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PND ENGINEERS, INC.

Harper Park Footbridge
Limited Geotechnical Report

Prepared for:
Kitsap County Parks Department

Prepared by:
PND Engineers, Inc.
1736 Fourth Ave S
Seattle, WA 98134

March 9, 2020

Permit Number: 19-00892

1.1 Project Description

Kitsap County Parks owns and maintains Harper Park, which includes a ballfield and a trail along the side of a forested valley. The trail is situated on a former narrow-gauge railroad embankment that crosses an unnamed intermittent stream. The stream crossing was spanned for a time by a used U.S. Navy gangway which has since been removed. An 18-in diameter concrete culvert lies exposed in the streambed and may have been part of the original embankment construction.

Kitsap County Parks desires to install a timber bridge to restore the trail over the stream crossing. Currently the trail dips down to the creek which runs through the culvert. The proposed bridge is 40-ft long by 6-ft wide. The timber beams would rest on two concrete bearing pads or sills, approximately 3 ft by 8 ft, to isolate them from the soil and distribute the weight of the bridge. The bridge would also keep foot traffic separated from the creek and provide a safer, more stable crossing.

1.2 Purpose of Report

In response to an Information Request on April 4, 2019, from the Kitsap County Department of Community Development, Parks must provide a geotechnical report addressing the requirements of KCC 19.700.725 and provide recommendations on the construction of the bridge foundation. This report is written to address the criteria under Part D which requires a Slope Evaluation (also referred to as a "Limited Geotechnical Report") and a Design Investigation.

1.3 Site Location

Harper Park is located in South Kitsap County, northwest of the Southworth ferry terminal. The project is located in unincorporated Kitsap County.

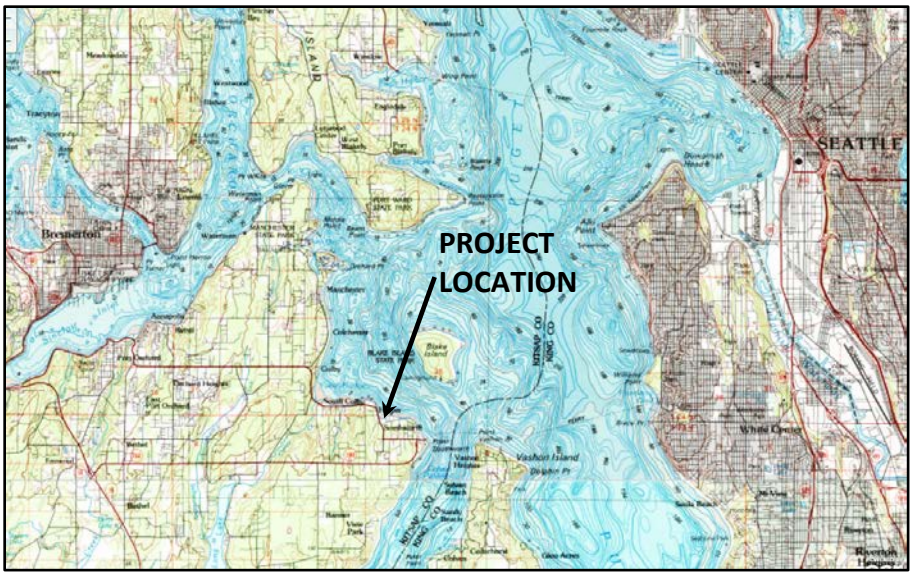


Figure 1-1: Harper Park Location. (USGS)

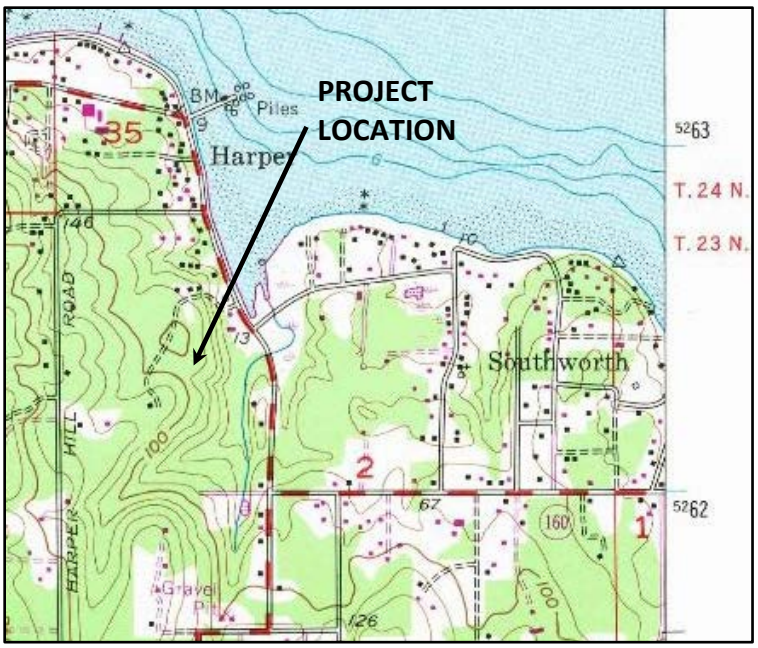


Figure 2-1: Overview of Harper Park vicinity (USGS, 1981)

