GEOTECH
CONSULTANTS, INC.

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March 29, 2023

JN 23098

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Subject: **Foundation and Critical Area Considerations**
Proposed Addition to Existing Residence
9204 Southeast 60th Street
Mercer Island, Washington

Greetings:

This report presents our geotechnical engineering report related to the planned addition to your existing home. The scope of our services consisted of assessing the site surface and subsurface conditions, and then developing this summary report.

Planning for the plans prepared by Centerline Design, a two-story addition will be constructed on the eastern side of the house. The foundation will be approximately 15 feet wide in the east-west direction. The lowest level will have a slab-on-grade floor.

The City of Mercer Island GIS maps the site as both a Potential Landslide Hazard and an Erosion Hazard. There are no steep slopes mapped on, or around, your property.

We visited the subject property on March 23, 2023 to observe the existing site conditions. The existing residence is located on the western two-thirds of the lot. The eastern approximately two-thirds of the main floor is underlain by a basement. The driveway extends from Southeast 60th Street to the garage located in the eastern end of the lower level. The remainder of the lot is covered primarily with yard and landscaping. The ground surface generally slopes gently downward toward the east. There are no steep slopes on, or near, the site.

There is no history of large-scale slope movement in this area. This is confirmed by our review of the *Mercer Island Landslide Hazard Assessment* (Troos and Wisher, 2009). According to this *Assessment*, the Potential Landslide Hazard Mapping is due to the site being over 15 percent inclination, near the mapped contact between coarse-grained deposits over fine-grained deposits, and where groundwater is less than 10 feet below the ground surface. The subject property lies several blocks from the steeper, taller slopes situated on the east side of East Mercer Way that have experienced documented landslides of varying sizes over the years.

We are familiar with the native subsurface conditions on the property from review of published geologic maps, explorations that our firm has completed in close proximity to the site, and the conditions exposed in a test hole completed around the planned addition. Test Hole 1 was excavated in the southeastern portion of the expected footprint of the planned addition. This test pit revealed a thin layer of topsoil overlying loose, weathered native soil consisting of very silty, fine-grained sand. At a depth of approximately 3.5 feet, this soil became dense (glacially compressed). At a depth of 5 feet, the test pit encountered very dense, gravelly, silty sand referred to as glacial

till. No groundwater seepage was encountered in the test pit, which was conducted following a wet fall and winter.

CONCLUSIONS AND RECOMMENDATIONS

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 site and surrounding area are underlain by competent, glacially-compressed native soils. All foundations for the new addition should be excavated through the topsoil and loose soils. This may require excavation below the planned footing subgrade elevations. Where this overexcavation is necessary, it should be filled using imported clean crushed rock (quarry spalls or railroad ballast rock).

Non-bearing floor slabs can be placed on the loose, weathered soils underlying the topsoil. Imported structural fill should be placed above the native soils where necessary to reach the planned slab subgrade elevation.

The onsite soils will not be suitable for reuse as compacted fill, due to their very high silt and moisture contents. Any compacted fill placed in structural areas, or where post-construction settlement is undesirable (patios, porches, stoops, etc.) should consist of imported granular material that can be properly compacted.

A footing drain is not needed for the new addition if the slab floor is located at, or above, the surrounding grade.

The glacially-compressed soils beneath the site are not susceptible to seismic liquefaction.

Potential Landslide Hazard Areas: The site and surrounding area have been mapped as a Potential Landslide Hazard area. No recent large-scale movement has been documented in this area. As previously discussed, the core of the subject site consists of dense, glacially compressed, silty sand that has a negligible potential for instability on the gentle to moderately-sloped ground. The proposed new addition will be supported on foundations bearing directly on these dense, glacially-compressed soils.

It is our opinion that no buffers or setbacks are required for the planned construction, provided the recommendations presented in this report are followed. The recommendations presented in the report are intended to prevent adverse impacts to the stability of the site and the neighboring properties, and to avoid the planned new addition from being damaged by slope movement.

