associated
earth sciences
incorporated

June 25, 2021
Project No. 20210148E001

Mr. Harvey Kanter
12 Meadow Lane
Mercer Island, Washington 98040

Subject: Limited Geotechnical Study
Kanter Residence Improvements
12 Meadow Lane
Mercer Island, Washington

Dear Mr. Kanter:

Associated Earth Sciences, Inc. (AESI) is pleased to present this report providing a summary of our subsurface exploration and geotechnical engineering evaluation concerning the proposed improvements for the residence at the above-referenced address. Our work has been completed in general accordance with our proposal, dated April 16, 2021, and in accordance with generally accepted geotechnical engineering practices. This report was prepared for the exclusive use of Mr. Harvey Kanter, and his authorized agents, for specific application to this project. No other warranty, express or implied, is made.

Project Description

The subject site is an existing single-family residence located on the west side of Mercer Island overlooking Lake Washington as shown on the "Vicinity Map" (Figure 1). The residence was reportedly built in 1926 and consists of a single-story structure with a daylight basement. The residence is bounded to the north and west by residential properties, to the east by Meadow Lane, and to the south by an undeveloped tract. The site is mapped by the City of Mercer Island as being within a Landslide Hazard Area and Erosion Hazard Area.

It is our understanding that current plans for the residence will involve lowering the basement level to increase ceiling height by about 3 feet. This will involve demolition of the existing floor slab, excavation below the bottom of existing footings, underpinning existing footings, and replacement of the floor slab. No improvements beyond the existing footprint are planned.

The primary purpose of this study was to evaluate the subsurface conditions adjacent to the existing footings, review available geologic literature pertaining to the subject site, and develop geotechnical recommendations related to excavation and foundation underpinning. No as-built foundation plan was available at the time this report was prepared.

Site and Geologic Reconnaissance

Our field studies for this project were conducted in June 2021 and included advancing three geotechnical exploration borings. The existing site conditions and the approximate locations of subsurface explorations completed for this study are presented on the "Existing Site and Exploration Plan" (Figure 2). The various types of sediments, as well as the depths where the characteristics of the sediments changed, are indicated on the exploration logs presented in the Appendix. The depths indicated on the logs where conditions changed may represent gradational variations between sediment types. If changes occurred between sample intervals in our exploration borings, they were interpreted. Our explorations were approximately located in the field by measuring from known site features.

The conclusions and recommendations presented in this report are based, in part, on the explorations completed for this study. The number, locations, and depths of the explorations were completed within site and budgetary constraints.

Subsurface Exploration

Three geotechnical exploration borings were completed using a rubber-tracked, limited-access, hollow-stem-auger drilling rig. Samples were obtained at depth intervals of approximately 2.5 to 5 feet using the Standard Penetration Test (SPT) procedure in accordance with *ASTM International* (ASTM) D-1586. This test and sampling method consists of driving a standard, 2-inch outside-diameter, split-barrel sampler a distance of 18 inches into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded, and the number of blows required to drive the sampler the final 12 inches is known as the Standard Penetration Resistance ("N") or blow count. If a total of 50 is recorded within one 6-inch interval, the blow count is recorded as the number of blows for the corresponding number of inches of penetration. The resistance, or N-value, provides a measure of the relative density of granular soils or the relative consistency of cohesive soils; these values are plotted on the exploration logs in the Appendix. Samples collected from the exploration borings were classified in the field by a geologist from our firm with representative portions placed in watertight containers. The samples were then transported to our laboratory for further visual classification.

Subsurface Conditions

Our borings were located around the outside perimeter of the existing residence. In general, our borings encountered a variable thickness of loose to dense fill overlying dense to very dense glacial till. A description of the soil types encountered in our borings is provided below. Because of the nature of exploratory work below ground, extrapolation of subsurface conditions between field explorations is necessary. It should be noted that differing subsurface conditions may sometimes be present due to the random nature of deposition and the alteration of topography by any past grading and/or filling. The nature and extent of any variations between the field explorations may not become evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this report and make the appropriate changes. A geologic cross-section is presented on Figure 3.

