

September 22, 2020
File No.19-338.500

Ms. Maya Nader
5472 West Mercer Way
Mercer Island, WA 98040

**Subject: Geologic Hazards Assessment
Single-Family Residence Remodel
5472 West Mercer Way, Mercer Island, WA**

Dear Ms. Nader:

As requested by you and your architect, Patricia Brennan Architects, PanGEO, Inc. completed a geologic hazards assessment to assist you with permitting your remodel project at the above referenced address. Our service scope included reviewing readily available geologic data, a site reconnaissance, and developing the conclusions presented in this letter.

SITE AND PROJECT DESCRIPTION

The subject property is located at 5472 West Mercer Way in Mercer Island, Washington. The approximately 44,220 square-foot irregularly shaped property is generally bound to the south and west by single-family residences, to the north by an undeveloped parcel, and to the east/northeast by a ravine. A single-family residence constructed in 1951 currently occupies the central portion of the site.

A topographic survey was not available at the time of our study. However, based on a review of topographic information available online, the existing residence is constructed on the east side of a relatively level ridge and the basement level is benched into the east side of the ridge. On the north/northeast side of the residence, slope gradients descend up to about 20 vertical feet at estimated gradients of about 20 to 30 percent to the bottom of a ravine. Please refer to Plate 4 on page 5 of this report for general topography at the site.

The existing residence consists of two levels of living space over a basement level that daylights to the east. We understand it is planned to remodel the residence which was damaged by fire. As part of the remodel/repair project, we understand the following new improvements are planned:

- Construct a new at-grade 3-car garage with an approximate footprint of about 740 square feet on the west side of the existing residence in an area that is currently a relatively level asphalt paved driveway (see Plate 1 below).



Plate 1. Vicinity of proposed three car garage near southwest portion of existing residence, facing east.

- Construct a small bay with a footprint of roughly 88 square feet on the north side of the daylight basement level. The new bay is planned within the footprint of the existing residence in an area currently occupied by a storage room (see Plate 2 below).



Plate 2. Proposed new bay on north side of basement level planned within footprint of existing storage room below deck, facing south.

- Construct a new modular block gravity retaining wall using Redi-Rock concrete blocks in the southern portion of the site to accommodate driveway modifications. The new wall will have a maximum retained height of 6 feet. Currently there is an approximately 2½-foot high modular block wall in this area that is performing well (see Plate 3 below). PanGEO previously reviewed and concurred with the soil values used by the project structural engineer for the Redi-Rock wall design.

