

September 12, 2025  
Project No. 23-017

Mr. David Do  
4649 Forest Ave SE  
Mercer Island, WA 98040

Subject: Geotechnical Services Report Addendum – Seismic Evaluation  
Beachfront DADU  
4649 Forest Ave SE, Mercer Island, Washington

This letter addresses the city request for additional subsurface information and characterization to further evaluate potential seismic hazard issues with the project site.

### **Background/Existing Conditions**

The area of the subject property where a new DADU is proposed is currently developed with a decades old small beach cottage that is quite debilitated and currently used as a storage shed. According to the Mercer Island geological hazard maps the property is classified as a critical area due to landslide, erosion and seismic hazards. Based on the current plans the existing beach cottage/shed will be demolished and a new 864 square foot DADU will be constructed on the site. Access to the property is via a trail and stairs down the slope from the existing main residence to the beach.

The subject building site is located at beach level on the far western portion of the overall property. The property begins along the west side of the Forest Ave SE right of way and extends approximately 425 feet to the west, well beyond the existing shoreline. An existing residence is located on the upper portion of the property adjacent to the street. Landscaping and stairs and a portion of a steep concrete driveway occupy the midportion of the parcel. Near beach level the parcel is nearly flat and contains the old cottage/shed and a boat dock. The shoreline is protected from erosion with a rockery. The steep concrete driveway leads to an existing residence that is on the adjacent property to the south. The adjacent residence to the south and the adjacent residence to the north, are both located at beach level and presumably on similar soil conditions.

### **Subsurface Exploration**

On August 1, 2025, a limited access Acker drill rig was mobilized to the site by Geologic Drill Partners, Inc. This small, limited access drill rig was necessary as access for any larger type of drill rig was inordinately difficult.

Two borings were drilled for this small project and small site. The approximate boring locations were measured from existing features at the site and are indicated on the attached Site & Exploration Plan. The borings were drilled to the maximum capacity of the Acker drill rig.

Soil samples were obtained from the borings at 2 ½ and 5-foot intervals in general accordance with Standard Penetration Test (SPT) sampling methods (ASTM test method D-1556) in which the samples are obtained using a 2 inch outside diameter split spoon sampler. The sampler was driven into the soil 18 inches using a 140-pound weight falling a distance of 30 inches. The number of blows required for each 6-inch increment of sampler penetration was recorded. The number of blows required to achieve the last 12 inches of sampler penetration is defined as the SPT N-value. The N-value provides an empirical measure of the relative density of cohesionless soil, or the relative consistency of fine-grained soils. After auger withdrawal the borings were backfilled with drill cuttings and bentonite chips in accordance with Department of Ecology guidelines. A licensed engineering geologist was present throughout the field exploration to observe the drilling, assist in sampling, and to document the soil samples obtained from the borings.

Boring EB-1 was drilled to 20 feet. The upper 15 feet consisted of medium stiff to stiff, silt with some sand to sandy silt. At a depth of 20 feet about 2 ½ feet of heaving sand into the auger was encountered and a soil sample was unable to be taken at that depth. The sample above at 15-16 ½ feet, and observations from the driller, indicated a contact between fine grained and granular soil at a depth of about 16 feet. Stiff to very stiff, brown silt to sandy silt was observed to be overlying medium dense to dense, gray, gravelly sand.

Boring EB-2 was drilled to 20 feet and sampled to 21 ½ feet. No further drilling could be done as the hard silt/clay soil bound up the auger such that it could not be turned. Observed soils above the hard silt/clay consisted entirely of stiff to very stiff, silt with trace sand to sandy silt.

### *Groundwater*

No significant amount of ground water was observed in either boring. Saturated soil was observed about 6 feet deep in EB-1 and minor seepage was observed at about 8 feet depth in EB-2. The fine grained soil likely smeared the sides of the borings and restricted ground water flow into the borings. Given the nearness to the lake, ground water will ultimately reflect the lake level which is about 5 feet below ground surface on the west side of the site.

