GEOTECH
CONSULTANTS, INC.

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March 20, 2019

JN 19083

Mr. John Banbury and Mrs. Eva Banbury
8275 Southeast 61st Street
Mercer Island, Washington 98040
via email: johnbanbury@msn.com

Subject: **Foundation, Landslide Hazard, and Erosion Hazard Considerations**
Proposed Addition to Single-Family Residence
8275 Southeast 61st Street
Mercer Island, Washington 98040

Dear Mr. and Mrs. Banbury,

We are pleased to provide this geotechnical report with recommendations for geotechnical aspects of the new addition to your house on Mercer Island. Our scope of work for this project included visiting the site to observe site conditions, conducting shallow hand explorations in the area of the proposed kitchen and deck additions, providing recommendations for foundations, and evaluating slope stability and erosion hazards at the site. This work was authorized by our **Contract for Professional Services** signed by you on March 3rd, 2019.

In preparation for writing this report, we were provided with plan sheets 1 through 6 of the architectural plans developed by Anne Schwab Architect and dated 2/9/19. Based on review of these documents, we understand that the new addition will expand the main level of the southern end of the new house to expand the kitchen. The kitchen addition will be limited to the second floor only, so will be supported on posts stemming from new foundations. As a part of this work, the bottom floor deck may be enlarged toward the south and include the construction of a spiral staircase descending from the existing main floor deck directly adjacent to the new kitchen addition.

SITE CONDITIONS

The existing residence is sited at 8275 Southeast 61st Street (Tax Parcel No. 1922800220) on Mercer Island. The property is trapezoidal in shape except where the northeastern "leg" of the property juts out from the northeast corner of the property to connect to Southeast 61st Street. The surrounding properties are developed with single-family housing.

Presently, the subject property is occupied by a single-family residence and a single-story detached garage. The residence is positioned centrally on the property, while the detached garage is situated on the eastern portion of the property. The bottom floor of the house is partially underground and daylights to the west. Attached to the southern-half of the back side (aka west side) of the house, a main-level deck overhangs over a patio level with the bottom floor of the house. A second deck extends from the western-most edge of the bottom floor patio. Around the house and the garage, the property features a variety of hardscapes and landscape features.

Topographically, the site generally declines downhill from the east side of the property toward the northwest corner of the property. Based on topographical information sourced from King County's iMap interactive mapping tool, the slope at the site averages between about 7 to 15 percent in slope gradient with its steepest portion at the northwest corner of the property measuring about 16 to 18 percent. These slope gradients generally fall within the range of 15 to 39 percent indicated for this site by City of Mercer Island's landslide and erosion hazard maps (Troost 2009). The area of the planned development is gently sloped for the area of the new kitchen, but approaches more of a moderate slope within the area of the proposed staircase and deck.

City of Mercer Island designates the site as a landslide hazard and erosion hazard (Troost 2009). The slope within the backyard area of the house is the area of the site that the landslide hazard definition is most applicable. We were able to visually evaluate this slope during our visits to the site. The area is moderately to well vegetated. No signs of recent movement were observed.

Three hand-augered borings were conducted in the area of the proposed new work. These explorations revealed loose, silty sand that became dense below a depth of 3 to 4 feet. Fill was revealed over the dense native soil at the proposed southwestern deck expansion.

CONCLUSIONS AND RECOMMENDATIONS

Based on our subsurface exploration, the site is underlain at shallow depths by competent, sandy soils. Consequently, conventional spread footings are adequate to support the new kitchen, deck, and staircase additions. The foundation locations should be excavated such that footings bear directly on the dense sandy soils, which we anticipate will be found at between 3 to 4 feet below ground surface. The construction will be accomplished using manual methods, as there is no access to the work area for equipment. We expect that even the excavation for the new isolated footings will be accomplished by hand. However, if manual excavation proves difficult or impractical, 2-inch diameter pipe piles may be optionally used for foundation support in lieu of conventional spread footings.

There are no steep slopes on the site. The site soils encountered at the sited during our subsurface investigation were in a dense condition, and the slopes are gentle to moderate, so the landslide potential in the development area is negligible. For this reason, it is our professional opinion that your property is not a potential landslide hazard. No mitigation measures for slope stability are necessary and no special measures are needed to provide adequate support for the new deck.

