



June 12, 2026
Report No.: 26-040 – Revision 1

Vladimir and Irina Belov
12790 Marine Drive
Anacortes, WA 98221

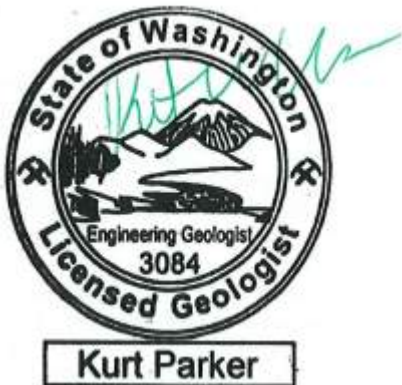
C/O: Tanya Belova
Via email: tanyab0105@yahoo.com

RE: Preliminary Geologic Hazard Site Assessment, 12790 Marine Drive, Anacortes, Washington
Parcel P68272

Dear Mr. and Mrs. Belov:

NW Geologic, PLLC (NW Geo) thanks you for the opportunity, and respectfully submits the following preliminary geologic hazard site assessment report summarizing the results of our evaluation for the recent landslide event at the above parcel in Skagit County, Washington. This report has been prepared in general accordance with the terms and conditions established in our Proposal for Services dated June 1, 2026. Should you have any further questions regarding the information contained within the report, or if we may be of service in other regards, please contact the undersigned.

Respectfully Submitted,



6/12/2026

Kurt Parker, Owner
Licensed Engineering Geologist
NW Geologic, PLLC
Ferndale, WA



PROJECT DESCRIPTION

NW Geo understands that the owners of the above parcel constructed staircase features on the west facing coastal bluff slope without approval from Skagit County Planning and Development Services (Skagit County). To our knowledge, the staircase and associated features were constructed within the last few years. Removal of vegetation on the bluff slope was part of the construction process. In December 2025, a landslide event occurred that encompassed the full height of the bluff face and destroyed most of the staircase, depositing it at the toe of the bluff slope. Skagit County provided the owners with an *Administrative Order to Abate Violation* document dated May 14, 2026. The document indicates that a code compliance case exists from 2019 where the deck adjacent to the west margins of the existing residence was extended and new footings were placed on the slope. We were provided with this document for review during the beginning of our involvement in the project.

We were requested by the family of the owners to provide a geologic hazard site assessment and report based on the existing conditions and Skagit County documents. As this project is a slope mitigation for an existing residence, not all of the code requirements for new construction apply to this project.

The general vicinity of the parcel contains sloping terrain that may be considered a geologic hazard area per Skagit County Critical Areas Ordinance 14.24 because of potential geologic hazards located within 200 feet of the existing residence.

We have performed this critical area assessment in consideration of Skagit County Code requirements. A summary of our observations, findings, interpretations, conclusions and recommendations to date are provided herein that will be utilized during the slope mitigation process.

The *Regional Map* and *Vicinity Map* can be found as Figures 1 and 2 at the end of this report. A *Site Plan* is shown as Figure 3. A schematic cross section A-A' is provided as Figure 4, with a *Geologic Map* presented as Figure 5. Lidar Imagery is shown as Figures 6 and 7. A USCS Chart is included as Figure 8.

SCOPE OF SERVICES

The purpose of this assessment is to establish general surface conditions at the property from which geologic hazard mitigation recommendations for the existing conditions could be formulated in conformance with Skagit County Code. Our scope of services for this report specifically includes the following tasks:

- Review readily available geologic and soils information along with publicly available data and Skagit County documents.
- Perform a visual reconnaissance of the landslide area and immediate vicinity to observe existing site topographic and geologic conditions.
- Provide an assessment of potential geologic hazards per Skagit County Critical Area Ordinance 14.24 and mitigation recommendations as applicable for future slope improvements.
- Provide recommendations for geotechnical consultation during construction.



INVESTIGATION METHODOLOGY

On May 29, 2026, a NW Geologic Licensed Engineering Geologist visited the site to perform visual reconnaissance of the surface and topographic features of the subject property and adjacent sloping terrain. Relevant site dimensions and topography were estimated and mapped at representative intervals using hand survey equipment as access allowed. Because of the existing steep slope conditions, we were not able to access the majority of the slope face due to safety concerns. The beach located below the residence has no public access and cannot be reached safely from the upper slopes. Our assessment was performed from the west-facing deck area and the immediate slope below the existing structures as safe access allowed. We were, however, able to observe and document all of the exposed coastal bluff face from the subject residence at the top of the bluff and vicinity.

We also reviewed geologic literature resources and geologic hazard maps published by the Washington State Department of Natural Resources (DNR), Washington State Department of Ecology (DOE), US Geological Survey (USGS), US Department of Agriculture (USDA), Skagit County, and other public sources, as available.

SITE CONDITIONS

Surface Summary

The 1.25-acre parcel is located on and within an elevated coastal bluff in Skagit County, south of the City of Anacortes. It is accessed via Marine Drive. Burrows Bay forms the western parcel boundary at beach level. The coastal bluff is approximately 160 to 170 feet tall vertically and composed of glacially derived sediment in its entirety. The existing single-story residence was built in 1980 and is approximately 3,266 square feet including an attached open garage or carport, according to Skagit County *iMap*. We were informed by family members that the house contains an interior slab on grade concrete floor. We estimate that the load intensity of the existing house is low or light, based on a single-floor residential design. The residence is located about 50 feet to the west of the margins of Marine Drive. The septic system is located on the northeast side of the residence. There are no obvious imported fill zones that we observed.

The western side of the residence includes several exterior, attached deck features at a similar elevation to the residence. There is a detached shed with viewing windows on the south side of the deck. Planter features comprise the north deck margins. Landscape planters are found downhill to the west of the residence about 10 to 15 feet below the deck elevation in the central area of the upper slope. The established deck is cantilevered out over the top of the bluff in the north and south margins. The central deck appears to be placed on existing soils. A hot tub is located centrally on the deck. The entire history of the deck construction is unknown however we presume an original-construction deck formed the western perimeter of the house and it was expanded in 2019 and was the cause for the above noted code compliance. The home site is currently set back approximately 10 to 15 feet from the crest of the bluff at the top of the recent landslide. The family indicated that the house foundation was not compromised by the landslide. No interior features of the house such as door or window function appeared to be impacted according to our conversations while on site.

A review of Skagit County *iMap* photo from 2025 shows a sinuous staircase and landings extending from the residence to the beach area along with less vegetation in the staircase corridor than in photographs from previous years.

The slope conditions observed during our site visit consisted of mostly exposed glacially derived soils in an over steepened condition. The scarp at the top of the bluff was about 35 feet tall at an angle of approximately 65 degrees. Some of the staircase was intact on the south side of the scarp area, which allowed limited access to



the slope face. Slope angles of 45 to 50 degrees over approximately 90 to 100 slope feet were documented in the central area of the slide. The toe of the bluff was measured at about 35 degrees for 40 to 50 slope feet and extended down to the contact with the natural gravel beach. Landslide debris, displaced vegetation and lumber from the staircase were observed at the toe of the bluff. It appears that high tide reaches the toe of the bluff and can be destabilizing the toe of the slope from below. The horizontal extent of the landslide includes the majority of the property width north to south. It was not evident that the landslide reached neighboring properties to the north and south, although access was limited beyond the deck area because of steep slopes and vegetation. Groundwater daylighting on the slope face was observed at about 40 vertical feet below the slope crest as light seepage.