### *Other Nearby Studies*

There have been multiple geotechnical studies performed all along the properties on Forest Ave SE. These studies were previously reviewed during our original geotechnical evaluation of the subject site. The most meaningful studies were for the property immediately adjacent to the site (4651 Forest Ave SE) and the next property to the south (4661 Forest Ave SE) as they are very near the subject site and have at least one exploration boring or pit at the same elevation as our current borings for the site. These explorations confirm our findings. Copies of exploration pit

TH-2, approximate elevation 22 feet, from 4651 Forest Ave SE and exploration boring PG-1, approximate elevation 22 feet, from 4661 Forest Ave SE are attached. It should be noted that the blow counts (N-value) from TH-2 were derived from a Porter Sampler which can be roughly converted (correlated) to SPT values. The Porter penetration resistance in blows per 6 inches approximately correlates to the SPT values in blows per foot.

## Site Geology

According to the Geology Map of Mercer Island, by Troost and Wisher, 2006, the site is mapped as Pre-Olympia fine grained non-glacial deposits (Qponf) overlying Pre-Olympia non-glacial deposits. The beach area where the planned DADU will be located is mapped as Holocene lake deposits (Ql). As stated in our previous geotechnical report, dated January 30, 2024, it is our opinion that the mapped lake deposits are reworked old landslide deposits. Also as previously stated, nearby studies where exploration borings have been placed into the near shore environment (lake deposits) have indicated that the materials are generally disturbed silt sediments overlying glacially consolidated silt/clay sediments.

Exploration borings EB-1 and EB-2 both encountered about 4 feet of disturbed material in the upper portion of the borings. In B-1 the soil had a disturbed matrix and in B-2 there was a slight blocky texture. This soil was medium stiff (B-1) closest to the lake and very stiff (B-2) furthest from the lake. Both samples consisted of moist, gray silt with some sand. This is most likely old fill soil but could also be colluvium from upslope sources.

Underlying this disturbed appearing soil was 9 to 12 feet of medium stiff to very stiff, gray silt with some sand to sandy silt with occasional pebbles and several small (1/2 inch thick) sand interbeds. Based on the density of this soil unit and lack of any organic material, we interpret this soil unit to be old landslide deposits from upslope sources and not lake deposits, as mapped on the published map for the area. This is in agreement with multiple studies in the area by others.

Below the old landslide deposits, the material in each boring was significantly different. At a depth of 15 ½ feet in EB1 the soil changed from silt to well sorted, medium sand with gravel. This material was medium dense (nearly dense) and based on drilling action appeared to extend to the bottom of the boring at a depth of 20 feet. As stated above, heaving sand into the auger prevented additional sampling of this material.

In EB-2, on the east side of the planned building pad, the soil changed at a depth of 13 feet from sandy silt to very stiff, becoming hard with depth, silty clay to clayey silt. Although a sample was able to be attained from 20 to 21 ½ feet, the auger could not be further advanced into the hard silt/clay with the limited access drill rig.

This lower material in each boring is consistent with the pre-Olympia nonglacial deposits mapped at the site. The high SPT-N values indicate that this material has been glacially overridden and consolidated.

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## CONCLUSIONS AND RECOMMENDATIONS

The findings in the two recently drilled exploration borings confirm the soil conditions encountered in the Hand Borings previously placed on the site for our January 30, 2024, geotechnical report. As such, our recommendations remain the same. Soil with a potential for liquefaction is typically cohesionless, poorly sorted, fine to medium sand and must be loose and below the groundwater table. Although most of the soil underlying the planned building site will be below water table as influenced by the nearby lake level, the soil is predominantly fine-grained deposits. In the upper 15 feet only very thin (1/2 inch thick) sand seams were observed. Below a depth of 15 feet in exploration boring EB-1, nearest the lake, medium dense to dense, well graded sand with gravel was observed. However, the well graded soil matrix and density of this material is sufficient to mitigate liquefaction potential.

Based on these conditions, in our professional opinion, the liquefaction potential of the site is negligible and neither additional liquefaction analysis nor design considerations related to soil liquefaction are necessary for this project. The geotechnical recommendations provided in our January 30, 2024, technical report should be followed for design of the project.

Our findings and recommendations provided in this report were prepared in accordance with generally accepted principles of engineering geology and geotechnical engineering as practiced in the Puget Sound area at the time this report was submitted. We make no other warranty, either express or implied.