Because the site has some areas sloped over 15 percent, it would meet their strictest definition of an erosion hazard area. However, considering the limited area of disturbance that is planned, and the fact that the work will be accomplished using manual methods, the erosion potential for the project is low. We expect that the entire sloped area in the backyard area of the property beyond the extent of the planned/existing deck areas will remain undisturbed by this construction. It would be most appropriate to perform construction work in dry weather, in order to reduce the potential for erosion control problems, especially given the presence of emergent water observed near the development area. A silt fence should be erected around the downslope sides of the work area. Existing vegetation and surface cover should remain undisturbed outside of the work area. Any small amounts of soil stockpiled on-site should be covered with plastic in wet weather. Care will have to be taken to prevent tracking of soil or mud off the site by trucks or workers.

We anticipate that potential obstructions within the development area may need to be clearing during construction to make room for foundations. Specifically, there are two stumps, 2 to 2.5 feet

diameter each, within the kitchen addition area that may need to be removed. Also, the is a 2 to 3 foot tall retaining wall adjacent to the new deck area made from concrete rubble that may need to be partially deconstructed. The contractor should plan accordingly for the potential need to clear these obstructions.

In order to satisfy the City of Mercer Island's requirements, we make the following statement:

> In our judgment, the development practices that we have recommended in this report should render the new construction as safe as if it were not located in a geologic hazard area.

We recommend including this report, in its entirety, in the project contract documents. This report should also be provided to any future property owners so they will be aware of our findings and recommendations.

SEISMIC CONSIDERATIONS

In accordance with the International Building Code (IBC), the site soil profile within 100 feet of the ground surface is best represented by Soil Profile Type D (Stiff Soil).

The dense sandy soils that will support the foundations will not liquefy under the ground motions of the Code-required Maximum Considered Earthquake (MCE), which has a 2 percent probability of occurrence in a 50-year time period (once in 2,475 years).

CONVENTIONAL FOUNDATIONS

If conventional spread footings are used to support the new addition, we recommend that they have minimum widths of 12 and 18 inches, respectively. Exterior footings should also be bottomed at least 18 inches below the lowest adjacent finish ground surface for protection against frost and erosion. The local building codes should be reviewed to determine if different footing widths or embedment depths are required. Footing subgrades must be cleaned of loose or disturbed soil prior to pouring concrete. Depending upon site and equipment constraints, this may require removing the disturbed soil by hand.

An allowable bearing pressure of 2,000 pounds per square foot (psf) is appropriate for footings supported on competent native soil. A one-third increase in this design bearing pressure can be used when considering short-term wind or seismic loads. For the above design criteria, it is anticipated that the total post-construction settlement of footings founded on competent native soil will be less than one-half-inch, with differential settlements on the order of one-quarter-inch in a distance of 25 feet along a continuous footing with a uniform load.

Lateral loads due to wind or seismic forces may be resisted by friction between the foundation and the bearing soil, or by passive earth pressure acting on the vertical, embedded portions of the foundation. For the latter condition, the foundation must be either poured directly against relatively level, undisturbed soil or be surrounded by level, well-compacted fill.

We recommend using the following ultimate values for the foundation's resistance to lateral loading:

PARAMETER	ULTIMATE VALUE
Coefficient of Friction	0.40
Passive Earth Pressure	300 pcf

Where: pcf is Pounds per Cubic Foot, and Passive Earth Pressure is computed using the Equivalent Fluid Density.

If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. The above ultimate values for passive earth pressure and coefficient of friction do not include a safety factor.

PIPE PILES

Two-inch diameter pipe piles can be used to support the isolated columns or structural wall supporting the kitchen addition, the spiral staircase, and the first-floor deck. Pile caps and grade beams should be used to transmit loads to the piles. A minimum of two piles should be used in isolated pile caps, in order to prevent eccentric loading on individual piles.

