TECHNICAL MEMORANDUM

Date:	January 29, 2025
To:	City of Planning Department
Copies:	City of Bellingham Parks and Recreation Department
From:	Jeff Parsons, PE, Johnny Ramus, LG, Herrera Environmental Consultants
Subject:	Hundred Acre Wood Trail Improvements Phase 1B – Geologically Hazardous Areas Assessment

Introduction

In 2022, the City of Bellingham (the City) developed the Hundred Acre Wood Master Plan to guide future activities within the Hundred Acre Wood Park (the Park) (Bellingham 2022). The Master Plan included preservation and restoration of the natural environment, environmental education opportunities, and low-impact recreational opportunities. Phase 1 of the Master Plan implementation strategy prescribed a series of trail improvements and restoration activities to be implemented before 2026 and was further divided into a Phase 1A and Phase 1B.

Phase 1A of the plan included trail narrowing, decommissioning, native planting, signage, and wayfinding throughout the Park, and was completed in the summer of 2024. Phase 1B expanded the area of trail narrowing and decommissioning which triggered the need for critical areas permitting as required by Bellingham Municipal Code (BMC) Chapter 16.55. Phase 1B includes the re-routing of three existing trail segments. One existing earthen trail in Wetland AA will be re-routed through the wetland buffer. The other existing earthen trails are north of Wetland JJ1/JJ2 and outside of any critical areas and buffers and will be relocated to avoid encroachment onto private property and will be "field fit" to avoid impacts to trees where possible.

The purpose of this memorandum is to provide the City with information regarding existing geological conditions in the Study Area (**Figure 1**), specifically the improvement area of trail re-routing and decommissioning north of Wetland JJ1/JJ2 as well as evaluate any potential impacts associated with the proposed trail work (**see Sheet 7 of the 90% Design Drawings**). In accordance with BMC 16.55, the Study Area does contain steep slopes that are regulated *Erosion Hazard Areas* and *Landslide Hazard Areas* defined by BMC 16.55.420.

