

MEMORANDUM

Project No.: AS240155

May 29, 2024

To: Dave Carson, BORArchitecture, PLLC

From:



5/29/2024

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Re: **Manastash Creek Channel Migration Zone Preliminary Evaluation, Ellensburg, Washington**

Introduction

Aspect Consulting, a Geosyntec company (Aspect) has prepared this memorandum summarizing the results of a geomorphology assessment and Channel Migration Zone (CMZ) evaluation of the area of a proposed outbuilding at 11810 Manastash Road, Ellensburg, Washington, also known as Kittitas County parcel number 145133 (Site). The Site lies within the county-mapped CMZ along the right bank (south) side of Manastash Creek. BORArchitecture, PLLC (BORArchitecture) has requested a site-specific CMZ study to address Washington Department of Natural Resource

(DNR) staff and County comments in general accordance with CMZ delineation methodology described by the Washington Department of Ecology (2014).

A CMZ is an Erosion Hazard Area (Kittitas County Code, Section 17A.02.290) where a river or stream channel is likely to move laterally during the next 100 years, based on evidence of active stream channel movement over the past 100 years. In Kittitas County, Washington, the County has a CMZ delineation that extends to the toe on either side of the valley wall. We understand that DNR staff have requested that a CMZ be delineated to extend to a 140-year area of potential lateral migration.

A brief portion of the code section 17A.06.050 is provided below for reference.

17A.06.050 Erosion Hazard Area Standards.

1. **Generally.** Alterations or development may be allowed within erosion hazard areas, provided that all responsible measures have been taken to minimize risks and other adverse effects with erosion hazards, and the amount and degree of the alteration are limited to minimum needed to accomplish the project purpose. Prior to approving a development or alteration in or adjacent to an erosion hazard area, a report will be prepared as defined in KCC 17A.06.100. Based on this information, the Director shall determine whether all the following standards are met.
 - a. The alteration or development includes all appropriate measures to eliminate or otherwise mitigate risks to health and safety;
 - b. The alteration or development includes best management practices to prevent, control and minimize erosion;
 - c. The alteration or development will not increase erosion potential;
 - d. The removal and disturbance of vegetation, clearing, or grading shall be limited to the area of the approved alteration or development;
 - e. The alteration or development will not increase surface water discharge or sedimentation to adjacent properties beyond predevelopment conditions, as documented in a geologically hazardous area risk assessment and/or geotechnical report;
 - f. The proposed alterations will not adversely impact other critical areas; and
 - g. Structures and improvements are designed to minimize alterations to the erosive soils and slopes.
2. **Channel Migration Zones.** If County maps or consultation by the Director with qualified professionals or agencies with expertise indicate that a potential channel migration zone hazard exists on or adjacent to a proposed development site, the applicant shall either:
 - a. Locate the proposed development outside of an already defined channel migration hazard area as indicated on the map; or
 - b. Submit a Channel Migration Zone Report, as described in [KCC 17A.06.100](#) prepared by a qualified geologist, or engineering geologist, or professional engineer, licensed in the state of Washington with experience

in analyzing channel response in the fluvial systems of the Pacific Northwest.

3. **Permitted Alterations and Development in Channel Migration Zones.** The following alterations and development shall be allowed as specified below and previous sections:
- a. **Surface Water Discharge.** Discharge of surface water, provided there are no other alternatives for discharge. The pipe shall be located on the surface of the ground and be properly anchored so that it will continue to function under erosion conditions and not create or contribute to adverse effects on downstream critical areas.
 - b. **Utility Lines.** Utility lines, when no feasible location is available. Above-ground lines shall be anchored and/or designed so that it will not preclude or interfere with channel migration. Below ground lines shall be of sufficient depth as to not be affected by future channel migration.
 - c. **Public Roads, Bridges, and Trails.** Public roads, bridges, and trails when no feasible alternative alignment is available. Facilities shall be designed such that the roadway prism and/or bridge structure will not be susceptible to damage from active erosion.
 - d. **Stream Bank Stabilization.** Stream bank stabilization may be permitted subject to all of the standards listed in [KCC 17A.04.050](#).

CMZ Evaluation

We completed the geomorphic study and CMZ evaluation to delineate channel migration erosion-related risks at the Site. The project Site is an approximately 1-acre parcel located approximately 8 miles west of Interstate 90, outside the city of Ellensburg, Washington. The Site parcel is located south of Manastash Creek and is developed with a single-family residence, a storage building and utility shed.

We evaluated channel behavior for an approximate reach area approximately between river mile 7.6 upstream to river mile 8.5 (Figure 2) bounded to the north by Manastash Road (Figure 1) and to the south by areas of higher topographic relief. Manastash Creek is generally characterized as single channel meander bend morphology.

