Appendix B: Geotechnical Report

Shoreline Geotechnical Assessment

Findlay Shoreline Protection

10227 SW Tillicum Lane
Parcel No. 0594000060
Vashon, Washington

December 9, 2025
Project #25320

Prepared For:

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Prepared By:

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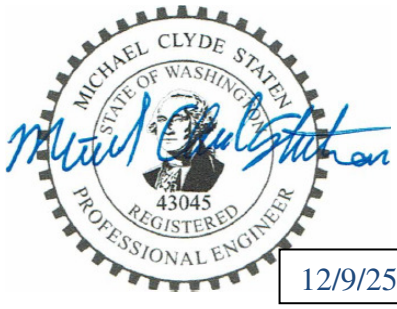

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1.0 INTRODUCTION

Envirotech Engineering, PLLC (Envirotech) has completed this shoreline geotechnical assessment in support of proposed shoreline armoring located at 10227 SW Tillicum Lane (parcel number 0594000060) in Vashon, Washington. As presented herein, this assessment includes information pertaining to the project in this Introduction Section; observations of the property and surrounding terrain in the Surface Conditions Section; soils and geological descriptions in the Subsurface Investigation Section; and, assessments and considerations for the development of this project in the Conclusions and Recommendations Section.

1.1 Project Information

Information pertaining to the project was provided by the proponent of the property and professional representatives of the property owner. The proposed project is planned to consist of a new soft shore approach consisting of large woody debris interspersed with boulders that will support the loss of property due to shoreline erosion within Quartermaster Harbor.

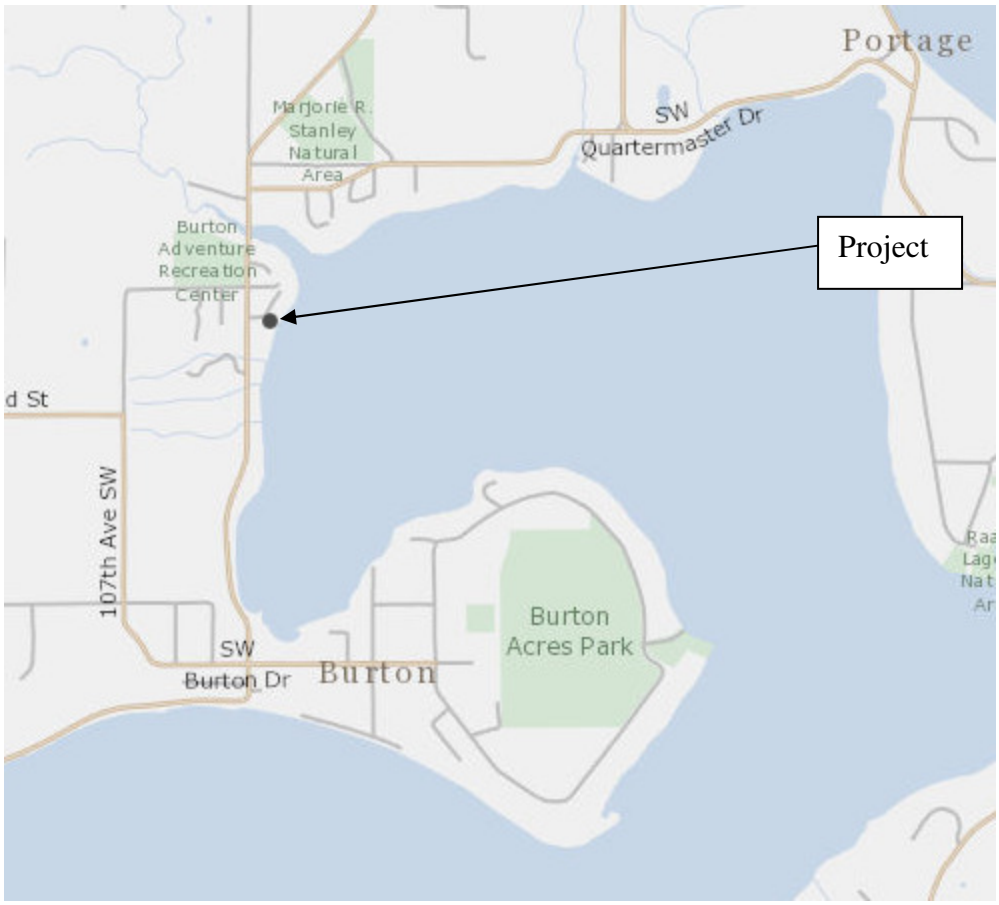
The purpose of the shoreline armoring is to benefit the long-term integrity of the existing residential home and septic system on the property due to continual shoreline erosion. The existing timber bulkhead is failing with severe scour and erosion occurring. Additional project information is provided in Section 2.0 of this report. Approximate site development with relation to site features are illustrated in the Site Map in Appendix A.

