relatively shallow root systems that, depending on the size and type of tree, have a root penetration likely ranging from about 2 to 4 feet. In comparison with mature evergreen trees, these shallow roots do not provide a significant amount of deep soil stabilization.
- The roots of the existing deciduous trees provide significant stability for the near-surface soils, and these roots will gradually decay after a tree has been cut. However, the roots will help maintain shallow soil stability for several years after tree cutting, thereby maintaining interim stability as new plant roots become established.
- The existing raised curb located along the eastern (downslope) edge of the 31st Avenue sidewalk provides an effective and permanent barrier against water flowing directly over the hillslope.

RECOMMENDATIONS

In order to minimize the possibility of adverse impacts to the subject hillside during and after future tree removal, we recommend that various geotechnical mitigation measures be incorporated into the park restoration work plan, as outlined below. It should be noted that the project arborist will likely recommend additional mitigation measures associated with existing and/or future vegetation management.

- Because the existing groundcover vegetation provides valuable resistance to shallow soil erosion, we recommend that existing groundcover be preserved on the hillslope to the greatest extent practical. This should include taking care to avoid disturbing the plants with foot traffic or machinery.
- We recommend that any existing or new areas of bare soil be revegetated as part of the restoration process. This revegetation should be completed using native groundcover plants and leafy bushes with a hardy root network, as selected by the project landscape architect. Ideally, the majority of new plants would be evergreens, such that they maintain their leaves during the wintertime rainy season.
- Temporary erosion-control measures should be installed on areas that are being revegetated. These measures could include any or all of the following: jute or coir matting; organic mulch or wood chips; and straw wattles. In areas where revegetation is impractical or undesired, we recommend placing a 2-inch-thick (minimum) layer of crushed gravel or a 4-inch-thick (minimum) layer of wood chips for permanent erosion-control purposes.

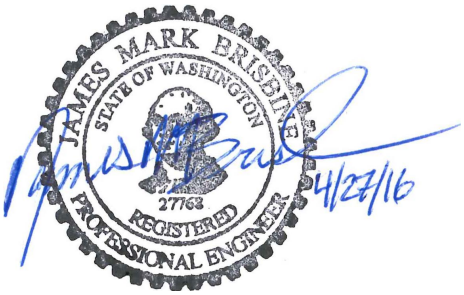
- If any sources of concentrated runoff water are discovered during park restoration work, they should be diverted away from the hillslope or terminated above the hillslope. In particular, the existing 6-inch-diameter plastic pipe located along the top of the hillslope should be inspected for leaks or discharges and then fixed as needed. Furthermore, no new water sources should be introduced on or immediately above the hillslope.

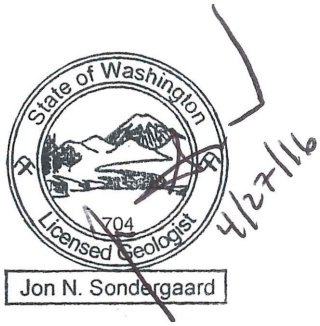
CLOSURE

AESI has prepared this report for the exclusive use of our clients, for specific application to this project. Within the limitations of scope and schedule, our services have been performed in accordance with generally accepted local geotechnical engineering practices in effect at the time our report was prepared. No other warranty, express or implied, is made.

We appreciate the opportunity to have been of service on this project. If you have any questions, please call our office at 253-722-2992 or 425-827-7701.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Tacoma, Washington