1.4 Parcel Map

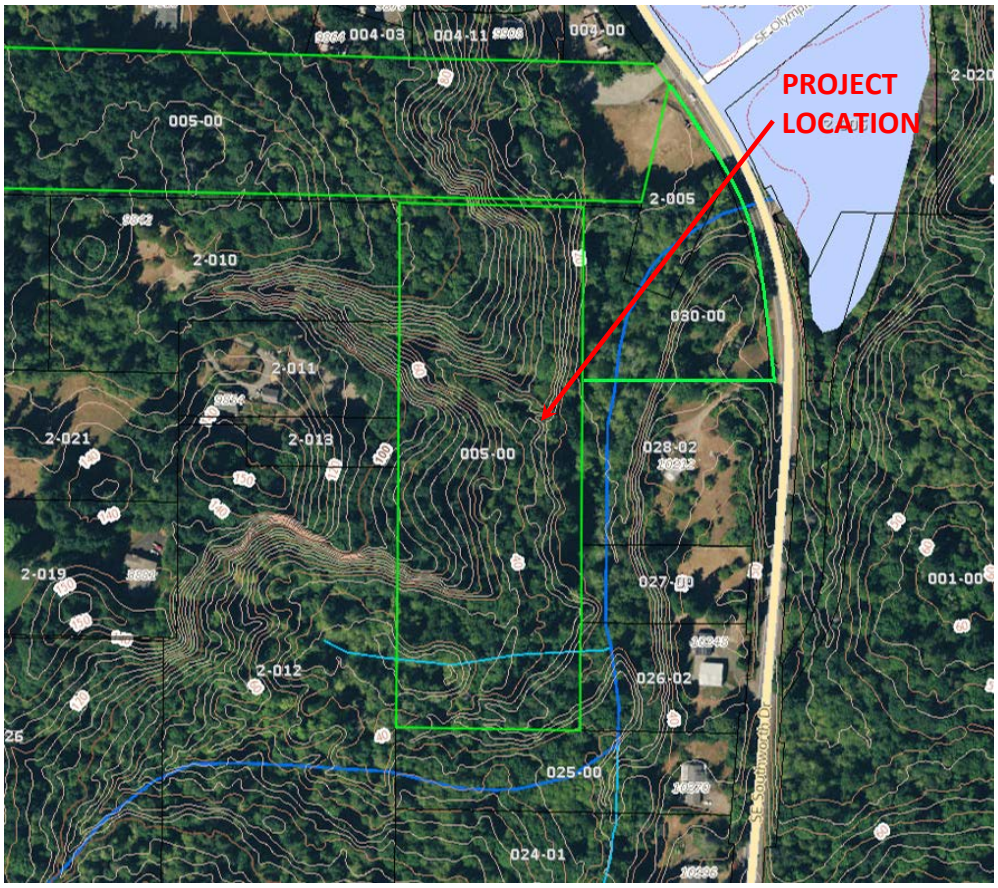


Figure 3-1: Park boundaries in green with 5-foot contours (Kitsap County Assessors).

2.1 Site Visit

On May 14, 2019, PND visited the footbridge location with Parks personnel. The trail is situated on a former rail roadbed at a constant upward grade as it runs south from the parking lot and ballfield. As indicated by the historical information sign, the railroad was part of the Harper Brick Company brickyard that operated between 1885 and the 1930's.

Approximately 600 feet south of the parking lot, the railway bed crosses the mouth of a ravine that opens to the east. The length of the embankment across the ravine, as judged by the subsequent topographic survey, is about 60 feet. An intermittent stream flows to the east through a skewed 18-inch-diameter concrete culvert, which the trail currently passes over. The embankment is heavily vegetated, except on the walking pathway. Mature cedars, maples, and alders are established along the sides of the embankment.

During the site visit, no subsurface explorations were made, nor samples collected for laboratory testing. Visual observations indicated that the railroad embankment consists of compacted sand and gravel fill.

