

**Mud Bay Geotechnical Services, LLC**

1001 Cooper Point Road SW, STE 140 PMB 108 | Olympia, WA 98502 | 360.481.9784 | CHeathman@MudBayGeotech.com

April 8th, 2024

Job: 2693-THU

Subject: Geotechnical Assessment
McAllister Creek Neighborhood Association,
Salmon Ln SE & Sockeye Ln SE
Olympia, WA 98513

Dear Liz Kohlenberg,

Mud Bay Geotechnical Services, LLC is providing a geotechnical assessment and findings report on behalf of the McAllister Creek Neighborhood Association. We understand that an existing single-family residence located at 654 Sandra Lee Ct SE, is constructing a new accessory dwelling unit (ADU). Due to the position of this property upslope from you, concerns of potential slope instability resulting from the ADU's construction has created the need for a review of the proposed project and our assessment of the geological hazards on-site. The opinions presented in this memorandum are based on a review of an existing Critical Area Ordinance Report and site plans for the new ADU structure, remote data analysis, available online resources, client testimony of geologic history, and our experience with similar geologic and soil conditions.

SITE LOCATION AND PROJECT DESCRIPTION

The primary focus of this report is the hillside situated between Sandra Lee Ct SE (upslope) and Salmon Ln SE (downslope). It is our understanding that the existing residence located at 654 Sandra Lee Ct SE has proposed the construction of a new ADU off the northwest corner of the existing structure. As the proposed work area is situated upslope from the home located at 717 SE Salmon Ln and the hillside has a known history of shallow mass-wasting, the proposed ADU construction has created the necessity for additional geotechnical assessment and project review.

Based on the documentation provided to us, we understand that the new ADU structure, as presently proposed, will add an additional 926 square feet (1.97% site area) of impervious surface

to Parcel #65120000400 (654 Sandra Lee Ct SE). Impervious surfaces associated with the existing developments on the 1.08-acre site include: 2120 square feet of driveway, 3230 square feet existing residence, 80 square feet existing shed, and 133 square feet existing sidewalk. Presently, the impervious surfaces across the site associated with the existing developments total 5562 square feet (11.82% site area). It is our understanding that the new ADU will be constructed with a minimum 50-foot setback from the steep slopes greater than 40%.

SITE GEOLOGY AND SOILS

As a part of this project, we reviewed available geologic data at the 1:100,000-scale and prepared a site-specific geologic map. The project vicinity geologic map indicates that the sediment underlying the proposed development area, hill slope, and downslope area at 717 SE Salmon Ln is comprised of *Pleistocene continental glacial drift –continental glacial outwash*. Along the hill slope, and the downslope area at 717 SE Salmon Ln, the geology is mapped as *Pleistocene continental glacial drift – advance glacial outwash*. Glacial outwash sediment is generally described as stratified sand and gravel layers deposited by the meltwater streams of the glacial ice mass. Though the sedimentary characteristics between glacial outwash and advance glacial outwash are generally similar, differences in texture and competency may exist between these deposits. As the sediment across the slope is associated with an advancing continental glacier, and may be glacially-overridden, discontinuities may exist within the overall stratigraphy.

In addition to the site geology, site-specific soil data made available by the United States Department of Agriculture, Natural Resources Conservation Service (USDA – NRCS) was reviewed. The USDA Soil Map indicates that the proposed development area is underlain by *No. 33 – Everett very gravelly sandy loam, 8 to 15 percent slopes*. According to the USDA-NRCS, this soil unit consists of somewhat excessively drained, very gravelly sandy loam to extremely cobbly coarse sand, sourced from glacial outwash. The estimated depth to restrictive feature is greater than 80 inches. The estimated depth to water table is also greater than 80 inches.

The slope between the proposed development area and McAllister Creek is mapped by the USDA-NRCS as *No. 30 – Dystric Xerochrepts, 60 to 90 percent slopes*. This soil type is described as a well-drained very gravelly sandy loam sourced from colluvium and glacial till. The estimated depth to restrictive feature within this unit is approximately 20 to 72 inches. The estimated depth to water table is greater than 80 inches.

The soil conditions mapped across the study area are generally consistent with the mapped geology for the region. It should be noted that the slope percentages described in the USDA-NRCS map are estimates made by the USDA and may not necessarily reflect true surface topography.