1.2 Purpose of Investigation and Scope of Work

The purpose of this shoreline geotechnical assessment was to evaluate the proposed project with relation to erosion, geologic hazards, shoreline alternatives, site adequacy, and geological and hydrological impacts to the property and adjacent/ downstream properties.

In order to fulfill the purpose of investigation, the geotechnical program completed for the proposed improvements include:

- Review project information provided by the proponents of the property;
- Conduct a site visit to document the site conditions that may influence the construction and performance of the proposed improvements;
- Define general subsurface conditions of the site by observing near surface soils, the exposed shoreline bank, review geotechnical reports prepared by others, and review soil/ geological maps for the vicinity of the project;
- Complete an engineering assessment supported by planned site alterations and the surface and subsurface conditions that were identified by the field investigation, soil testing, and applicable project research; and,
- Establish engineering conclusions and recommendations based on findings and the anticipated development.



Vicinity Map from King County Website

2.0 SURFACE CONDITIONS

Information pertaining to the existing surface conditions for the project was gathered on November 14, 2025 by a representative with Envirotech. During the site visit, site features were documented that may influence construction or reveal potential geological or hydrologic hazards. This Surface Conditions Section provides information on general observations, vegetation, topography, drainage and slope/ erosion conditions for the project and surrounding areas.

2.1 General Observations

The parcel is currently developed with a single family residence, driveway, septic system, bulkhead, and other ancillary features typical of this type of development. Vegetation consists mainly of landscaping, and native vegetation common to the Pacific NW. Beach flora was not observed at the time of our site visit. An aerial photo of the project and immediate vicinity is provided below. See the photographs in Appendix B for illustrations of site conditions.

The closest point from the existing infrastructure to the bulkhead is approximately 50 feet. The existing timber bulkhead is approximately 4.5 feet high, and is in failure mode with a large gap that has allowed shoreline erosion to occur. The scour is over 3.5 feet high, and about 10 feet horizontally behind the bulkhead. Per property owner accounts, the land has been receding for about 6 years.

2.2 Topography

The topographic information provided in this section was extrapolated from a public lidar source, and incorporated observations and field measurements, where necessary. Slopes are relatively mild upland from the low to medium shoreline bank.

2.3 Surface Drainage and Hydrology

Surface water such as streams or wetlands do not affect the properties. The upslope watershed from the property is relatively small, and since the upland slope grade is perpendicular to the shoreline, storm runoff entering the site appears to be negligible. Seepage or indications of excessive seepage along the shoreline bank was not observed.

The ordinary high water mark of the Puget Sound is approximately 4 feet up the face of the adjacent timber bulkhead from existing beach grade. It is apparent that the shoreline area to the is within the FEMA flood zone.

2.4 Slope and Erosion Observations

As previously mentioned, severe erosion has occurred behind the existing timber bulkhead. The 4.5 feet high by approximately 10 feet deep scour is largely denuded of vegetation at the base indicating active erosion. Additional landslide and shoreline erosion information is provided in the Engineering Conclusions and Recommendations Section of this report.

Aerial Photo from King County Website

3.0 SUBSURFACE INVESTIGATION

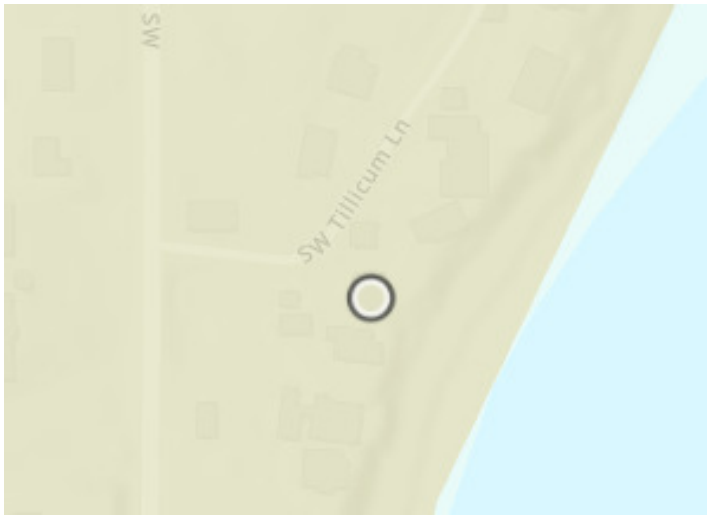
Information on subsurface conditions pertaining to the project was gathered during research and a site reconnaissance. Our site visit was accomplished on November 14, 2025 by a representative with Envirotech. Specific information on field methods, sampling, field testing, subsurface conditions, and results from soil testing are presented in this section of the report.