2.2 Site Photos

Several photos of the trail approach to the footbridge site and of the existing culvert were taken during the site visit, as follows.

Figure 2-1: Footbridge site, looking north

Figure 2-2: Footbridge site, looking south

Figure 2-3: Existing culvert inlet

Figure 2-4: Existing culvert outlet

2.3 Topographic Survey

Ward C. Muller & Associates of Port Orchard conducted a topographic survey of the vicinity surrounding the footbridge location in November 2019. The survey provided a base map drawing that was used for the footbridge positioning, as shown in the permit drawings in Appendix A.

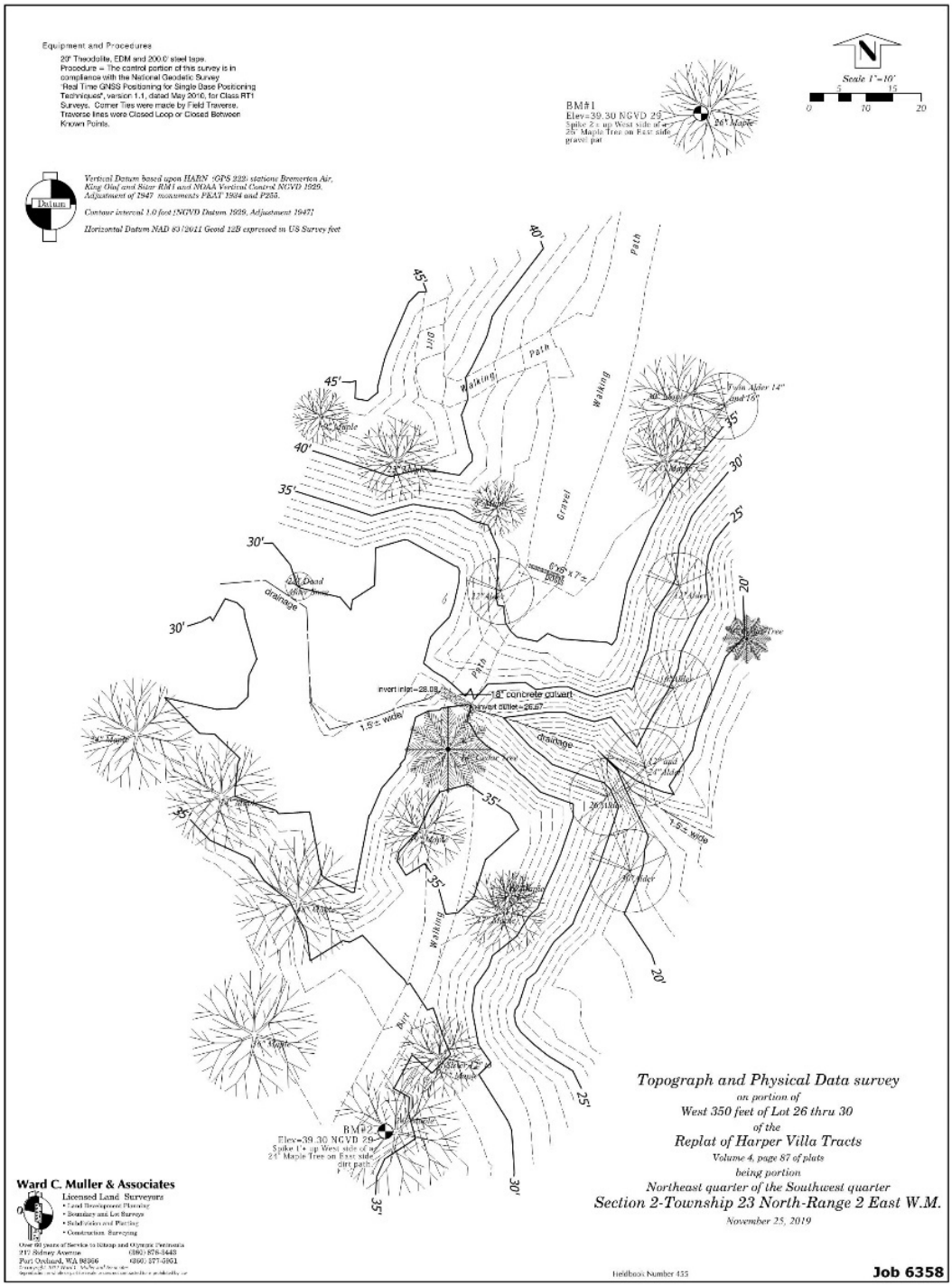


Figure 2-1: Topographic Survey for footbridge.