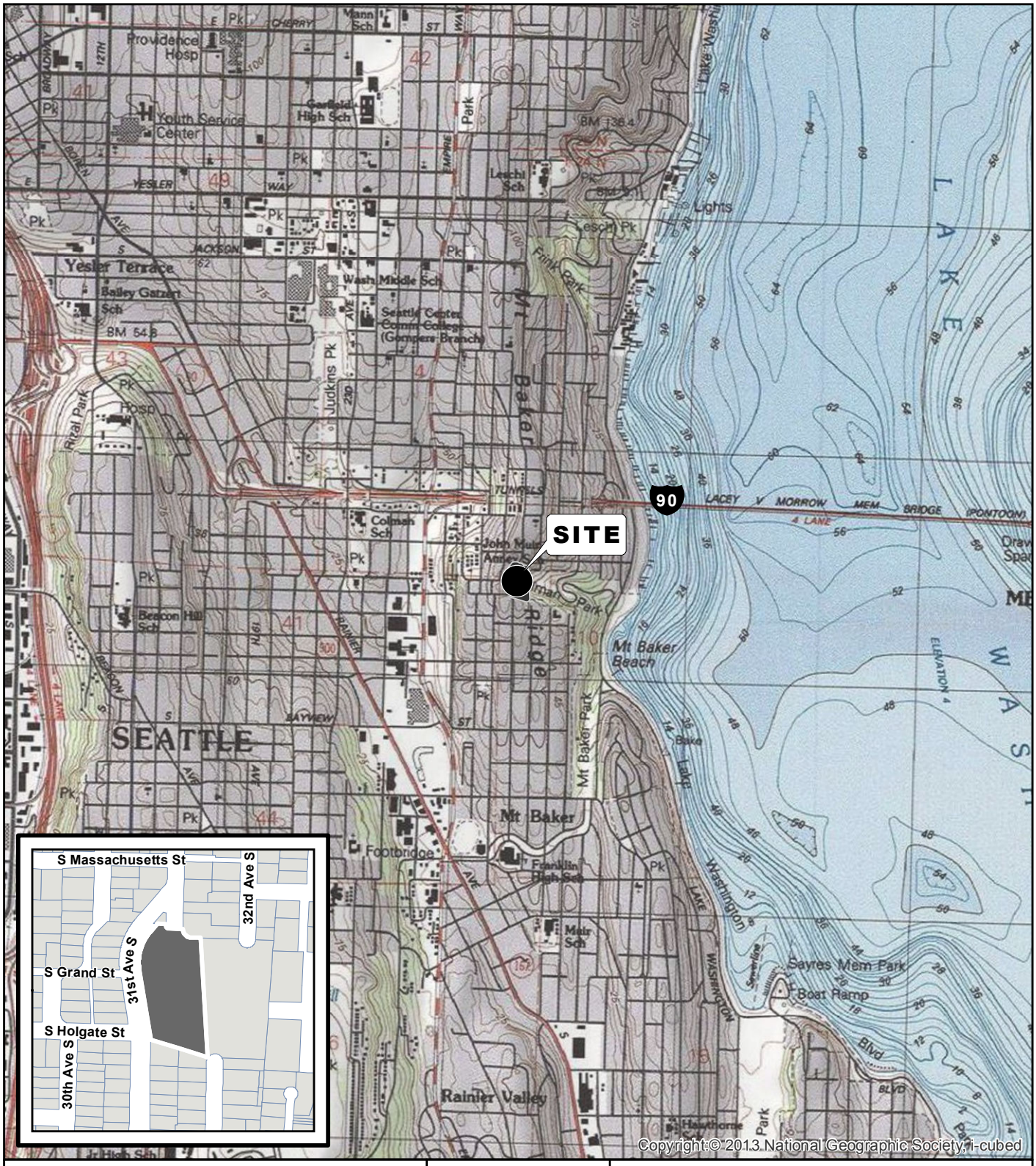




James M. Brisbine, P.E., L.G., L.E.G.
Senior Associate Geotechnical Engineer

Jon N. Sondergaard, L.G., L.E.G.
Senior Principal Engineering Geologist

Attachments:
- Figure 1. Vicinity Map
- Figure 2. Site and Exploration Plan
- Figure 3. Site Photographs (3A and 3B)
- Figure 4. Site Photographs (4A and 4B)
- Appendix A. Hand Boring Logs