Stratigraphy

Topsoil

A surficial layer of topsoil approximately 12 inches in thickness was encountered at the current ground surface in all borings.

Existing Fill

Directly below the topsoil, all borings encountered existing fill soils (those not naturally placed) consisting of loose to dense, moist, light brown, silty sand with variable gravel content and trace debris and organics. Fill thickness ranged from approximately 4.5 to 6.5 feet where encountered.

Pre-Olympia Glacial Till

Underlying the fill, all borings encountered dense to very dense, grayish brown ranging to dark gray with depth, unsorted, silty to very silty, fine sand with trace gravel. We interpret these sediments to be representative of pre-Olympia-age glacial till. This glacial till was deposited directly from basal, debris-laden glacial ice during an older glaciation prior to the Olympia nonglacial interval. In both EB-2 and EB-3, in the 15-foot sample, the sediments were massive to faintly bedded, indicating some degree of water-sorting and possible glacio-lacustrine deposition conditions. The high relative density characteristic of pre-Olympia glacial till is due to its consolidation by the massive weight of the glacial ice from which it was deposited and by subsequent glaciations. Pre-Olympia glacial till is suitable for support of structural loads when prepared as recommended in this report. Glacial till contains a significant fine-grained fraction and is sensitive to excess moisture during placement in structural fill applications. Occasional cobbles and boulders may be present throughout the site.

Geologic Mapping

Review of a regional geologic map (GeoMapNW, 2006, *Geologic Map of Mercer Island, Washington,* GeoMapNW, Department of Earth and Space Sciences, University of Washington) indicates that the subject site vicinity is underlain by pre-Olympia-age glacial till. Our interpretations are consistent with the regional mapping.

Hydrology

Our explorations did not encounter groundwater seepage at the time of drilling to the maximum depth explored. Groundwater seepage referred to as “interflow” may occur during wetter times of the year. Interflow occurs when surface water infiltrates down through relatively permeable soils, such as the topsoil or weathered lodgement till, and becomes perched atop a comparatively very low-permeability barrier such as silty, pre-Olympia-age glacial till. This water may travel laterally and typically will follow the ground surface topography.

Groundwater conditions will largely depend on the soil grain-size distribution, topography, seasonal precipitation, on- and off-site land usage, and other factors. Our exploration was conducted in early June when groundwater levels are typically declining after a seasonal high.

Conclusions and Recommendations

Underpinning

Based on the subsurface conditions encountered in our explorations, we infer that the existing residence foundations are likely underlain by loose to dense fill soils, dense to very dense pre-Olympia glacial till, or a combination of these soils. It appears that foundations on the east side of the residence may bear on the glacial till and those on the west side up to 5 feet of fill. Given the potential mixture of subsurface conditions, it may be necessary to use a combination of underpinning and temporary excavation methods to facilitate lowering the basement floor 3 feet. We consider the following three underpinning approaches feasible for the project:

1) Driven pipe piles
2) Screw jack shoring
3) Phased temporary excavation

Pipe Pile Foundations

Underpinning the foundations of the existing residence could be accomplished with small-diameter steel pipe piles that are driven through the existing fill soils and penetrate the underlying native soils at depth. These could provide temporary shoring or a new permanent foundation element that is incorporated into a new basement wall.

Small-diameter pipe piles are lengths of steel pipe driven into the soil, usually by an air or hydraulically actuated jackhammer. The jackhammer may be hand-operated or mounted on a small excavator. The piles are driven in a series of small excavations. Once the piles have been driven into the soil, the forms are placed and the piles are cast with reinforced concrete to form the underpinning element. The loads from the footing are then transferred to the pipe piles through the upper loose fill soils to the underlying bearing soils. A qualified structural engineer, using the design guidelines presented herein, should complete the design of the foundation underpinning system to determine the number and spacing of piles required for each footing.