2.4 Design Analysis

The timber footbridge will be designed by the supplier, Western Wood Structures of Tualatin, Oregon. Information provided by the supplier shows that the dead weight of the bridge is estimated to be 5,500 lbs, while the design live load is specified to be 90 psf.

The proposed bridge will bear on two concrete sills, assumed to be 3 ft x 8 ft, but yet to be designed. The bridge is assumed to be anchored to the concrete sills cast on the ground. See Appendix A for permit drawings.

Footbridge Bearing Loads

Load	Design	Tributary Area	Load at Each Sill	Bearing Pressure at Each Sill
Dead Load:	5,500 lbs		2,750 lbs	115 psf
Live Load:	90 psf	20 ft x 6 ft	10,800 lbs	450 psf
Total:			13,550 lbs	565 psf

Prescriptive load-bearing values from the 2015 IBC (Table 1806.2) indicate that soils of the type in the embankment (sand, silty sand, clayey sand, silty gravel and clayey gravel) have a minimum capacity of 2,000 psf, which is well above the maximum bearing pressure induced by the footbridge (565 psf). The lateral bearing pressures are similarly within capacity of the embankment. Final values will depend on the precise design dimensions of the concrete sills.

General Critical Areas information for the Harper Park site is provided by the Kitsap County Department of Community Development. As reference in KCC 19.700.725, actual site conditions govern the design basis.

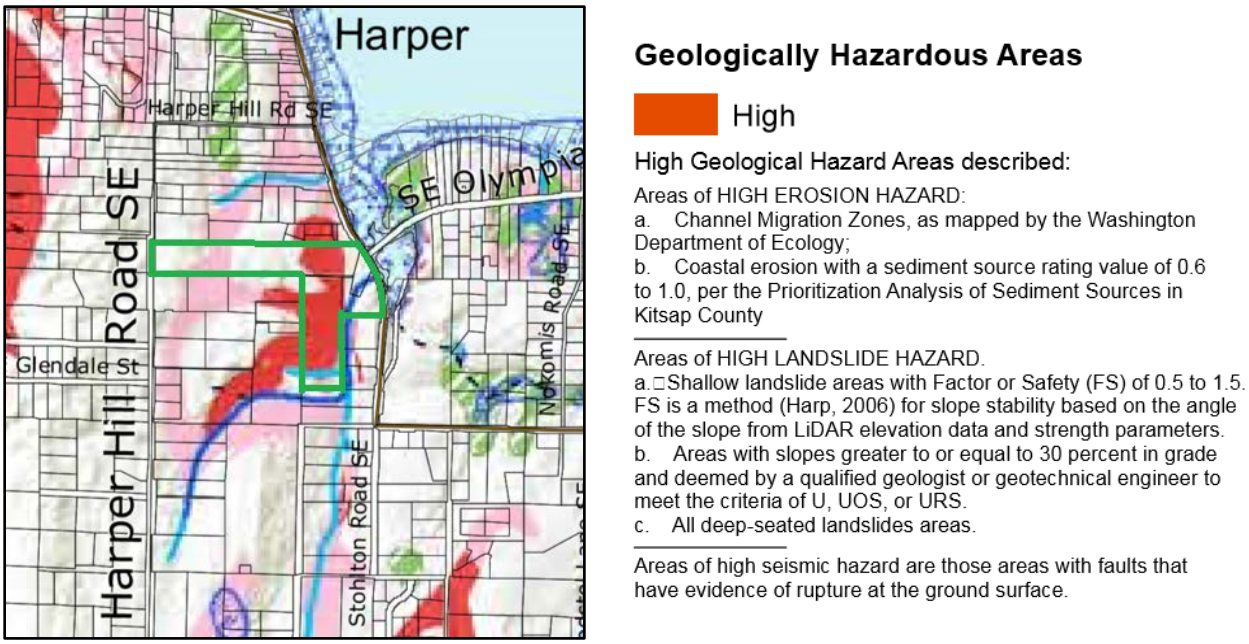


Figure 3-1: Harper Park, outlined in green, superimposed on the Critical Areas map.

