

# Technical Memorandum



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**To:** Tom Hansen, P.E.  
**From:** Nick Allmendinger, L.G., Ph.D.  
**Copies:** Nico Vanderhorst, Kevin O'Brien  
**Date:** July 13, 2011  
**Subject:** Mitigation Concepts for Woodinville-Duvall Road at Woodin Creek Park  
**Project No.:** 31423

## Executive Summary

Stream and wetland mitigation alternatives are presented to compensate for losses associated with planned improvements to NE Woodinville-Duvall Road. Stream mitigation is required by WDFW because, due to utility conflicts, it is not possible to replace an existing culvert that conveys a portion of upper Cold Creek with a fish passable culvert. Although this portion of Cold Creek is a seasonal, non-fish-bearing stream, Washington DNR classifies it as a Type F (fish habitat) waterbody. Wetland mitigation is required because approximately 400 square feet of fill is likely to occur in two wetlands associated with the roadside ditch that are rated Class 3 by Woodinville, and Category IV by Ecology. While there are no opportunities to improve fish passage within the Cold Creek basin ("in-kind/in-basin" mitigation), an opportunity to improve passage exists near the mouth of Woodin Creek (an "in-kind/out-of-basin" mitigation) (Figure 1 in Appendix A). The proposed mitigation would include altering a channel-spanning bed log that was probably initially installed as grade control for a stormwater pond on the left bank of Woodin Creek, but which now causes a 1.3 foot drop in water surface elevation that is at least a partial barrier to fish. Wetland enhancement will occur in riparian wetland habitat in the immediate project vicinity, and will consist of invasive plant species removal and installation of native wetland species. City of Woodinville Municipal Code requires that the wetland mitigation enhancement occur in a 1.5:1 ratio (mitigation to impact), bringing the total required area of enhancement to approximately 600 square feet.

## Introduction

The City of Woodinville plans to widen NE Woodinville-Duvall Road from 156<sup>th</sup> Avenue to the Woodinville city limits at 171<sup>st</sup> Place NE. This action will result in the widening of the roadway by an average of 10 feet on both the north and south sides of the existing pavement to the full width of

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the right-of-way. A stream (known locally as Cold Creek) runs through the project site. Although this stream is a seasonal, non-fish bearing system within the project area, it is modeled as a type F stream by Washington DNR. Under existing conditions, a 24-inch culvert conducts a portion of Cold Creek along Woodinville-Duvall Road for approximately 345 feet. Due to conflicts with the location of an existing gas main, replacement of this culvert with a fish passable structure is not possible. During a site visit on November 8, 2010, Ginger Holser of WDFW indicated that some level of stream mitigation would be required for the culvert replacement element of the project, based on the DNR typing of Cold Creek in the project vicinity. Opportunities for stream mitigation opportunities for the project were previously evaluated by Otak (Hawkins, 2011), and the City indicated it preferred mitigation for the project to occur within the Woodin Creek system—a salmon-bearing stream.

Although the project was designed to avoid impacts to wetlands in the project vicinity by employing retaining walls, the project will result in approximately 400 square feet of fill in two roadside ditch wetlands, which are categorized as Class 3 wetlands per the City's Critical Areas portion of their Municipal Code (WMC 21.24.320) (and Category IV per Ecology). Although the Army Corps of Engineers and the Washington Department of Ecology have indicated that no mitigation would be required for this small amount of wetland impact, the City of Woodinville has communicated that wetland mitigation for these impacts must occur, per the City's Critical Areas Code. Wetland mitigation involving enhancement of existing Class 3 wetlands would require a mitigation ratio of 1.5:1 (E. Martindale, July 11, 2011; personal communication), per the City's Critical Areas portion of their Municipal Code (WMC 21.24.350). Opportunities for wetland mitigation have also been evaluated in the Woodin Creek system, in association with proposed stream mitigation for the project.

This memorandum is intended to provide the City of Woodinville with a summary of one alternative for satisfying both stream and wetland mitigation conditions in the Woodin Creek system, located specifically in Woodin Creek Park.

### **Mitigation Area Setting**

Woodin Creek drains an area of 0.9 square miles with a maximum relief of 555 feet. The stream originates on a northwest-south-east trending glacial ridge located to the east of the city of Woodinville and flows into the Sammamish River at Woodin Creek Park. The average gradient of Woodin Creek is 8.5% with the steepest gradients in the headwaters (east of 143<sup>rd</sup> Place NE) and gradients of roughly 0.7% as it flows across the Sammamish River floodplain. Land use in the steeper headwaters of the watershed is predominantly low-density residential and there is a significant amount of forest cover in this area. In the lower watershed, Woodin Creek flows through the central business district and a high-density residential/office area before flowing under 131<sup>st</sup> Avenue NE and entering Woodin Creek Park. Woodin Creek is a Type F stream per DNR, and WDFW indicates a presence of coho and sockeye salmon in the lower portions of the system.

