



July 5, 2018
Project No. 180337E001

City of Bainbridge Island
280 Madison Avenue North
Bainbridge Island, Washington 98110

Attention: Mr. Paul Nylund

Subject: Geotechnical Review of Documents
Rouser SFR - BLD22834
6450 Adas Will Lane
Bainbridge Island, Washington

Dear Mr. Nylund:

At your request, Associated Earth Sciences, Inc. (AESI) recently reviewed the geotechnical engineering report and associated documents for the proposed Rouser residence. Specifically, we reviewed the following:

- "Updated Geotechnical Engineering Evaluation," (May 18, 2018) prepared by Aspect Consulting (Aspect), Project No. 180204, including attachments and appendices.
- Plan set for "Rouser Residence," Sheets: A1.0, A1.1, A1.2, A1.2 (sheet number duplicated), A2.0 through A2.4, A3.0, A3.1, A4.0, A4.1, A5.0, A6.0, V-1, and V-2 (18 sheets total), revision date May 21, 2018, prepared by Paul J. Eberharter, Architect.
- Civil plan set for "Meisha Rouser," Sheets 1 through 5, dated June 30, 2017, prepared by ADA Engineering, LLC.

AESI was requested to provide third-party review of the project as detailed by Subsection 16.20.150 (D) of Chapter 16.20 of the *Bainbridge Island Municipal Code* (BIMC). The review was requested due to the location of the subject site within a Geologically Hazardous Area as defined by Subsection 16.20.030 (A).

The scope of our review was limited to an evaluation of the report with respect to compliance with the subsections found within the BIMC, as detailed within your Notice to Proceed letter, dated June 1, 2018.

SITE AND PROJECT DESCRIPTION

The site consists of a vacant parcel located at 6450 Adas Will Lane in Bainbridge Island, Washington. The parcel is generally rectangular shaped in plan view and has an approximate area of 0.25 acres. The project parcel is bordered by single-family residential properties to the south and east, an undeveloped parcel to the north, and a steep slope that extends downward to the shoreline of the Puget Sound to the west. The project parcel slopes downward toward the west to northwest with overall vertical relief estimated at 26 feet. Adjacent to the west side of the project parcel is a steep slope with a reported height of 90 feet and inclinations greater than 40 percent. Indications of landsliding were reported along the west-facing steep slope in the vicinity of the project parcel, including a scarp feature adjacent to the parcel and a recent landslide occurring in May of 2018, 70 feet north of the project site. Landslide deposits have also been mapped 200 to 400 feet from the project site.

We understand that the proposed project will consist of a new single-family residence set back from the crest of the steep west-facing slope a minimum horizontal distance of 75 feet. The project also proposes a septic field located west of the residence and within 50 feet of the steep slope, and a driveway located east of the new residence.

Aspect reviewed one exploration boring (designated B-1) completed by Myers Biodynamics (Myers) on April 25, 2007. Boring B-1 was advanced to depth of 81.3 feet and completed as a groundwater monitoring well. Boring B-1 generally encountered glacially consolidated, bedded sands and silty sands overlying very stiff to hard laminated clay with interbedded silt, overlying very dense silty fine sand. Perched groundwater was encountered at the time of drilling at 3.5 to 10 feet below the surface. A subsequent groundwater measurement taken on May 5, 2007, indicated water was at 24 feet below the surface, which Aspect interpreted as an artesian condition. The BIMC specifies a buffer from the landslide hazard area equal to the height of the slope, or approximately 90 feet in this case. Aspect are requesting a reduced buffer of 60 feet from the landslide hazard area, in addition to a 15-foot building setback. The Aspect report included the following Myers reports in the appendix to be used in conjunction with their report:

- "Geotechnical Design Report - Proposed Brobeck Residence," Myers Biodynamic, Inc. June 6, 2007.
- "Geotechnical Design Report Addendum," Myers Biodynamic, Inc. April 21, 2008.

REVIEW COMMENTS

AESI reviewed the aforementioned geotechnical engineering report to determine if it meets the criteria specified within Subsection 16.20.150 (D)(1)(e). This subsection details the requirements for a critical areas assessment and geotechnical reports to be submitted for proposed developments in Geologically Hazardous Areas. Our review was also based upon the requirements found within Subsection 16.20.150 (D)(2), which requires additional information for sites classified as a Landslide Hazard and Erosion Hazard. In our opinion, the submitted geotechnical report currently does not meet the requirements of the BIMC. We have identified items in the report that require additional clarification or revision.

