

August 14, 2023

JN 23271

Jody and Eric Blohm
5642 East Mercer Way
Mercer Island, Washington 98040
via email: jody.blohm@comcast.net; eblohm@savills.us

Subject: **Geotechnical Engineering Study**
Proposed Deck / Roof Addition to Existing Residence
5642 East Mercer Way
Mercer Island, Washington

Greetings:

This report presents the findings and recommendations of our geotechnical engineering study for the site of the proposed deck / roof addition to an existing residence to be located at 5642 East Mercer Way on Mercer Island. The scope of our services consisted of exploring site surface and subsurface conditions, and then developing this report to provide recommendations for general earthwork and design considerations for foundations and critical area considerations. This work was authorized by your acceptance of our proposal, P-11434, dated August 2, 2023.

We were provided with architectural plans for the project that included topographic information from HhLo Design, which are dated April 4, 2023. Based on these plans, we understand that an existing deck along the eastern side of the residence will be removed and replaced with a similarly-sized deck. However, the larger, southern portion of the deck will be covered with a roof. The deck will extend off the main level, which is in the range of 9 feet above the outside ground.

If the scope of the project changes from what we have described above, we should be provided with revised plans in order to determine if modifications to the recommendations and conclusions of this report are warranted.

SITE CONDITIONS

SURFACE

The Vicinity Map, Plate 1, illustrates the general location of the site on the central-eastern side of Mercer Island. The property is nearly rectangular with its dimensions being approximately 100 feet by 300 feet; the long dimension is in the east-west direction. Although the property has an East Mercer Way address, it is not directly adjacent to that street. It is located west of a drive lane that resembles a street; this drive lane extends from East Mercer Way that begins a few blocks to the north/northwest of the property. This drive lane provides access to many houses in the area of the subject property.

The entire property slopes upward from the drive lane to East Mercer Way in generally an east/southeast direction. Directly adjacent to the lane, there is a steep slope with an inclination in the range of 50 to 60 percent whose height varies from about 8 to 10 feet. This slope is mostly covered with hedge-like vegetation. The property then has only a gentle inclination over a horizontal

distance of approximately 100 to 120 feet. This area contains the existing residence, and detached garage, a driveway, and yard. The residence has an existing main-level deck in the gently-sloped area that is located about 35 to 40 feet east of the top of the steep slope (that is near the drive lane). West of the gently-sloped area on the property slopes upward over a total vertical distance of about 70 feet up to East Mercer Way. However, the property only contains about 50 feet of this vertical distance (the remainder is on an adjacent property). The first, approximately 20 vertical feet of this slope has an inclination in the 45 to 50 percent range. Above this first, steeper portion, the slope above is only inclined in the 20 to 35 percent range up to East Mercer Way. The slope east of the gentle to moderate area on the property is covered with forest and landscape vegetation. We did not observe any indications of instability of the steep slopes on the site.

Most of the properties surrounding the subject property are developed with residences. However, based on Mercer Island GIS Portal, there is a watercourse on the adjacent northern property; this watercourse begins upslope of East Mercer Way and extends down to Lake Washington. We observed that water was flowing in this area during our recent visit. The watercourse is located in a swale; the top of the southern portion of the swale is near or just on the subject property.

Also based on the Mercer Island GIS portal, the entire property is noted as being a Potential Landslide Hazard Area and an Erosion Hazard Area. The above-noted swale is considered a Potential Seismic Hazard Area. Part of the steep slope that is on the western portion of the property is considered a Steep Slope Area. However, no known landslides are noted in the GIS information on or in the vicinity of the property.

SUBSURFACE

A test hole was hand-excavated just east of the southern, larger portion of the proposed deck. An attached Site Exploration Plan indicates the location of the test hole. The soils revealed in the test hole consist of a few inches of topsoil overlying native, silty sand with gravel soil. This native soil was initially relatively loose, but then became very dense at a depth of approximately 2 feet; the very dense soil is glacially-consolidated and known geologically as Glacial Till.