We anticipate that 2-inch- or 3-inch-diameter pipe piles will be suitable for this project, depending on the structural loading requirements. The piles should be driven with a suitable hydraulic hammer to the refusal criteria shown in Table 1 below. The following table provides required minimum hammer weights, refusal criteria, and allowable loads for pipe piles. Based on our explorations, we anticipate that pile embedment depths may be 5 to 10 feet. <u>It should be noted that actual driven lengths are unpredictable and may be substantially longer or shorter than the estimated range. The piles must extend through the existing fill soils and penetrate the underlying native sediments to reach final pile tip elevations at least 1 foot below the planned basement floor excavation elevation</u>. Pile penetration into the dense till sediments will be limited and the contractor should be prepared for difficult driving or "overdriving" piles to reach the required penetration depth. Three-inch piles driven with a large hammer will improve pile penetration rates and depth. Where piles cannot be driven sufficiently deep into the dense till, the phase temporary excavation method described below may be used.

Table 1
Pipe Pile Design Parameters

Pipe Diameter (inches)	Wall Thickness	Minimum Hammer Size (pounds)	Refusal Criteria[1] (seconds/inch)	Allowable Load[2] (kips)
2	Schedule 80	90	60	6
3	Schedule 40	400	30	12

(1) Refusal is defined as less than 1 inch of penetration in "X" seconds under constant driving.
(2) Allowable load for 3-inch or greater diameter piles to be verified by load tests (200 percent of allowable load) in accordance with *ASTM International* (ASTM) D 1145 "quick load test."

Anticipated settlement of pipe pile-supported foundations should be less than ½ inch
No lateral capacity will be provided by vertically installed pipe piles. Lateral resistance can be derived from passive soil resistance against the buried portion of the concrete footing and the adjoining concrete slab, or from the installation of batter piles. Lateral resistance for batter piles should be taken as the horizontal component of the axial pile load. Batter piles are typically installed at 1H:4V (Horizontal:Vertical) inclination.

Screw Jack Shoring

Screw jack shoring involves the installation of an adjustable steel post that has an upper plate that would support the existing foundation and a lower plate that would bear on competent soil. This is a common temporary shoring method that could be encapsulated into a permanent foundation wall. We recommend that the lower plate for each screw jack bear on the dense to very dense glacial till. The spacing of each screw jack and required loading capacity should be determined by the project structural engineer. For lower bearing plate design, an allowable bearing capacity of 2,000 pounds per square foot (psf) could be used. The screw jack system could be considered sacrificial and encapsulated into a new foundation wall.

Phased Temporary Excavation Beneath Foundations

In our opinion, a near-vertical temporary cut up to 4 feet tall could be excavated in alternating sections beneath existing foundations within the dense to very dense glacial till to facilitate lowering the basement floor. New foundations and foundation walls could be constructed in these sections and then remaining sections could be excavated and foundations and foundation walls constructed. Alternatively, the excavated sections could be backfilled with structural concrete. Our explorations suggest the phased excavation approach might be viable along the east side of the residence and portions of the north and south sides where the glacial till is expected to be at or near the current basement level elevation. The length of excavated sections beneath foundations would be a function of the maximum span the foundations could handle unsupported which would need to be determined by the project structural engineer. In our experience, the excavation segments are typically 4 to 6 feet long.

Shallow Foundations

Spread footings may be utilized for building support when founded directly on the dense to very dense natural sediments. For footings bearing directly on the dense natural sediments, an allowable soil bearing pressure of 2,500 pounds psf may be used for design purposes, including both dead and live loads. An increase of one-third may be used for short-term wind or seismic loading. Perimeter footings should be buried a minimum of 18 inches into the surrounding soil for frost protection. No minimum burial depth is required for interior footings; however, all footings must penetrate to the prescribed stratum, and no footings should be founded in or above loose, organic, or existing fill soils.