From our observations, we determined that the landslide was a shallow, concave translational debris landslide. The landslide was observed to be 70 to 80 feet wide and included the majority of the bluff height, likely about 160 vertical feet. We estimate that soils encapsulated in the failure zone were 3 to 7 feet thick vertically across most of the central and upper slope face.

Limited exposed soils were observed within the scarp area and classified as silty sand with gravel and some cobble that are likely of glacial outwash origin. The groundwater seepage observed indicates that a low permeability horizon exists at this location about 40 feet below the bluff slope crest. The soils at and below the seepage are likely glacial till comprising the middle to lower slope face and extending to the beach interface. The beach was observed to be a typical Pacific Northwest gravel beach with some driftwood logs.

Vegetation is sparse within the landslide footprint and includes mostly juvenile horsetails, blackberry and other new growth. Two mature maple trees were observed near the toe of the landslide and appear to be intact. Both trees were straight and vertical and extended to heights of 50 to 75 feet. One large fir tree was observed near the top of the slope on the south property margins that was straight and vertical at 45 feet in height. The north and south perimeters of the landslide were densely vegetated with common deciduous trees dominated by maple. Understory vegetation includes salal, ivy, short grasses and blackberry. The family reported a large tree on the north margins near the scarp area was included in the landslide failure prism. Other large trees on the north slope crest had been removed before the landslide, and the stumps were left intact according to discussions with family members.

No other surface water was observed beyond the seepage noted within the slope. The ocean margins at Burrows Bay intersect the toe of the slope at high tide levels. Lake Erie is located about 0.3 miles to the southeast at a lower elevation.

General signs of global and local slope instability were observed during our reconnaissance of the property and vicinity. Beyond general slope morphology, we observed the 2025 landslide footprint, associated scarp, landslide runout debris at the toe of slope and displaced vegetation and staircase materials at the base of the landslide.

Field conditions on the day of our site visit were mostly cloudy, windy and in the low 60s Fahrenheit. Photographs of site conditions are provided in Appendix A at the end of this report.

Groundwater

Groundwater was observed daylighting as light seepage on the slope face as noted above. We consider the site to have potential perched groundwater conditions due to relatively permeable upper slope materials overlying a low permeability horizon that likely consists of glacial till. We do not know if the observed seepage persists all



year but estimate that more seepage occurs in the winter set season. We advise that slope improvements occur in the dry summer months to avoid the potential for perched water conditions.

A review of the Washington State Department of Ecology (DOE) *Well Report Viewer* indicates there are no water wells in the nearby vicinity of the subject parcel.

General Geologic Conditions

The mapped geologic conditions in the vicinity of the project site were referenced from the *Surficial Geologic Map of the Port Townsend 30-by60-Minute Quadrangle, Puget Sound Region, Washington* (Pessl et al., 1989), and the *Washington Geologic Information Portal*. Pessl et al. maps glacial and nonglacial sedimentary deposits, undivided within the coastal bluff slopes encompassing the area of Marine Drive (Unit Qu). The unit is described as glacial and nonglacial sediments deposited during the Pleistocene Epoch. The unit is shown where field data are insufficient for more precise differentiation or where steep slopes preclude more precise delineation at map scale (Pessl et al., 1989).

The *Geologic Information Portal* maps the bluff slopes and vicinity as Pleistocene nonmarine recessional glacial outwash (Unit Qgo). The unit is described as *sand and pebble to cobble gravel; local lenses of silt; loose; mostly fluvial; includes deltaic deposits and may contain small exposures of compact ice-contact deposits*. This unit extends to the east, toward Lake Erie and north and south of the subject property along Marine Drive. To the north of Unit Qgo, Pleistocene continental glacial till (Unit Qgt) is mapped extending generally north along Marine Drive. The unit is described as *unsorted clay, silt, sand, and gravel, in varied abundance, with scattered to abundant pebbles, cobbles, and boulders; compact; typically structureless; locally contains subordinate amounts of ice-contact deposits such as eskers, ablation till, and flow till; may locally include marine deposits*. To the northeast of the parcel, intrusive mafic and intermediate rocks of the Fidalgo Ophiolite are mapped extending to the summit of Mt Erie and beyond. This unit is described as *Jurassic tonalite (plagiogranite) sheeted dike complex with minor layered hornblende gabbro and pyroxenite* (DNR).

The *Geologic Information Portal* maps no active faults or landslides within the immediate vicinity of the parcel. There are several inactive thrust faults and concealed faults to the east, north and south of the project site mostly related to the bedrock conditions of the Fidalgo Ophiolite complex. The site is mapped as *very low* susceptibility to liquefaction induced settlement. There is a mapped landslide along the coastal bluff about 0.85 miles south of the parcel on Rosario Road (DNR).

Based on the documented geology and subsurface conditions, it is our opinion that the site conditions support the presence of glacial outwash over glacial till and is in general accordance with the mapped geology. It should be noted that the published soil types are representative of regional conditions that are mapped on a large scale and some variation between on-site conditions and mapped geologic units should generally be anticipated.

Web Soil Survey

According to the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) *Web Soil Survey* website, two soil units are mapped within the subject area. Within the project vicinity, the bluff slopes are mapped as Dystric Xerochrepts, while the upland area is mapped as Swinomish gravelly loam. Please refer to the table below for additional characteristics.



Map Unit Symbol	47	138
Map Unit Name	Dystic Xerochrepts, 70 to 90% slopes	Swinomish gravelly loam, 8 to 15% slopes
Soil Description	Very gravelly loam over very gravelly clay loam over extremely gravelly loam over unweathered bedrock	Gravelly ashy loam over very gravelly fine sandy loam over very gravelly sandy loam
Landform	Mountain slopes	Ridges
Parent Material	Colluvium from serpentine and glacial drift	Volcanic ash and glacial drift
Land Capability Classification	7e	3e
Erosion K Factor, Whole Soil	0.15 - Low	0.24 - Moderate

Values of erosion factor K range from 0.02 to 0.69, and the higher the value, the more susceptible the soil is to sheet and rill erosion by water. The soil mapped by the USDA at the project site is rated as having a **low to moderate** erosion susceptibility with erosion K factors of 0.15 to 0.20. We consider the potential for erosion to be high on the bluff face if soils are left in an exposed condition over time due to the amount of exposed soil, slope angles and general topography.

Aerial Photo Review

We reviewed historic and recent aerial photos of the subject property from 1969 to 2025 in order to determine changes in slope conditions within the vicinity of the project site. Aerial photos were obtained from the Skagit County *iMap* website. The 1969 photo shows the property undeveloped, with some vegetation clearing on the bluff slopes in the area of the property, however the resolution of the image makes a detailed review difficult. The 1998 image shows the exiting residence and forested bluff slope conditions, but again the resolution does not allow for a detailed review. The 2001 to 2006 images resolution again makes detailed review difficult, but it appears that forested conditions exist on the bluff slope face. The 2007 to 2023 photographs show densely forested conditions on the bluff face at the subject site. The parcels to the south appear to have exposed soils with varying amounts of younger vegetation. The 2025 image of the subject site shows less vegetation with likely large tree and understory vegetation removal, as well as the staircase structure in place. The general perimeter of the staircase seems to be devoid of vegetation (Skagit County, 2026).