Our firm observed the excavation of test pits in the past on sites located adjacent to the north and just above the site to the southwest. We also obtained the logs of test pits excavated by others above and west of the site. Above the site, Glacial Till was revealed as the core soils in the test pits. To the north, dense to very dense or hard, glacially-consolidated soils (Glacial Till or silt) were revealed as the core soil in the test pits. We have included the logs of the test pits; these are for addresses at 5632, 5638, and 5650 East Mercer Way, respectively.

SEISMIC CONSIDERATIONS

In accordance with the International Building Code (IBC), the site class within 100 feet of the ground surface is best represented by Site Class Type C (Very Dense Soil and Soft Rock). As noted in the USGS website, the mapped spectral acceleration value for a 0.2 second (S_s) and 1.0 second period (S_1) equals 1.45g and 0.50g, respectively.

The IBC and ASCE 7 require that the potential for liquefaction (soil strength loss) during an earthquake be evaluated for the peak ground acceleration of the Maximum Considered Earthquake (MCE), which has a probability of occurring once in 2,475 years (2 percent probability of occurring in a 50-year period). The MCE peak ground acceleration adjusted for site class effects (F_{PGA})

equals 0.74g. The soils beneath the site are not susceptible to seismic liquefaction under the ground motions of the MCE because of their dense nature.

Sections 1803.5 of the IBC and 11.8 of ASCE 7 require that other seismic-related geotechnical design parameters (seismic surcharge for retaining wall design and slope stability) include the potential effects of the Design Earthquake. The peak ground acceleration for the Design Earthquake is defined in Section 11.2 of ASCE 7 as two-thirds (2/3) of the MCE peak ground acceleration, or 0.50g.

CONCLUSIONS AND RECOMMENDATIONS, AND CRITICAL AREAS STUDY

GENERAL

THIS SECTION CONTAINS A SUMMARY OF OUR STUDY AND FINDINGS FOR THE PURPOSES OF A GENERAL OVERVIEW ONLY. MORE SPECIFIC RECOMMENDATIONS AND CONCLUSIONS ARE CONTAINED IN THE REMAINDER OF THIS REPORT. ANY PARTY RELYING ON THIS REPORT SHOULD READ THE ENTIRE DOCUMENT.

The test hole that was excavated in the area of the deck/roof, as well as the nearby test pits, indicate that the soil at shallow depths at the deck and in the vicinity of the residence are very dense/hard, and glacially-consolidated. Specifically, very dense, Glacial Till soil was revealed at approximately 2 feet adjacent to approximately the east edge of the larger, southern portion of the proposed deck/roof. The foundations of the deck/roof can consist of conventional footings provided they bear on the very dense soil.

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.

CRITICAL AREAS STUDY (MICC 19.07)

Potential Landslide Hazard Area: The entire property of the subject site is located within a mapped Potential Landslide Hazard area. However, the area where the new deck/roof are proposed has an inclination of only about 10 percent, which is quite gentle. An 8- to 10-foot-tall slope is located about 35 to 40 feet east and downslope of the proposed deck/roof area, while a much taller steep slope is located between about 35 feet and 90 feet west and upslope of the deck/roof area. The existing residence, garage, and/or driveway are essentially located between the slope and the proposed deck/roof area. We did not observe indications of instability of the steep slopes or gentle slopes on the property, and no past landslides are noted in the vicinity of the property. As noted previously, the core of the subject property and adjacent properties upslope is comprised of very dense/hard glacially-consolidated soils, mostly Glacial Till. These soils have a very high internal shear strength, and thus a quite low potential for deep seated landslides and are excellent in supporting building loads. Because of the existence of the very dense/hard soils, because the foundations of the deck/roof will bear in these soils, and because there are no known landslides in the area, it is our professional opinion that there is not a potential for a landslide affecting the proposed deck/roof.

Steep Slope Hazard Areas: Based on the topographic survey for the site, the eastern steep slope that is 10 feet tall meets Mercer Island's code criteria for a Steep Slope Hazard. The taller steep slope on the western portion of the site is also a Steep Slope Hazard; such a hazard also qualifies

as a Landslide Hazard Area under the Mercer Island Code. As discussed in the previous section, very dense/hard soil is the core soil of the property and vicinity, and the new deck/roof foundations will bear in these soils. Because of this, and because the deck will be located at least 35 feet from the steep slopes, which do not show indications of instability and there are no previous nearby landslides, we believe the location of the deck/roof is very suitable in our opinion. Provided that the recommendations in this report are incorporated into the project plans and construction, the construction of the new structure is very suitable in our professional opinion. The setback distance the deck/roof structure will be located from the steep slopes is very suitable in our opinion.