Site Geology

Geologic mapping for the reach that includes the Site is underlain by Quaternary alluvium (Qas), described as stream deposits of silt, sand, and gravel dominantly of basaltic composition and largely confined to valley bottoms (Bentley and Campbell, 1983). Valley walls to the north and south of the Site are mapped as Tertiary volcanic rocks (Tgn (2)) and further classified as part of the Grande Ronde Basalt group. This material is generally described as a nonporphyritic, fine-grained, gray-black basalt (Bentley and Campbell, 1983). We also reviewed a local well log (Ecology, 2024) from a parcel to the east that corroborates the geologic mapping and indicates that the thickness of the alluvium extends to a depth of approximately 67 feet before a comparative migration-resistant basalt bedrock is encountered.

Methodology

Lateral channel migration risk for Manastash Creek was evaluated by review of aerial photographs, 2020 publicly available Light Detection and Ranging (LiDAR) data, field reconnaissance, review of nearby Department of Ecology well data, and using a channel migration analysis tool from the Washington State Department of Ecology (2014) to estimate the CMZ.



To evaluate the Manastash Creek channel behavior in the reach we reviewed historical aerial photographs from 1954, 2000 and 2021 and digitized channel banks, spanning a period of record of 67 years. The results of digitizing the various year channel banks are provided in Figure 2.

The channel bank data was used along with LiDAR data to develop a historical migration zone (HMZ) that identifies current and past locations of the creek banks as shown in Figure 3. The HMZ represents areas where the channel has been historically. The HMZ does not necessarily include areas where flooding has historically occurred.

Geomorphic Reconnaissance

On April 29, 2024, we conducted a field geomorphic reconnaissance by walking the Site and noting visible features such as gravel bars, bank armoring, alluvium composition, river terraces, existing infrastructure age and condition, vegetation, and building site condition. We also visited a county bridge crossing approximately 3.25 miles upstream along Manastash Road. We observed the creek was generally below bank full conditions during our visit. There is an area west of the Site at the adjacent property and south of the creek where some hillslope processes have occurred providing some apparent topographic steering of the channel to the north toward the Site bridge crossing. Select photographs are shown below and included in Appendix A. Table 1 summarizes the key observations.

Table 1. Summary of Site Reconnaissance Observations

Project Area	Key Observations
Upstream	Adjacent upstream property has built a bridge within the past decade with concrete pier, abutments, and wing walls. Bridge appears in good condition. Creek is mostly linear with narrowing channel width towards property bridge. Gravel bars are present in channel. Alluvium comprised primarily of subangular to rounded basalt gravel and cobbles. Trace woody debris present in channel represented by log against the neighboring bridge pier. Cottonwood trees, grass, and low brush vegetation grow on both banks
	
Bridge Over Creek at Subject Property	Creek channel constrained below bridge by ecology block walls on both banks. Ecology blocks are locally in poor condition with a right bank abutment slightly bulging toward the creek. Right bank armored upstream of ecology block wall protects the south bridge approach. Banks are not armored downstream of bridge, with visible erosion on left bank approximately 40 feet downstream of the bridge. No woody debris in the channel is observed upstream, with few woody debris tree stumps in channel near left bank downstream.
	

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Downstream	Creek channel through and leaving property mostly linear with few mid-channel gravel bars. Creek alluvium comprised primarily of subangular to rounded basalt gravel and cobbles with overlying silty sand deposits. Cottonwoods grow on both banks defining channel width. Grass, saplings, and low brush vegetation comprise ground cover. Left bank has localized armoring with abandoned automobile. Woody debris is observed on both banks and on gravel bars.
	
Outbuilding Site	The planned Site of the outbuilding is approximately 320 feet south of the creek at the toe of the slope. Nearby shallow excavation for utilities exposes rounded creek alluvium. Rounded cobbles are weathered basalt, suggesting alluvium is older. Younger coniferous trees on the slope adjacent and above Site have bowed trunks, while older trees have straighter trunks.
	

Lateral Migration Estimates

Aspect used the collected data from our reconnaissance, LiDAR, and the digitized approximate channel centerline data from 1954, 2000, and 2021 to estimate annual lateral migration over the available period of record. The centerline data (Figure 3) was compiled into Ecology's analysis tool (2014) and run for estimates of annual migration. For each year digitized in a 2D setting, the tool provides an annual estimate for lateral migration estimates for a series of profiles numbered 1 through 58 as shown on Figure 4.