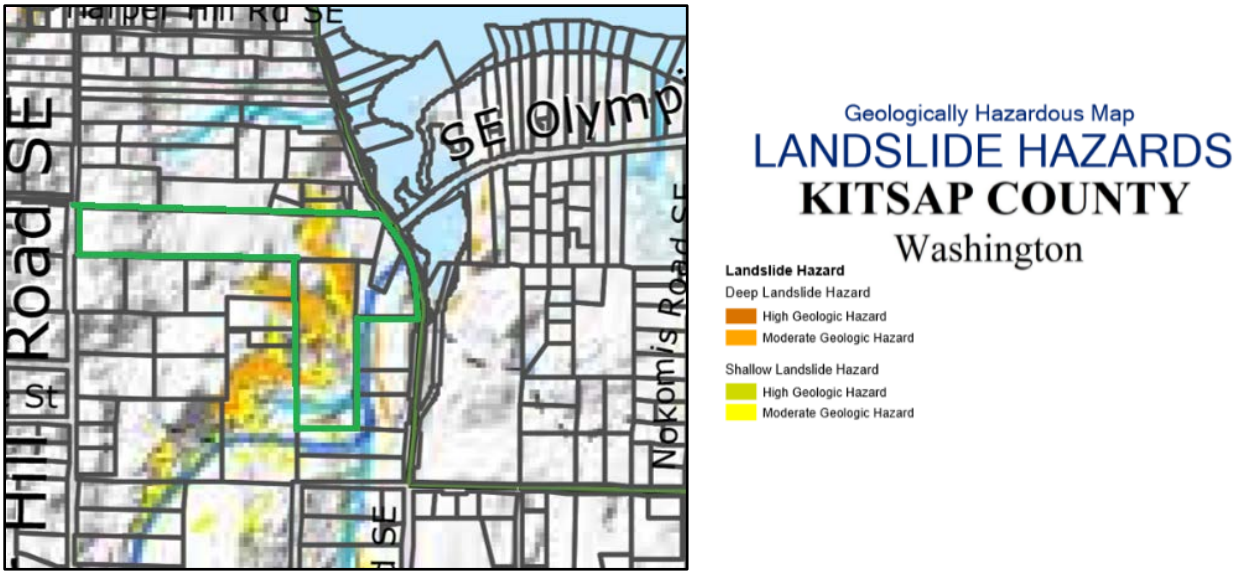


Figure 3-2: Harper Park, outlined in green, superimposed on the Landslide Hazards map.

The Information Request from the Department of Community Development states that the requirements of KCC 19.700.725 are to be addressed. The specific requirements of Parts C, D and E are listed below along with the applicant (Parks) response.