Erosion Hazard Areas: The site meets the City of Mercer Island's criteria for an Erosion Hazard Area. The temporary erosion control measures needed during the site development will depend heavily on the weather conditions that are encountered during the site work. 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 bedded in compost, not native soil

or sand, should be erected as close as possible to the planned work area, and the existing vegetation around the work area should be left in place. Rocked construction access and staging areas should be established wherever trucks will have to drive off of pavement, in order reduce the amount of soil or mud carried off the property by trucks and equipment. Covering the base of the excavation with a layer of clean gravel or rock is also prudent to reduce the amount of mud and silty water generated. Cut slopes and 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.

We provide the following "statement of risk" to satisfy City of Mercer Island conditions:

> "It is our professional opinion that the development practices proposed in this report for the planned alteration would render the development 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 class within 100 feet of the ground surface is best represented by Site Class Type D (Stiff Soil).

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 dense soils that will support the new construction are not susceptible to seismic liquefaction under the ground motions of the MCE because of the absence of near-surface groundwater.

CONVENTIONAL FOUNDATIONS

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. In wet conditions, the prepared footing subgrades should be protected with several inches of clean crushed rock, in order to prevent softening or disturbance during the placement of forms and rebar.

Depending on the final site grades, overexcavation may be required below the footings to expose competent native soil. Unless lean concrete is used to fill an overexcavated hole, the overexcavation must be at least as wide at the bottom as the sum of the depth of the overexcavation and the footing width. For example, an overexcavation extending 2 feet below the

bottom of a 2-foot-wide footing must be at least 4 feet wide at the base of the excavation. If lean concrete is used, the overexcavation need only extend 6 inches beyond the edges of the footing.

An allowable bearing pressure of 2,500 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, or compacted rock structural fill up to 5 feet in thickness will be less than one 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.

The above ultimate values for passive earth pressure and coefficient of friction do not include a safety factor.

SLABS-ON-GRADE

The building floors can be constructed as slabs-on-grade atop non-organic native soil, or on structural fill. The subgrade soil must be in a firm, non-yielding condition at the time of slab construction or underslab fill placement. Any soft areas encountered should be excavated and replaced with select, imported structural fill.

Even where the exposed soils appear dry, water vapor will tend to naturally migrate upward through the soil to the new constructed space above it. This can affect moisture-sensitive flooring, cause imperfections or damage to the slab, or simply allow excessive water vapor into the space above the slab. All interior slabs-on-grade should be underlain by a capillary break drainage layer consisting of a minimum 4-inch thickness of clean gravel or crushed rock that has a fines content (percent passing the No. 200 sieve) of less than 3 percent and a sand content (percent passing the No. 4 sieve) of no more than 10 percent. Pea gravel or crushed rock are typically used for this layer.

As noted by the American Concrete Institute (ACI) in the *Guides for Concrete Floor and Slab Structures*, proper moisture protection is desirable immediately below any on-grade slab that will be covered by tile, wood, carpet, impermeable floor coverings, or any moisture-sensitive equipment or products. ACI recommends a minimum 10-mil thickness vapor retarder for better durability and long term performance than is provided by 6-mil plastic sheeting that has historically been used. A vapor retarder is defined as a material with a permeance of less than 0.3 perms, as determined by ASTM E 96. It is possible that concrete admixtures may meet this specification, although the

manufacturers of the admixtures should be consulted. Where vapor retarders are used under slabs, their edges should overlap by at least 6 inches and be sealed with adhesive tape. The sheeting should extend to the foundation walls for maximum vapor protection.

If no potential for vapor passage through the slab is desired, a vapor *barrier* should be used. A vapor barrier, as defined by ACI, is a product with a water transmission rate of 0.01 perms when tested in accordance with ASTM E 96. Reinforced membranes having sealed overlaps can meet this requirement.

LIMITATIONS

This report has been prepared for the exclusive use of Jeffrey and Nicole Ahrenholz 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.