Anticipated settlement of footings founded as described above should be less than 1 inch. However, disturbed soil not removed from footing excavations prior to footing placement could result in increased settlements. All footing areas should be observed by AESI prior to placing concrete to verify that the design bearing capacity of the soils has been attained and that construction conforms with the recommendations contained in this report. Such observations may be required by the governing municipality.

Lateral loads can be resisted by friction between the foundation and the competent natural sediments or supporting structural fill soils, and/or by passive earth pressure acting on the buried portions of the foundations. The foundations must be backfilled with compacted structural fill to achieve the passive resistance provided below. We recommend the following allowable design parameters.

- Passive equivalent fluid = 300 pcf
- Coefficient of friction = 0.30

Floor Slabs

Slab-on-grade floors may be constructed either directly on the dense to very dense natural sediments, or on structural fill placed over these materials. Areas of the slab subgrade that are disturbed (loosened) during construction should be recompacted to an unyielding condition prior to placing the capillary break, as described below.

If moisture intrusion through slab-on-grade floors is to be limited, the floors should be constructed atop a capillary break consisting of a minimum thickness of 4 inches of washed gravel. The gravel should be overlain by a 10-mil (minimum thickness) plastic vapor retarder.

Drainage Considerations

Wall and Foundation Drains

All new perimeter footings should be provided with a drain at the footing elevation. The drains should consist of rigid, perforated, minimum 4-inch-diameter polyvinyl chloride (PVC) pipe surrounded by washed gravel. The level of the perforations in the pipe should be set at the bottom of the footing, and the drains should be constructed with sufficient gradient to allow gravity discharge away from the building. All retaining walls should be lined with a minimum, 12-inch-thick, washed gravel blanket, provided to within 1 foot of finish grade and which ties into the footing drain. Roof and surface runoff should not discharge into the footing drain system but should be handled by a separate, rigid, tightline drain.

Subslab Drains

In order to control moisture below the floor slab, we recommend construction of a subslab drainage system. This system should consist of a rigid, perforated, 6-inch-diameter, PVC pipe surrounded by washed pea gravel that span the full length of the underslab area, oriented parallel to the long axis of the residence. The pipe should be located approximately midway between the central axis and the building perimeter. The subgrade below the slab should be graded at a minimum 1-percent slope toward the drainpipe. The collected flow should then drain to a suitable point of discharge.

Statement of Risk

For Section 19.07.060(D) of the Mercer Island *Unified Land Development Code* (ULDC), the City of Mercer Island requires a statement of risk by the geotechnical engineer. It is the opinion of Associated Earth Sciences, Inc. (AESI) that the development practices proposed for the alteration would render the proposed residence as safe as if it were not located in a geologic hazard area provided the recommendations in this report are followed.