REVIEW OF LANDSLIDE MAPS AND LiDAR IMAGERY

As part of the investigation of the site, we reviewed landslide hazard mapping and LiDAR imagery, available from the Washington Department of Natural Resources. The DNR landslide data indicates that there are no mapped landslides within the study area or immediately surrounding area. The nearest mapped landslide is situated approximately 1.15 miles to the north along the same, western bluff of the Nisqually River valley, immediately north of Interstate-5. This mapped landslide is characterized by the WA DNR as a dormant, deep-seated undifferentiated landslide with questionable certainty. This landform shows a concave scarp feature, consistent with landslides and slope failure. It must be noted that the DNR's landslide compilation is not a complete database for all landslide events or landslide hazard areas. Landforms that are too small in scale, recent, or have not been investigated or verified in field may not be identified on the map.

The geomorphology (shape of the land) was analyzed during the site evaluation and compared to the Light Detection and Ranging images (LiDAR) from the Washington State LiDAR Portal. LiDAR is a remote sensing methodology where light is pulsed down to the surface of the Earth and back to a sensor. The most recent available LiDAR images of this site are from 2021. The LiDAR imagery for the site and region displays numerous concave landforms along the western bluff of McAllister Creek and the Nisqually River floodplain that are potentially indicative of previous mass-wasting events. These landforms appear similar to the mapped deep-seated landslide deposit described in the previous paragraph and indicate that the slopes in the region may have experienced deep-seated slope failure throughout its geologic history.

REVIEW PACKET

Mud Bay Geotechnical Services, LLC has been provided with several documents relevant to the subject project including testimonial history of the study area, a project-specific site plan, and professional-prepared critical area ordinance report. Our assessment and opinions pertaining to each resource is described below.

Landslides, February 1996 – McAllister Creek and Nisqually Heights Neighborhoods

We reviewed a seven-page document titled *1996 Landslides McAllister Creek Hoa.pdf*. This document includes a map of the McAllister Creek and Nisqually Heights neighborhoods and identifies the locations of five (5) separate slope failure events which occurred during February 1996. The slides varied in size and impact to structures and roads, though each of the failures appear to be caused primarily by heavy rainfall and saturated soil conditions. From the photographs included within this document, the slope failure events generally appear to be shallow in nature and would likely be classified as a type of earth or debris flow. Review of this resource suggests that the area surrounding this report's area of focus has a history of shallow slope failure, with several events occurring within recent geologic history.

High-Tech Building & Design Site Plan – Britcher Addition, February 16, 2023

As a part of this project, we reviewed the site plans prepared for the ADU construction by High-Tech Building & Design dated 02/16/2023. This site plan identifies that the new addition will be constructed along the northwestern corner of the existing structure with a minimum slope setback of 50 feet. The site plan includes multiple BMPs to limit site disturbance and implement temporary erosion and sediment control. Several important observations arose from our review of this site plan:

- The new ADU will add a total of 926 square feet of impervious surface to the site.
 - The ADU will be constructed with a minimum setback of 50 feet from the top of the steep slopes exceeding 40 percent. The setback for the new structure is greater than the setback for the presently existing home structure.
 - The site plan identifies 964 square feet of salal will be planted east of the new ADU, directly north of the existing home structure.
 - The plan indicates that the new roof gutters will include splash blocks discharging at the ground surface. This feature is identified as TYP and the plans were created prior to the preparation of the drainage recommendations made in the Quality Geo NW report.
 - The site plan indicates that the wastewater from the ADU will be routed to a new pump tank which feeds to the existing septic tank and drain field.
 - A total of eight (8) BMPs are identified on Sheet No. C-102. These BMPs are aimed to mitigate site disturbance to the least possible extent and control erosion and sedimentation during construction.
-

Quality Geo NW – Critical Area Ordinance (CAO) Report, September 8, 2023

During our review of available documentation, we evaluated the Critical Area Ordinance Report prepared for the ADU project of focus. This report was written by Quality Geo and was published on September 8, 2023. This report summarizes the scope of work, describes the findings of a site assessment and subsurface exploration, provides an opinion of the on-site geologic hazard, and includes recommendations pertaining to the construction of the ADU to mitigate geologic hazards on and off-site.