We also reviewed satellite images from Google Earth Pro™ during our review from 2005 to 2024. The images from 2005 to 2014 show a vegetated bluff slope face similar to the above noted photos from Skagit County. The 2015 images shows bluff slope face landslide activity to the north and south of the subject parcel. The parcel to the immediate south has exposed soils indicating recent soil movement during the 2015-to-2018-time frame. The 2016 to 2022 images depict new vegetation growth on the bluff slopes where pervious landslides had occurred. The 2024 image shows what appears to be the staircase in place at the subject property, with associated vegetation removal.

Based on our review, there are indications of large-scale “global” instability on the subject slopes or vicinity, as observed in the reviewed aerial photos. We did observe signs of local instability as well associated with bluff slope conditions. Please note that the aerial photographs may not fully depict actual surface conditions due to the tree canopy and other vegetation possibly obscuring the ground surface.



Lidar Imagery Review

Light detection and ranging (Lidar) imagery of the site vicinity was reviewed during the research process. The 2016 Skagit County *iMap* lidar image shows scalloped ridge crests to the north and south of the subject property. The properties to the immediate south of the subject property have what appears to be a landslide footprint. The DNR lidar from 2023 shows similar bluff slope conditions along Marine Drive with better resolution. A notable scarp and probable slope failure is visible to the south of the subject site. Scalloped ridge crests and generally shallow translational landslide features are common along this coastal bluff zone.

Based on our review, we did not observe any direct evidence of landslide or erosion impacting the property or immediate vicinity because of the time of image acquisition. We did observe landslide evidence to the immediate south of the property. There are typical indications of ongoing or historic slope instability such as head scarps and landslide footprints in the vicinity of the subject parcel.

Please note that not all signs of slope instability can be observed in Lidar imagery review due to resolution and scale. In addition, any signs of instability on the site slopes or vicinity that have occurred within the last approximately 3 years, if present, have occurred after the imagery acquisition.

Coastal Atlas Map

NW Geo reviewed information from the Washington State Department of Ecology (DOE) *Coastal Atlas Map*. According to the DOE, the bluff slopes in the area of the parcel are mapped as *Unstable Slopes*. Locations to the north and south of the property have some zones mapped as *Unstable Slope with Recent Slides* within 500 feet to the north and south of the property. The upland area to the east is generally mapped as a *Stable Slope*.

The immediate shoreline area is classified as a Feeder Bluff, with general littoral transport of material from right to left (north) when facing the shoreline. The historic shoreline is similar to the current shoreline based on DOE mapping. Aerial photographs from 1990 show exposed soils on some of the coastal bluffs to the south of the property. The 2001 and 2006 pictures show the same exposed soils to the south with slightly more vegetation. The subject property slopes are mostly densely vegetated. The 2016 picture shows similar conditions. The neighboring parcel to the south has what appears to be a stormwater tightline that routes upland collected water to the beach area.

Sea Level Rise

According to the NOAA *Sea Level Rise Viewer*, the site vicinity could be subject to a rise in sea level of 0.36 feet by 2050 and 1.08 feet by the year 2100 in an intermediate low scenario. In a high scenario, the site could be subject to a rise of 0.89 feet by 2050 and 5.51 feet by 2100. These generated scenarios were developed based on sea level rise in Anacortes, the closest station to the subject site. We anticipate that the toe of the slope will be impacted by future rise in sea level related erosion.

Bluff Retreat

The bluff retreat rate can only be estimated based on topography, weather events, seasonal fluctuations, vegetation and exposed soils. Under normal static conditions we estimate the bluff retreat rate to be approximately 1 inch or less per year across this area of Marine Drive. We cannot predict with any accuracy future bluff retreat events associated with seismic activity or future 100-year storms. Significant retreat is recognized within this report due to the atmospheric river rain and flood events in December 2025 that contributed to the landslide that impacted the site slopes. The region was impacted by a larger scale event in



November 2021. Future punctuated storm events impacting the region are probable and appear to occur more frequently as the climate changes.

GEOLOGICALLY HAZARDOUS AREAS

According to Skagit County Code (SCC) section 14.24.400, geologically hazardous areas include areas susceptible to the effects of erosion, sliding, earthquake, or other geologic events. They pose a threat to the health and safety of citizens when incompatible development is sited in areas of a hazard. Geologic hazards pose a risk to life, property, and resources when steep slopes are destabilized by inappropriate activities and development or when structures or facilities are sited in areas susceptible to natural or human-caused geologic events. Some geologic hazards can be reduced or mitigated by engineering, design, or modified construction practices so that risks to health and safety are acceptable. When technology cannot reduce risks to acceptable levels, building and other construction in, above and below geologically hazardous areas should be avoided. Geologically hazardous areas shall be classified as *known or suspected risk* or *unknown risk*. Skagit County Code 14.24.410, sections 1-5 define specific general hazard types: erosion, landslide, seismic, volcanic and mine hazards that are present within 200 linear feet of a potential geologic hazard.

Based on the project site location and elevation, we have identified potential erosion, landslide and seismic hazards to be relevant to development at the subject site. These geologic hazards are discussed below.

Erosion Hazard Areas

Skagit County Code 14.24.410(1) classifies known or suspected erosion hazard areas based on five possible criteria related to slope inclination, soil type, and proximity to shorelines or stream channels. Based on our research and site work, the sloping coastal bluff slope terrain facing generally west is considered an erosion hazard area because of slope gradient, soil type, coastal beaches and bluffs and by the Coastal Atlas Map destination. The slopes below the existing homesite are primarily composed of glacially derived materials that were observed at the surface during our site visit. As such, the entirety of the parcel and vicinity is considered to be within a known or suspected erosion hazard area.

There is ongoing concern for additional erosion at the subject site, especially during the wet season, because of the exposed soils from the 2025 landslide. The slopes are in an over steepened condition, especially in the scarp area closest to the residence. There is ongoing erosion at the toe of the slope. Mitigation must be implemented to reduce the potential erosion at the subject site and preserve the existing residence. We consider the potential risk of erosion impacting the existing residence and associated features to be high overall.

Landslide Hazard Areas

Skagit County Code 14.24.410(2) contains 13 definitions of potential landslide hazard areas. We consider that the site conditions meet criteria 14.24.410(2)a to 14.24.410(2)f and 14.24.410(2)l for landslide hazards. The site slopes and vicinity contain a recent landslide area that was at least partially induced by unpermitted construction of the stairway and associated features. Removal of vegetation for this construction likely increased the potential for a full slope landslide. Future events are possible and unpredictable in static or seismic conditions. We consider the site to encompass a high risk for future landslides that could impact the residence if the current bluff slopes are left unmitigated.

Our field exploration indicates that the steep site slopes are composed of a medium dense glacial outwash over dense glacial till that are in an over steepened and potentially unstable condition from the recent landslide. We observed evidence of a shallow translational landslide that encompassed most of the bluff face as noted above.



Based on this information, we anticipate that the bluff slope will continue to weather by common erosion and wave action eroding the toe over time. We consider the risk of future landslide events to be high. The risk of habitation of the residence is entirely the choice of the owner. Proper stormwater management, vegetation augmentation and slope mitigations must be implemented to reduce the potential for future events impacting the existing residence.