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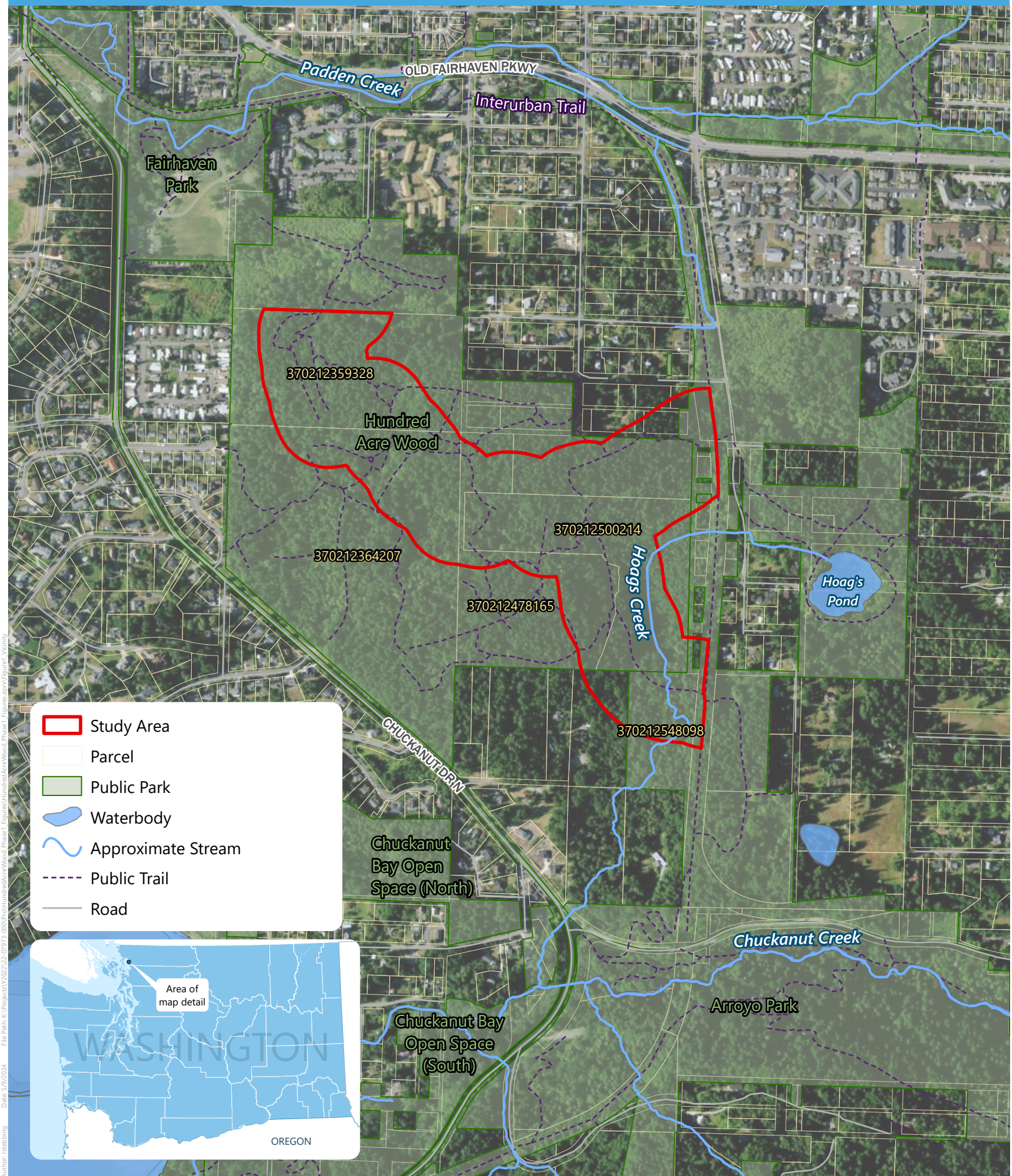
Figure 1.
Vicinity Map for the Hundred Acre Wood Phase 1 Project.



Produced by Herrera Environmental Consultants (herrerainc.com) | Sources: City of Bellingham, ESRI (Aerial, 2021)

0 250 500 1,000 Feet

File Path: K:\Projects\V2022\22.07973.000\Pro\HundredAcreWood_Phase1_Figures\HundredAcreWood_Phase1_Figures.aprx\Figure1_Vicinity
Date: 5/9/2024
Author: rstebbing

Site Description

The Hundred Acre Wood Park property encompasses approximately 82-acres in the southwest corner of Bellingham within Sections 12, Township 37 North, Range 02 East of the Willamette Meridian within the Bellingham city limits, Whatcom County, Washington, and consists of multiple tax parcels (tax parcels #370212359328, #370212364207, #370212478165, #370212500214, #370212497234 and #370212548098). The Park is located amid a residential neighborhood in the southwest corner of Bellingham and is connected to a regional trail network and City parks, including Fairhaven Park, Lake Padden Park, Woodstock Farm, Teddy Bear Cove, Arroyo Park, and Happy Valley Park, as well as other adjacent open space properties. The Park is served by direct connections to the Interurban Trail, which provides linkage between trails at Galbraith Mountain, Larrabee State Park, and the Chuckanut Mountains, and has numerous formal and informal trails that weave throughout the Park varying from 2 to 10 feet wide and consist of compacted native soil, a mix of native soil/gravel/cobble, and more formal limestone/gravel trails.

The specific improvement area of trail re-routing and decommissioning north of Wetland JJ1/JJ2 is located on a glacial upland within Whatcom County tax parcel #370212497234, which is just south of the north adjoining residential property identified as tax parcel #370212518314. The trail improvement area is approximately 21,600 square feet (sqft) measuring approximately 240 feet east to west by 90 feet north to south (see Sheet 7 of the 90% Design Drawings).