Respectfully submitted,

  
  
**Gary A. Flowers**

Gary A. Flowers, P.G., P.E.G.  
Principal Engineering Geologist


Robert M. Pride, P.E.  
Geotechnical Engineer

Attachments: Site & Exploration Plan  
Exploration Borings EB-1 & EB-2  
Previous Test Hole #2 for 4651 Forest Ave SE  
Previous Exploration Boring PG-1 for 4661 Forest Ave SE



# EXPLORATION BORING LOG

Number **EB-1** PAGE 1 OF 1

SEDIMENT DESCRIPTION	DEPTH	SAMPLE GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot			
			10	20	30	40
Medium stiff, moist, gray silt with some sand, disturbed matrix (fill?).		3 4	8 ▲			
Medium stiff, moist, gray silt with some sand, slightly plastic.	5	3 3 3 4 A.T.D.	6 ▲			
Stiff, saturated, gray sandy silt with occasional pebbles.		3 4 6	10 ▲			
Very stiff, saturated, brown, sandy silt.	10	6 9 10		19 ▲		
Upper 6" - Very stiff, saturated, brown sandy silt.	15	7				
Lower 12" Medium dense, saturated, gray, medium sand with gravel, well sorted.		12 15		27 ▲		
Drilled to 20 ft. 2 1/2 feet of heave. Cannot sample. Bottom of boring at 20 feet.	20					

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, 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.

# EXPLORATION BORING LOG

Number **EB-2** PAGE 1 OF 1

SEDIMENT DESCRIPTION	DEPTH	SAMPLE GROUND WATER	STANDARD PENETRATION RESISTANCE Blows/Foot			
			10	20	30	40
Stiff to very stiff, moist, gray silt with some sand, slight blocky texture.	5	5 7 8		▲15		
Medium stiff, moist, tannish gray silt, with some sand.		4 6 7		▲13		
Very stiff, moist, gray silt, with some sand.	10	7 8 8		▲16		
Very stiff, very moist, gray, sandy silt, small 1/2-inch sand interbeds.		9 10 10			▲20	
Very stiff, very moist, gray, silty clay to clayey silt.	15	9 12 14			26▲	
Hard, very moist, gray, silty clay to clayey silt.	20	18 22 24				46▲
Auger unable to turn further. Bottom of boring at 21-1/2 feet. Free water was not observed in the boring at the time of drilling. Very small groundwater seep observed at 8 feet.						

