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April 10, 2019

Fat Boy Construction
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Attn: Mr. Mike Boyle

Geotechnical Report Addendum
Proposed Residential Development
3603 West Mercer Way
Mercer Island, Washington
Parcel No: 3623500260
Doc ID: FatBoyCon.WMercerWay.RGA(3)

INTRODUCTION

This third geotechnical report addendum summarizes our recent subsurface explorations requested by the City of Mercer Island (the City) geotechnical third-party reviewer, addresses plan review comments from the geotechnical review and the building review and updates our previous geotechnical report. We previously completed a *Geotechnical Engineering Report* dated March 3, 2016, a *Geotechnical Report Addendum* dated October 6, 2017, and a second *Geotechnical Report Addendum* dated November 16, 2018. Our continued understanding of the project is based on our discussions with you, discussions with James Guerrero Architects, a review of the plans provided by you, our subsurface explorations, our May 20, 2016, December 30, 2016 and September 5, 2018 site visits, our experience in the area and our recent correspondences.

The project consists of a garage at the top of the sloping site that will be connected to the new house, that is replacing the existing house, with an elevator shaft. This addendum provides additional recommendations for the new structures requested in the comments from the third-party reviewer and the building reviewer from the interactive pdf used by the City for its permit process.

ENGINEERING RECOMMENDATIONS

Micropile Design Recommendations

We understand that the vertical loads generated from the proposed elevator shaft and structure above will be distributed to micropiles for vertical support. Our micropile design is based on the FHWA micropile design and construction guidelines published in June, 2000.

We recommend the bond zone for the micropiles be located in the dense silt and sands encountered in our subsurface investigations. The top 4 feet of resistance should be ignored. For the soil-grout bond in the dense silty sand we recommend an ultimate adhesion of 4 kips per square foot. Pressurized grouting may be required to achieve this value. These values do not include end bearing as the piles may be loaded in tension or compression in the design seismic event. These values should be factored appropriately by the structural engineer.

Based on our subsurface explorations and experience in the area the contractor performing the micropile installation should be prepared to encounter very dense to hard gravel, cobbles and boulders that are encountered commonly in glacial soils, even if not encountered in our subsurface explorations. We recommend a Georesources LLC. representative observe the micropile construction to verify the soil conditions encountered, observe the construction methods, verify the depth drilled and observe the load testing.

Micropile Construction

A micropile is a small diameter (usually 6 to 12 inches) drilled and grouted replacement pile that is reinforced with steel. To construct a micropile a borehole is drilled, the reinforcement placed and the grout is poured. The axial strength of a micropile is typically assumed to come from the skin friction resulting from the grout to soil adhesion. This adhesion is affected by the drilling method, grout pressure and other factors that can be controlled during pile construction.

During drilling of the borehole fluid is typically flushed in order to remove the soil cuttings. This may be done with an open hole, but is typically done with temporary casing installed, at least for a portion of the borehole. The casing is used when cohesionless or caving soils are encountered, which may be the case for this project. Drilling in dense glacial soils can be extremely difficult and time consuming and may require specialized equipment. The contractor selected should be able to demonstrate significant experience on multiple projects in similar conditions.

After the borehole has been completed the reinforcement is installed and then it is filled with grout. The reinforcement is centered in the borehole using centralizers and typically consists of a single large piece rebar, DWYIDAG bar or continuous-thread hollow-core bar.

The grouting is done using a tremie from the bottom up. It may also be done under pressure to increase the penetration of the grout into the surrounding soils. In some cases additional grout tubes will be installed to introduce high pressure grout after the grout placed initially has begun to harden, usually 10-25 minutes later. This method of “post-grouting” may be done once or numerous times. Whether pressure grouting is being used or not may affect the mix design of the grout and should be taken into account.

To verify the design assumptions we recommend at least one pile be load tested to the ultimate design load. Typically for a single project 1 pile is tested to confirm the design values and then 5% of the subsequent piles are tested, however given the small number of piles to be installed it is our opinion one test should be sufficient. We recommend load testing be performed in accordance with FHWA-SA-97-070 (v00-06), Implementation Manual for the Design and Construction of Micropiles. The maximum allowable deflection for the verification test should be provided by the structural engineer.

LIMITATIONS

We have prepared this report addendum for use by Mr. Mike Boyle of Fat Boy Construction and other members of the design team, for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. 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.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

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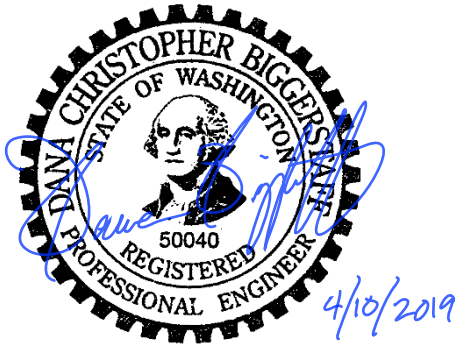
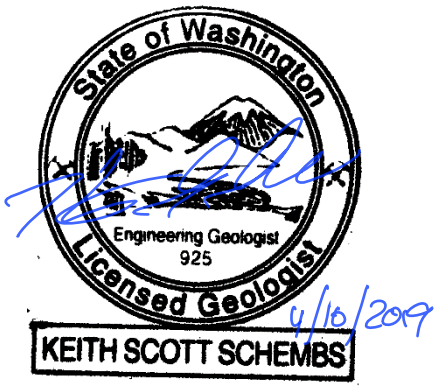
We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

Respectfully submitted,
GeoResources, LLC





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Attachments: None