The geologic literature review section of the report found geology and soil conditions similar to those described in this report. The site investigation and subsurface exploration of the site found the following key notes:

- The slope is heavily vegetated and includes mature trees that do not exhibit curved or rotated trunks.
 - No surface water was observed on-site during the 08/08/2023 site investigation. No signs of seepage were observed within the slope where accessible.
 - Review of available groundwater well data found no shallow groundwater table underlying the site.
 - “No obvious evidence of rotational or translational failures or major toppling hazards was observed on the slope in the proximity of the potential building footprint.” (Page 3)
 - No evidence of groundwater was found in the hand auger boring completed for the project. This boring was completed to a maximum depth of 2 feet below existing ground surface elevation.
 - The boring found silty sand topsoil from 0 to ~9 inches below ground surface. Beneath this topsoil, *medium dense to dense, gray-brown, dry, silty sand with gravel (SM)* was encountered.
 - Dynamic cone penetrometer testing was completed at two separate locations to maximum depths of 1-foot beneath ground surface. In both locations, the testing found loose conditions near the surface, followed by medium-dense sediment at ~6-inches depth, and very dense sediment at 12-inches below grade.
 - Quality Geo NW concluded that their findings “...do not indicate any excessively prohibitive conditions exist for the, assuming appropriate site management efforts are maintained.” Quality Geo NW continues to state that the landslide hazard area designation is based on topography rather than “a known active deep-seated hazard at the subject
-

site” and that “at this time QC **does not consider the building site to be within an active landslide hazard area.**” (Page 4)

- Based on the findings discussed in the report, Quality Geo NW recommended that the new ADU be constructed with a minimum setback of 50 feet from the critical slope and does not recommend reducing the setback unless further engineering design to ensure the maintenance of slope stability is completed.
- Drainage recommendations for the new ADU include tightlining the new roof and footing drains to an existing catch basin or approved discharge areas. Specific recommendations for design are included in the report.
- Recommendations for erosion control appear consistent with BMPs and are discussed in-detail in the report.

FINDINGS AND OPINIONS

Based on the information reviewed and described in this report, Mud Bay Geotechnical Services, LLC is of the opinion that the steep slope southeast of the proposed development area is of moderate to high risk of shallow mass-wasting. From our evaluation of the geology and site history, it is our opinion that groundwater seepage and springing commonly emerges from the hillside of discussion. Relevant resources to support this finding include the February 1996 Landslide document; such slope failure events appear to be heavily influenced by groundwater and saturated soils within the slope. Though the regional well log data found depth to groundwater table well below the elevation of the proposed work area, based on our understanding of the site geology, slope stratigraphy, and regional hydrology it is our interpretation that perched groundwater may occur where compacted advance glacial outwash exists. As the study area is mapped as both glacial outwash and advance glacial outwash, distinct textural differences in the slope stratigraphy may create perched groundwater conditions where more permeable sediment overlies hardpan or less impermeable soil units. Based on the subsurface exploration completed by Quality Geo NW, the site includes very dense soil conditions within the shallow subsurface of the site.

As the Quality Geo NW site exploration was completed during the dry season (08/08 2023), it is possible that the seeps/springs active during wet periods were not active during the site investigation of the slope. Additionally, it should be noted that while Quality Geo NW did not find groundwater in the subsurface exploration of the site, the final depth of the hand auger boring was only 2 feet below existing grade. Due to the shallow nature of the subsurface data collected

from the site, it is our opinion that groundwater seepage and springing cannot be ruled out from potential geologic hazards on- or off-site.

Despite that no indications of active or recent deep-seated slope instability were observed, it should be restated that the slopes within the McAllister Creek Neighborhood and extending north and south of the study area show landforms potentially indicative of pre-historic deep-seated mass-wasting. Due to the geology at the site and the potential for perched groundwater, landslides similar to the 1996 landslides could occur during a winter with heavy rain or a rain on top of snow event. Any excess water from additional impervious surfaces resulting from new development discharged at the top of the slope would increase the potential for landslides to occur. At a minimum, we recommend that further investigation and geotechnical design be conducted to determine the effects of the development on nearby and on-site slope stability prior to approval of the development.

We appreciate the opportunity to serve your geotechnical needs on this project and look forward to working with you in the future. Please contact us at your earliest convenience if you have any questions or would like to discuss any of the contents of this report.

Sincerely,

Chris Heathman, P.E.
Mud Bay Geotechnical Services, LLC



4/8/2024