Larger scale global instability, consisting of deep-seated failures, can extend down into the subsurface to substantial depths. These failures commonly leave geomorphic evidence of their existence on the slope. Typical indicators include scalloped ridge crests, crescent-shaped depressions, head scarps, side scarps, sag ponds, benches on midslope, hummocky topography or linear ground fractures. We did not observe evidence of a deep-seated failure at the subject site. The above language is precautionary and reflects common observations on coastal bluff slopes that have undergone failures historically.

Adjacent properties along Marine Drive contain many deep-seated landslide features as observed in aerial photo and lidar review. For the subject site, we anticipate a relatively high risk of slope failure impacting the existing development over the life of the structure. Overall, we do not anticipate that new slope mitigations will increase the risk of slope failure beyond what already exists. The load intensity for a single-family residence is generally low, however a setback of only 10 to 15 feet exists.

We consider the site slopes to be relatively unstable under static conditions based on soil density characteristics explored during field work and the risk of future landslides to be high.

Please consider that the Pacific Northwest is a seismically active region, and it is difficult or impossible to predict how slopes at the subject site and within the region will behave under earthquake loading conditions.

Slopes can gradually retreat over time due to natural weathering or erosion of soils or bedrock annually. The rate of retreat can be influenced by rainfall, freeze-thaw cycles, winter storms, groundwater conditions, land clearing and grading, climate change and other factors that may influence slope morphology over time. The site slopes may be subject to naturally occurring erosion patterns and seasonal weathering. The slopes were generally non-vegetated, with significant exposed soils. We anticipate that erosion at the toe of the slope is ongoing and may accelerate future landslide events by destabilizing the toe of the slope.

The owner should be aware that record rainfall, seasonal flooding, slope raveling, king tides and other naturally occurring events have the potential to change slope conditions over extended periods of time. These cyclical, and sometimes punctual events may have direct impacts to the stability of existing slopes that cannot be fully accounted for in our analysis. NW Geologic cannot reasonably be expected to predict active, naturally occurring geologic processes such as erosion or landslide events over extended periods of time. Accordingly, the property owner must be made aware that these processes may occur on sloping terrain, to varying degrees over time and that incorporating the recommended mitigations will benefit the project as a whole. The owners assume all the risk of living in a coastal bluff slope environment that has had recent landslide activity.

The existing home location and recommended mitigations should not be interpreted as a "zero risk" condition over the lifetime of the structure and property. The owners should understand that there are inherent risks associated with owning or residing on property that lies within proximity to sloping terrain and that the owner is willing to accept the associated risks.



Seismic Hazard Areas

Skagit County Code 14.24.410(3) defines seismic hazard areas as locations subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement, soil liquefaction or surface faulting. Of the four applicable known or suspected hazards within this section of the SCC, the applicable definitions are:

- Those known or suspected erosion and landslide hazards referenced in Subsections (1) and (2) of this Section.

The project site is not located within a high liquefaction susceptibility zone or within 1/4 mile of an active fault. We therefore consider the site slopes to be within a seismic hazard area because they contain erosion and landslide hazards meeting the definition per SCC.

The project ownership should be informed that the Pacific Northwest is seismically active. Large Cascadia subduction zone earthquakes with possible magnitudes of 8 or 9 could produce ground shaking events with the potential to significantly impact the region and subject property. Cascadia subduction zone earthquakes have occurred 6 times in the last 3,500 years with the most recent occurrence in 1700, approximately 326 years ago. They have been determined to have an average reoccurrence interval of approximately 300 to 700 years (Atwater and Haley, 1997).

The subject property is located approximately 6 miles north of the Darrington Devil's Mountain fault zone, which is an active fault system considered to have the potential to generate high magnitude earthquakes. An unnamed active fault is located about 4 miles to the southwest and to the east of Lopez Island.

The subject property is located within Seismic Design Category D₁, which states that the site may be unstable during a seismic event. Because of the age of the residence, we do not know if it was designed in accordance with the provisions of the International Building Code or International Residential Code which contain structural safeguards to reduce the risk from seismic activity.



CONCLUSIONS AND RECOMMENDATIONS

Geologic Hazard Mitigation

Based on Skagit County Code definitions, the parcel and vicinity are considered to present erosion, landslide and seismic hazards. A full height of slope landslide occurred in late 2025. We consider the only way to protect the existing house for continued occupancy is to implement slope mitigations immediately to safeguard life and property. The slope is over steepened and in a potentially unstable condition. There is minimal setback from the existing residence to steep slopes at present and the risk of new landslides in conjunction with continued use and occupancy is high. We recommend the following mitigations be included to protect the slope and reduce the risk of future landslides, erosion and seismic concerns at the parcel. We consider the below mitigations to be part of emergency repairs that should be implemented as soon as possible once approved by Skagit County.

- Place robust erosion control netting or matting across the entirety of the landslide footprint. A specific product that has been used successfully in slope stabilization is woven coconut fiber coir matting. We recommend a robust coir matt be selected and placed in accordance with the manufacturer's recommendations. We have attached an example of the specifications for this material in email correspondence with the client. The matting should be firmly attached to the site slopes with u-shaped, steel landscape staples that are typically 4 to 8 inches long. Overlap individual sections of fabric by at least one foot.
- Revegetate the site slopes as soon as possible following coir matt installation. We have included a DOE document titled *Vegetation Management: A Guide for Puget Sound Bluff Property Owners* (Menashe, 1993) in email correspondence with the client team. We generally recommend that low lying, deep rooting flora be selected. The planting of trees that will eventually grow tall and add significant weight to the slopes should be avoided. Hydro seeding from the upper slopes should be considered by the project team.
- Manage stormwater at the site. We understand that stormwater is currently routed toward Marine Drive from the roof downspouts and driveway drains. We recommend verification that the existing system routes water to Marine Drive and not into the existing soils on the east side of the house. If collected stormwater is not or cannot be routed to an approved municipal outlet adjacent to the roadway, then an HDPE tightline system should be considered. A tightline system would route all the collected stormwater to the beach level. A similar system was observed in aerial photos at the parcel to the immediate south. Tightline systems are considered a common mitigation for bluff slope property stormwater management and are recommended by the DOE.
- Remove the observation shed on the south deck area. Removing the weight of structures on the existing deck at the top of slope should be part of the new plan for mitigation. Removing excess weight from the top of slope lessens the forces acting to destabilize the upper slopes.
- Monitor the slopes for any changes in morphology. Our office should be contacted if new erosion or landslide events occur at the parcel.
- The client should consider the use of soil nails at least within the upper 30 feet of the crest of the slope to add additional ground improvement stabilization measures.
- Under pining of the foundation may be necessary to maintain proper support. At the time of the site visit, the owner said the foundation and building interior were not impacted.
- The stand-alone fir tree on the south property area is impacted by wind events and could fall on the subject residence or impact the property to the south. Removal of the tree will lessen the chances for these impacts. We recommend the stump be left intact.



- Moving the house to the east should be considered to increase the setback, however no horizontal area exists that will entirely protect the house with County defined setbacks based on a slope height of 160 to 170 feet.
- The client should consider removing the planter feature on the north side of the residence. We understand that tree stumps are located in this area. The tree stumps should be left intact as they contribute to soil stabilization and may take years before they completely decay.
- We recommend that existing vegetated areas along the landslide margins be maintained with no disturbance zones during mitigation.