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,

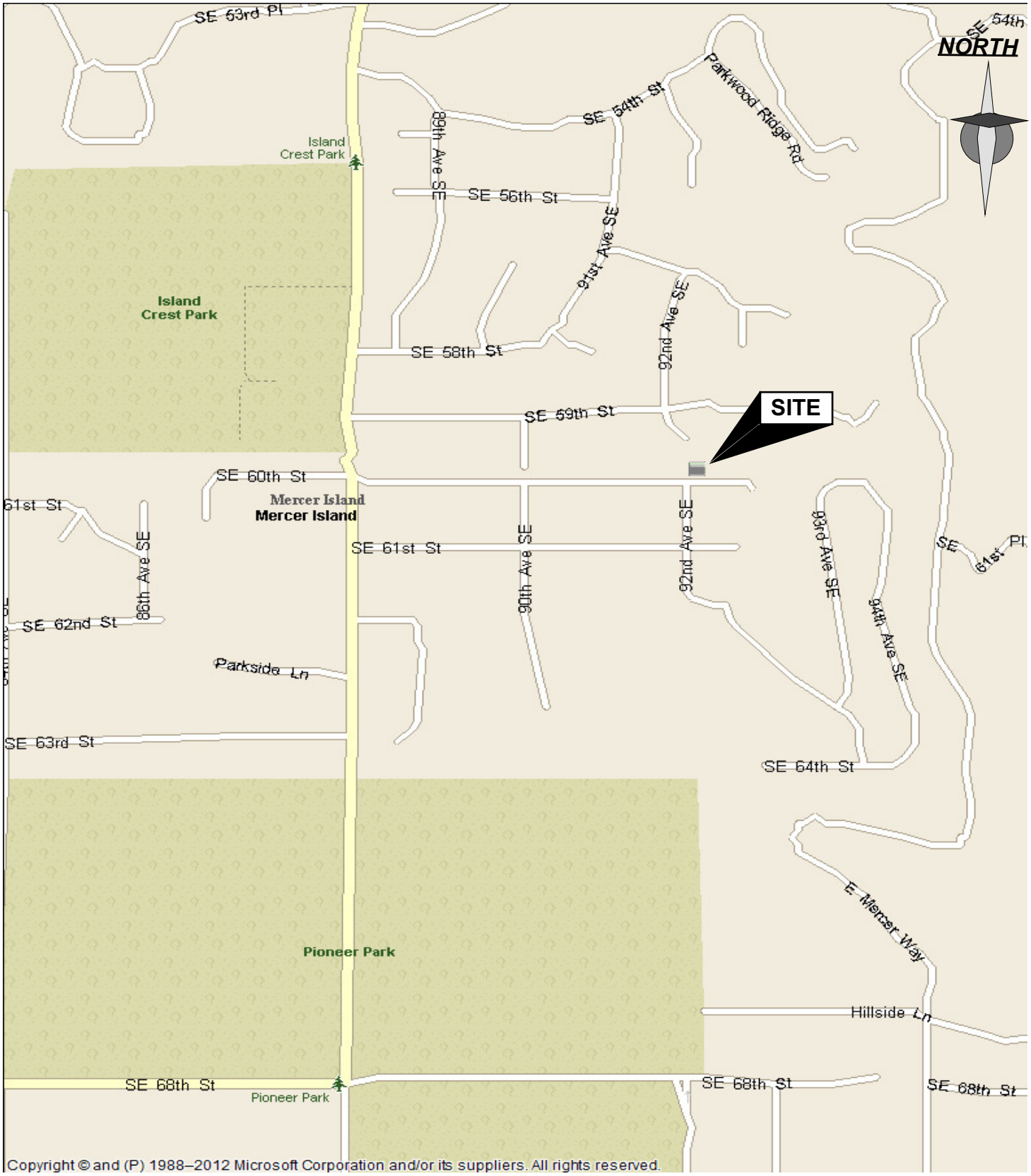
GEOTECH CONSULTANTS, INC.

3/29/2023
Marc R. McGinnis, P.E.
Principal

Attachments: Vicinity Map, Site Exploration Plan, Test Pit Log, Footing Drain Detail

cc: **Aspen Homes** – Mike Yeganeh
via email: mike@aspenhomesnw.com

MRM:kg



(Source: Microsoft MapPoint, 2013)