3.1 Geologic Conditions

In general, soils at the project are composed of materials from glacial advances. The geologic conditions as presented in the "Geologic Map of Washington," compiled by J. Eric Schuster, 2002 indicates Quaternary sediments, Q_g. Quaternary sediments are generally unconsolidated deposits, and dominantly deposited from glacial drift, including alluvium deposits. This project is located within the Puget Lowland. Typically, "lower tertiary sedimentary rocks unconformably overlie the Crescent Formation." as revealed in the Geologic Map. Initial sedimentary rocks were formed from shales, sandstones and coal deposits from rivers. During the Quaternary period, the Puget Lowland was covered by numerous ice sheets, with the most recent being the Fraser glacier with a peak of approximately 14,000 years ago. Upon the glacial retreat, the landscape was formed by glacial erosion glacial drift deposits.

The "Interactive Geologic Map" from the Department of Natural Resources provides the following caption(s) for the project area:

Map Unit: Qga
Age: Quaternary
Name: Advance Outwash
Description: Glaciofluvial sand and gravel and lacustrine clay, silt, and sand deposited during the advance of glaciers; sandy units commonly thick, well sorted, and fine grained, with interlayered coarser sand, gravel, and cobbles; locally contains nonglacial sediments and deposits mapped as transitional between glacial and nonglacial.



Geological Map Department of Natural Resources Washington State

3.2 Specific Subsurface Conditions

The following subsurface conditions are estimated descriptions of the project subgrade utilizing information from the depth of penetration at all testing, sampling, observed and investigated locations. Soils for this project were described utilizing the Unified Soil Classification System (USCS). Using the USCS in conjunction with estimated relative densities and other anticipated engineering properties of the soil, susceptibility for potential landslides, erosion and seismic hazards may be assessed.

Soils within the upper 4 feet or so below the existing upland grade were observed to be primarily medium dense, silty sand with clay and gravel (SM). Indications of substantial fill or cemented hardpan soils were not observed.

3.2.1 Groundwater and Hydrogeology

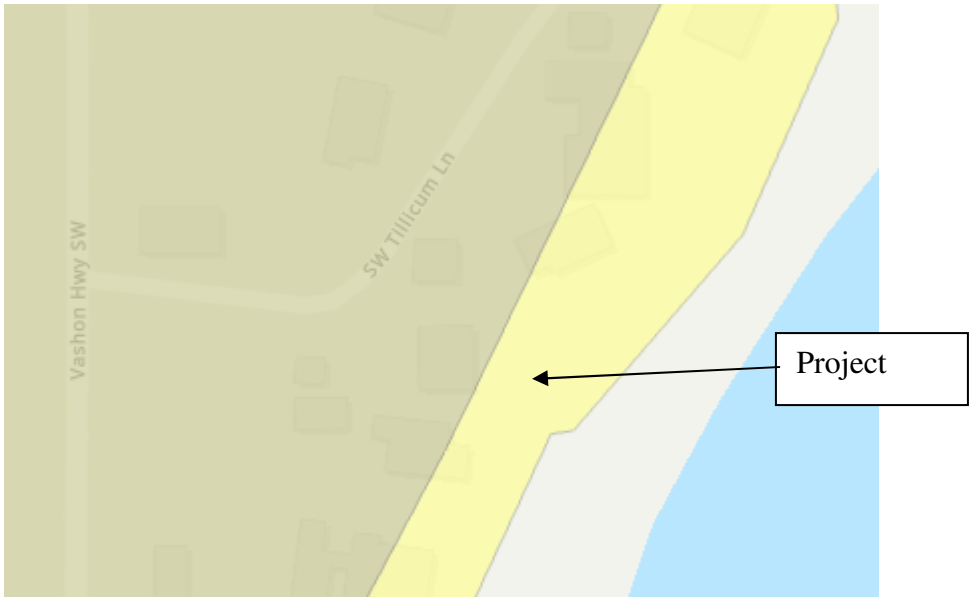
Permanent groundwater is expected to be at least 30 feet directly below the ground surface near the lowlands of the property (beach). Groundwater at shallow depths or surface seepage was not observed at the time of our site visit.

4.0 ENGINEERING CONCLUSIONS & RECOMMENDATIONS

The following sections present engineering assessments and conclusions concerning the project. These conclusions have been made available based on the planned construction activities as outlined in the Introduction Section of this report; general observations of drainage and topography as summarized in the Surface Conditions Section; and, soil conditions that were identified by the field investigation and soils testing as outlined in the Subsurface Investigation Section. Conclusions for the project that is provided herein, includes pertinent information for landslide, erosion and seismic hazards.