DATA SOURCES / REFERENCES:
USGS: 24K SERIES TOPOGRPAHIC MAPS
KING CO: STREETS, PARCELS

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 1000 2000
FEET

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

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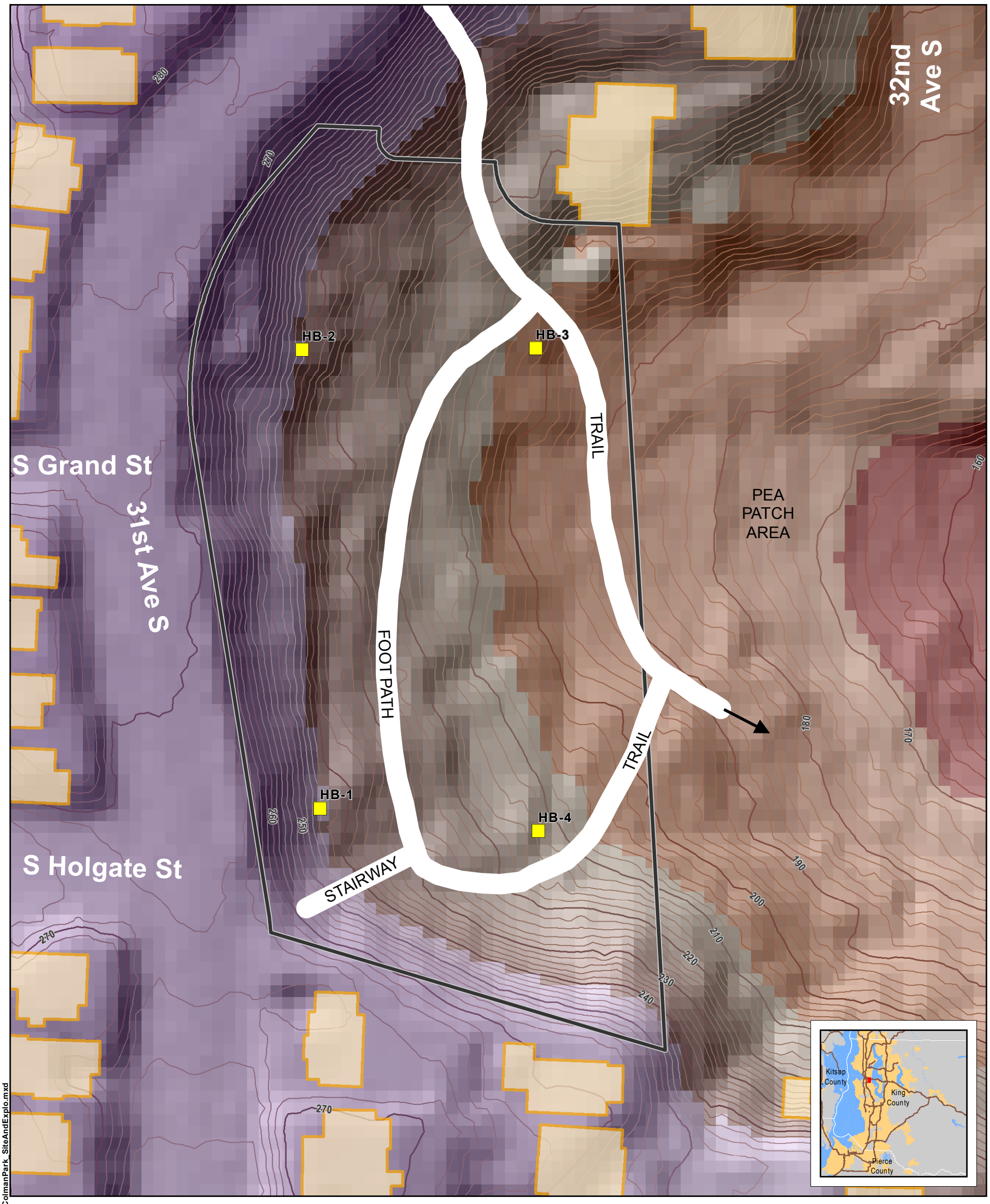
VICINITY MAP

COLMAN PARK RESTORATION
SEATTLE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
KE160115A	4/16	1

Document Path: G:\GIS_Projects\aTemplates\NTRP\aVM_Template\VM_MXD\160115 Fig1 ProjectVicinity_KingNTRP1.mxd



LEGEND:

- HAND BORING
- SITE BOUNDARY (APPROXIMATE)
- BUILDING OUTLINE

N

0 25 50

FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

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DATA SOURCES / REFERENCES:
PSLC: 2005 LIDAR, 6FT GRID
WA STATE PLANE NORTH COORDINATE SYSTEM
NAD83(1991 HARN). VERTICAL: NAVD88 GEOID 09.
ELEVATION UNITS IN US SURVEY FEET.
KING CO: STREETS, WATER, PARCELS
SEATTLE: BUILDING OUTLINES

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

SITE AND EXPLORATION PLAN

COLMAN PARK RESTORATION
SEATTLE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
TE160115A	4/16	2

Document Path: G:\GIS_Projects\aaYear2016\160115 Colman Park Renovation\mxd\160115_ColmanPark_SiteAndExplo.mxd

Photo 3A: TYPICAL HILLSLOPE VIEW LOOKING SOUTH

Photo 3B: TYPICAL HILLSLOPE VIEW LOOKING NORTH

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SITE PHOTOGRAPHS

COLMAN PARK RESTORATION
SEATTLE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
TE160115A	4/16	3

160115 Colman Pk \ 160115 F3 Site Photos.cdr

Photo 4A: 31ST AVENUE SIDEWALK VIEW LOOKING SOUTH

Photo 4B: 31ST AVENUE SIDEWALK VIEW LOOKING NORTH

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SITE PHOTOGRAPHS

COLMAN PARK RESTORATION
SEATTLE, WASHINGTON

PROJ NO.	DATE:	FIGURE:
TE160115A	4/16	4

160115 Colman Pk \ 160115 F4 Site Photos.cdr

APPENDIX A

Hand Boring 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
		≥12% 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
		≥12% 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

Coarse-Grained Soils

Density	SPT(2) blows/foot
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	>50

Fine-Grained Soils

Consistency	SPT(2) blows/foot
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)

