December 17, 2019
ES-2074.08

Earth Solutions NW LLC
Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

Robert and Jayne Manlowe
3645 – 92nd Avenue Southeast
Mercer Island, Washington 98040

Subject: Geotechnical Evaluation
Failing Bulkhead
10750 Northeast Broomgerrie Road
Bainbridge Island, Washington

Dear Bob and Jayne:

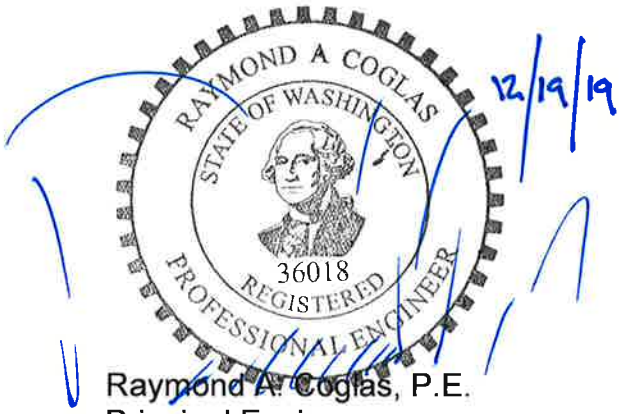
As requested, Earth Solutions NW, LLC (ESNW) has prepared this letter and evaluation of the existing bulkhead alignment along the shoreline frontage of the property. The attached site plan (Plate 1) illustrates the subject site and associated bulkhead structure. A boring log representative of the site geology above the slope is also provided. Indications of bulkhead displacement and related dislodging of boulders has recently been observed. Overall degradation of the decades old bulkhead is also ongoing and has been evident over the past several years. The undersigned ESNW representative visited the site in October 2019 and recently on December 6, 2019. During our October 2019 site visit, the effects of ongoing bulkhead displacement were evident along the beach access trail that descends from the rear yard area of the residence. Most notable were localized areas of downset along the descending slope areas above the bulkhead structure. A follow up visit by the undersigned on December 6, 2019 indicated a worsening of the downset below the trail and obvious additional indications of continued bulkhead displacements. During our December 6, 2019 site visit, a representative of Ellisport Engineering, Inc. was also present. Most concerning at the time of our December site visit was the degree of scour along the bulkhead alignment and the absence of keyway support below the base boulders. A partial collapse of the bulkhead near the north end of the structure was also identified and was determined to have resulted from the ongoing undermining of the structure.

From a geotechnical standpoint, there is a high degree of certainty that failure of the entire bulkhead is imminent. Based on the compromised nature of the structure that has resulted from scour and undermining, we recommend steps be taken immediately to replace the bulkhead. Given the bulkhead support afforded to the descending slope and associated residence above, an immediate and imminent threat to the property exists. Collapse of the bulkhead structure would most certainly result in a progressive failure of the descending (high bank) slope areas, likely resulting in significant impacts to the residential structure above. As such, and given a high degree of certainty that the bulkhead could fail during the current winter storm season, we recommend the owner and engineer immediately engage the services of a bulkhead contractor and contact the City of Bainbridge Island to declare an emergency with respect to the condition of the bulkhead. ESNW will be available, as necessary, to provide geotechnical support during the implementation of repairs and related bulkhead replacement.

We trust this letter and geotechnical evaluation meet your current needs. If you have any questions, or if additional information is required, please call.