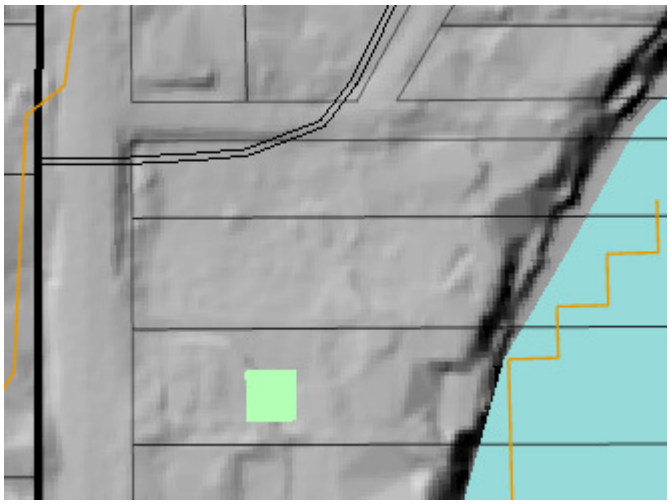
4.1 Landslide Hazards and Effects of Proposed Development

According to the Coastal Zone Atlas of King County, Washington, the project is within and near terrain labeled 'Intermediate' regarding potential landslide activity. A Stability Map from the Coastal Zone Atlas for the general area of this project may be found below.



Map from Washington State Department of Ecology Website

Mapping from the Department of Natural Resources, as shown below, does not indicate historic landsliding or high potentials for future landslides. It is our opinion that landslides are not a significant problem for this project.



Map from Washington State Department of Natural Resources Website

4.2 Erosion Hazards

Based on the USCS description and soil density of the upland soils from the existing bulkhead, the soils are considered moderately to highly erodible. Once factoring in the dynamic respect from shoreline waves, currents and storm surges, these soils are highly susceptible to erosion.'

Due to the shoreline dynamics such as waves and currents, especially during storm surges, it is our opinion that this property has a high susceptibility risk for additional shoreline erosion with or without the existing bulkhead. The small opening within the existing timber bulkhead has allowed significant shoreline erosion to occur. Complete failure of the bulkhead would allow shoreline erosion to occur along the entire property frontage at a must faster rate.

4.3 Seismic Hazards

There appears to be a fault near the property to the north identified as the Tacoma Fault Zone. This fault is a Class 'B,' and is located about 2.1 miles to the south of the project. This information is supported by the USGS Quaternary Fault and Fold Database for the United States.

The potential for liquefaction are believed to be low for this project. According to the Interactive Geologic Map of Washington, liquefaction susceptibility is very low within the vicinity of this project. This is also based on subsurface conditions such as soil characteristics and the lack of a permanent and substantial shallow water table. Subgrade characteristics that particularly contribute to problems caused by seismic events include submerged and confined, poorly-graded granular soils. Although gravel- and silt-sized soil particles could be problematic, fine and medium grained sands are typically subjected to these types of seismic hazards.

4.4 Shoreline Development Conclusions & Recommendations

Conclusions in this report are based on the type and location of the anticipated development, and existing on-site and off-site conditions. Site development that significantly deviates from the

anticipated improvements presented in this report, or future nearby development that influences this project may require a geotechnical re-evaluation.

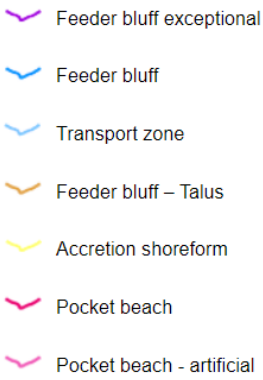
This Shoreline Development Conclusions and Recommendations Section provides our analysis and conclusions of the local shoreline process and how it relates to the existing and/ or proposed infrastructure. Envirotech analyzed alternative approaches and mitigation measures for the project site. We also included recommendations for the structural aspect and development.

4.4.1 Shoreline Protection Necessity

As demonstrated in this report, shoreline protection is needed for the existing infrastructure, especially the home and septic features on the subject property.

- The unprotected shoreline is a high erosion hazard, and is active. Shoreline erosion is the primary culprit that, if left unrestrained, will endanger the existing residence and undermine the onsite septic tanks. Per the Surface Conditions Section of this report, Envirotech observed active shoreline erosion. The property is mapped as having a feeder bluff per the Washington State Department of Ecology. See the illustration below. By definition, a feeder bluff is actively contributing or "feeding" sediments to beaches.
- Based on the existing amount of erosion, and rates of erosion per testament from the owner, the partially failed bulkhead has allowed for an erosion rate of about 10 feet in 6 years, which is equivalent to 1.67ft per year. Based on our judgment, a completely failed bulkhead would yield an erosion rate of at least 3 ft per year, and ultimately compromise the legally established home and utilities.
- The project is medium risk per the Marine Shoreline Design Guidelines (MSDG) by the Washington Department of Fish & Wildlife. It is recommended by the MSDG that medium risk sites utilize soft armoring. See Appendix C for a depiction of the cumulative risk model that pertains to this project.

Coastal Landform Map from Washington State Department of Ecology Website



4.4.2 Shoreline Stabilization Per King County Code

Shoreline Stabilization per King County Code 21A.25.170 was considered in our geotechnical assessment as outlined below. The following excerpts from the Code that are relevant to geological and shoreline hazards and the need for hard armoring is provided below as italicized type. Below each code provision, we describe how the project satisfies or dissatisfies the key criteria cited in that code provision with respect to our field of study.