Seismic Hazard Area: This Hazard Area is mostly located north of the property where a swale exists. The Hazard is shown on the GIS portal as extending just into the northern edge of the property. As noted earlier, the core soil of the property and nearby properties is very dense/hard, glacially-consolidated soil. Because of this, it is our professional opinion that the property does not meet the criteria for a Seismic Hazard Area. The new foundations will bear on the underlying very dense/hard soils, and no additional mitigation to address the mapped seismic hazard is warranted from a geotechnical perspective at this time.

Erosion Hazard: The site also meets the City of Mercer Island's criteria for an Erosion Hazard Area. However, because the work area for the proposed deck/roof structure is located in only a gently-sloped area and excavations for the project will be minimal. Thus, typical erosion control measures will be very suitable to suitably control the potential of erosion. One of the most important considerations, particularly during wet weather, is to immediately cover any bare soil areas to prevent accumulated water or runoff from the work area from becoming silty in the first place. A wire-backed silt fence should be erected as close as possible to the east side of the planned work area, and the existing vegetation (mostly yard grass) east of the silt fence. Straw wattles may also be used in tandem with the silt fence as needed. Also, any soil stockpiles should be covered with plastic during wet weather. Soil stockpiles should be minimized. Following rough grading, it may be necessary to mulch or hydroseed bare areas that will not be immediately covered with landscaping or an impervious surface.

Buffers and Mitigation: The recommendations presented in this geotechnical report are intended to allow the project to be constructed in the proposed configuration without adverse impacts to critical areas on the site or the neighboring properties. The geotechnical recommendations associated with foundations will mitigate any potential hazards associated with the Steep Slope and Erosion Hazard, as well as the mapped Seismic Hazard. No buffers are needed in our opinion. No buffer is required by the MICC for an Erosion Hazard Area.

Statement of Risk: In order to satisfy the City of Mercer Island's requirements, a statement of risk is needed. As such, we make the following statement:

Provided the recommendations in this report are followed, it is our professional opinion that the recommendations presented in this report for the proposed deck/roof structure will render the development as safe as if it were not located in a geologically hazardous area and will not adversely impact critical areas on adjacent properties.

CONVENTIONAL FOUNDATIONS

The proposed structure can be supported on conventional continuous and spread footings bearing on competent, undisturbed, very dense/hard, native soil. We recommend that continuous and individual spread footings have minimum widths of 12 and 16 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 as noted above. A one-third increase in this design bearing pressure may be used when considering short-term wind or seismic loads.

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	0.50
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.

EXCAVATIONS AND SLOPES

No excavation taller than about 3 feet is anticipated for this project. Temporary excavation slopes should not exceed the limits specified in local, state, and national government safety regulations. Also, temporary cuts should be planned to provide a minimum 2 to 3 feet of space for construction of foundations, walls, and drainage. Temporary cuts to a maximum overall depth of about 4 feet may be attempted vertically in unsaturated soil, if there are no indications of slope instability. However, vertical cuts should not be made near property boundaries, or existing utilities and structures. Based upon Washington Administrative Code (WAC) 296, Part N, the soil at the subject site would generally be classified as Type B. Therefore, temporary cut slopes greater than 4 feet in height should not be excavated at an inclination steeper than 1:1 (Horizontal:Vertical), extending continuously between the top and the bottom of a cut.