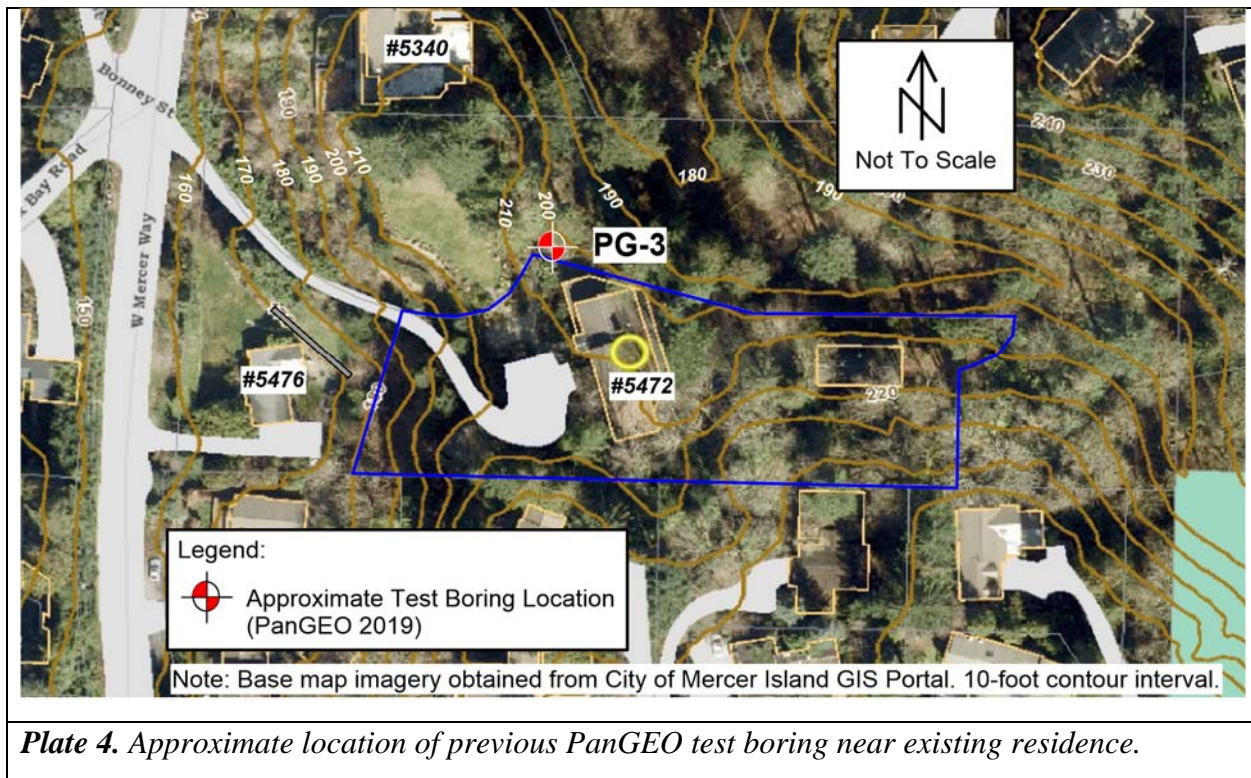


Plate 3. *New Redi-Rock gravity modular block wall planned south of existing modular block wall, facing west.*

PREVIOUS PANGEO TEST BORING

PanGEO previously logged three test borings at the undeveloped parcel to the north which is in common ownership with the 5472 West Mercer Way parcel. One of our test borings, test boring PG-3, was located about 35 feet north of the existing 5472 West Mercer Way residence. The ground surface at test boring PG-3 is approximately the same as the finished floor elevation of existing basement level. Test boring PG-3 was drilled to about 16½ feet below grade and the

approximate location of PG-3 is indicated in Plate 4 on the following page. The test boring PG-3 summary log is included in Appendix A of this letter.



GEOLOGY AND SUBSURFACE CONDITIONS

Generalized subsurface information for the site was obtained from review of *The Geologic Map of Mercer Island* (Troost and Wisher, 2006). Based on our review, the surficial geologic unit in the vicinity of the site is Lawton Clay (Geologic Map Unit Qv1c). Lawton clay is a glacially overridden deposit that typically consists of very stiff to hard laminated to massive silty clay and clayey silt.

Our previous test boring located near the existing residence encountered a sequence of possible ice-contact deposits over glacially consolidated fine-grained deposits consistent with the Lawton clay deposits mapped in the area. A copy of the PG-3 test boring log is provided in Appendix A of this letter.

A summary of the generalized soil units encountered in our previous test boring is presented below.

Possible Ice-Contact Deposits (Qvi): Near the ground surface at PG-3, loose to medium dense silty fine to medium sand that we interpret as a possible ice-contact deposit was encountered. This soil unit generally resembled an outwash type deposit with a relatively high fines content. This soil unit was encountered to about 5 feet below grade at PG-3.

Lawton Clay (Qvlc): Underlying the possible ice-contact deposits at test boring PG-3, stiff to hard clayey silt that we interpret to be consistent with the mapped Lawton clay deposit was encountered. This soil unit was encountered to the maximum exploration depth of 16½ feet below grade.

Groundwater was not encountered at test boring PG-3 at the time of drilling in December 2019.

GEOLOGIC HAZARDS ASSESSMENT

Based on review of environmental hazard information available on the City of Mercer Island's GIS portal, the geotechnically related hazards mapped at the site include potential landslide, seismic, and erosion hazard areas. We performed a site reconnaissance on October 29, 2019 and July 8, 2020 to observe the existing site conditions in the vicinity of the proposed improvements and to evaluate the potential impacts the proposed improvements could have on the mapped geologically hazardous areas. The following sections discuss each of the mapped hazard areas.

POTENTIAL LANDSLIDE HAZARDS

The subject site is mapped within a potential landslide hazard area according to the City of Mercer Island's Geologic Hazards Map. During our site reconnaissance, we observed the mature trees in the descending slope on the east side of the ridge to have generally straight trunks, and no evidence of significant soil creep was observed. We did not observe evidence of past instability surrounding the existing residence or in the area of the proposed Redi-Rock retaining wall, such as hummocky terrain, obvious slide scarps, uneven topography, or tension cracks. No groundwater seeps or springs were observed at the time of our reconnaissance. In addition, the foundation of the approximately 70-year-old residence appeared to be performing well.

Based on our reconnaissance, our understanding of subsurface conditions at the site, it is our opinion that the proposed improvements are feasible from a geotechnical engineering standpoint.