A 2-inch-diameter pipe pile driven with a minimum 90-pound jackhammer or a 140-pound Rhino hammer to a final penetration rate of 1-inch or less for one minute of continuous driving may be assigned an allowable compressive load of 3 tons. Extra-strong steel pipe should be used. The site soils are not highly organic, and are not located near salt water. As a result, they do not have an elevated corrosion potential. Considering this, it is our opinion that standard "black" pipe can be used, and corrosion protection, such as galvanizing, is not necessary for the pipe piles. Subsequent pipe sections should be connected together using threaded or slip couplers, or by welding. If slip couplers are used, they must fit snugly into the ends of the pipes. This can require that shims or beads of welding flux be applied to the couplers.

Lateral loads may be resisted by passive earth pressure acting on the vertical, embedded portions of the foundation. For this condition, the foundation must be either poured directly against relatively level, undisturbed soil or surrounded by level structural fill. We recommend using a passive earth pressure of 300 pounds per cubic foot (pcf) for this resistance. If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. We recommend a safety factor of at least 1.5 for the foundation's resistance to lateral loading, when using the above ultimate passive value.

LIMITATIONS

The conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our exploration and assume that the soil and groundwater conditions encountered in the test holes are representative of subsurface conditions on the site. Unanticipated conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking samples in test holes. Subsurface conditions can also vary between exploration locations. Such unexpected conditions often require making additional expenditures to attain a properly constructed project. It is recommended that the owner consider providing a contingency

fund to accommodate such potential extra costs and risks. This is a standard recommendation for all projects.

This report has been prepared for the exclusive use of John Banbury, Eva Banbury, and their representatives, for specific application to this project and site. Our conclusions and recommendations are professional opinions derived in accordance with our understanding of current local standards of practice, and within the scope of our services. No warranty is expressed or implied. The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. Our services also do not include assessing or minimizing the potential for biological hazards, such as mold, bacteria, mildew and fungi in either the existing or proposed site development.

ADDITIONAL SERVICES

Geotech Consultants, Inc. should be retained to provide geotechnical consultation, testing, and observation services during construction. This is to confirm that subsurface conditions are consistent with those indicated by our exploration, to evaluate whether earthwork and foundation construction activities comply with the general intent of the recommendations presented in this report, and to provide suggestions for design changes in the event subsurface conditions differ from those anticipated prior to the start of construction. However, our work would not include the supervision or direction of the actual work of the contractor and its employees or agents. Also, job and site safety, and dimensional measurements, will be the responsibility of the contractor.

During the construction phase, we will provide geotechnical observation and testing services when requested by you or your representatives. Please be aware that we can only document site work we actually observe. It is still the responsibility of your contractor or on-site construction team to verify that our recommendations are being followed, whether we are present at the site or not.

The following plates are attached to complete this report:

Plate 1	Vicinity Map
Plate 2	Site Exploration Plan
Plate 3 - 4	Hand Auger Logs

We appreciate the opportunity to be of service on this project. Please contact us if you have any questions, or if we can be of further assistance.

Respectfully submitted,
GEOTECH CONSULTANTS, INC.