21A.25.170 (A). Shoreline stabilization shall not be considered an outright use and shall be permitted only when the department determines that shoreline protection is necessary for the protection of existing legally established primary structures, new or existing non-water-dependent development, new or existing water-dependent development or projects restoring ecological functions or remediating hazardous substance discharges. Vegetation, berms, bioengineering techniques and other nonstructural alternatives that preserve the natural character of the shore shall be preferred over riprap, concrete revetments, bulkheads, breakwaters and other structural stabilization. Riprap using rock or other natural materials shall be preferred over concrete revetments, bulkheads, breakwaters and other structural stabilization. Lesser impacting measures should be used before more impacting measures.

The least impacting shoreline protection measure has been analyzed per the Alternative Approaches Section 4.4.3 of this report.

21A.25.170(B). Structural shoreline stabilization may be permitted subject to the standards in this chapter and as follows:
1. The applicant provides a geotechnical analysis that demonstrates that erosion from waves or currents is imminently threatening or that, unless the structural shoreline stabilization is constructed, damage is expected to occur within three years;
2. The erosion is not caused by upland conditions;
3. The proposed structural shoreline protection will provide greater protection than feasible, nonstructural alternatives such as slope drainage systems, vegetative growth stabilization, gravel berms and beach nourishment;

4. The proposal is the minimum necessary to protect existing legally established primary structures, new or existing non-water-dependent development, new or existing water-dependent development or projects restoring ecological functions or remediating hazardous substance discharges; and
5. Adequate mitigation measures will be provided to maintain existing shoreline processes and critical fish and wildlife habitat and ensure no net loss or function of intertidal or riparian habitat.

It is our opinion that this geotechnical analysis demonstrates that erosion from waves or currents is imminently threatening or that, unless the structural shoreline stabilization is constructed, damage is expected to occur within a time frame of more than three years. See the Bulkhead Necessity Section 4.4.1 outlined earlier in this report for additional details.

Current erosion is not caused by upland conditions. Erosion of the shoreline due to waves or currents is isolated to the where the existing bulkhead has partially failed.

The proposed soft shore shoreline protection will provide needed protection. Other nonstructural alternatives such as slope drainage systems, vegetative growth stabilization, gravel berms and beach nourishment are not adequate for this project. See Section 4.4.3 of this report for an analysis on nonstructural alternatives, and why they are not feasible for this project.

The proposed shoreline protection is the minimum necessary to protect the existing legally established primary structure and utilites.

Adequate mitigation measures will be provided by others to maintain existing shoreline processes and critical fish and wildlife habitat and ensure no net loss or function of intertidal or riparian habitat.

21A.25.170 (C). Shoreline stabilization to replace existing shoreline stabilization shall be placed landward of the existing shoreline stabilization, but may be placed waterward directly abutting the old structure only in cases where removal of the old structure would result in greater impact on ecological functions. In critical saltwater habitats, existing shoreline stabilization shall not be allowed to remain in place if the existing shoreline stabilization is resulting in the loss of ecological functions. Adequate mitigation measures that maintain existing shoreline processes and critical fish and wildlife habitat must be provided that ensures no net loss or function of intertidal or riparian habitat.

Due to both neighboring properties having existing hard armoring, the proposed type of shoreline stabilization should not be located landward as it is not feasible. In addition, the structural engineer should consider this in the design so that the proposed armoring does not create a hazard to the neighboring bulkheads. We recommend adequate rock at each termination point that extends at least 10 feet from the adjacent bulkheads.

21A.25.170 (D). The maximum height of the proposed shoreline stabilization shall be no more than one foot above the elevation of extreme high water on tidal waters, as

determined by the National Ocean Survey published by the National Oceanic and Atmospheric Administration, or four feet in height on lakes.

Envirotech concurs that it is not necessary to have the maximum height of the shoreline stabilization structure no mare than one foot above the elevation of extreme high water. The structural engineer should take this into account during their design process.

21A.25.170 (E). Shoreline stabilization is prohibited along feeder bluffs and critical saltwater habitat, unless a geotechnical report demonstrates an imminent danger to a legally established structure or public improvement. If allowed, shoreline stabilization along feeder bluffs and critical saltwater habitat must be designed to have the least impact on these resources and on sediment conveyance systems.

This geotechnical report demonstrates an imminent danger to legally established structures. See the rationale and details provided in Section 4.4.1 of this report.

21A.25.170 (F). Shoreline stabilization shall minimize the adverse impact on the property of others to the maximum extent practical.

It is our opinion that the new shoreline stabilization that is planned will mitigate adverse impacts on the properties if our recommendations in this report are adhered to.

21A.25.170 (G). Shoreline stabilization shall not be used to create new lands.

New lands shall not be created when establishing the bulkhead. From a geotechnical perspective, this would not be required per our recent observations.

21A.25.170 (H). Shoreline stabilization shall not interfere with surface or subsurface drainage into the water body.