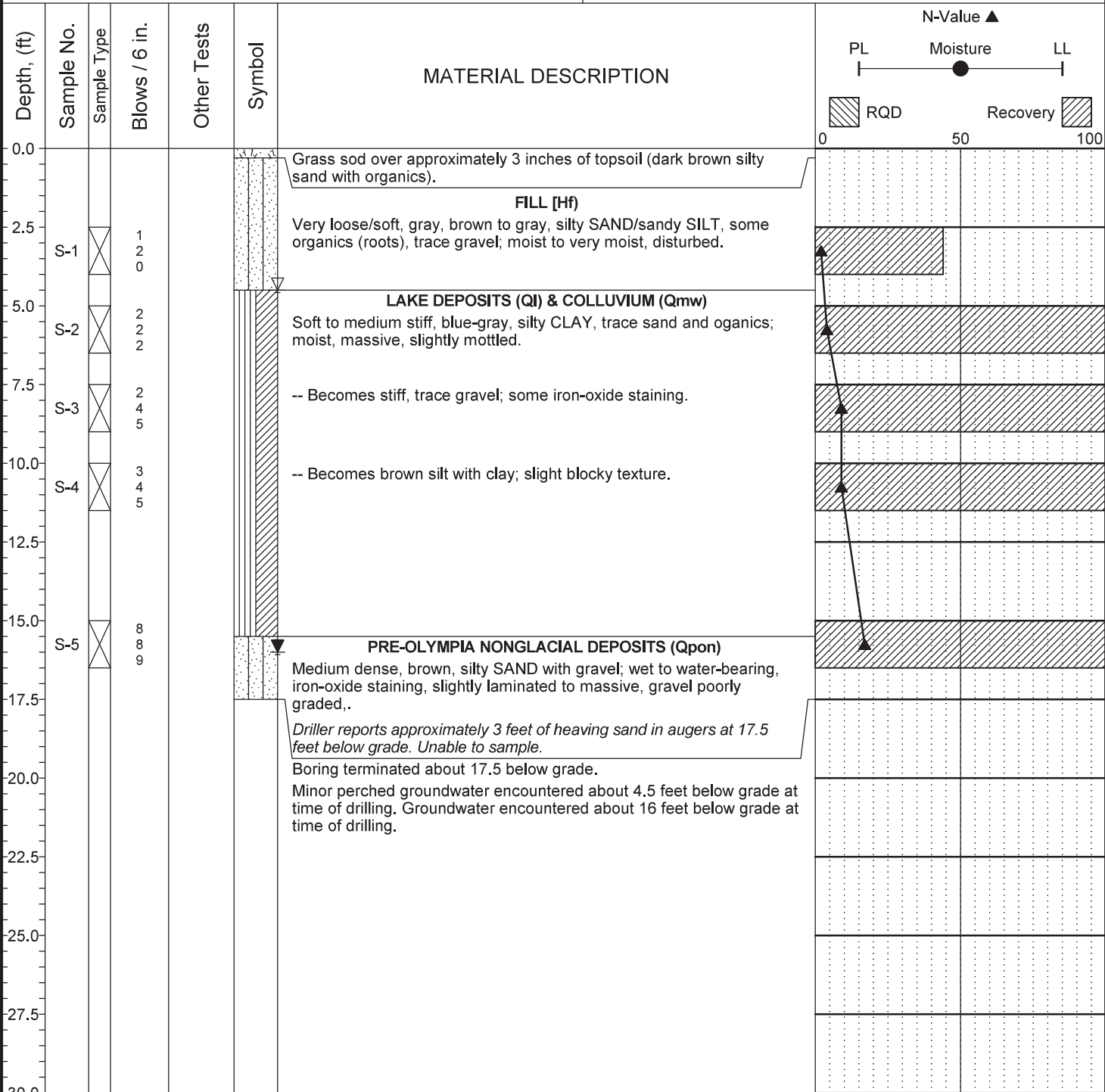
Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by geologic interpretations, engineering analysis, and judgment. They are not necessarily representative of other times and locations. We will not accept responsibility for the use or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

JAMES EATON, 1988  
4651 FOREST AVE SE  
TEST HOLE #2 - APPROXIMATE ELEVATION 22 FEET

#2

- 0' - (6) Variable brown sandy loam and clayey loam (fill)  
(9)
- 2.0' - (3) Medium brown sandy clayey silt w/ pockets of silty sand  
(9) and clasts of clay to 6" across, occasional gravel  
(9) (ancient slide debris)
- 4.0' - (8)  
(13)  
(16)
- 6.0' - (6) Sand grades out  
(15)  
(20)
- 8.0' - (9)  
(15) Light gray silty clay below 8-1.2 ft.  
(24)
- 10.0' - (8)  
(21)  
(30)
- 12.0' - (12)  
(30)  
(22)
- 14.0' - (8) Brown well graded sand  
(13)  
(26)
- 15.5' - Completed 3-1-88; groundwater level at 7.8' 3-2-88'  
backfilled 3-2-88.

Project:	Zimmer Residence	Surface Elevation:	~22 ft
Job Number:	21-552	Top of Casing Elev.:	n/a
Location:	4661 Forest Ave SE, Mercer Island, WA	Drilling Method:	HSA
Coordinates:	Northing: 47.56205, Easting: -122.23109	Sampling Method:	SPT



Completion Depth:	17.5ft	Remarks: Hand-portable Acker drill rig used. Standard Penetration Test (SPT) sampler driven with a 140 lb. safety hammer. Hammer operated with a rope and cathead mechanism. This surface elevation is estimated from topographic survey prepared by Bush, Roed & Hitchings, Inc., dated June 4, 2021. <b>Vertical datum: NAVD 88.</b>
Date Borehole Started:	12/15/21	
Date Borehole Completed:	12/15/21	
Logged By:	S. Harrington	
Drilling Company:	Geologic Drill Partners	