Closure

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

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

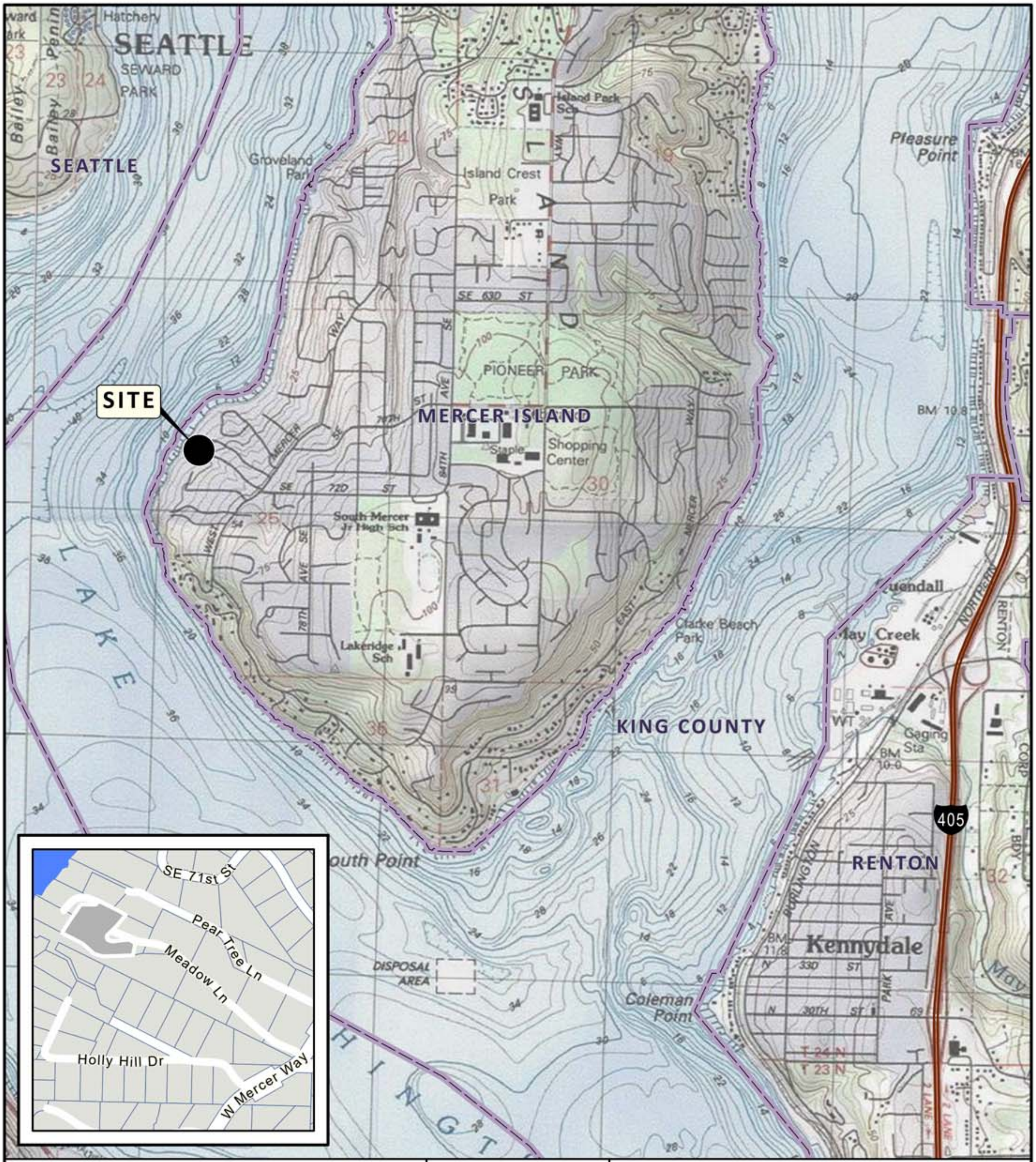
Joshua S. P. Greer, G.I.T.
Senior Staff Geologist

Bruce L. Blyton, P.E.
Senior Principal Engineer

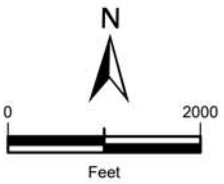
STEPHEN A. SIEBERT
30329
6/25/21

Stephen A. Siebert, P.E.
Associate Geotechnical Engineer

Attachments: Figure 1: Vicinity Map
Figure 2: Existing Site and Exploration Plan
Figure 3: Geologic Cross-Section
Appendix: Exploration Logs



DATA SOURCES / REFERENCES:
USGS: 7.5' SERIES TOPOGRAPHIC MAPS, ESRI/I-CUBED/NGS 2013
KING CO: STREETS, CITY LIMITS, PARCELS, PARKS 3/20
LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



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

associated earth sciences incorporated

VICINITY MAP

KANTER RESIDENCE
MERCER ISLAND, WASHINGTON

PROJ NO.	DATE:	FIGURE:
20210148E001	6/21	1

G:\GIS_Projects\aaY2021\210148 Kanter Residence\APRX\20210148E001 F1 VM_Kanter.aprx | 20210148E001 F1 VM_Kanter | 6/8/2021 9:34 AM