Considering that the 3-car garage is planned in a relatively level area west of the existing residence and a considerable distance from descending slopes, and the small bay on the north side of the residence is also within a relatively level area distanced from descending slopes, it is our opinion that these lightly loaded structures would not adversely affect the overall stability of the site or adjacent properties. Furthermore, it is our opinion that the Redi-Rock gravity retaining wall planned in the vicinity of an existing modular block wall would result in an increase in stability in that area, since Redi-Rock blocks are larger than the existing blocks.

SEISMIC HAZARDS

The City of Mercer Island Code defines seismic hazard areas as those areas subject to risk of damage as a result of earthquake-induced ground shaking, slope failure, soil liquefaction or surface faulting.

Based on the very stiff to hard glacial soils underlying the site, as well as the lack of groundwater, in our opinion, the potential for soil liquefaction during an IBC-code level earthquake is considered minimal, and special design considerations associated with soil liquefaction are not required.

It is our opinion that the proposed garage and small bay on the north side of the residence are planned sufficiently far away from the descending slopes at the site that they should not be subject to seismically-induced slope instability.

EROSION HAZARDS

The subject site is mapped within a potential erosion hazard area according to the City of Mercer Island's Geologic Hazards Map. Based on soil conditions encountered at our previous test boring, the near-surface site soils are likely to exhibit moderate to high erosion potential. In our opinion, the erosion hazards at the site can be effectively mitigated with the best management practice during construction and with properly designed and implemented landscaping for permanent erosion control. During construction, the temporary erosion hazard can be effectively managed with an appropriate erosion and sediment control plan, including but not limited to installing silt fencing at the construction perimeter, limiting removal of vegetation to the construction area, placing gravel or hay bales at the disturbed/traffic areas, covering stockpile soil or cut slopes with plastic sheets, constructing a temporary drainage pond to control surface runoff and sediment trap, and placing quarry spalls at the construction entrance.

Permanent erosion control measures should include establishing vegetation, landscape plants, and hardscape established at the end of project, and reducing surface runoff to the minimum extent possible.

STATEMENT OF RISK

The site is mapped as a geologic hazard area by the City of Mercer Island, as documented above. Per Mercer Island City Code, development within geologic hazard areas and critical slopes may occur if the geotechnical engineer provides a statement of risk with supporting documentation indicating that one of the following conditions can be met:

- a. The geologic hazard area will be modified, or the development has been designed so that the risk to the lot and adjacent property is eliminated or mitigated such that the site is determined to be safe; or
- b. Development practices are proposed for the alteration that would render the development as safe as if it were not located in a geologic hazard area; or
- c. The alteration is so minor as not to pose a threat to the public health, safety, and welfare;
or
- d. An evaluation of site-specific subsurface conditions demonstrates that the proposed development is not located in a geologic hazard area.

It is our opinion that Criterion C would apply to the garage/remodel portion of the project and Criterion A can be met for the new Redi-Rock gravity retaining wall. As discussed above, it is our opinion that construction of the relatively small, lightly loaded improvements planned for the existing residence can be developed without adversely affect the overall stability of the site or adjacent properties. It is our opinion that construction of the Redi-Rock gravity retaining wall would result in an overall increase in global stability in that area. Permanent erosion control measures, including landscape and hardscape installations, will effectively mitigate the risk of erosion to disturbed areas of the site in the long term. As such, in our opinion, the development will not negatively affect the stability of the slope, or the surrounding properties.

Ms. Maya Nader
Geologic Hazards Assessment
5472 West Mercer Way, Mercer Island, WA
September 22, 2020

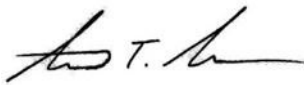
CLOSURE

We have prepared this report for use by Ms. Maya Nader and the project design team. Recommendations contained in this report are based on a site reconnaissance, a review of existing subsurface data, and our understanding of the project. The study was performed using a mutually agreed-upon scope of work.

We appreciate the opportunity to be of service.

Sincerely,

PANGEO INC.