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## Existing Conditions

### Woodin Creek

Figure 2 in Appendix A and the photos in Appendix B illustrate points along the Woodin Creek system in Woodin Creek Park. Woodin Creek is conveyed beneath 131st Avenue NE (just north of where 131st Avenue NE becomes NE 171<sup>st</sup> Street) through a 48 inch corrugated metal pipe culvert (point 0 in Figure 2, photo 1 in Appendix B). Downstream from the culvert outfall, Woodin Creek has a fairly consistent bankfull width to depth ratio of 4.5 (4.2 to 5.0) with bankfull widths ranging from five feet near the upstream end (point 1, photo 2) to nine feet approximately 100 feet upstream from the stormwater pond outfall (point 3, photo 3). Bankfull depth increases in proportion to width from 1.2 feet near the 131st Avenue NE culvert to two feet upstream from the pond outfall. The channel capacity is reduced by significant aggradation of fine to medium-grained sand which has accumulated to a minimum thickness of 0.7 feet near the upstream end of the reach and reaches a maximum sustained thickness of 1.4 feet within 150 feet of the culvert outfall (point 2). This aggrading reach is lined with invasive vegetation species, dominated by reed canary grass. Near the downstream end of this reach, root-forced head cuts demonstrate a transition from a system dominated by aggradation to one dominated by incision (point 3, photo 4).

Approximately 450 feet downstream from the 131<sup>st</sup> Avenue NE culvert, Woodin Creek receives runoff from a surface water detention pond on its left bank (point 4). Flashy urban hydrology is the likely cause of substantial channel enlargement in the reach downstream from the pond outfall. Significant bed scour has occurred downstream from a large channel-spanning log that was probably originally installed as grade control for the pond outfall (point 5, photo 5). This log causes a vertical drop in water surface of one foot or more during low flow and therefore presents an impediment/partial barrier to fish migration. Downstream from this log the channel becomes wider; gravel is present in larger quantities on the bed and fines are more commonly found forming bars along the channel margins. Immediately upstream from the confluence with the Sammamish River, Woodin Creek flows under a pedestrian bridge associated with the Sammamish River Trail. The channel is roughened through this crossing with coarse quarry spalls and 1-man boulders (point 6, photo 6).

The stormwater pond on the left bank of Woodin Creek (points 7 and 8, photos 7 and 8) appears to collect storm water runoff from the Waterford Place Apartments located at 13305 NE 171<sup>st</sup> Street. In its current condition it is largely dead storage, having accumulated a large volume of fine sediment that has reduced its capacity to detain storm water. There is some evidence that overland flow originates from the pond during some large storm events and causes sheetwash erosion downstream from the pond. Matted vegetation and exposed non-adventitious roots at the base of at least two different tree species on the left bank top indicate a general lowering of the land surface, while a thin duff layer indicates that this erosion has not occurred recently.

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**Table 1. Points of Interest from June 11, 2011 Reconnaissance**

Point	Description
0	NE 171st Street Culvert Outfall
1	5 foot wide x 1.2 foot deep channel with 0.7 foot depth of medium grain sand in bed
2	1.4 foot depth of fine grain sand in bed
3	knickpoint: 9 foot wide x 2 foot deep channel with 1.4 foot depth of fine grain sand in bed
4	pond outfall
5	channel-spanning bed log
6	quarry-spall roughened bed beneath pedestrian bridge
7	inlet for stormwater pond
8	satuated ground surrounding sw pond

### Riparian Vegetation

In May 2010, Otak's Senior Wetland Ecologist visited the Woodin Creek Park site and described the vegetation growing in the riparian zone along Woodin Creek. Trees present within the park include red alders along much of the stream channel, and tall willows grow around approximately 50% of the stormwater pond perimeter (Anderson, 2010). In the understory, large patches of Himalayan blackberry are present along the left (east) bank of the stream, and extensive blackberry clearing appears to have occurred along the right (west) bank. The right bank is currently dominated by non-native invasive reed canary grass. On the left bank, beyond the densely vegetated riparian zone and north of the storm water pond, is a large meadow area that is also dominated by reed canary grass.