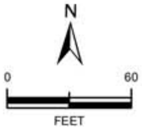
\\kirkfile2\GIS\GIS_Projects\aaY2021\210148 Kanter Residence\APRX\20210148E001 F2 ES_Kanter.aprx | 20210148E001 F2 ES_Kanter | 6/18/2021 1:22 PM

LEGEND

- ▭ SITE
- ● EXPLORATION BORING
- ▬ CROSS-SECTION
- ▭ PARCEL
- ∿ CONTOUR 10 FT
- ∿ CONTOUR 5 FT

DATA SOURCES / REFERENCES:
PSLC: KING COUNTY 2016, GRID CELL SIZE IS 3'.
DELIVERY 1 FLOWN 2/24/16 - 3/28/16
CONTOURS FROM LIDAR
KING CO: STREETS, PARCELS, 3/20
AERIAL PICTOMETRY INT. 2019

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



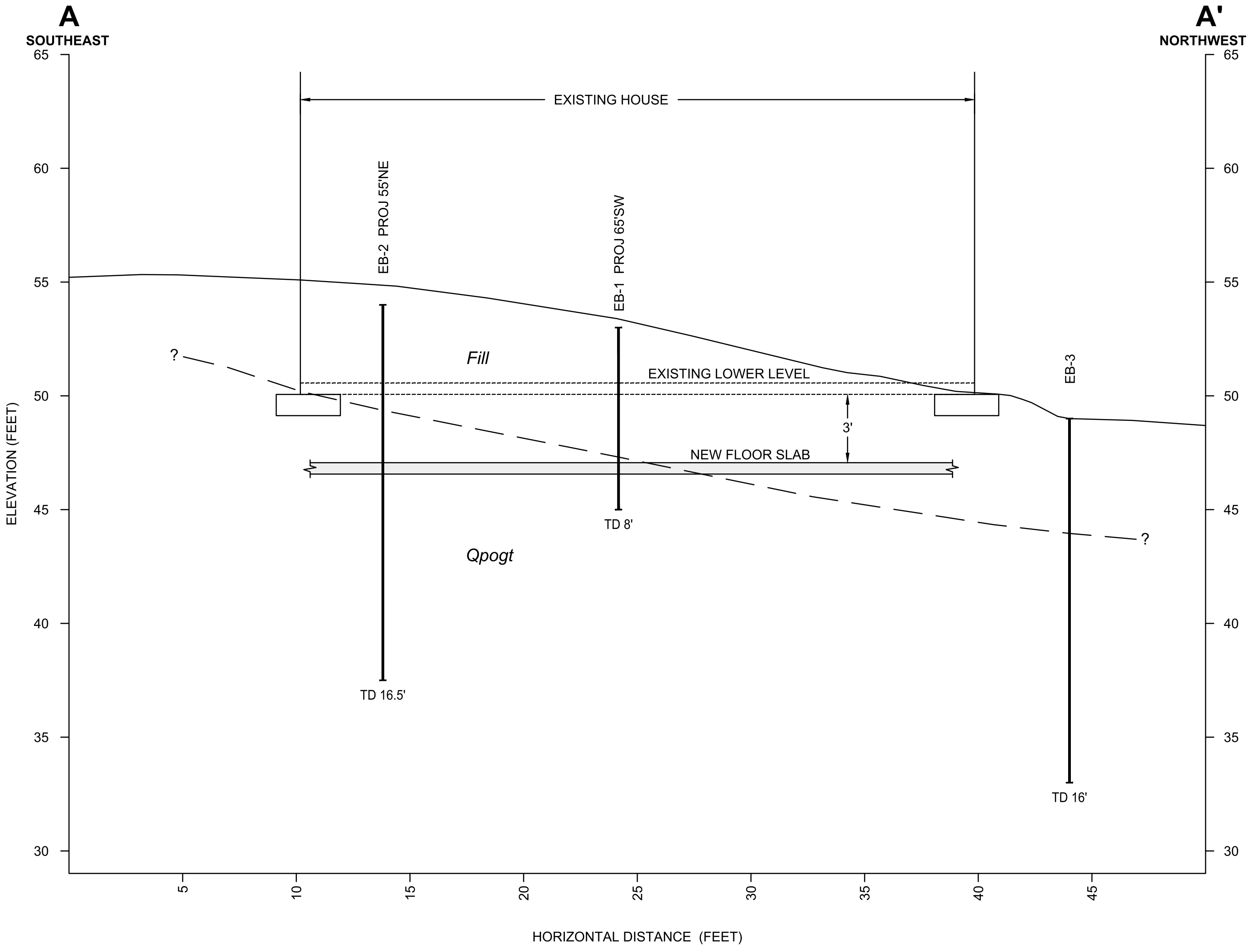
BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