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VICINITY MAP

9204 S.E. 60th Street
Mercer Island, Washington

Job No:	*Date:*		*Plate:*
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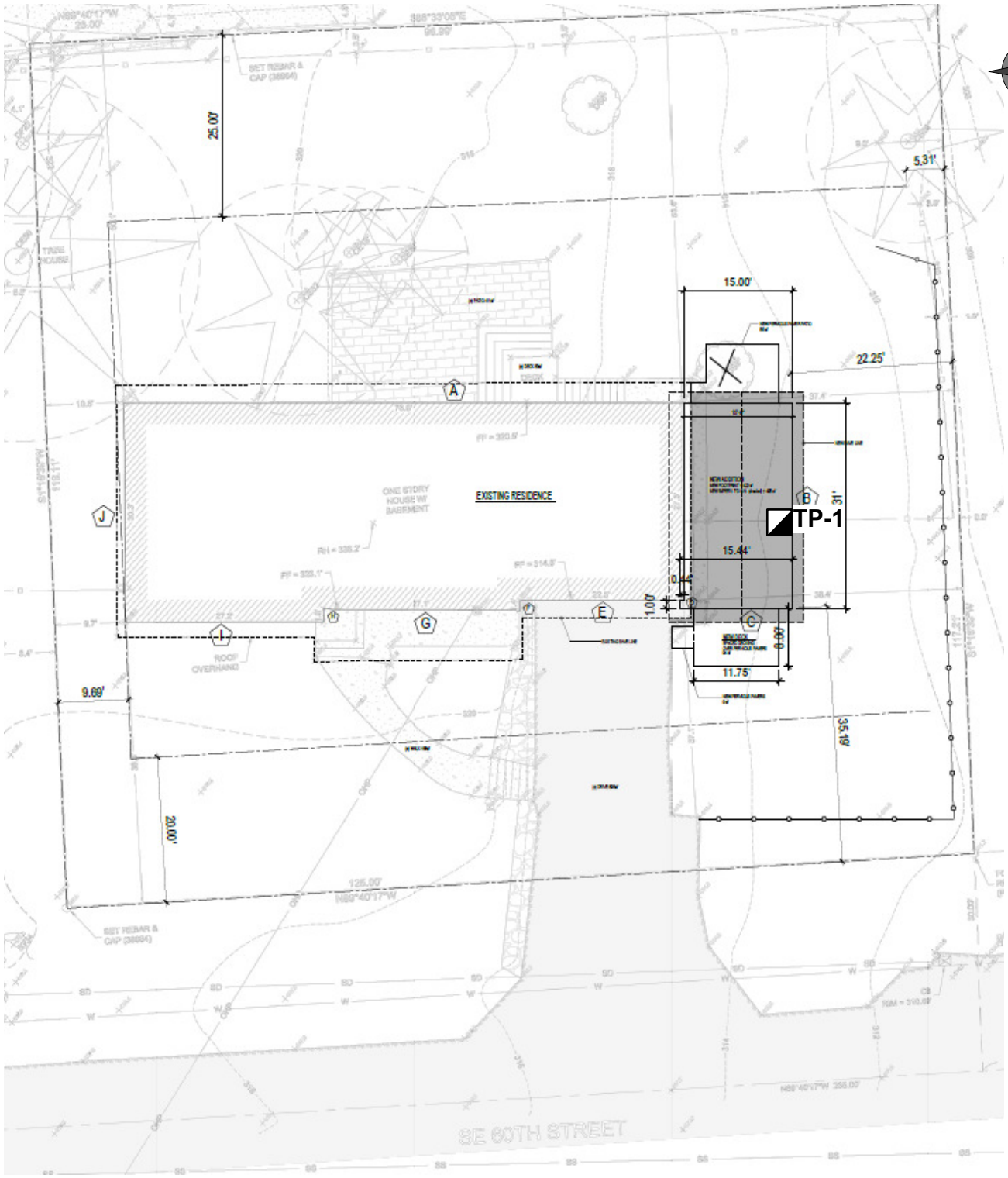

Legend:

TH-1 Test Hole Location

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SITE EXPLORATION PLAN

9204 S.E. 60th Street
Mercer Island, Washington

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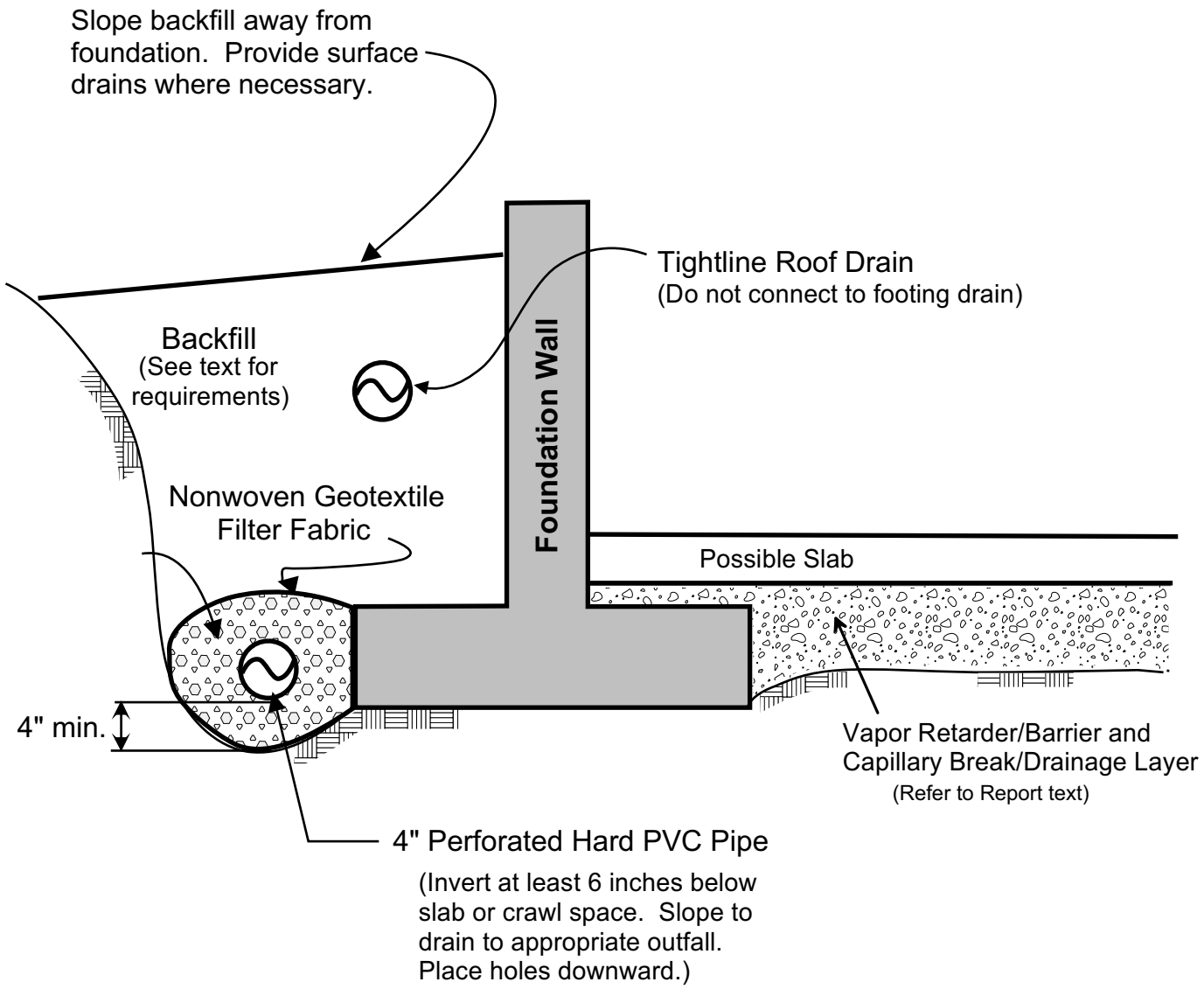
TEST PIT 1

Depth (feet)	Soil Description
0 – 1.0	Sod and Topsoil
1.0 – 5.0	Brown, mottled, very silty SAND, fine-grained, very moist, loose -becomes dense and less mottled at 3.5 feet
5.0 – 6.0	Gray, gravelly, silty SAND, cemented, fine-grained, very moist, very dense (Glacial Till)

Test Pit was terminated at a depth of 6.0 feet on March 23, 2023.
No groundwater seepage was observed.



NOTES:

(1) In crawl spaces, provide an outlet drain to prevent buildup of water that bypasses the perimeter footing drains.

(2) Refer to report text for additional drainage, waterproofing, and slab considerations.

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TYPICAL FOOTING DRAIN

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Mercer Island, Washington

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