### Proposed Mitigation

We propose to improve the fish passage conditions in Woodin Creek and provide wetland enhancement mitigation in Woodin Creek Park. Improvement of fish passage conditions will be accomplished by eliminating the physical barrier that is formed by the channel-spanning bed log (Appendix C). This goal will be achieved by creating a low-flow notch in the log, and making minor channel improvements in the immediate vicinity. This alternative requires minimal use of heavy machinery and disturbance to the riparian zone of the stream. The low-flow notch alternative involves using gravel bags to divert flow around the work zone, excavating a small volume of sediment upstream from the channel-spanning log, attaching geotextile to the upstream end of log, and backfilling with stream gravel that would be transported to the channel in wheel barrows. A chain saw would be used to add a low-flow notch to the log to allow a lower energy drop in water surface elevation between the upper reach and the lower reach.

Wetland enhancement will provide functional lift to the riparian wetlands in the immediate project vicinity by restoring areas disturbed by project implementation, removing invasive plant species in areas adjacent to the project, (including dominant species such as Himalayan blackberries,

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bittersweet nightshade, and reed canary grass), and installing appropriate native tree and shrub species (Figure 1). Due to the existing canopy present at the proposed project site, plantings will include shade-tolerant native shrubs and trees such as vine maple, pacific ninebark, wild clustered rose, salmonberry, snowberry, red osier dogwood, Sitka spruce, and western red cedar. A minimum area of 600 square feet will be enhanced to compensate for the 400 square feet of wetland impact along the Woodinville-Duvall Road at a 1.5:1 ratio. Specific planting plans are currently being prepared for the project.

## References

Anderson, S., 2010. Mitigation Concept Memorandum – Stream adjacent to NE 145<sup>th</sup> Street sidewalk project (Otak project# 31422D). Written for Matt Elliss, City of Woodinville Public works Department, May 7, 2010.

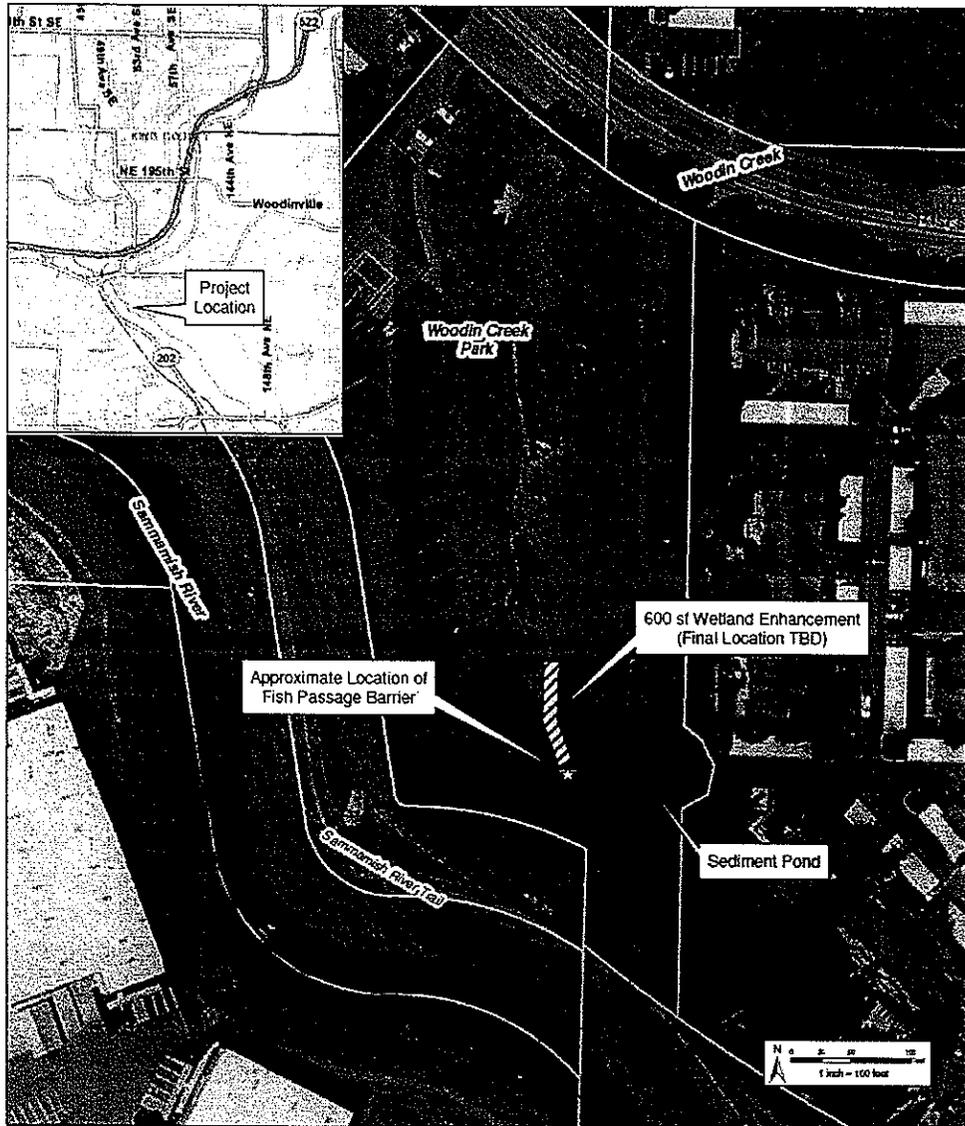
Hawkins, R., 2011. Woodinville-Duvall Road Culvert Mitigation Options on Cold Creek. Written for City of Woodinville Public Works Department, April 15, 2011.