In our opinion, the incorporated mitigations, in combination with stormwater management, will reduce potential risks to the existing residence and improve slope stability from what currently exists. Our firm typically works to prevent landslides and erosion concerns in new developments. But as the landslide has already occurred, mitigations must be implemented to improve the slope conditions.

Stormwater from impervious surfaces should be collected and directed to approved discharge locations.

Once the recommendations to mitigate geologic hazards are incorporated into the plans for site improvements, it is our opinion that the proposed improvements will reduce the risk from what currently exists.

There is a high level of hazard in the area to the west of the residence as demonstrated by recent landslide activity, over steepened slopes and exposed soils. If slope conditions deteriorate, evacuate the residence to inland areas.

The properties to the north and south could be affected by the recent landslide events but we did not observe direct evidence within the limited access area during our site visit.

Mitigation is intended to reduce the risk posed by site slopes and it should not be interpreted that mitigation is representative of eliminating any and all risk that might be present on the site. It is assumed that the property owner are aware of the slopes that are present on the site and that they have been adequately informed and are accepting of the risks associated with sloped property development.

Geologically hazardous critical area review is often a multi-phase process. Evaluations typically consist of at least two stages; First, the geologic hazards are identified, and applicable mitigations are recommended. Stage two typically consists of a plan review stage in which the final plans are reviewed to assess the incorporation of the recommended mitigations, presented herein, into the project plan sets. Our client should be aware that Skagit County may require a formal review and brief letter from this firm stating that the relevant site plans have adequately implemented the recommendations presented in this report. We are unsure what Skagit County will require in this situation based on the necessity to take action before the slopes deteriorate further.

Geotechnical Consultation During Construction

NW Geo recommends that we be involved in the project design review process. The purpose of the review is to verify that the recommendations presented in this report are understood and incorporated in the design and specifications. We also recommend that geotechnical construction monitoring services be provided. The purpose of these services is to observe compliance with the design concepts, specifications, and recommendations of this report. In the event that subsurface conditions differ from those anticipated before the start of construction, we would be pleased to provide revised recommendations appropriate to the conditions revealed during construction.



LIMITATIONS AND USE OF THIS REPORT

Recommendations contained in this report are based on our understanding of the proposed development and construction activities, our field observations, exploration and interpreted results. It is possible that soil, bedrock and groundwater conditions could vary and differ between or beyond the points explored. If soil or groundwater conditions are encountered during construction that vary or differ from those described herein, NW Geo shall be notified immediately in order that a review may be made, and supplemental recommendations provided. If the scope of the proposed construction, including the proposed loads or structural locations, changes from that described in this report or in the provided plans, our recommendations shall also be reviewed.

We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty, expressed or implied, is made. The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be conducted by NW Geo during the construction phase in order to evaluate compliance with our recommendations. Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the author of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference", as that latter term is used relative to contracts or other matters of law.

This report may be used only by Vladimir and Irina Belov and their design consultants and only for the purposes stated within a reasonable time from its issuance, but in no event later than 5 years from the date of the report. Note that if another firm assumes Geotechnical Engineer of Record responsibilities, they need to review this report and either concur with the findings, conclusions, and recommendations or provide alternate findings, conclusions and recommendations under the guidance of a professional engineer registered in the State of Washington. The recommendations of this report are based on the assumption that the Geotechnical Engineer of Record has reviewed and agrees with the findings, conclusion and recommendations of this report.

Land or facility use, on- and off-site conditions, regulations, or other factors may change over time, and additional work may be required with the passage of time. Based on the intended use of the report, NW Geo may recommend that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by Vladimir and Irina Belov or anyone else will release NW Geo from any liability resulting from the use of this report by any unauthorized party and Vladimir and Irina Belov agrees to defend, indemnify, and hold NW Geo harmless from any claim or liability associated with such unauthorized use or non-compliance. We recommend that NW Geo be given the opportunity to review the final project plans and specifications to evaluate if our recommendations have been properly interpreted. We assume no responsibility for misinterpretation of our recommendations. The scope of work for this report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater monitoring at this site.



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Figure 1: *Regional Map* showing the general project location south of Anacortes in Skagit County. Image courtesy of Skagit County *iMap*, 2026.

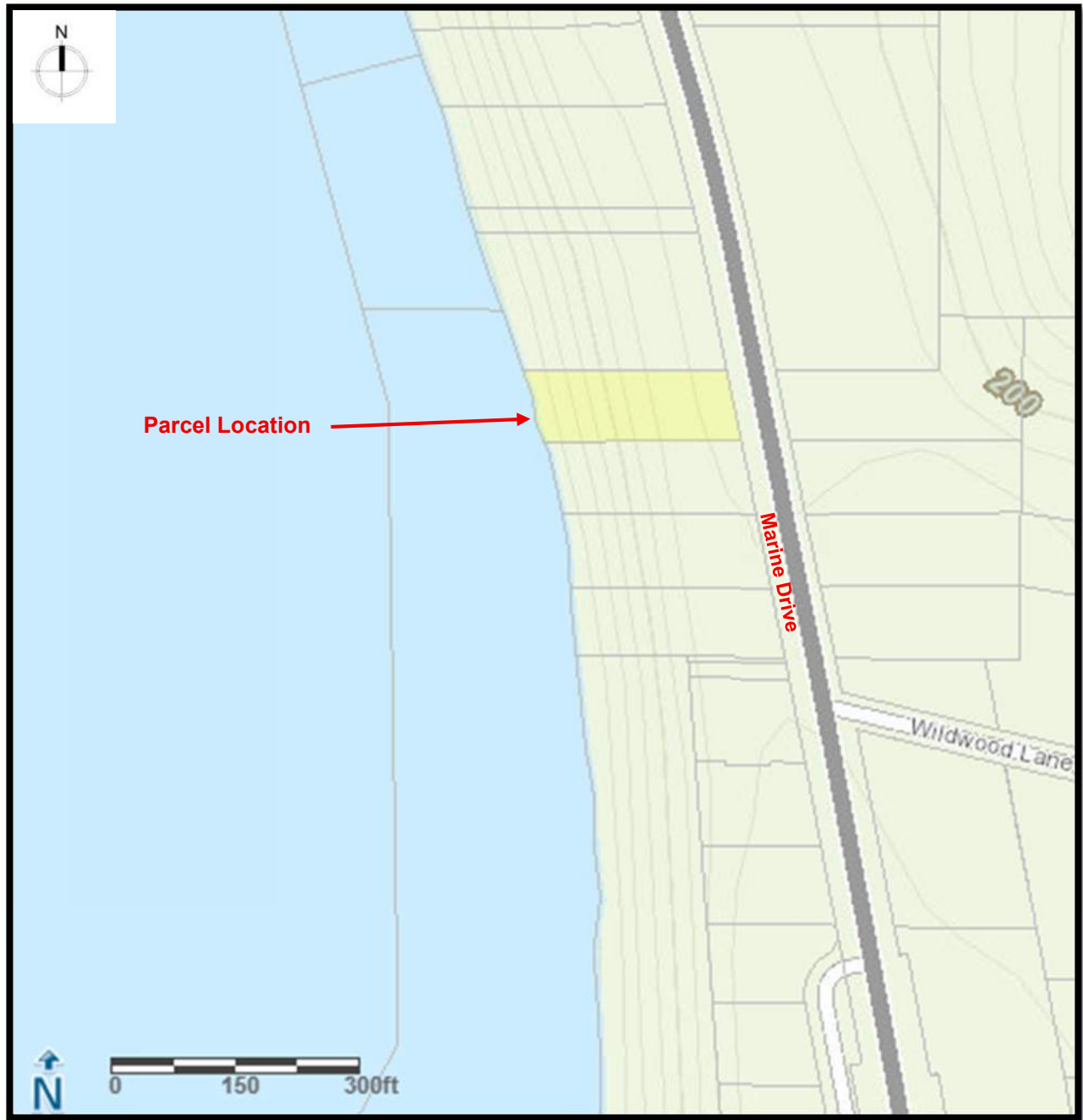


Figure 2: *Vicinity Map* showing the parcel location and topography in the vicinity of the project site. Image courtesy of Skagit County, *iMap*, 2026. 20-foot contours.