Foundation

- The 2007 Myers report provided recommendations for new foundations which includes a recommended bearing pressure of 2,000 pounds per square foot (psf) for foundations bearing on 2 feet of compacted crushed rock over native sediments. However, sheet A2.0 of the plan set indicates a bearing pressure of 2,500 psf was used for design. We recommend that Aspect comment on the appropriate value to be used for design.

Lateral Wall Pressures

- Aspect should include a seismic surcharge for permanent walls in accordance with *The International Building Code (2015)*.

Slope Stability Analysis

- Aspect completed a slope stability analysis and provided the static and seismic factors of safety in their report. The graphic output from their analysis was also included in the report. Based on their graphic output it appears that Aspect have assumed “glacially overridden” sediments extend out to the face of the steep slope. However, based on Aspect’s reported visual indications of past slope movement adjacent to the site (scarp), and known recent slides in the project vicinity, colluvium or landslide debris should be expected to underlie the surface at the face of the slope. We recommend that Aspect comment on the presence of colluvium or landslide debris and update their slope modeling, if necessary.
- The Aspect report states that their stability analysis was performed using infinite slope analysis, which is applicable where a thin layer of loose soil overlies a thick unit of dense soils. For an infinite slope failure, the potential failure surface is parallel to the slope. This analysis is not consistent with the slope stability output provided in the report. The graphical outputs show rotational potential failure surfaces as thick as 75 feet, which is

more consistent with deep-seated failures and not infinite slope failures. We recommend that Aspect clarifies what type of analysis was used for slope stability.

- Table 2 of Aspect's report provides strength parameters for the sediments encountered in Boring B-1, used for the slope stability analysis. The table provides static cohesion values and values for transient apparent cohesion during seismic events. The transient apparent cohesion during seismic events values are double that of the static cohesion values for each soil type. In our opinion, the use of a transient apparent cohesion is non-conservative and is not considered standard of practice for seismic slope stability modeling. We recommend that Aspect provide a technical reference that supports using transient apparent cohesion during seismic events and also provide clarification in the report on how the values were obtained.
- Table 2 also provides a friction angle value for each soil type. According to this table, the glacially overridden sand has a friction angle of 42 degrees. Based on the Myers' boring log, the glacially overridden sand unit generally consists of dense to very dense, fine sand to silty fine sand with no gravel content called out. The exception to this is S-18, which was considered a sand with trace gravel. No laboratory testing was completed by Myers on the glacially overridden sand. In our opinion, based on the soil type indicated on the boring log, a friction angle of 42 degrees is non-conservative without lab testing. We recommend that Aspect provide lab testing on the glacially overridden sand to confirm the value provided for friction angle or assume a more conservative friction angle is in their analysis.

Bluff Retreat Estimate

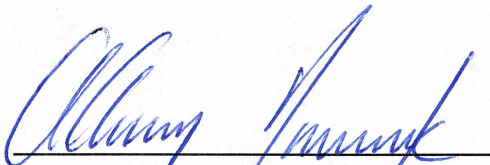
- In accordance with 16.20.150(D)(2)(b)(E), Aspect should provide an estimate of the bluff retreat rate that reflects events such as seismic activity or a 100-year storm event.

CLOSURE

Our scope of work for this letter was limited to a review of the documents supplied to us. Our scope did not include a site visit, exploration of actual subsurface conditions, nor does our review purport to verify the accuracy of exploration logs or geotechnical analysis results presented within the documents.

We trust this letter meets your current needs. Should you have any questions, please contact us at your convenience.

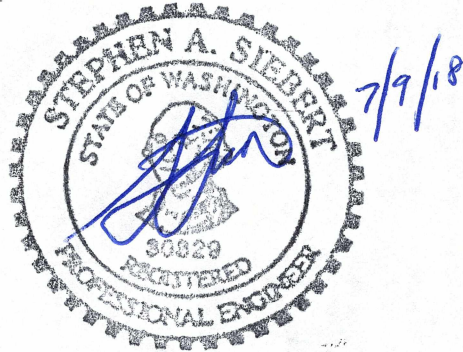
Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington



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