Desktop Review and Interpretation

Geology

According to the Washington State Department of Natural Resources (DNR) Geologic Map of Bellingham, Washington, "Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington" by Lapen (2000), the Park is located in the Puget Lowlands physiographic region of Washington State and is mapped as undifferentiated Pleistocene glacial deposits (Qgd), which is generally used when there are gaps in detailed field and mapping data, or differing interpretations of Quaternary glacial deposits are unreconcilable. A geotechnical report was prepared in 2009 by GeoEngineers, Inc (2009) for a previous development proposal in the Park. This report documents the geological units encountered in the Park vicinity as follows:

- Bellingham (Glaciomarine) Drift;
- Recessional Outwash;
- Glacial Till; and,
- Chuckanut Formation.

Subsurface conditions in the Park are noted in GeoEngineers, Inc (2009) as including silt, clay, and silty sand soils representative of glaciomarine drift; sand with gravel deposits representative of glacial outwash; silty sand soils representative of glacial till; and sandstone bedrock representative of the Chuckanut Formation.

Hydrology

According to a well report search conducted on the Washington State Department of Ecology (WDOE) website, groundwater resources as static water levels have been encountered in the same township, range section, and quarter/quarter section at depths ranging from approximately 5 feet below ground surface (bgs) to 16 feet bgs. Groundwater conditions were also evaluated during the 2009 geotechnical investigation and were measured at depths of 5 feet, 6 feet, and 37 feet bgs at various sections of the Park. It was noted that two different groundwater conditions existed at the time of the investigation, seasonally dependent perched groundwater located in the upper soils and an aquifer located within the deeper glacial outwash soils.

GeoEngineers (2009) determined that the groundwater flow direction is likely to the southwest. Additionally, the United States Geological Survey (USGS) Bellingham South, Washington Quadrangle 7.5-minute series topographic map was reviewed for this memorandum. According to the contour lines on the topographic map, the Park elevation ranges approximately 100-280 feet above mean sea level. Hoags Creek likely influences groundwater flow in the Park area. The United States Environmental Protection Agency (USEPA) Ground Water Handbook, Vol.1 Ground Water and Contamination, September 1990, indicates that the water table typically conforms to surface topography. This means the direction of flow for shallow groundwater is generally from higher elevations to lower elevations. Localized flow direction may vary as a result of tide, rainfall, development, geologic characteristics, nearby surface water bodies, underground utilities such as storm drains, septic systems and sewers, or other influences such as the presence of high-volume wells.

Surface Conditions

The Park is located on a glacial upland which consists of a predominantly undeveloped coniferous and deciduous forest containing multiple wetlands and Hoags Creek. The topography of the 82-acre Park is moderately sloping to the west and southwest in the northern and eastern sections of the Park. According to the City of Bellingham CityIQ web portal depicting LiDAR DEM-generated slope gradients, the trail improvement area north of Wetland JJ1/JJ2 consists of slopes ranging from flat to 15-30% to 40-100%. The topography of the Park has been modified from its natural state due to historical land uses which have included gravel mining and forestry operations. The Park traverses a natural watershed break between the Padden Creek and Chuckanut Creek watersheds.

Subsurface Conditions

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey, the dominant soil composition in the area is classified as Chuckanut gravelly ashy sandy loam, which consists of 30 to 65 percent slopes, is a deep, well-drained soil that forms from volcanic ash mixed with colluvium derived from sandstone over dense glacial till and occurs on hillslopes. A typical soil profile includes a 7-inch layer of slightly to moderately decomposed forest material; a 2-inch layer of gravelly ashy sandy loam; a 13-inch layer of gravelly ashy loam; a 20-inch layer of gravelly sandy loam; and a 13-inch layer of gravelly loam underlain by sandstone bedrock. Chuckanut

gravelly ashy sandy loam is not considered a hydric soil. Minor components within the study area consist of hydric soil Bellingham, and non-hydric soils Beausite, Rock outcrop, and Tokul (NRCS 2025).