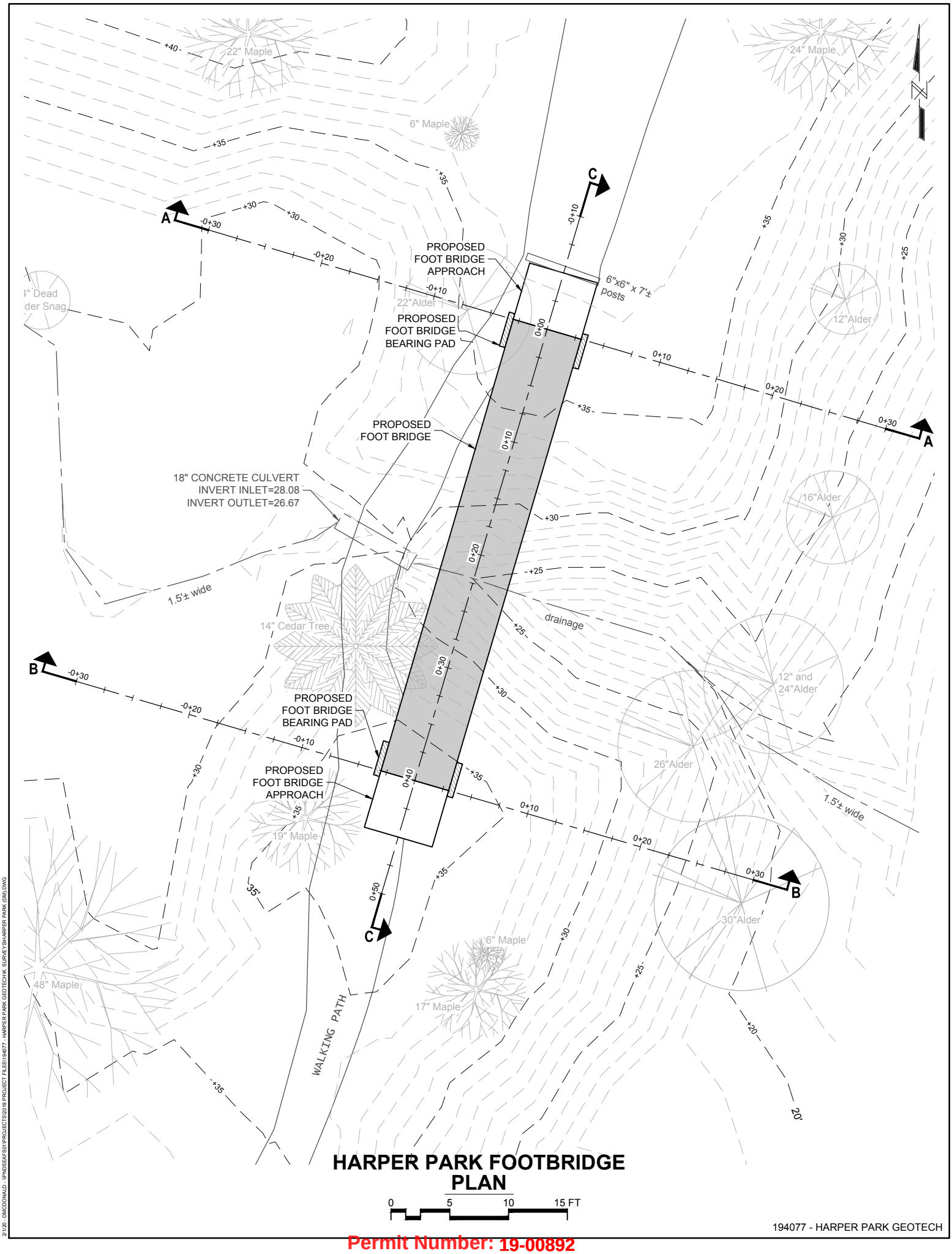
KCC 19.700.725	Applicant Response:
C. Geological Report Submittal Standards. A geological report is required for site development proposals that involve development activity or the installation of structures within a geologically hazardous area or shoreline setback, or as otherwise required pursuant to Chapters 19.300 and 19.400, but do not involve or require engineering design recommendations. The following minimum information is required:	
1. Site information regarding the Kitsap County shoreline environment designation and critical areas designations that affect site features;	Shoreline designation not applicable. See Section 3 above for Geological and Landslide Hazards maps.
2. Description of surface and subsurface conditions, including ground materials, vegetation, surface drainage, groundwater, and a preliminary geologic hazard assessment which includes the locations of structures and the identification of the slope and/or coastal processes occurring at the site and factors that contribute to them;	See Section 2 above for Field Observations. No coastal processes are involved.
3. Review of available site information, literature, and mapping;	See Section 4 above for local information provided by County.
4. Detailed description of slope and other topographic features; and	See topographic survey in Section 2, and Footbridge plan and sections in Appendix.
5. Conceptual siting of structures and general recommendations, which include methods and practices that avoid and/or reduce slope and shore impacts. Minimum recommendations should include upland and slope drainage control, groundwater control, site vegetation management, and erosion control.	See Appendix for Footbridge plan and profile for general siting. Impacts to existing slope is negligible, as installation of concrete sills are only on surface of embankment. Disruption of existing vegetation will be negligible.
D. Geotechnical Report Submittal Standards. A geotechnical report is required when the department or a geological report determines that a site development proposal requires additional site information such as engineering design recommendations, slope stability analysis, subsurface exploration and testing, coastal process analyses, or construction recommendations. Depending on the level of activity proposed, the report will either be a more ***limited geotechnical slope evaluation report*** or a full geotechnical design investigation report as described below.	Applicant understands that due to the simplicity of the project that only a ***limited geotechnical slope evaluation report*** is required.
1. Geotechnical Slope Evaluation Report. A geotechnical slope evaluation report is required when slope stability analyses are confined to addressing only existing surface and/or drainage conditions, including the relationship of natural and constructed slope features to proposed changes in environmental conditions such as drainage, vegetation removal and slope geometry. The following minimum information is required:	
a. All the information required under subsection (C) of this section (geological report);	See subsection C above.