As previously stated in this report, surface for subsurface drainage is not a limiting factor for this project, and will not be interfered with.

21A.25.170 (I). Automobile bodies or other junk or waste material that may release undesirable material shall not be used for shoreline stabilization.

Waste material will not be used for shoreline protection.

21A.25.170 (J). Shoreline stabilization shall be designed so as not to constitute a hazard to navigation and to not substantially interfere with visual access to the water.

The shoreline armoring designer shall design accordingly, and in our belief, will not interfere with navigation or visual access to the water.

21A.25.170 (K). Shoreline stabilization shall be designed so as not to create a need for shoreline stabilization elsewhere.

It is our opinion that the required shoreline stabilization will not be located or designed in such a manner that would create a need for shoreline stabilization elsewhere if our report is adhered to.

21A.25.170 (L). Shoreline stabilization shall comply with the Integrated Stream Protection Guidelines (Washington state departments of Fish and Wildlife, Ecology and Transportation, 2003) and shall be designed to allow for appropriate public access to the shoreline.

From a geotechnical perspective, it is our opinion that this portion of the code will be adhered to.

21A.25.170 (M). The department shall provide a notice to an applicant for new development or redevelopment located within the shoreline jurisdiction on Vashon and Maury Island that the development may be impacted by sea level rise and recommend that the applicant voluntarily consider setting the development back further than required by this title to allow for future sea level rise. (Ord. 16985 § 41, 2010: Ord. 5734 § 5, 1981: Ord. 3688 § 413, 1978. Formerly K.C.C. 25.16.180).

The existing residence is sufficiently elevated from impacts of sea level rise.

4.4.3 Alternative Approaches Analysis

Alternative approaches were considered in our geotechnical assessment as outlined in the Washington Administrative Code (WAC) 220-660-370 (3). Per this selection process, the code requires the use of the least impacting technically feasible shoreline stabilization alternative, whereas feasible means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes. Furthermore, the WAC states that a hard armoring technique should be proposed after considering site characteristics such as the threat to major improvements, wave energy, and other factors in an alternative analysis.

The following key excerpts from that are relevant to geological and shoreline hazards and the need for to maintain a functional, hard armored bulkhead (such as what is proposed in the current plans) is provided below in italics. Below each code provision, we describe how the project satisfies or dissatisfies all of the key criteria cited in that code provision with respect to our field of study.

WAC 220-660-370(3)(c) – Common alternatives for replacement or rehabilitation of residential shoreline stabilization are, from most preferred to least preferred:

(i) Remove the existing shoreline stabilization structure and restore the beach.

This alternative is infeasible because a major improvement (existing residence) is in danger without an adequately functioning shorleline protection. As previously

substantiated in this report, the home would ultimately be compromised in addition to existing infrastructure on both neighboring properties.

(ii) Remove the existing shoreline stabilization structure and install native vegetation.

This alternative is infeasible due to vegetation having a lack of shoreline bank protective qualities for this specific project. The lack of vegetation within the denuded, eroded shoreline area shows that vegetation is not protective – especially along a feeder bluff.

(iii) Remove the existing shoreline stabilization structure and control upland drainage.

As previously outlined in Section 2.3 of this report, upland drainage issues are not a problem for this project, therefore this alternative analysis is not feasible.

(iv) Remove the existing shoreline stabilization structure and replace it with a soft structure constructed of natural materials, including bioengineering.

This alternative is feasible for this project with the emphasis on rock protection at both ends of the property as displayed in this report so that neighboring bulkheads are not compromised.

4.4.4 Mitigation Measures

Measures to mitigate potential site specific and cumulative geological and hydrological impacts of the proposed development are provided herein in order to mitigate adverse impacts to adjacent and down-current properties.

Envirotech believes that the soft shore approach with rock interspersion is a positive ecological friendly shoreline armoring system over the existing timber bulkhead. In addition, habitat management protocols from the biologist and the reviewing authority should be implemented as per their code.

4.5 Construction Recommendations

The following recommendations are offered for the proposed project. This includes foundations, earthwork and drainage considerations.

4.5.1 Foundations

Foundations (bottom rock) where rock is protecting neighboring bulkheads should be established on relatively undisturbed native soil. For a bearing capacity requirement of no more than 2500 psf, rock shall be placed at a minimum depth of 24 inches below beach grade or deeper if required by the structural engineer or per code. Foundation recommendations are made available based on adherence to the remaining recommendations that are provided in this report.

Anchoring of large wood debris shall be designed by the structural engineer, and should be anchored at a depth of at least 4 feet below beach grade.

Total and differential settlement that a structure will undergo depends primarily on the subsurface conditions, type of structure, amount and duration of pressure exerted by the structure, reduction of pore water pressure, and in some instances, the infiltration of free moisture. Based on the expected native soil conditions, anticipated development, and construction abides by the recommendations in this report, the assumed foundation system may undergo a maximum of 0.50 inch total settlement, and a maximum differential settlement of 0.25 inch over a 50 ft span.