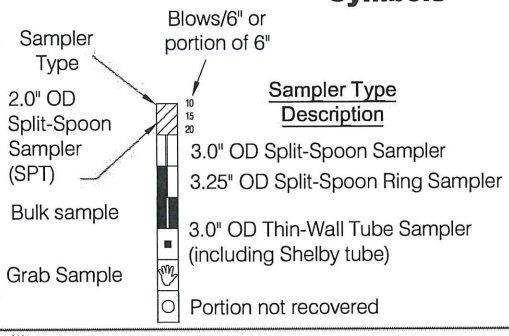
(3) Estimated Percentage

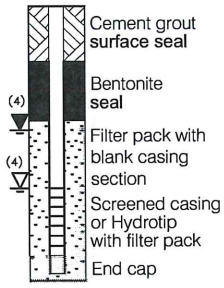
Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

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 12%

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

blocks \ dwg \ log_key.dwg LAYOUT: Layout 4 -2014 Qty Chng

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Exploration Log

Project Number	Exploration Number	Sheet
TE160115A	HB-1	1 of 1

Project Name	Colman Park Restoration	Ground Surface Elevation (ft)	245
Location	Seattle, WA	Datum	N/A
Driller/Equipment	Hand Auger	Date Start/Finish	4/8/16,4/8/16
Hammer Weight/Drop	N/A	Hole Diameter (in)	4 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Colluvium / Topsoil Loose, moist, dark brown, fine SAND and SILT, some roots (SM/ML).					
				Recessional Outwash Loose to medium dense, moist, brown, silty, fine SAND, trace gravel (SM).					
				Weathered Glacial Soil Medium dense to dense, moist, mottled brown and gray, silty, fine SAND, some gravel (SP).					
				Bottom of exploration boring at 3.75 feet No ground water seepage observed.					
5									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

Water Level ()

Water Level at time of drilling (ATD)

Logged by: JMB

Approved by: JNS

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Exploration Log

Project Number	Exploration Number	Sheet
TE160115A	HB-2	1 of 1

Project Name	Colman Park Restoration	Ground Surface Elevation (ft)	243
Location	Seattle, WA	Datum	N/A
Driller/Equipment	Hand Auger	Date Start/Finish	4/8/16,4/8/16
Hammer Weight/Drop	N/A	Hole Diameter (in)	4 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Colluvium / Topsoil Loose, moist, dark brown, fine SAND and SILT, some roots (SM/ML).					
				Recessional Outwash Loose to medium dense, wet, brown, silty, fine SAND, trace gravel (SM). Becomes moist.					
5				**Weathered Glacial Soil** Medium dense to dense, moist, mottled brown and gray, silty, fine SAND, some gravel (SP).					

Bottom of exploration boring at 5.75 feet
Slow ground water seepage observed at 3 feet.

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
Water Level ()
Water Level at time of drilling (ATD)

Logged by: JMB
Approved by: JNS

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Exploration Log

Project Number	Exploration Number	Sheet
TE160115A	HB-3	1 of 1

Project Name	Colman Park Restoration	Ground Surface Elevation (ft)	203
Location	Seattle, WA	Datum	N/A
Driller/Equipment	Hand Auger	Date Start/Finish	4/8/16,4/8/16
Hammer Weight/Drop	N/A	Hole Diameter (in)	4 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Colluvium / Topsoil Loose, moist, dark brown, silty, fine SAND, some roots (SM).					
				Recessional Outwash					
		S-1		Loose to medium dense, moist, brown, silty, fine SAND (SM).					
		S-2							
				Weathered Glacial Soil Medium dense to dense, moist, mottled brown and gray, silty, fine SAND, some gravel (SP).					
5				Bottom of exploration boring at 4.75 feet No ground water seepage observed.					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

Water Level ()

Water Level at time of drilling (ATD)

Logged by: JMB

Approved by: JNS

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
TE160115A	HB-4	1 of 1

Project Name	Colman Park Restoration	Ground Surface Elevation (ft)	213
Location	Seattle, WA	Datum	N/A
Driller/Equipment	Hand Auger	Date Start/Finish	4/8/16,4/8/16
Hammer Weight/Drop	N/A	Hole Diameter (in)	4 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Colluvium / Topsoil					
				Loose, moist, dark brown, silty, fine SAND, some roots (SM).					
				Recessional Outwash					
				Loose to medium dense, moist, brown, silty, fine SAND (SM).					
				Becomes gravelly at 2.5 feet (possible weathered glacial soil).					
				Bottom of exploration boring at 2.5 feet Terminated due to refusal. No ground water seepage observed.					
5									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

Water Level ()

Water Level at time of drilling (ATD)

Logged by: JMB

Approved by: JNS