EXISTING SITE AND EXPLORATION PLAN

KANTER RESIDENCE
MERCER ISLAND, WASHINGTON

PROJ NO. 20210148E001
DATE: 6/21
FIGURE: 2



LEGEND:

Fill FILL
Qpogt PRE-OLYMPIA GLACIAL TILL

| EXPLORATION BORING
TD TOTAL DEPTH OF BORING
/ GEOLOGIC CONTACT

VERTICAL EXAGGERATION = 1X

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE

NOTES:
1. THE SUBSURFACE CONDITIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION ARE BASED ON AN INTERPRETATION OF CONDITIONS ENCOUNTERED IN WIDELY SPACED EXPLORATIONS COMPLETED AT THE SUBJECT SITE AND RELEVANT SITE INFORMATION DEVELOPED AND PROVIDED BY OTHERS. THE SUBSURFACE INTERPRETATIONS PRESENTED IN THIS GEOLOGIC CROSS-SECTION SHOULD NOT BE CONSTRUED AS A WARRANTY OF ACTUAL SUBSURFACE CONDITIONS AT THE SITE. OUR EXPERIENCE HAS SHOWN THAT SOIL AND GROUNDWATER CONDITIONS CAN VARY SIGNIFICANTLY OVER SMALL DISTANCES.

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

associated
earth sciences
incorporated

GEOLOGIC
CROSS-SECTION A - A'
KANTER RESIDENCE IMPROVEMENTS
MERCER ISLAND, WASHINGTON

PROJ NO. 20210148E001
DATE: 6/21
FIGURE: 3

APPENDIX

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
		≥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

	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)

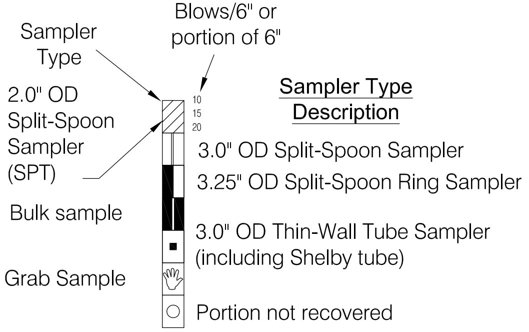
(3) Estimated Percentage

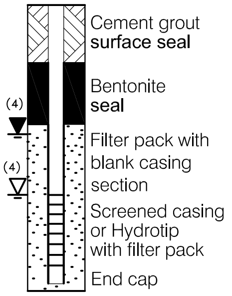
Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

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.