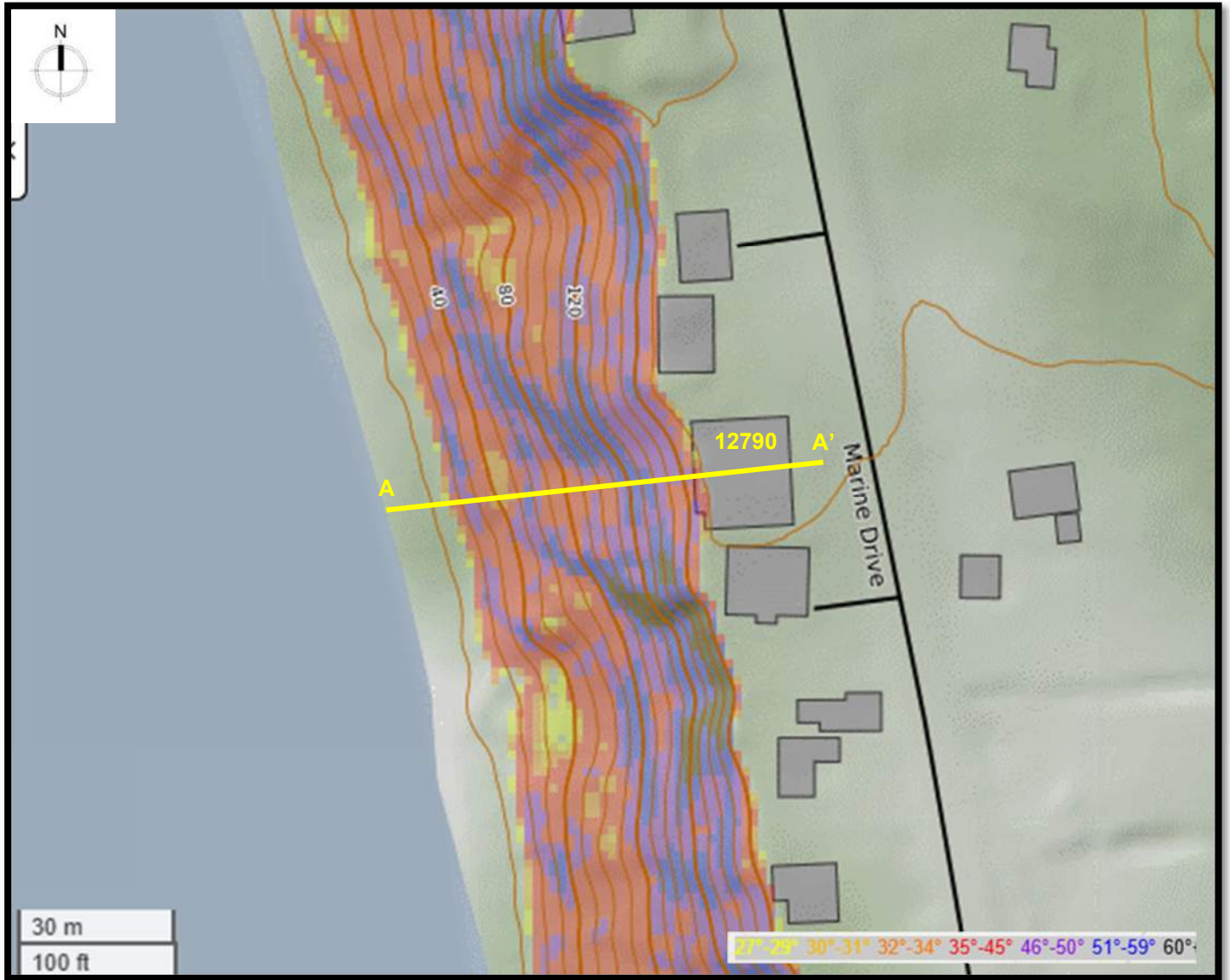


Figure 3: *Site Plan* showing coastal bluff topography and relative gradients in the vicinity of 12790 Marine Drive. Cross-section A-A' shown in yellow. Image courtesy CalTopo™, 2026. Scale as shown.