The above-recommended temporary slope inclination is based on the conditions exposed in our explorations, and on what has been successful at other sites with similar soil conditions. It is possible that variations in soil and groundwater conditions will require modifications to the inclination at which temporary slopes can stand. Temporary cuts are those that will remain unsupported for a relatively short duration to allow for the construction of foundations, retaining walls, or utilities. Temporary cut slopes should be protected with plastic sheeting during wet weather. It is also important that surface runoff be directed away from the top of temporary slope cuts. Cut slopes should also be backfilled or retained as soon as possible to reduce the potential for instability. Please note that loose soil can cave suddenly and without warning. Excavation,

foundation, and utility contractors should be made especially aware of this potential danger. These recommendations may need to be modified if the area near the potential cuts has been disturbed in the past by utility installation, or if settlement-sensitive utilities are located nearby.

Water should not be allowed to flow uncontrolled over the top of any temporary or permanent slope. All permanently exposed slopes should be seeded with an appropriate species of vegetation to reduce erosion and improve the stability of the surficial layer of soil.

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 borings are representative of subsurface conditions on the site. If the subsurface conditions encountered during construction are significantly different from those observed in our explorations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. Unanticipated conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking samples in test borings. Subsurface conditions can also vary between exploration locations. Such unexpected conditions frequently 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 Jody and Eric Blohm, 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.

ADDITIONAL SERVICES

In addition to reviewing the final plans, 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:

- Vicinity Map
- Site Exploration Plan
- Test Hole Log
- Logs of Nearby Test Pits

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.



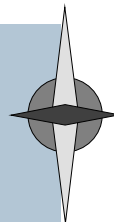
8/14/2023

D. Robert Ward, P.E.
Principal

cc: HhLodesign – Henry Lo
via email: hhlodesign@gmail.com

DRW:kg

NORTH



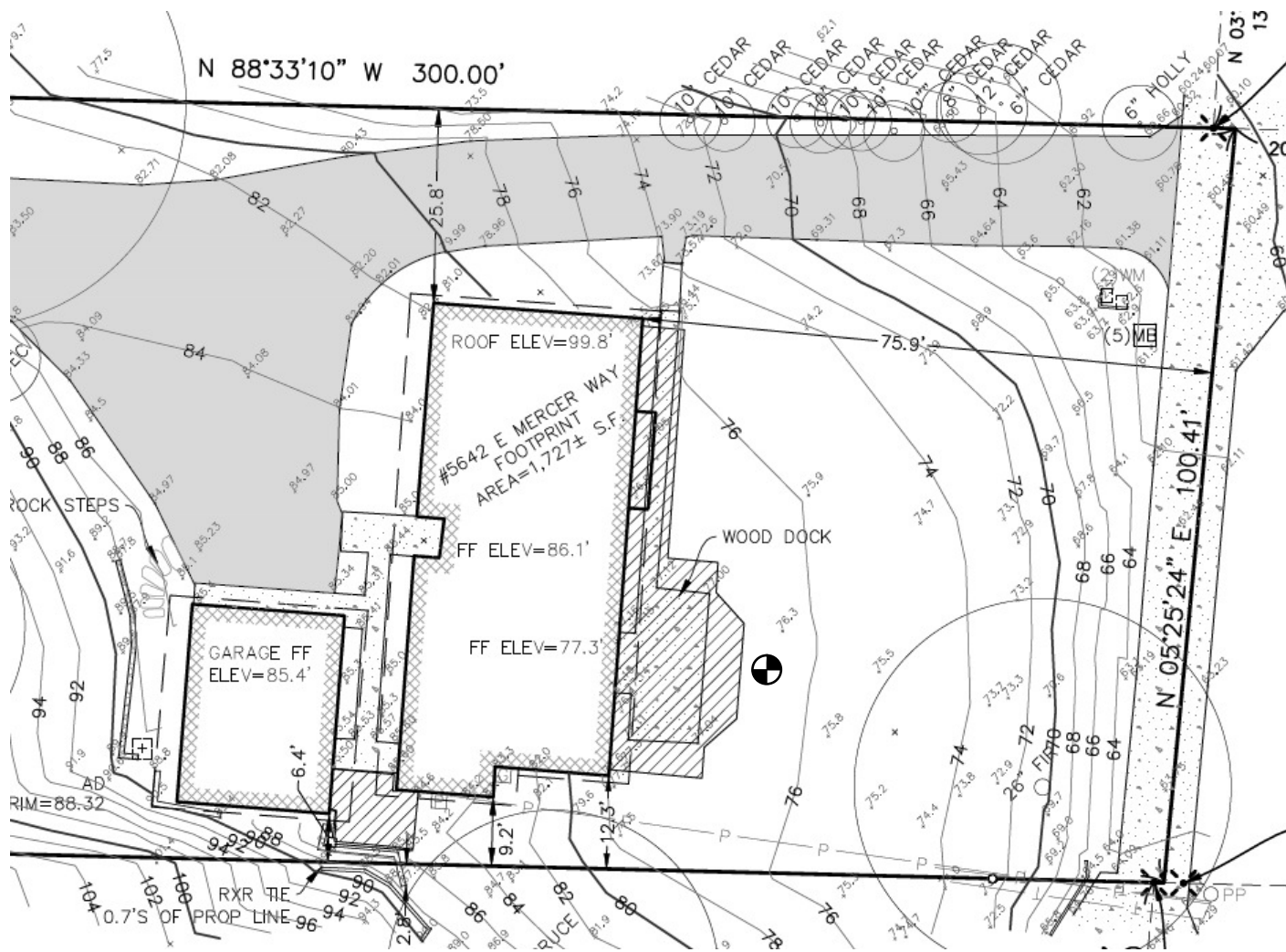
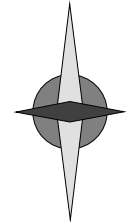
(Source: Microsoft MapPoint, 2013)