b. Subsurface data, exploration logs, and testing data, when required by the geotechnical engineer;	No subsurface exploration or testing was deemed necessary for the concrete sills.
c. Estimated (or surveyed) site plan with ground surface profiles and typical cross-sections;	See Section 2 for topographic survey, and Appendix for footbridge plan and sections.
d. Relative location of ordinary high water (OHW) on the surface profile and cross-sections, which includes mean higher high water (MHHW) for the site location, where applicable;	OHW was not located. Bridge will span 5 to 10 feet above the intermittent stream.
e. Soil strength parameters;	Not specifically tested. Used prescriptive values for structural fill.
f. Stability analysis of existing site;	Slope grades were based on topographic survey, and visual observations of embankment side-slopes.
g. Analysis of the relationship of vegetation and slope stability; and	See Section 2. Existing slopes are heavily vegetated and contain mature trees. Disturbance to vegetation will be minimal.
h. Conceptual site development plans and cross-sections.	See Appendix for footbridge plan and sections.
2. Geotechnical Design Investigation Report. A geotechnical design investigation report is required for site development activities that propose design and construction measures at the slope crest, face and/or toe. If a designed structure does not impact slope stability or coastal processes, the report will not be required to perform all items listed under this section, as long as each item is addressed and the report details why a particular item does not apply. The report shall include all items considered necessary by the engineer to fully address the engineering design requirements of the site. The following minimum information is required:	The footbridge bearing pads (sills) and their loads are relatively light, and well under the minimum prescriptive bearing values. Slope stability on the compacted structural fill should not be affected, as set-backs are at least 5 feet from slope crests. No coastal processes are involved.
a. All the information required under subsection (D)(1) of this section (Geotechnical Slope Evaluation Report);	See Section D1 above.
b. Geotechnical requirements and measures to reduce risks;	Slope stability is the primary risk in the area. Footbridge bearing pads will have no effect on slope stability of embankment. Slope stability of embankment is improved by removing foot traffic away from stream.
c. Geotechnical criteria used for any designs including all critical dimensions, lateral earth pressures, soil bearing pressures, location and limits of structures on or near the slope, maximum constructed slope angles, minimum soil reinforcement embedment, soil compaction requirements, and structure heights;	See Design Analysis in Section 2.
d. Temporary construction slope stability recommendations and analysis of proposed final site stability measures;	Disturbance to the railroad embankment is limited to the pathway surface. Side slopes should not be affected by construction.
e. Required construction specifications and construction monitoring procedures;	To be determined by the design engineer.
f. Revegetation and surface and groundwater management requirements;	Disturbance of existing slope vegetation and trees will be minimal. Groundwater will be unaffected.
g. Evaluation of erosion potential, recommendations for erosion avoidance and any proposed mitigation measures;	Erosion potential during installation should be minimal as work will be on the surface of the embankment. Installation of footbridge will eliminate foot traffic in streambed.
h. Detailed tabulation of all basic geotechnical engineering test results pertinent to design and construction, and when required for clarification, detailed examples of tests conducted for the project; and	Geotechnical testing was not performed, and prescriptive load-bearing values have been used.

i. Information outlined in the geotechnical design investigation report site evaluation checklist (see subsection (F) of this section).	Project Information and Project Description are described in Section 1 and 2, and in the permit application.
E. Additional Requirements for Sites in Geologically Hazardous Areas. When a project site is located within a landslide-prone geologically hazardous area, as classified in Section 19.400.415, the following additional project submittal requirements shall apply:	The geological hazards on the park parcel relate to the steep slopes of the ravine, rather than the historical manmade railroad embankment on which the footbridge project will be located.

This report was prepared in accordance with generally accepted professional principles and practices in the field of geotechnical engineering. This report describes the background information, data, geotechnical data gathered during this investigation along with nearby historical data that may be of interest to the Owner.

The nature and extent of subsurface variations across the site may not become evident until construction. If during construction, fill, soil, rock, bedrock, surface water, or groundwater conditions appear to be different from those described herein, PND's geotechnical engineer should be advised at once so re-evaluation of the information contained in this report can be made and evaluated by designers of this facility.



HARPER PARK FOOTBRIDGE PLAN

0 5 10 15 FT

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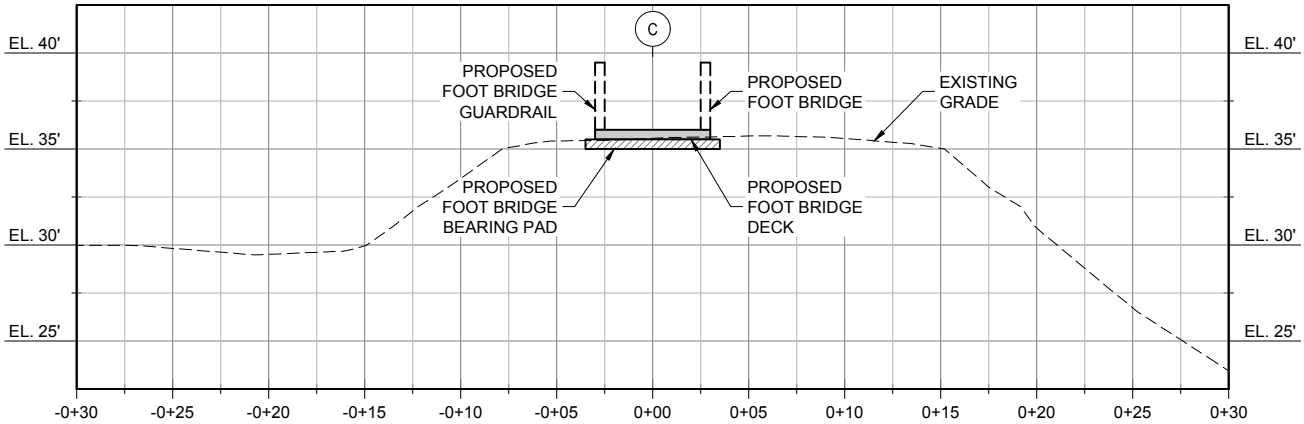