David Crawford
Geotechnical Engineer

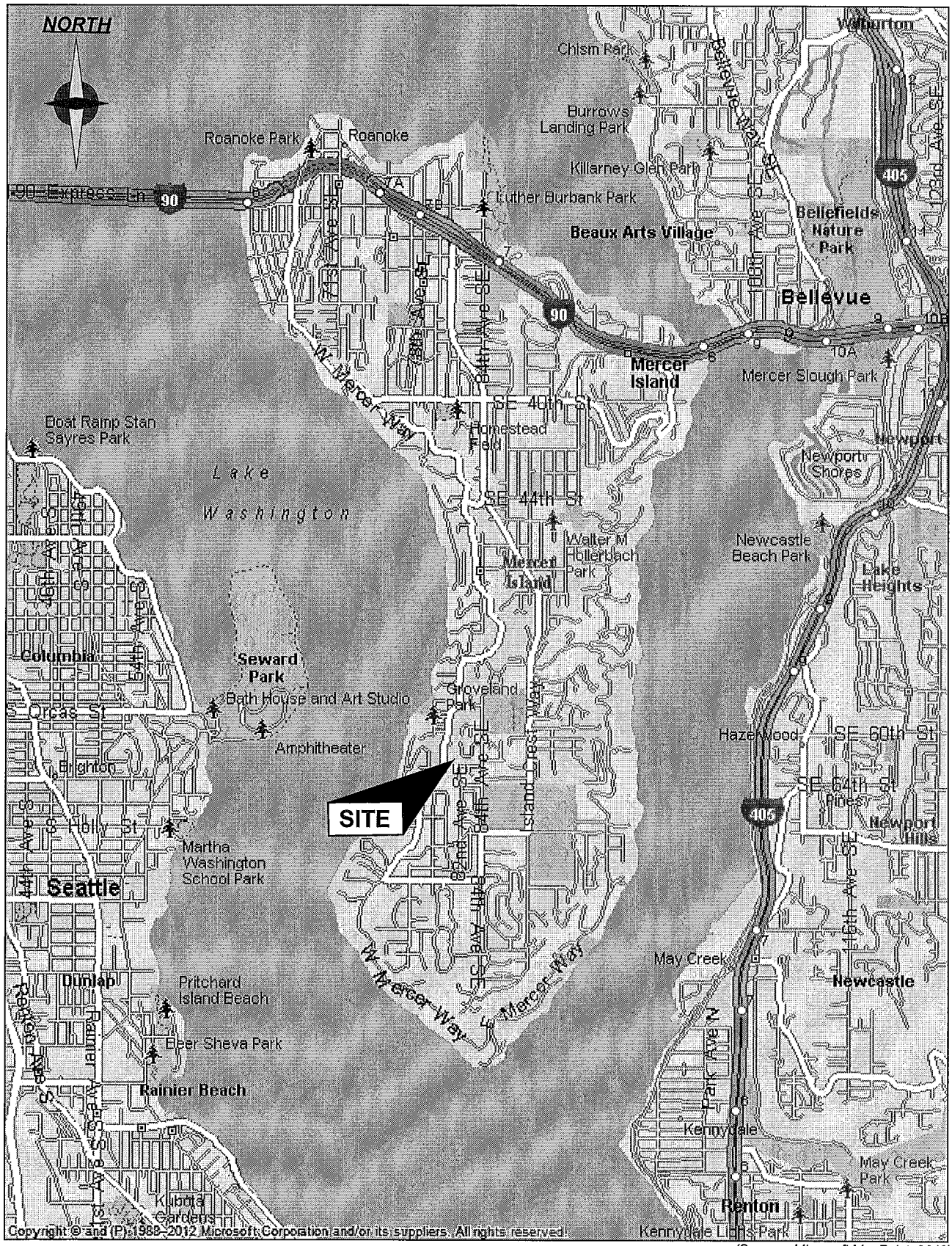
03/20/19
Marc R. McGinnis, P.E.
Principal

References:

Troost, Kathy G., and Wisher, Aaron P., 2009, Mercer Island Erosion Hazard Assessment.

Troost, Kathy G., and Wisher, Aaron P., 2009, Mercer Island Landslide Hazard Assessment.

DCC/MRM:kg



(Source: Microsoft MapPoint, 2013)

