

November 15, 2021

JN 21457

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Mercer Island, Washington 98040  
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Subject: **Foundation Considerations and Critical Area Report**  
Proposed Covered Deck and Deck Expansion  
4600 Forest Avenue S.E.  
Mercer Island, Washington

Greetings:

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

Based on the October 6, 2021 drawings developed by Brandt Design Group, we expect that a roof will be constructed over the existing deck located on the east side of your house. The western side of this roof will be supported of the existing house, while several isolated columns supported on new footings will carry the eastern side of the cover. The sides of the covered deck will remain open to create outdoor living space; it will not be enclosed. The work associated with the construction of the roof will be completed using manual methods, as there is no access to the east side of the house for equipment. The ground disturbance for this new construction will be limited to minor excavation for the foundations of the new columns. Also proposed is a small expansion of the existing western deck to allow access to the deck from the kitchen. A single column will be added approximately 5 feet west of the existing house perimeter, between the dining room and kitchen, to support this small deck expansion. As with the new roof over the deck, the amount of ground disturbance for this work will be limited to minor excavation for the foundation that will carry the new column.

The City of Mercer Island GIS maps your entire lot as a Potential Landslide Hazard, Erosion Hazard, and Seismic Hazard. There is a swath of steep slope area mapped to the east of your lot, and then curving through the north portion of the property. These steep slope areas are outside of the planned work areas.

We visited the subject property on October 7, 2021 to observe the existing site conditions. The property is irregularly-shaped, roughly consisting of a main body of the lot, with a panhandle connecting to Forest Avenue S.E. for the driveway access. The existing residence, which consists of two floors overlying a west-facing daylight basement, is located in the southwestern portion of the main body of the lot. This house was constructed in 1990. From our discussions with the project team, the plans indicate that the structure is supported on drilled, concrete-filled piles. This is consistent with the information contained in the original geotechnical report, which is discussed in following paragraphs.

The ground surface on the lot, and in the vicinity, generally slopes down toward the west, eventually to Lake Washington. The ground surface on the developed portion of the lot slopes only gently to

moderately. To the west of the lot is a short slope dropping to your adjacent western neighbor's house. On the east side of your existing house is a wood-framed deck located at the elevation of the main floor. This deck is supported on isolated posts that appear rest on shallow footings. There is no information to indicate that the deck was also supported on drilled piles, like the house. East of the deck, the ground slopes upward to the eastern property line over several reinforced modular walls that were constructed previously to provide usable space for landscaping and outdoor recreation. East of the site, the ground slopes steeply upward to the neighboring eastern residence. There is also a swath of steep slopes extending along the north side of the site. The shorter (less than 20 feet tall) steep slopes extend along the north side of the lot, and are at least 25 feet from the limits of the existing rear deck. The taller (approximately 40 feet tall) slopes are located 50 feet or more to the east of the existing deck. We saw no indications of recent instability of slope movement on, or around, the subject property. The stepped reinforced modular walls to the east of the deck show no signs of excessive movement since they were constructed approximately 20 years ago.

Your property lies within a well-known ancient landslide feature resulting from a massive slope failure that occurred sometime following the recession of the last glaciers 10,000+ years ago. The entire Forest Avenue S.E. neighborhood is underlain by 10 to 20 feet of loose, disturbed soils remaining from that landslide, with dense, glacially-compressed silt typically found underneath. With the exception of some failures of improper cuts and fills, more recent episodes of ground movement in the neighborhood have been relatively shallow, typically occurring as mudflows or shallow slumps involving the loose soils on the steeper slopes following extended wet weather.

We are familiar with the subsurface conditions on the site from: 1) geotechnical studies our firm has completed on lots surrounding your property, 2) explorations conducted for the pre-construction geotechnical study for your home, and 3) review of geologic mapping for the area. As discussed above, the properties around the site are underlain by 10 to 20 feet of loose, disturbed soils, with dense, glacially-compressed silt below this depth. Explorations conducted on your property by Shannon and Wilson in 1987 found 8 to 11 feet of loose, disturbed soil over glacially-compressed silt in the area of the house. Their report recommends supporting the residence on drilled or driven piles embedded into the glacially-compressed silt. Groundwater was encountered within a few feet of the ground surface, so a subsurface interceptor drain was proposed to be installed to the east, upslope, of the residence.

## **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.*

Your existing house is supported on drilled, concrete-filled piles extending into the underlying dense soils. Piles should similarly be used to support the new roof to be constructed over the deck, and the new column to support the deck expansion on the west side of the house. Considering the limited access, and the desire to minimize site disturbance, we recommend that these new elements be supported on 2-inch-diameter pipe piles driven to refusal in the dense, native silt. These piles can be installed using hand-held jackhammers.

**Seismic Hazard:** The underlying glacially-compressed soils beneath the site are not susceptible to seismic liquefaction. The pipe piles for the new foundations will be driven through the fill and any loose upper soils and will be embedded into this dense, non-liquefiable native soil layer.

**Potential Landslide Hazard and Steep Slopes:** The planned new foundations are at least 25 feet from any steep slopes, and significantly further away from any tall slopes. The stability of the steep slopes will not be adversely affected by the limited excavation and the pipe pile installation for the covered deck structure. Also, the setback between the deck and the steep slopes is sufficient to protect the new construction from damage in the event of future soil movement on the steep slopes. No buffer or other mitigation measures are required to address the Potential Landslide Hazard mapping of the site.

**Erosion Hazard:** The site disturbance for the proposed development will be limited, and will occur primarily on gently-slope ground. The mapped Erosion Hazard can be mitigated by implementing proper temporary erosion control measures that will depend heavily on the weather conditions that are encountered. We anticipate that a silt fence will be needed around the downslope sides of any work areas. Existing ground cover and landscaping should be left in place wherever possible to minimize the amount of exposed soil. Small soil stockpiles should be covered with plastic during wet weather. Soil and mud should not be tracked onto the adjoining streets, and silty water must be prevented from traveling off the site. It should be possible to complete the planned addition during the wet season without adverse impacts to the site and neighboring lots. On most construction projects, it is necessary to periodically maintain or modify temporary erosion control measures to address specific site and weather conditions.

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 new development 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 beneath the site are not susceptible to seismic liquefaction under the ground motions of the MCE because of the absence of near-surface groundwater.

## ***PIPE 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. Load tests are not required to verify this allowable capacity.

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.

Pile caps and grade beams should be used to transmit loads to the piles. In general, a minimum of two piles should be used in isolated pile caps, in order to prevent eccentric loading on individual piles.

## **LIMITATIONS**

This report has been prepared for the exclusive use of Brad and Janell Stewart, 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**

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.

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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.



11/15/2021

Marc R. McGinnis, P.E.  
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