SECTION A-A

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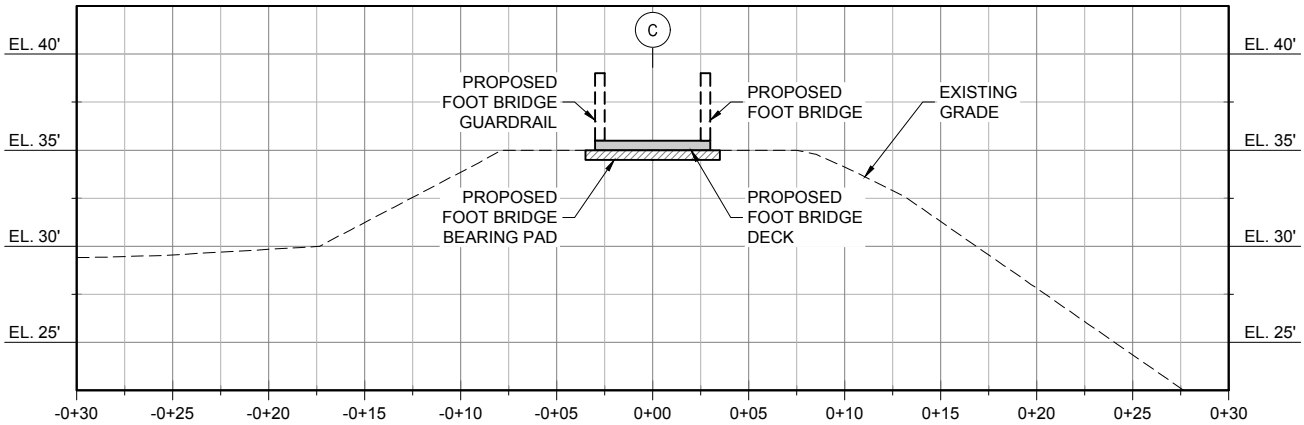

SECTION B-B

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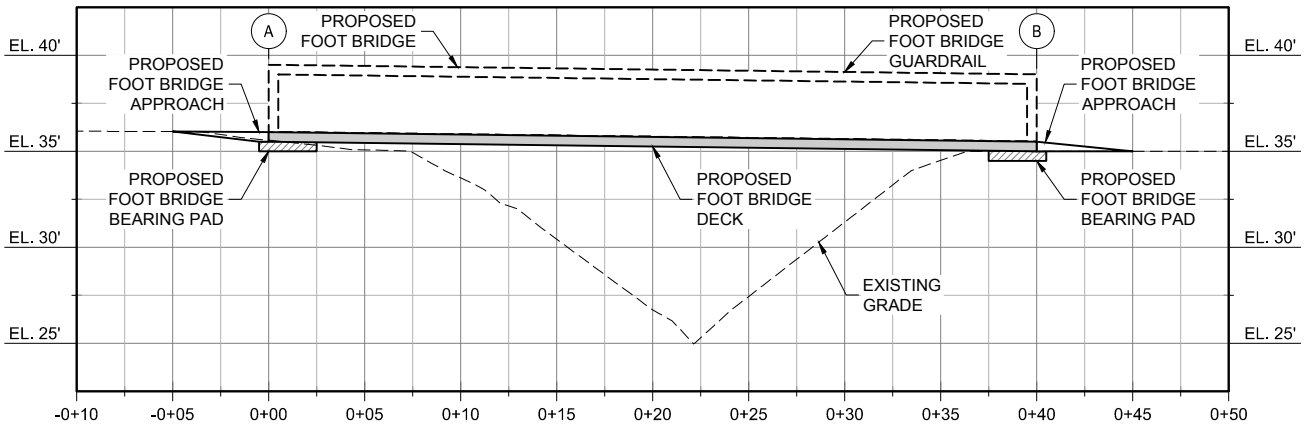

SECTION C-C

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