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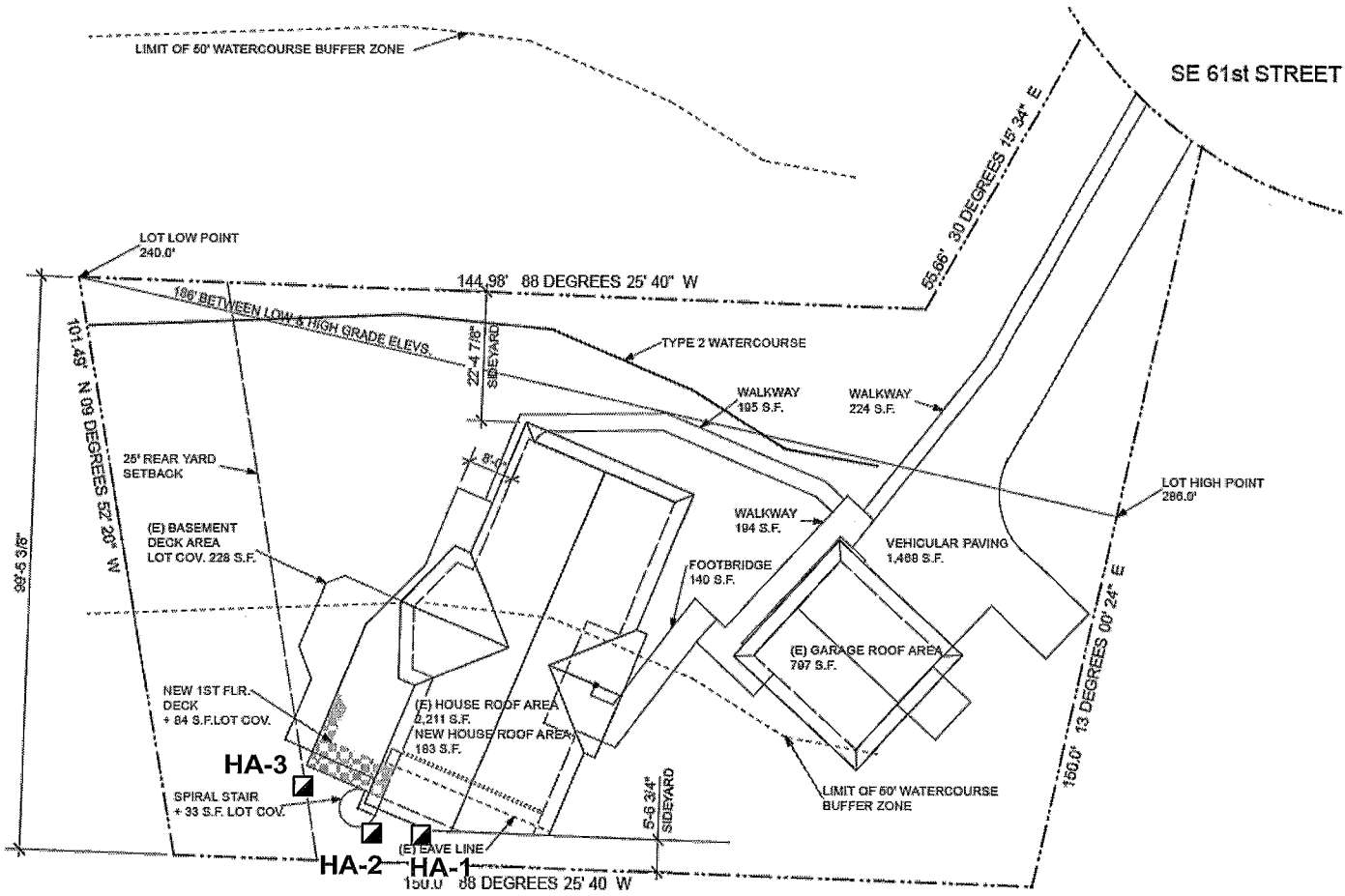
VICINITY MAP

8275 Southeast 61st Street
Seattle, Washington

Job No:	Date:		Plate:
19083	Mar. 2019		1



Legend:

Test Pit Location

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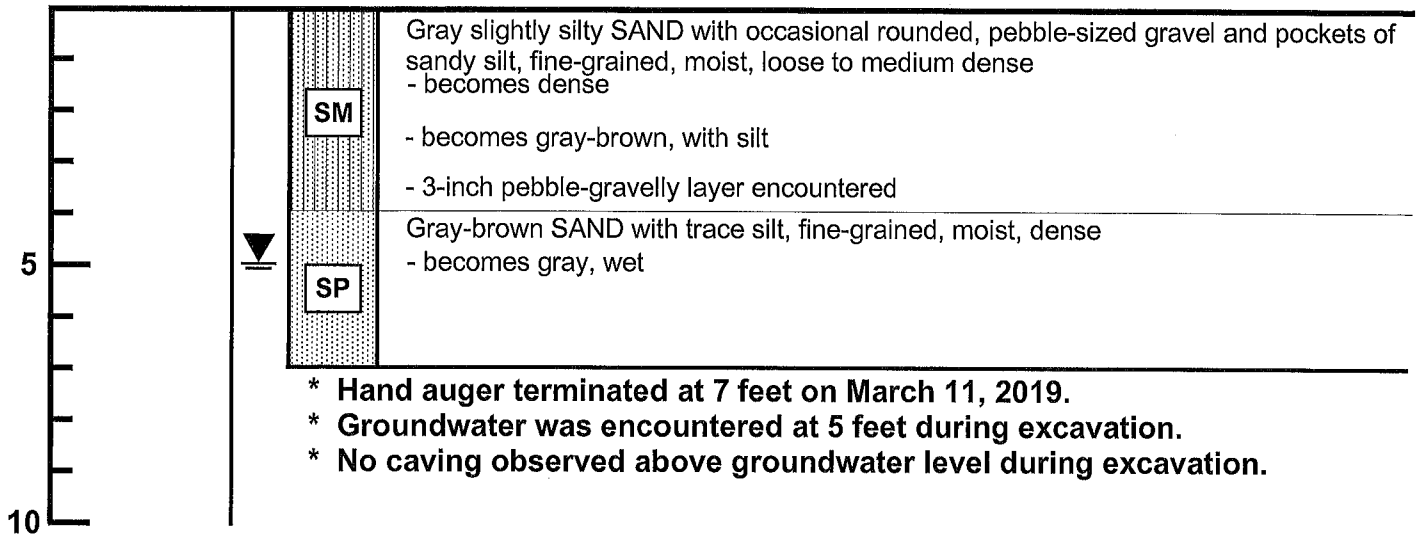
SITE EXPLORATION PLAN

8275 Southeast 61st Street
Seattle, Washington

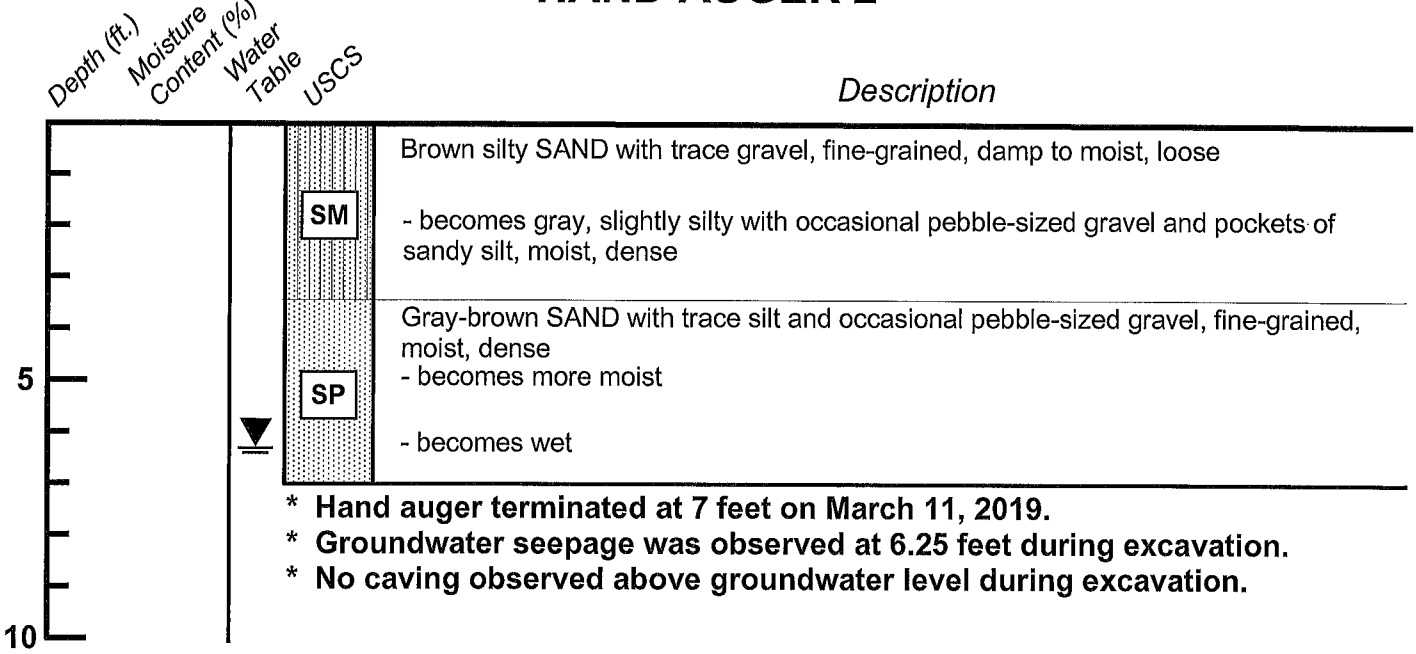
Job No:	Date:		Plate:
19083	Mar. 2019	No Scale	2