VICINITY MAP
5642 East Mercer Way
Mercer Island, Washington

Job No: 23271	Date: Aug. 2023	Plate:
------------------	--------------------	--------

NORTH



Legend:

 Test Hole Location



SITE EXPLORATION PLAN
5642 East Mercer Way
Mercer Island, Washington

Job No: 23271	Date: Aug. 2023	No Scale	Plate:
------------------	--------------------	----------	--------

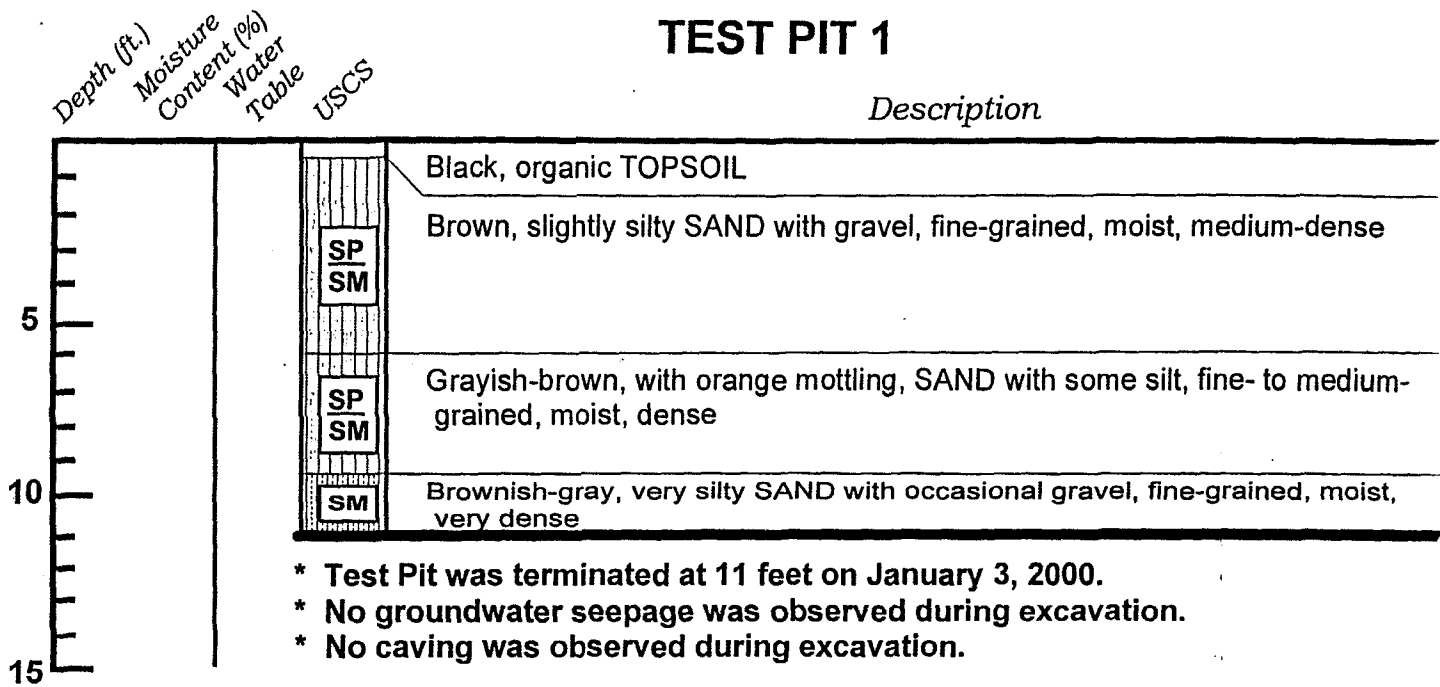
TEST HOLE LOG

TEST HOLE

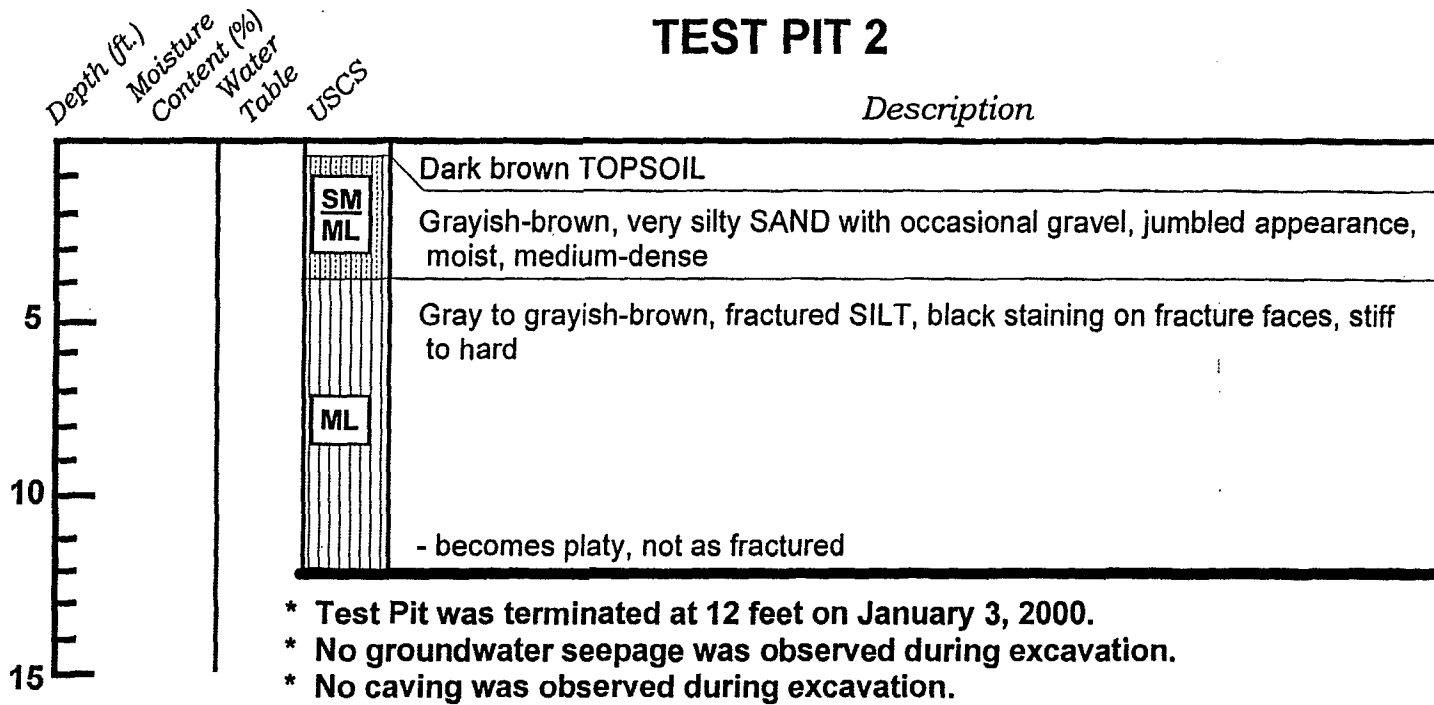
Depth (feet)	Soil Description
0 – 0.25	Sod and topsoil
0.25 – 3.0	Brown, silty Sand with minor organics, moist, loose to medium-dense - at 2 feet, becomes gray, no organics, very dense (Glacial Till) [SM]