Field Assessment

Surface Characteristics

Surficial conditions were evaluated during a site visit on January 22, 2025, which included any surface modifications, vegetation characteristics, and any drainage characteristics. The trail improvement area includes a previous foot path that encroaches onto private property. The existing foot path would be considered a Class 3 trail as per the National Forest Service (NFS) Trail Class Matrix where the tread is developed, continuous, and obvious.

The trail improvement area was covered by a thick layer of forest duff, organic detritus, and topsoil substrate. An established tree canopy of coniferous, and mixed coniferous/deciduous was observed and is consistent with the dominant tree species in upland and buffer areas, including Western red cedar, Douglas fir, Western hemlock, Grand fir, Bitter cherry, Black cottonwood, Western paper birch (*Betula papyrifera*) and Big leaf maple and the dominant understory components include vine maple, osoberry, western sword fern, dull Oregon grape, Pacific trailing blackberry, salal (*Gaultheria shallon*), and bleeding heart (*Dicentra formosa*).

The localized topography suggests that the surface runoff and shallow groundwater flows to the east and southeast toward Hoags Creek and Wetland JJ3. This would be consistent with the determination that the dominant source of hydrology to Wetland JJ3 is a hillside seep. Groundwater seeps were not observed in the trail improvement area during the site visit.

No evidence of historical or ongoing slope instability (i.e. headscarps, hummocky terrain, or mass wasting) was observed in the trail improvement area during the field assessment. No evidence of field indicators of erosion (i.e. drainage channelization) was observed in the trail improvement area during the field assessment.

Subsurface Characteristics

Fiberglass soil probing in the trail improvement area indicated that the area was covered by an approximately 12-inch layer of forest duff, organic detritus, and topsoil substrate before shallow probe refusal suggesting compacted soils below 12 inches. To the extent feasible, a small test pit was hand-dug to assess the substrate down to 12 inches. Soil consisted of sandy loam with abundant organic and root material.

Geologic Hazard Areas Assessment

The trail improvement area contains slopes ranging from <20 to 48% that meet regulatory requirements for *Erosion Hazard Areas* and *Landslide Hazard Areas* defined by BMC 16.55.420.

Erosion Hazards

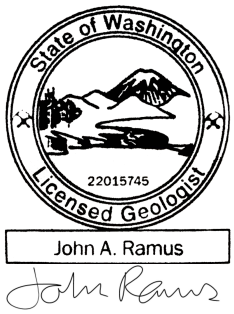
The trail improvement area contains slopes ranging from <20 to 48% that exceed 30% grade, meeting the regulatory requirements for *Erosion Hazard Areas* defined by BMC 16.55.420 (A). Despite this, no evidence of field indicators of erosion (i.e. drainage channelization) was observed in the trail improvement area during the field assessment. That said, appropriate temporary erosion and sediment control measures should be implemented during trail improvements to minimize any potential for erosion impacts to the critical areas.

Landslide Hazards

The trail improvement area contains slopes ranging from <20 to 48% that exceed 40% grade, meeting regulatory requirements for *Landslide Hazard Areas* defined by BMC 16.55.420 (B); however, all slopes within the 21,600 sqft trial improvement area with >40% inclination are not continuous for 10 or more vertical feet, and therefore not considered *Landslide Hazard Areas* as defined by BMC 16.55.420 (B). Furthermore, evidence of historical or ongoing slope instability (i.e. headscarps, hummocky terrain, or mass wasting) was not observed in the trial improvement area, other than natural variability in the ground surface. Therefore, no mitigation for landslide hazards should be required.

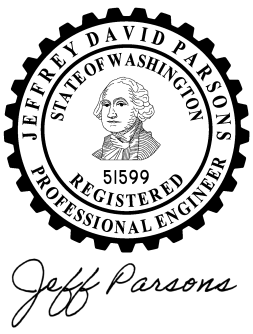
Prepared by:

Johnny Ramus, LG



Reviewed by:

Jeff Parsons, PE



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