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

associated
earth sciences
incorporated

EXPLORATION LOG KEY

FIGURE A1

associated
earth sciences
incorporated

Exploration Boring

Project Number	Exploration Number	Sheet
20210148E001	EB-1	1 of 1

Project Name: Kanter Residence
Location: Mercer Island, WA
Driller/Equipment: Geologic Drill Partners / Mini-Bobcat
Hammer Weight/Drop: 140# / 30

Ground Surface Elevation (ft): 53
Datum: NAVD 88
Date Start/Finish: 6/2/21,6/2/21
Hole Diameter (in): 6

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot 10 20 30 40	Other Tests
				Topsoil					
				Fill					
				Moist, light brown, silty, fine SAND, trace gravel; unsorted (SM).					
		S-1					3 5 6	▲11	
5				Moist, light brown with irregular orange mottling, silty, fine SAND, trace gravel, trace debris (glass fragments), trace organics (SM).					
		S-2		Drilling speed slows.			5 9 11	▲20	
				Pre-Olympia Glacial Till Difficult drilling.					
		S-3		Moist, gray, silty, fine SAND, trace gravel; unsorted (SM).			50/3"	▲50/3"	
				Bottom of exploration boring at 8 feet Driller notes refusal at 8 feet. No groundwater encountered.					
10									
15									

Sampler Type (ST):

▯ 2" OD Split Spoon Sampler (SPT)	☐ No Recovery	M - Moisture
▯ 3" OD Split Spoon Sampler (D & M)	◧ Ring Sample	▽ Water Level ()
✋ Grab Sample	▨ Shelby Tube Sample	▼ Water Level at time of drilling (ATD)

Logged by: JG
Approved by: JHS

associated earth sciences incorporated

Exploration Boring

Project Number	Exploration Number	Sheet
20210148E001	EB-2	1 of 1

Project Name Kanter Residence
Location Mercer Island, WA
Driller/Equipment Geologic Drill Partners / Mini-Bobcat
Hammer Weight/Drop 140# / 30

Ground Surface Elevation (ft) 54
Datum NAVD 88
Date Start/Finish 6/2/21,6/2/21
Hole Diameter (in) 6

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot 10 20 30 40	Other Tests
				Grass / Topsoil					
				Fill					
		S-1		Moist to very moist, light brown with irregular oxidation, silty, fine SAND, trace gravel, trace organics (SM).			10 11 23	▲34	
				Drilling speed slows.					
				Pre-Olympia Glacial Till Difficult drilling 4.5 to 15 feet.					
5		S-2		Moist, grayish brown, silty, fine to coarse SAND, some gravel; massive to unsorted (SM).			8 22 30	▲52	
10		S-3		Moist, gray, silty, fine SAND, some gravel; unsorted (SM).			19 50/6"	▲50/6"	
15		S-4		Moist, gray, very silty, fine SAND, trace coarse sand, trace fine gravel dropstones; massive to faintly bedded (SM).			22 35 50/5"	▲50/5"	
				Bottom of exploration boring at 16.5 feet No groundwater encountered.					

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: JG
Approved by: JHS

associated earth sciences incorporated

Exploration Boring

Project Number	Exploration Number	Sheet
20210148E001	EB-3	1 of 1

Project Name: Kanter Residence
Location: Mercer Island, WA
Driller/Equipment: Geologic Drill Partners / Mini-Bobcat
Hammer Weight/Drop: 140# / 30
Ground Surface Elevation (ft): 49
Datum: NAVD 88
Date Start/Finish: 6/2/21,6/2/21
Hole Diameter (in): 6

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot 10 20 30 40	Other Tests
				Grass / Topsoil					
				Fill					
		S-1		Moist, light brown to gray with irregular oxidation, silty, fine to medium SAND, some gravel, trace organics (SM).			3 5 6	11	
5		S-2		**Pre-Olympia Glacial Till** Drilling speed slows. Moist, light brownish gray, silty, fine SAND, trace gravel; unsorted (SM). Difficult drilling 6 to 15 feet.			11 19 21	40	
10		S-3		Moist, light brownish gray, silty, fine SAND, trace gravel; layer (1 inch thick) of gray to dark gray, silty, fine sand at tip; unsorted (SM).			17 50/6"	50/6"	
15		S-4		Moist, gray to dark gray, very silty, fine SAND; massive to faintly bedded (SM).			27 50/6"	50/6"	
				Bottom of exploration boring at 16 feet No groundwater encountered.					

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: JG
Approved by: JHS