The test hole was terminated at 3 feet on August 5, 2023.
No groundwater seepage was encountered.

TEST PIT 1



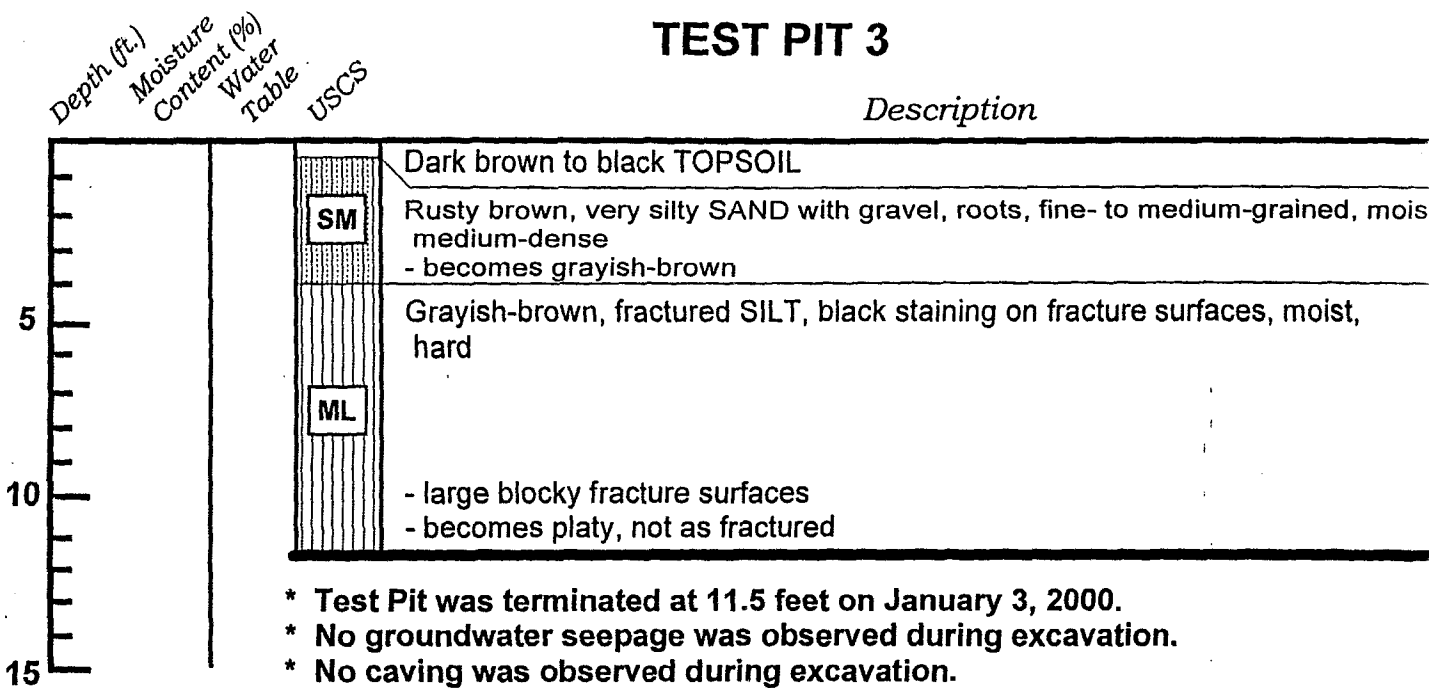
TEST PIT 2



TEST PIT LOG
 56xx East Mercer Way
 Mercer Island, Washington

Job No: 00007	Date: January 2000	Logged by: TAJ	Plate: 3
------------------	-----------------------	-------------------	-------------