4.5.2 Earthwork Construction Recommendations

Founding material for both rock and large woody debris shall consist of undisturbed native soils.

Excavation is recommended to remove any deleterious material, if present, beneath foundations and to achieve appropriate foundation depth. Additional sub-excavation will be required for this project if the soils below the required foundation depth are loose, or otherwise incompetent due to inappropriate land disturbing.

Temporary and permanent earth cuts and fill slopes exceeding 4 feet in height should be limited to a slope of 2:1 (horizontal:vertical). Utility trenches or other confined excavations exceeding 4 feet should conform to OSHA safety regulations. Permanent cut and fill slopes shall be limited to a slope of 2:1, unless otherwise approved by an engineer.

Any rock or crushed ballast material as allowed by the structural engineer is suitable for this project. Standard compaction is not necessary. Fill beneath foundations should be avoided for this project.

4.5.3 Retaining Walls and Lateral Earth Pressures

The proposed shoreline protection is a soft shore approach that utilizes some rock. The lateral earth pressures exerted through the backfill of a retaining wall are dependent upon several factors including height of retained soil behind the wall, type of soil that is retained, degree of backfill compaction, slope of backfill, surcharges, hydrostatic pressures, earthquake pressures, and the direction and distance that the top of the wall moves.

An equivalent fluid unit weight used for structural design may be estimated as the product of the backfill soil unit weight and the earth pressure coefficient for respective earth pressures:

	At-Rest	Active
Native Soils	69 pcf	42 pcf
Engineered Fill Soils	45 pcf	28 pcf

The values provided above shall be increased by 1 pcf for every 1 degree of backfill/ natural slope angle. These equivalent fluid unit weight values do not include lateral earth pressures induced by earthquakes, groundwater, or surcharges from live loads. These loads should be accounted for at the discretion of the structural engineer.

4.5.4 Drainage Considerations

Shoreline armoring of the proposed nature are not required to have drainage provisions, as we believe that any potential groundwater will not be inhibited.

5.0 CLOSURE

Based on the project information and site conditions as presented in this report, it is Envirotech's opinion that additional geotechnical studies are not required to further evaluate this project.

Due to the inherent natural variations of the soil stratification and the nature of the geotechnical subsurface exploration, there is always a possibility that soil conditions encountered during construction are different than those described in this report. Therefore, it is recommended that Envirotech is promptly notified if project and subsurface conditions found on-site are not as presented in this report so that we can re-evaluate our recommendations.

This report presents a geological/ geotechnical assessment, and is intended only for the owner, or owners' representative. Furthermore, this report is only valid for the project information and location described herein. Significant geological or property changes prior to the implementation of this project could render this report outdated, and will require additional geotechnical studies.

The services described in this report were prepared under the responsible charge of Michael Staten, a professional engineer with Envirotech. Michael Staten has appropriate education and experience in the field of geotechnical engineering in order to assess landslide hazards, erosion hazards, earthquake hazards, and shoreline dynamics.