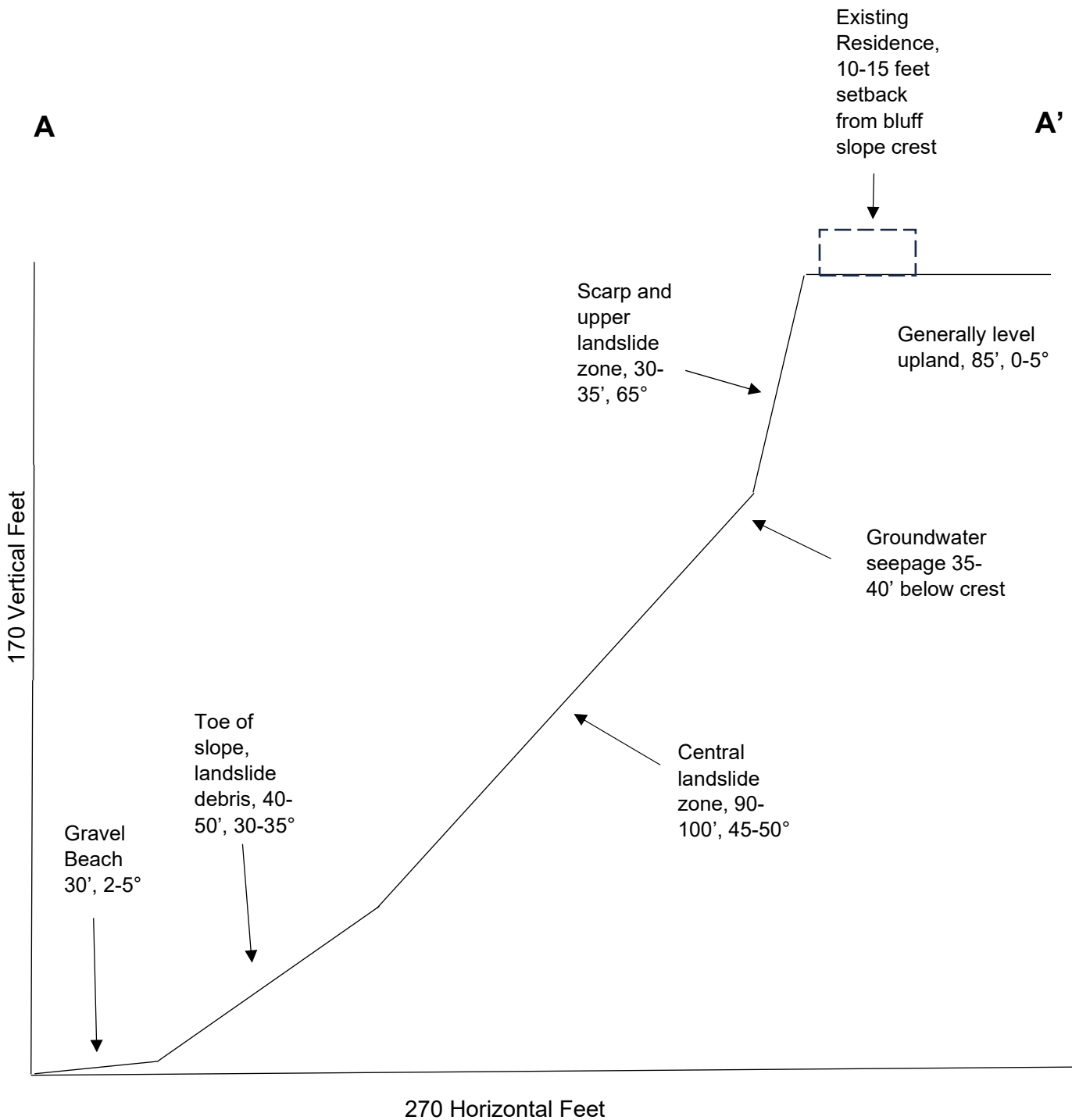


Figure 4: Schematic cross section A-A' profile facing N. Data is based on field hand measurements in conjunction with CalTopo™ mapping software. Locations are approximate and should not be used for construction.

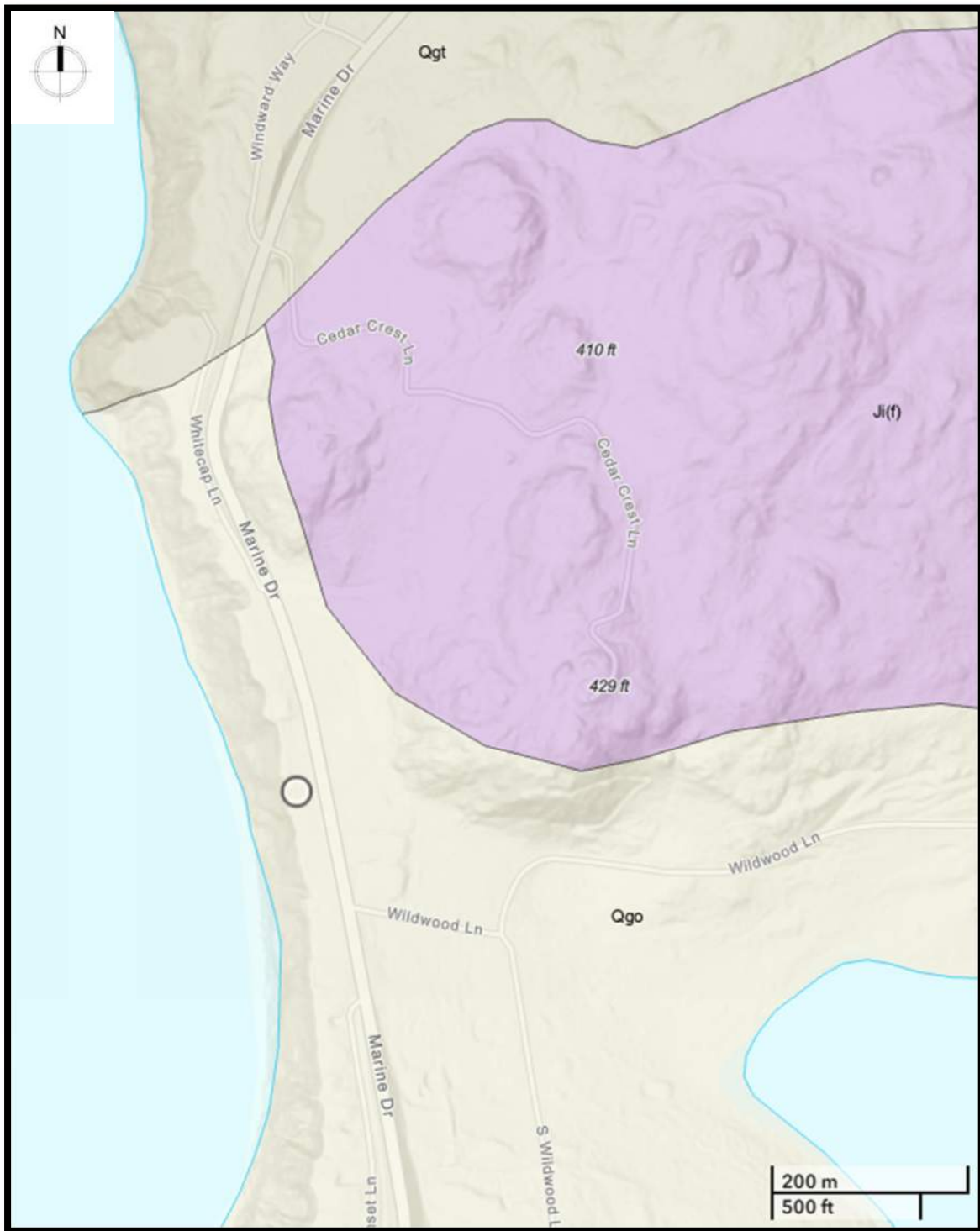


Figure 5: *Geologic Map* showing the mapped units Qgo, Qgt and Ji(f). The project location is shown by the black dot. Map courtesy of *Washington Geologic Information Portal*, 2026.



Figure 6: *Lidar Imagery 1* showing scalloped ridge crests on the coastal bluff in the vicinity of the project site shown as the black dot. Imagery courtesy of *Washington Geologic Information Portal*, 2026.