The tool results for each profile were reviewed and range from a minimum of a few inches per year lateral migration at Profile 17 to a maximum of 3.4 feet per year at Profile 6, both of which are upstream of the Site near Profiles 31 to 34 (Figure 4).

We selected Profile 31 as representative of the lateral migration near the site which gave us a rate of 0.57 feet per year. Profile 31 is considered reasonable to apply to the Site because of the existing infrastructure, proximity to the proposed outbuilding and armoring just upstream of Site, and the ability of a localized meander bend to migrate downstream as it erodes alluvium.

CMZ Delineation

Using the selected estimate of channel migration (0.57 feet per year) for the creek in the vicinity of the proposed building, Aspect applied a multiplier of 50, 100 and 140 to the HMZ to show the potential for channel migration across the Site (Figure 4). Note that Figure 4 was developed using the same channel migration rate at all Profile locations. The preliminary 100-year CMZ would be in general accordance with the County code given the current conditions at the Site. The 140-year CMZ meets the requirements provided by DNR staff.

Conclusions

Our preliminary CMZ delineation has identified areas within the Site that are within the estimated 50-, 100-, and 140-year CMZ. None of the predicted CMZ areas are in the vicinity of the proposed new structure. Our conclusions are summarized below:

- An erosion-resistant bedrock unit that would limit channel migration is not present at the Site, based on review of nearby well logs around the Site.
- Topographic relief (high bedrock cliffs and talus rockfall deposits) south of the Site and Manastash Creek limit lateral migration south of the HMZ and likely decrease the risk of migration to the south toward the proposed new structure.
- Creek behavior local to the Site is constrained between bridge abutments and piers as well as riprap-armored embankment sections.
- The estimated potential lateral migration of the channel over time is shown on Figure 4:
 - 50-year period (purple shading), 28.5 ft
 - 100-year period (orange shading), 57 ft
 - 140-year period (yellow shading), 79.8 ft

References

- Bentley, R.D., Campbell, N.P., 1983, Geologic map of the Ellensburg quadrangle, Washington: Washington Division of Geology and Earth Resources Geologic Map GM-28, scale 1:62,500.
- Kittitas County Code, Section 17A.02, Critical Areas definitions, accessed April 17, 2024, https://www.co.kittitas.wa.us/boc/countycode/title17a.aspx#Chapter_17A.02
- Washington State Department of Ecology (Ecology), 2014. The Channel Migration Toolbox: ArcGIS® Tools for Measuring Stream Channel Migration. Publication number 14-06-032. Published October 2014.
- Washington State Department of Ecology (Ecology), 2024, Washington State Well Report Viewer, accessed April 17, 2024, <https://apps.wr.ecology.wa.gov/wellconstruction/map/WCLSWebMap/default.aspx>

Limitations

Work for this project was performed for BORArchitecture, PLLC (Client), and this report was prepared consistent with recognized standards of professionals in the same locality and involving similar conditions, at the time the work was performed. No other warranty, expressed or implied, is made by Aspect Consulting (Aspect).

Recommendations presented herein are based on our interpretation of site conditions, geotechnical engineering calculations, and judgment in accordance with our mutually agreed-upon scope of work. Our recommendations are unique and specific to the project, site, and Client. Application of this report for any purpose other than the project should be done only after consultation with Aspect.

Variations may exist between the soil and groundwater conditions reported and those actually underlying the site. The nature and extent of such soil variations may change over time and may not be evident before construction begins. If any soil conditions are encountered at the site that are different from those described in this report, Aspect should be notified immediately to review the applicability of our recommendations.

It is the Client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, and agents, are made aware of this report in its entirety. At the time of this report, design plans and construction methods have not been finalized, and the recommendations presented herein are based on preliminary project information. If project developments result in changes from the preliminary project information, Aspect should be contacted to determine if our recommendations contained in this report should be revised and/or expanded upon.

The scope of work does not include services related to construction safety precautions. Site safety is typically the responsibility of the contractor, and our recommendations are not intended to direct

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the contractor's site safety methods, techniques, sequences, or procedures. The scope of our work also does not include the assessment of environmental characteristics, particularly those involving potentially hazardous substances in soil or groundwater.

All reports prepared by Aspect for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect. Aspect's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Please refer to Appendix B titled "Report Limitations and Guidelines for Use" for additional information governing the use of this report.

We appreciate the opportunity to perform these services. If you have any questions please call Chip Barnett, Senior Geologist, 206-413-5398.

Attachments: Figure 1 – Vicinity Map
Figure 2 – Historic River Bank Edges
Figure 3 – Historic Migration Zone
Figure 4 – Channel Migration Zone
Appendix A – Site Photographs
Appendix B – Report Limitations and Guidelines for Use

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