TEST PIT 3



TEST PIT LOG
56xx East Mercer Way
Mercer Island, Washington

Job No: 00007	Date: January 2000	Logged by: TAJ	Plate: 4
-------------------------	------------------------------	--------------------------	--------------------

EXPLORATION PIT LOG

Number EP-1

0	Topsoil/roots.
	Loose, moist, brown, mottled, gravelly, fine SAND, some gravel, many roots. (Regolith)
5	Very dense, moist, brown, gravelly, silty, fine SAND with zones of hard; laminated silt. (Lodgement Till)
10	BOH @ 8' Note: No seepage; no caving.
15	

Number EP-2

0	8" Topsoil/roots.
	Loose, moist, brown, silty, fine SAND, many roots. (Regolith)
5	Dense to very dense, moist, yellow-brown, silty, fine SAND; trace silt, coarser grained and wetter with depth. (Advance Outwash)
10	BOH @ 6' Note: No seepage; no caving.
15	

Subsurface conditions depicted represent our observation at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Reviewed By

ghb

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701

Single Family Residence
Mercer Island, Washington
Project No. G96065A

EXPLORATION PIT LOG

Number EP-3

0

Loose, moist to wet, brown, mottled, silty, fine SAND, some gravel. (Regolith)

Very dense, wet, brown, gravelly, silty, fine SAND; blocks of hard silt. (Lodgement Till)

5

BOH @ 6-1/2'

Note: No seepage; no caving.

10

15

Number EP-4

0

8" Topsoil/roots.

Loose, moist to wet, brown, silty, fine SAND, trace gravel, many roots. (Regolith)

5

Hard, moist, brown, sandy SILT. (Lodgement Till)

BOH @ 5-1/2'

Note: No seepage; no caving.

10

15

Subsurface conditions depicted represent our observation at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Reviewed By

ghb

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206-827-7701

Single Family Residence
Mercer Island, Washington
Project No. G96065A

EXPLORATION PIT LOG

Number EP-5

0

Topsoil/root zone.

Loose, moist to wet, brown, silty, fine SAND, some gravel, many roots. (Regolith)

Very dense, moist, brown-gray, gravelly, silty, fine SAND. (Lodgement Till)

5

BOH @ 5-1/2'

Note: No seepage; no caving.

10

15

Number

0

5

10

15

Subsurface conditions depicted represent our observation at the time and location of this exploratory hole, modified by geologic interpretation, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or interpretation by others of information presented on this log.

Reviewed By

ghb

Associated Earth Sciences, Inc.
911 Fifth Avenue, Suite 100
Kirkland, Washington 98033
Phone: 206 827 7704

Single Family Residence
Mercer Island, Washington
Project No. G96065A

TEST PIT 1

LOGGED BY: DBG

DEPTH (FT.)	MOIST. (%)	USCS	DESCRIPTION	ELEVATION =
0		SM	Brown Silty SAND, Moist, Loose (Fill)	
15.6		SM	Dark Brown Organic Silty SAND, Moist, Loose (Topsoil)	
		SM	Gray Very Silty SAND, Moist, Medium Dense	
		SM	Mottled SAND and SILT, Moist to Wet, Medium Dense	
		SM	Gray Silty Gravelly SAND, Moist, Dense (Glacial Till)	
10			Test Pit terminated on 3/25/87 at 8.5 feet below existing grade. No groundwater seepage was encountered during excavation.	
15				

TEST PIT 2

DEPTH (FT.)	MOIST. (%)	USCS	DESCRIPTION	ELEVATION =
0		SM	Tan to Gray Silty SAND, Moist, Medium Dense to Dense with depth	
13.9		SM	Gray Silty Slightly Gravelly SAND, Moist, Dense (Glacial Till)	
		SP	Gray SAND, Moist, Dense	
10				
15				



**GEOTECH
CONSULTANTS**

TEST PIT LOGS
5650 EAST MERCER WAY
MERCER ISLAND, WASHINGTON

JOB NO. 87063

PLATE 3