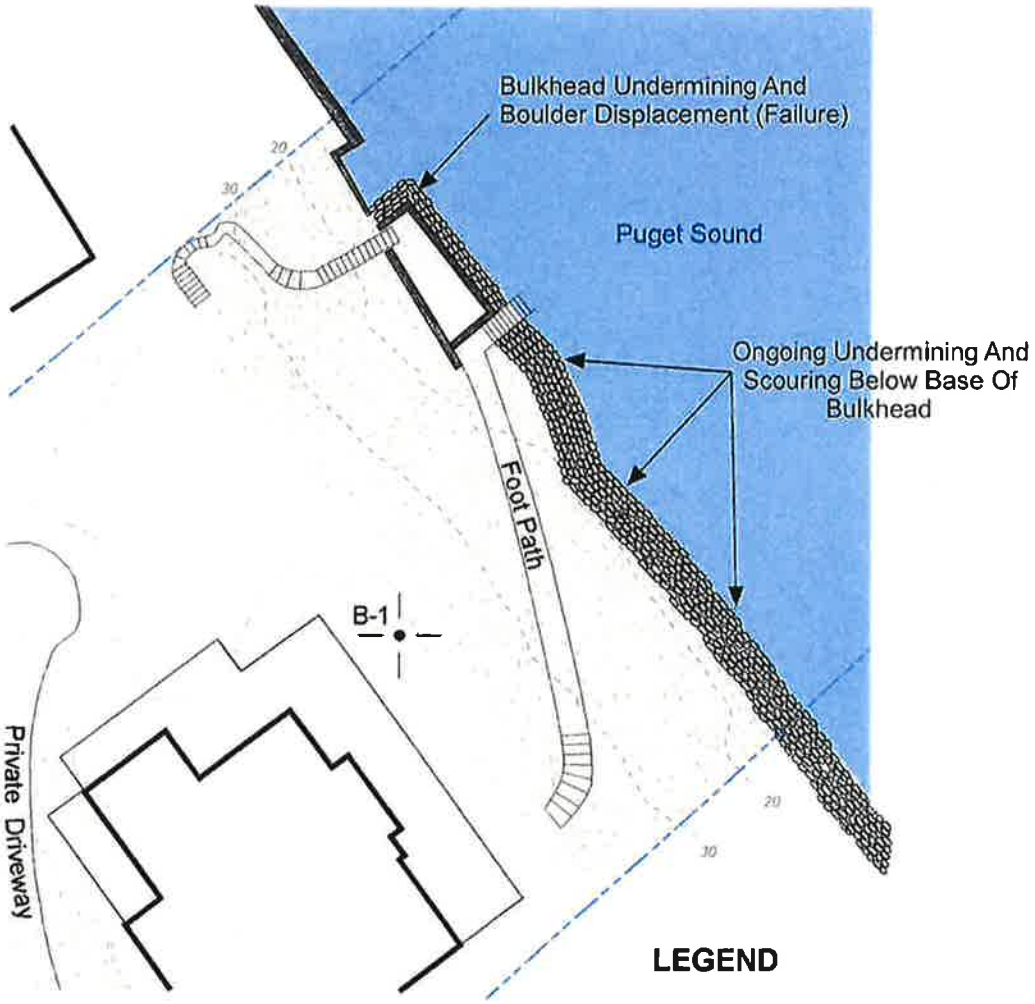
Sincerely,

EARTH SOLUTIONS NW, LLC



Raymond A. Coglas, P.E.
Principal Engineer

Attachments: Bulkhead Site Plan (Plate 1)
Boring Log



LEGEND

B-1 — Approximate Location of ESNW Boring, Proj. No. ES-2074.02, Sept. 2019

Subject Site

Existing Building

NORTH

NOT - TO - SCALE

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Bulkhead Site Plan
Manlowe SFR
Bainbridge Island, Washington

Drwn. MRS	Date 12/12/2019	Proj. No. 2074.08
Checked RAC	Date Dec. 2019	Plate 1

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

BORING NUMBER B-1

CLIENT Bob Manlowe
PROJECT NAME 10750 & 10760 - N.E. Broomgerrie Road
PROJECT NUMBER 2074.02
PROJECT LOCATION Bainbridge Island, Washington
DATE STARTED 9/25/12 **COMPLETED** 9/25/12
GROUND ELEVATION 37 ft **HOLE SIZE**
DRILLING CONTRACTOR Boretec
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY BTS **CHECKED BY** SSR
AT END OF DRILLING ---
NOTES Grass
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					TPSL		Brown TOPSOIL / SOD 4"-6" thickness
0.5							36.5
							Brown silty SAND with gravel, loose to medium dense, moist
5	SS	100	8-6-12 (18)	MC = 11.50% Fines = 31.30%			-becomes medium dense -mottled texture
					SM		
	SS	100	4-9-9 (18)	MC = 11.50% Fines = 29.90%			-becomes gray with mottled texture
10	SS	100	6-8-7 (15)	MC = 10.70%			
	SS	100	6-9-10 (19)	MC = 12.10%			
14.0							-increase silt content
							23.0
15							Grades to silty fine SAND with gravel, medium dense, moist
	SS	100	6-9-12 (21)	MC = 13.30%			-slight increase in moisture -increase in gravel
					SM		
	SS	100	4-4-6 (10)	MC = 12.60%			-becomes loose
20							

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DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	11-13-13 (26)	MC = 11.00%	SM		Grades to silty fine SAND with gravel, medium dense, moist *(continued)* -4" layer of poorly graded fine to medium sand
25	SS	100	6-8-10 (18)	MC = 11.00%			
30	SS	100	5-6-6 (12)	MC = 11.50%			-silt and sand layers -sand layers, perched seepage
35	SS	100	4-6-9 (15)	MC = 13.50%	SP-SM		35.0 2.0 Grades to gray poorly graded fine to coarse SAND with silt, medium dense, wet
40	SS	100	5-8-7 (15)				-very little recovery

GENERAL BH / TP / WELL 2074-2.GPJ GINT US.GDT 10/18/12

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DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
45					SP-SM		Grades to gray poorly graded fine to coarse SAND with silt, medium dense, wet *(continued)*
							45.0 -8.0
	SS	100	5-8-11 (19)	MC = 30.70%	ML		Gray clayey SILT with pockets of very fine sand, very stiff, moist
50							50.0 -13.0
	SS	100	5-9-11 (20)	MC = 34.00%	CL		Gray CLAY with silt, very stiff, moist
							51.5 -14.5
							Boring terminated at 51.5 feet below existing grade. Groundwater seepage encountered at 30.0 and 35.0 feet during drilling. Boring backfilled with bentonite. Bottom of hole at 51.5 feet.