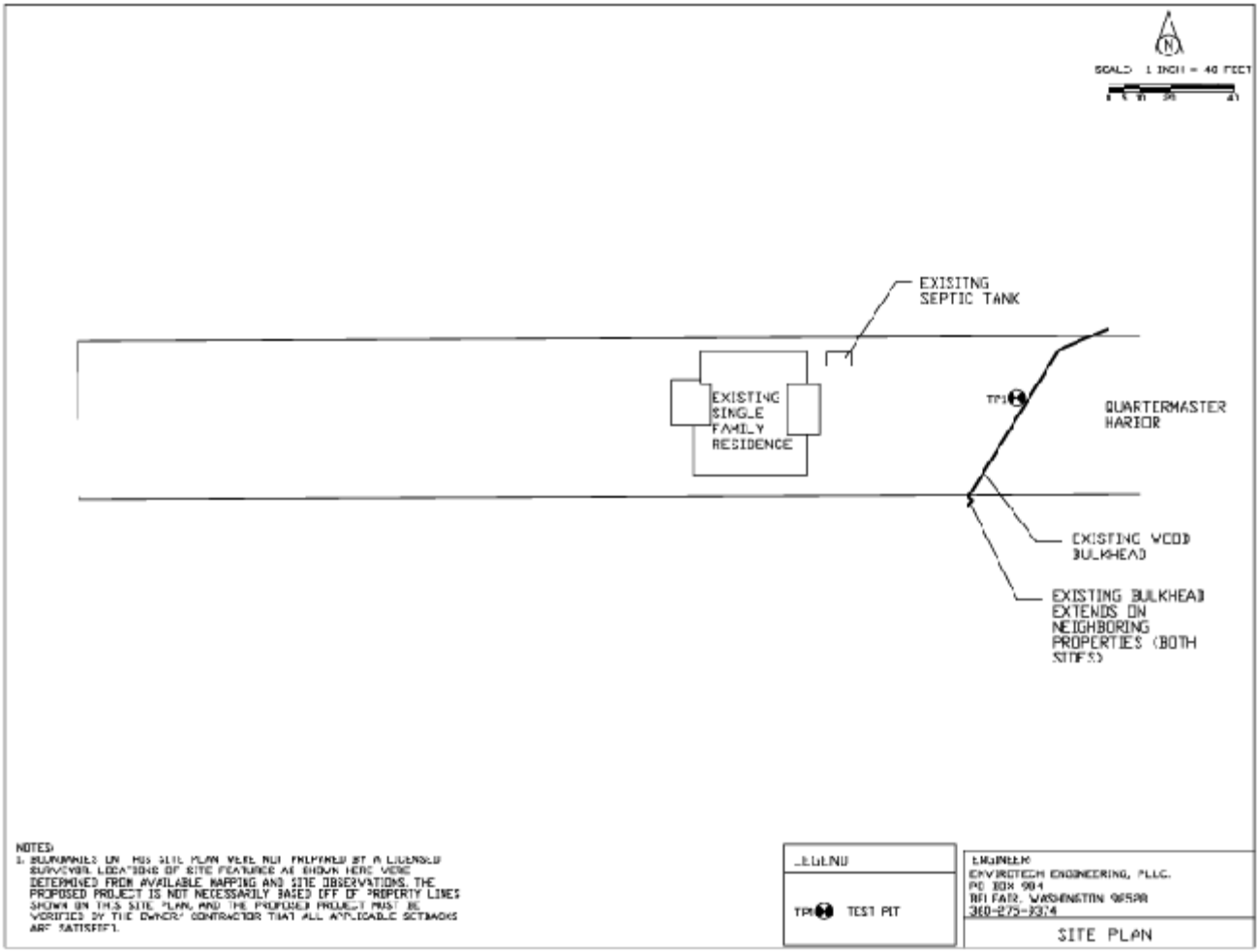
Please contact Michael Staten at 360-275-9374 if you have any questions, comments, or require additional information.

Sincerely,
Envirotech Engineering

Michael Staten, P.E.
Geotechnical Engineer

APPENDIX A

SITE PLAN



NOTES:
1. BOUNDARIES ON THIS SITE PLAN WERE NOT PREPARED BY A LICENSED SURVEYOR. LOCATIONS OF SITE FEATURES AS SHOWN HERE WERE DETERMINED FROM AVAILABLE MAPPING AND SITE OBSERVATIONS. THE PROPOSED PROJECT IS NOT NECESSARILY BASED OFF OF PROPERTY LINES SHOWN ON THIS SITE PLAN, AND THE PROPOSED PROJECT MUST BE VERIFIED BY THE OWNER/ CONTRACTOR THAT ALL APPLICABLE SETBACKS ARE SATISFIED.

LEGEND

TP# TEST PIT

ENGINEER
ENVIROTECH ENGINEERING, PLLC.
PO BOX 984
BELFAIR, WASHINGTON 98528
360-275-8374

SITE PLAN

APPENDIX B

PHOTOGRAPHS

Photo 1: Failed Timber Bulkhead w/ Backfill Erosion

Photo 2: Active Shoreline Erosion Behind Bulkhead to South Beyond Bulkhead Failure

Photo 3: Shoreline Erosion Behind Bulkhead to North Beyond Bulkhead Failure

APPENDIX C

CUMULATIVE RISK MODEL

CUMULATIVE RISK MODEL			
EROSION POTENTIAL			
Shoretype	**Score**	**Fetch**	**Score**
No Appreciable Drift (NAD)-Bedrock/Low Energy	0	0–1 mile	1
Modified, Accretion Shoreform, NAD-Delta	1		
NAD- Artificial , Transport Zone, Pocket Beach	2	1–5 miles	2
Feeder Bluff	3	5–15 miles	3
Feeder Bluff Exceptional	4	15+ miles	4
Erosion Potential Score =	**Shoretype Score + Fetch Score**		5
INFRASTRUCTURE THREAT			
Setback	**Score**	**Infrastructure Type**	**Score**
>60 ft	1	Property without structures	1
36–60 ft	2	Septic drainfield or unattached residential infrastructure, not lived in	2
21–35 ft	3	Home or residential building	3
0–20 ft	4	Major infrastructure	4
Infrastructure Threat Score =	**Setback Score + Infrastructure Type Score**		5
CUMULATIVE RISK TOTAL (product):	**Erosion Potential x Infrastructure Threat**		25

Table 3-4 from the Washington Department of Fish & Wildlife, Marine Shoreline Design Guidelines

- Low risk scores between 0–15
- Moderate risk scores between 16–36
- High risk scores greater than 36

Feeder bluff delination from WA State Department of Ecology Coastal Atlas Map

Fetch is measured as greatest distance of open water to project site from aerial mapping.