HAND AUGER 1



* **Hand auger terminated at 7 feet on March 11, 2019.**
* **Groundwater was encountered at 5 feet during excavation.**
* **No caving observed above groundwater level during excavation.**

HAND AUGER 2



* **Hand auger terminated at 7 feet on March 11, 2019.**
* **Groundwater seepage was observed at 6.25 feet during excavation.**
* **No caving observed above groundwater level during excavation.**

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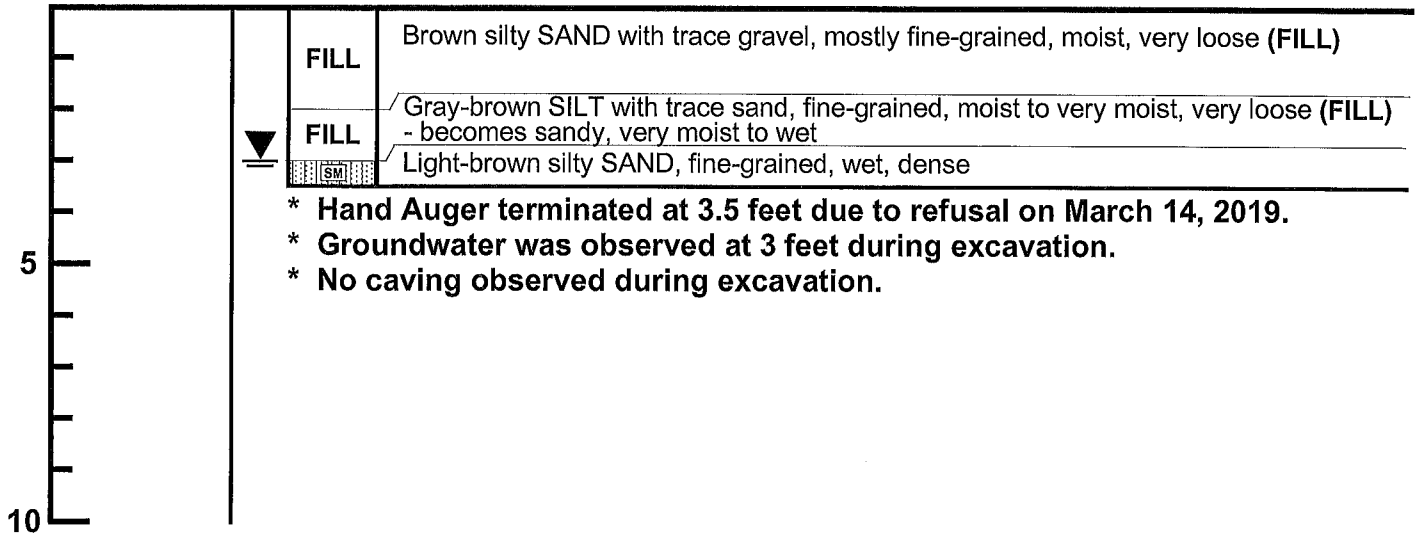
HAND AUGER LOG

8275 Southeast 61st Street
Mercer Island, Washington

Job	Date:	Logged by:	Plate:
19083	Mar. 2019	DCC	3

HAND AUGER 3



* **Hand Auger terminated at 3.5 feet due to refusal on March 14, 2019.**
* **Groundwater was observed at 3 feet during excavation.**
* **No caving observed during excavation.**

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HAND AUGER LOG

8275 Southeast 61st Street
Mercer Island, Washington

Job	Date:	Logged by:	Plate:
19083	Mar. 2019	DCC	4