Steven T. Swenson, L.G.
Project Geologist



Siew L. Tan, P.E.
Principal Geotechnical Engineer

ATTACHMENT:

Appendix A Log of PanGEO Test Boring PG-3

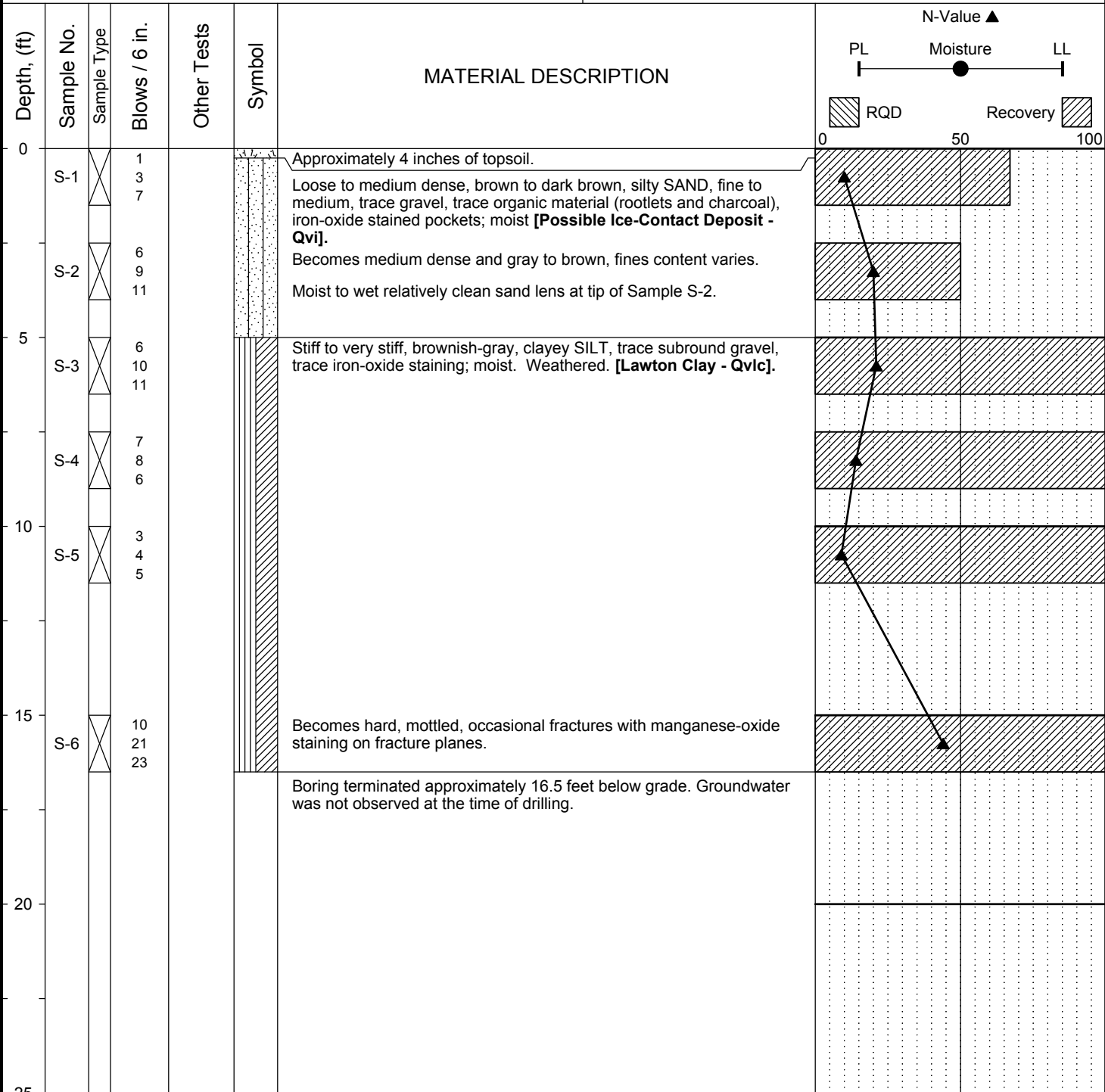
REFERENCES

Troost, K.G., and Wisler, A.P, 2006, *Geologic Map of Mercer Island, Washington*, scale 1:24,000.

APPENDIX A

LOG OF PANGEO TEST BORING PG-3

Project:	Proposed Single-Family Residence	Surface Elevation:	~209 feet (Google Earth)
Job Number:	19-338	Top of Casing Elev.:	Not Applicable
Location:	54XX West Mercer Way, Mercer Island, WA	Drilling Method:	HSA
Coordinates:	Northing: 47.55328, Easting: -122.22858	Sampling Method:	SPT



Completion Depth: 16.5ft
 Date Borehole Started: 12/10/19
 Date Borehole Completed: 12/10/19
 Logged By: C. Venturino
 Drilling Company: CN Drilling

Remarks: Test boring drilled by CN Drilling using a hand-portable Acker drill rig. Standard penetration test (SPT) sampler driven with a 140 lb. safety hammer. Hammer operated by a rope and cathead mechanism. Surface elevation estimated from topographic information available on Google Earth.