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Sitts & Hill Engineers, Inc.
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Attention: Kathy Hargrave, P.E.

Subject: Geological Assessment-Landslide Hazard Geotechnical Letter
Manke Residence
9020 Baird Rd NE
Olympia, WA 98516
P/N 11904130700

MGI Project P999-T17

Dear Ms. Hargrave:

Migizi Group, Inc. (MGI) is pleased to submit this Geological Assessment-Landslide Hazard Geotechnical Letter for your residential parcel in unincorporated Thurston County, Washington. The purpose of our assessment is to address Chapter 24.15 of Thurston County Code, as it relates to landslide hazards on the site.

Our scope of services is limited to surface observations, geotechnical research, and letter preparation. This letter has been prepared for the exclusive use of Sitts & Hill Engineers, Inc., and their consultants, for specific application to this project, in accordance with generally accepted geotechnical practice.

PROJECT DESCRIPTION

The project site consists of a roughly triangularly-shaped, 4.76-acre residential property, located along the east side of Baird Cove, towards the north end of the point, in unincorporated Thurston County, Washington. The subject property extends upwards of 813 feet from north to south and 466 feet from east to west; with the long axis of the parcel, or "hypotenuse", following the course of Baird Cove. Topographically, the project area contains a gently to moderately sloped upland area, a steeply sloped marine bluff, and a gently sloped beach front. The project site has previously been developed, with the original single-family residence being situated towards the north end of the parcel. Recent improvements involve the construction of

a 1,530 sf garage with an 850 sf concrete apron towards the southwest corner of the property, and a new 640 sf home office / sanctuary building towards the center of the parcel. Each of these new structures were developed within the upland portion of the property, setback approximately 30 to 40 feet from the top of the steeply sloped marine bluff.

It is our understanding that a geological assessment of the relative slope stability of the region is required by Thurston County prior to the issuance of a building permit for the new facilities.

SITE CONDITIONS

We performed a reconnaissance of the site and nearby areas on May 19, 2017. We observed, as described above, that the site consists of a roughly triangularly-shaped, 4.76-acre residential property, located along the east side of Baird Cove, towards the north end of the point, in unincorporated Thurston County, Washington. The majority of the upland portion of the property has been cleared, and is fully developed. The existing residence with a detached garage occupies much of the north end of the parcel, whereas the newly constructed garage and home office / sanctuary buildings occupy the southwest corner and central portions of the site, respectively. The region between the two new facilities is primarily utilized as garden/orchard space. The upland portion of the site is gently to moderately sloped, predominately containing gradients between 5 to 10 percent. The marine bluff along Baird Cove, which travels southwest to northeast along the length of the parcel, is steeply sloped, containing localized gradients between 80 to 100 percent; representing an elevation change of 30 to 35 feet. The marine bluff is densely vegetated with fir and maple trees; containing a thick understory.

Access to the parcel is gained from the southeast, along a private driveway which travels along the eastern margin of the site, and access to the beach front is gained through a stairway adjacent to the residential site, and a rough-cut pathway towards the interior of the parcel. The subject parcel is situated within a modestly populated residential area, with residential sites within 300 feet of the subject property all displaying a similar topography.

No irregularities indicating slope failure, such as ancient or recent landslide scarps, hummocks, slide blocks, or jack-strawed trees, were observed on site or nearby off site during the time of our reconnaissance.

No seeps, springs, or other surface expressions of groundwater were observed on site, nor were indications of surface hydrology, such as rill marks or stream channels present.

The Coastal Zone Atlas of Washington, Volume 8, 1979 (Thurston County), classifies the upland portion of the site as S for Stable, and the marine bluff as U for Unstable. The unstable classification is based primarily on the steepness of the gradients observed on site; with there being no documented landslides within the interior of Baird Cove.

Soil conditions were evaluated through reviewing available soil exposures and geologic maps of the region. Olympia, and the larger Puget Sound area in general, has been glaciated a number of times over the last 2.4 million years. The most recent of these glacial events, the

Vashon Stade of the Fraser Glaciation, receded from this region approximately 13,500 years ago. The majority of near surface soils encountered within the south sound area are either directly associated with, or have been physically altered by the Vashon glacial event. Pre-Vashon glacial, and non-glacial deposits are commonly encountered along marine bluffs overlooking the Puget Sound with high vertical relief. In the *Geologic Map of the Longbranch 7.5-minute Quadrangle, Thurston, Pierce, and Mason Counties, Washington*, as prepared by the Washington State Department of Natural Resources (WSDNR)(2003), the upland portion of the project area is mapped as containing Qgof, or Latest Vashon fine-grained sediments. This soil group consists predominately of lacustrine clayey and/or fine sandy silt with sparse, disseminated dropstones, and includes deposits of glacial Lake Russel and other lakes of the Vashon glacial recession. Within the same publication, the marine bluff encountered on site is mapped as containing Qps, or Pre-Vashon gravel. This geologic unit contains gravel and sand of northern provenance, and stratigraphically underlies the Vashon Drift inferred to be of glacial origin because interglacial conditions do not appear conducive to streams with sufficient competency to deposit widespread gravels in most of the Puget Lowland.

The National Cooperative Soil Survey (NCSS) for Thurston County, Washington, classifies soils within the upland portion of the site as 108 – Skipopa silt loam, 3 – 15 percent slopes. This soil series consists primarily of silt loam – clay, and reportedly formed within glaciolacustrine deposits. The more steeply sloped portions of the site are classified as 30 – Dystric Xerochrepts, which is a product of colluvium. Mappings, as prepared by the WSDNR and NCSS, generally correspond with field observations performed by MGI field staff.

CONCLUSIONS AND RECOMMENDATIONS

Based on our site reconnaissance and geologic research, the marine bluff contained on site should be considered a potential, but not an active landslide hazard area. Additionally, we are of the opinion that the positioning of the new garage and home office / sanctuary buildings approximately 30 to 40 feet from the edge of the steeply sloped areas, adequately addresses site slope conditions, and poses a minimal risk of adversely affecting the localized slope conditions, or the greater, regional stability of the area. In our opinion, building permits should be granted to the property owner for the aforementioned structures. To address any future developments on site, a **25-foot Landslide Hazard Buffer Area** should be implemented and maintained from the edge of the marine bluff. With this buffer area being occupied by undisturbed native vegetation. Any future structures should maintain a 5-foot structural setback from the landslide hazard buffer area.


CLOSURE

The conclusions and recommendations presented in this letter are based, in part, on our interpretations and assumptions regarding subsurface conditions; therefore, if variations in the site conditions are observed at a later time, we may need to modify this letter to reflect those changes.

We appreciate the opportunity to be of service on this project. If you have any questions regarding this letter or any aspects of the project, please feel free to contact our office.

Respectfully submitted,

MIGIZI GROUP, INC.



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