GEOTECH
CONSULTANTS, INC.

2401 10th Ave E
Seattle, Washington 98102
(425) 747-5618

November 16, 2023

JN 20343-1

Bruce and Ann Vanderwall
7179 Holly Hill Drive
Mercer Island, Washington 98040

via email: brucevanderwall@comcast.net & annvanderwall@comcast.net

Subject: **Shoring Addendum**
Proposed New Accessory Structure
7179 Holly Hill Drive
Mercer Island, Washington

Reference: *Geotechnical Engineering Study*, same site, proposed deck addition, Geotech Consultants, Inc.; November 17, 2020.

Geotechnical Engineering Report and Critical Area Study, same site, proposed retaining walls and accessory structure, Geotech Consultants, Inc.; July 31, 2023.

Greetings;

We have been involved with design and construction work at this property since November of 2020, when we prepared a report regarding a deck expansion. Recently, we prepared a supplemental report and critical area study for new developments at the property. In the recent study, we provided temporary excavation recommendations. Now, we understand that soldier pile shoring (temporary and/or permanent) may be needed along the northern perimeter of the accessory structure planned to be constructed east of the residence. This appears to be due to conflicts with existing utilities, and the northern property line, which we understand prohibit the use of open, sloped excavations. Information regarding shoring is below:

Cantilevered soldier pile systems have proven to be an efficient and economical method for providing excavation shoring where the depth of excavation is less than approximately 15 feet. Soldier pile walls would be constructed after making planned cut slopes, and prior to commencing the mass excavation, by setting steel H-beams in a drilled hole and grouting the space between the beam and the soil with concrete for the entire height of the drilled hole. Excessive ground loss in the drilled holes must be avoided to reduce the potential for settlement on adjacent properties. If water is present in a hole at the time the soldier pile is poured, concrete must be tremied to the bottom of the hole.

As excavation proceeds downward, the space between the piles should be lagged with timber, and any voids behind the timbers should be filled with pea gravel, or a slurry comprised of sand and fly ash. Treated lagging is usually required for permanent walls, while untreated lagging can often be utilized for temporary shoring walls. Temporary vertical cuts will be necessary between the soldier piles for the lagging placement. The prompt and careful installation of lagging is important, particularly in loose or caving soil, to maintain the integrity of the excavation and provide safer working conditions. Additionally, care must be taken by the excavator to remove no more soil between the soldier piles than is necessary to install the lagging. Caving or

overexcavation during lagging placement could result in loss of ground on neighboring properties. Timber lagging should be designed for an applied lateral pressure of 30 percent of the design wall pressure if the pile spacing is less than three pile diameters. For larger pile spacings, the lagging should be designed for 50 percent of the design load.

Soldier Pile Wall Design

Temporary or permanent soldier pile shoring that is cantilevered and that has a level backslope should be designed for an active soil pressure equal to that pressure exerted by an equivalent fluid with a unit weight of 35 pounds per cubic foot (pcf). Temporary or permanent slopes above the shoring walls will exert additional surcharge pressures. These surcharge pressures will vary, depending on the configuration of the cut slope and shoring wall. Active pressures act on the pile spacing above the base of the excavation, and on the pile diameter below the base of the excavation.

A seismic surcharge of 9**H** psf should be applied to the wall for permanent retention where more than 6 feet of soil is retained. **H** is the design retention height.

It is important that the shoring design provides sufficient working room to drill and install the soldier piles, without needing to make unsafe, excessively steep temporary cuts. Cut slopes should be planned to intersect the backside of the drilled holes, not the back of the lagging.

Lateral movement of the soldier piles below the excavation level will be resisted by an ultimate passive soil pressure equal to that pressure exerted by a fluid with a density of 450 pcf. For temporary shoring, we recommend a minimum factor of safety of 1.2 be applied to overturning and sliding calculations when using this ultimate value. A safety factor of at least 1.5 should be applied for permanent conditions. This soil pressure is valid only for a level excavation in front of the soldier pile. Due to the glacially consolidated nature of the site soils, this passive pressure can act on three times the grouted pile diameter, or the pile spacing, whichever is smaller. Cut slopes made in front of shoring walls significantly decrease the passive resistance. This includes temporary cuts necessary to install internal braces or rakers. The minimum embedment below the floor of the excavation for cantilever soldier piles should be equal to the height of the "stick-up."

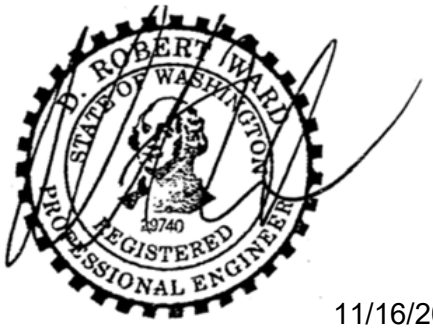
If permanent foundation walls or a facing will be constructed against the shoring walls, a plastic-backed drainage composite, such as Miradrain, Battledrain, or similar, should be placed against the entire surface of the shoring prior to pouring the foundation wall. Weep pipes located no more than 6 feet on-center should be connected to the drainage composite and poured into the foundation walls or the perimeter footing. A footing drain installed along the inside of the perimeter footing will be used to collect and carry the water discharged by the weep pipes to the storm system. Isolated zones of moisture or seepage can still reach the permanent wall where groundwater finds leaks or joints in the drainage composite. This is often an acceptable risk in unoccupied below-grade spaces, such as parking garages. However, formal waterproofing is typically necessary in areas where wet conditions at the face of the permanent wall will not be tolerable. If this is a concern, the permanent drainage and waterproofing system should be designed by a specialty consultant familiar with the expected subsurface conditions and proposed construction.

Footing drains placed inside the building or behind backfilled walls should consist of 4-inch, perforated PVC pipe surrounded by at least 6 inches of 1-inch-minus, washed rock wrapped in a non-woven, geotextile filter fabric (Mirafi 140N, Supac 4NP, or similar material).

Please contact us if you have any questions regarding this letter.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.



11/16/2023
D. Robert Ward, P.E
Principal

cc: **Conard Romano Architects** – Erik Voris
via email: erik@conardromano.com

Harriet Valentine Engineers – Kathryn Warner
via email: kwarner@harriotvalentine.com

MKM/DRW:kg