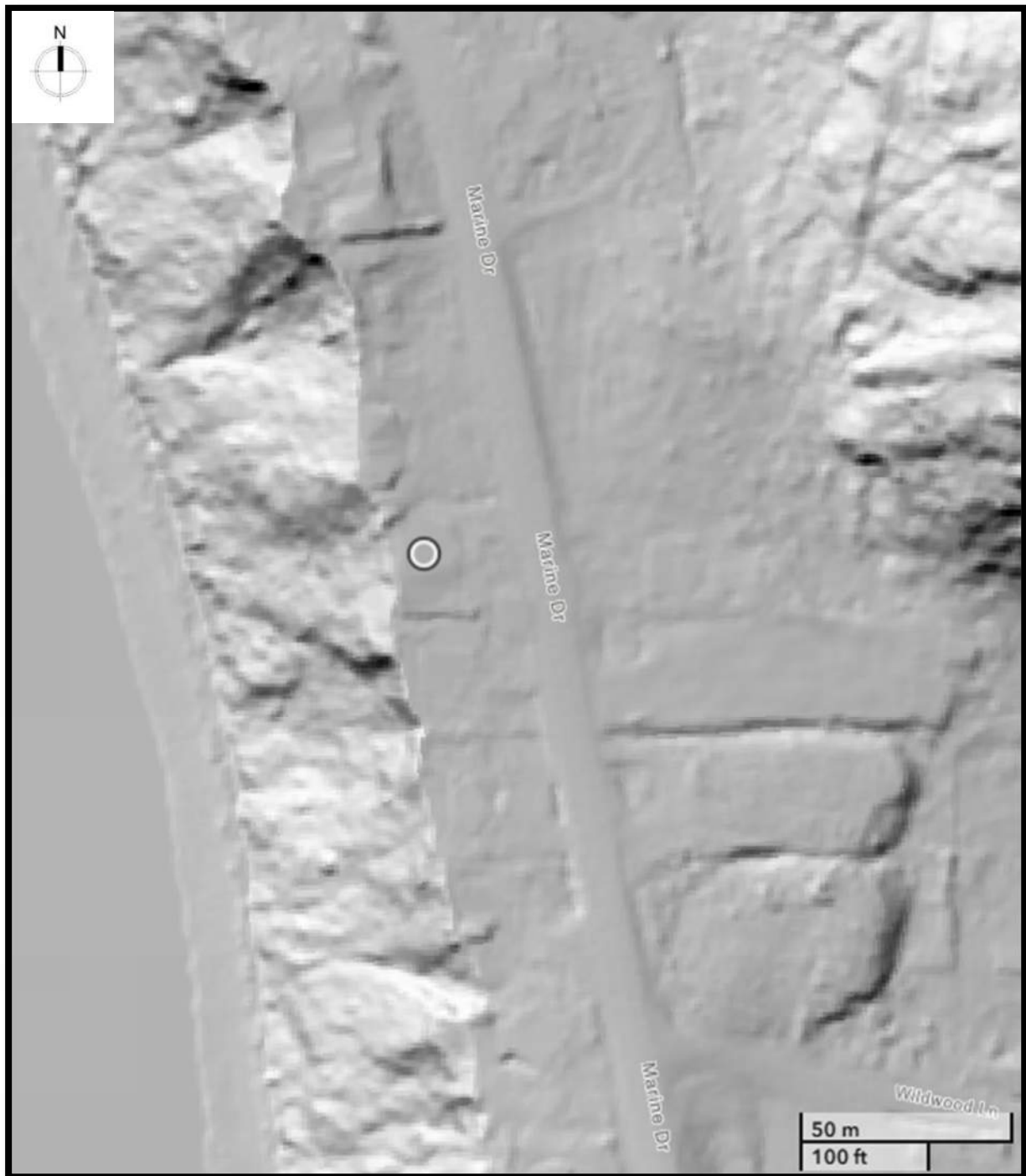


Figure 7: *Lidar Imagery 2* showing scalloped ridge crests on the coastal bluff in the immediate vicinity of the project site shown as the black dot. Imagery courtesy of *Washington Geologic Information Portal*, 2026.

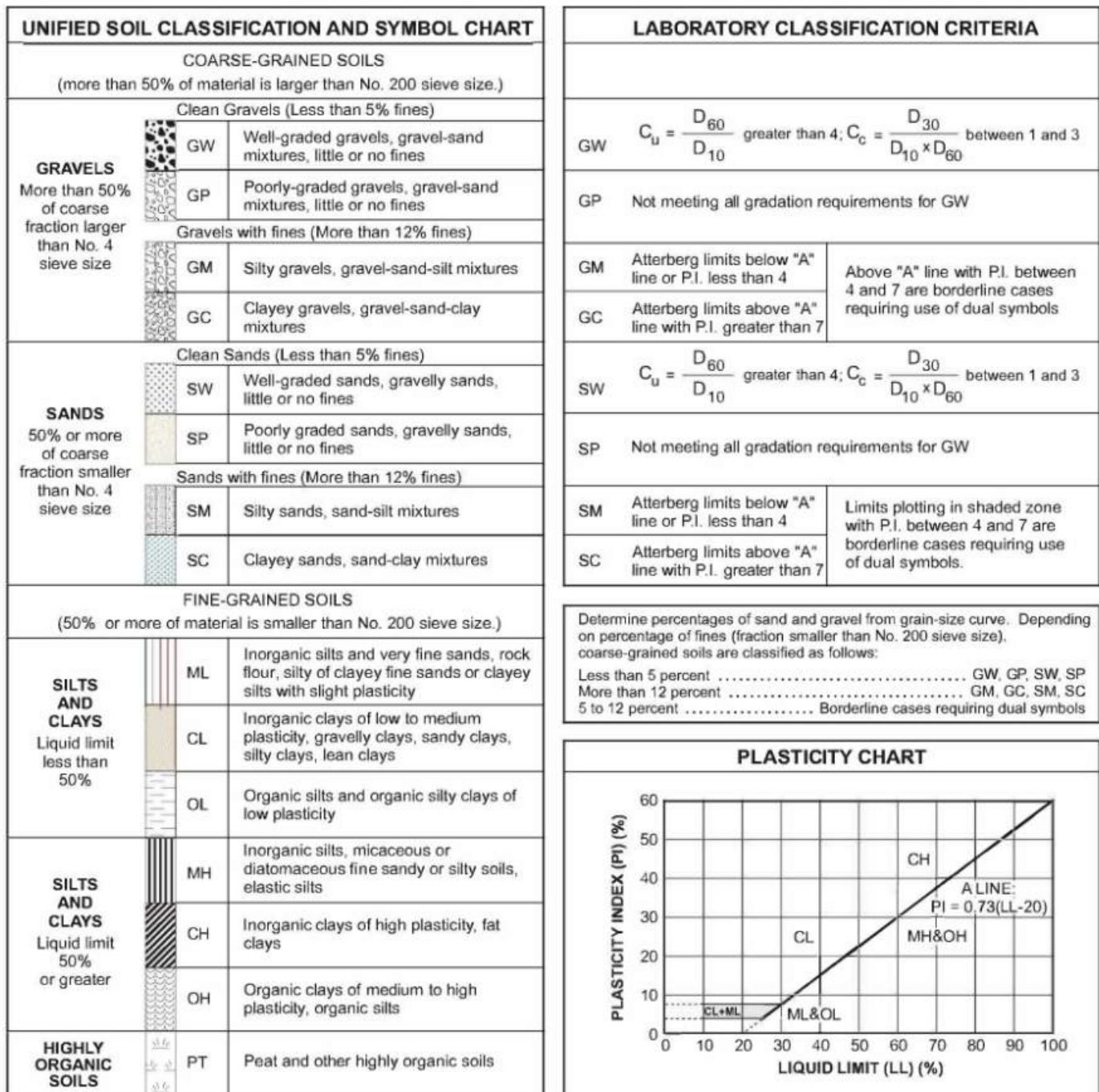


Figure 8: Unified Soil Classification and Symbol Chart (USCS)



Appendix A: Photographs of Site Conditions



Photo 1: Existing conditions at the bluff slope face showing the landslide footprint. Facing N on May 29, 2026.



Photo 2: Existing conditions looking down the slope toward the beach area. Note seepage in upper central slope. Facing NW on May 29, 2026.



Photo 3: Facing N showing existing conditions in the scarp area on May 29, 2026.



Photo 4: The north area of the scarp showing existing conditions after the landslide. Facing NE on May 29, 2026.



Photo 5: Upper deck area adjacent to the existing residence. Facing N on May 29, 2026.