## Appendices

Appendix A – Figures

Appendix B – Photo Log

Appendix C - Conceptual Drawings



**Woodinville-Duvall Road Widening**  
Mitigation Concepts  
Vicinity Map

**Legend**

- Streams
- Roads
- ▭ Parcels



Figure 1. Mitigation concepts vicinity map

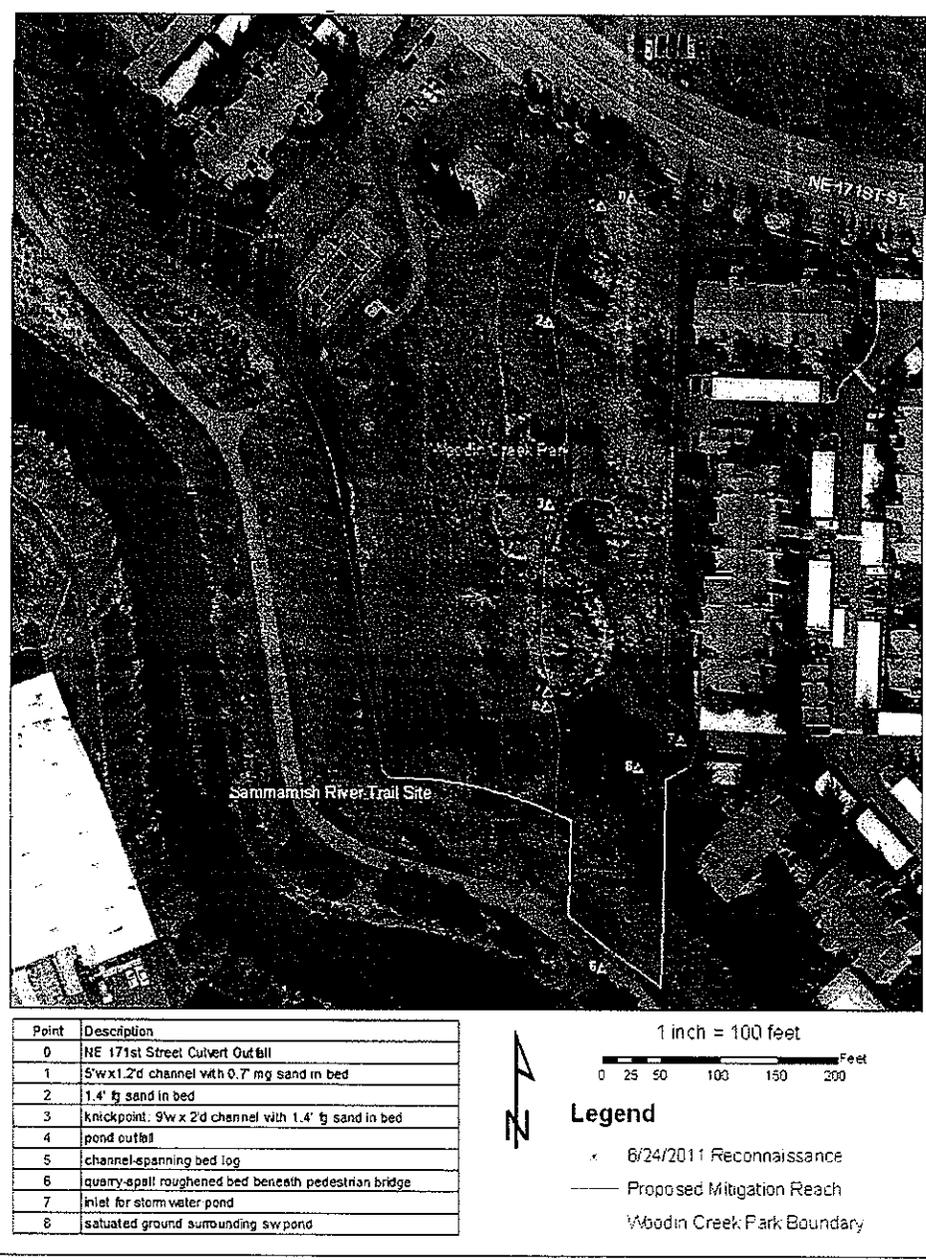
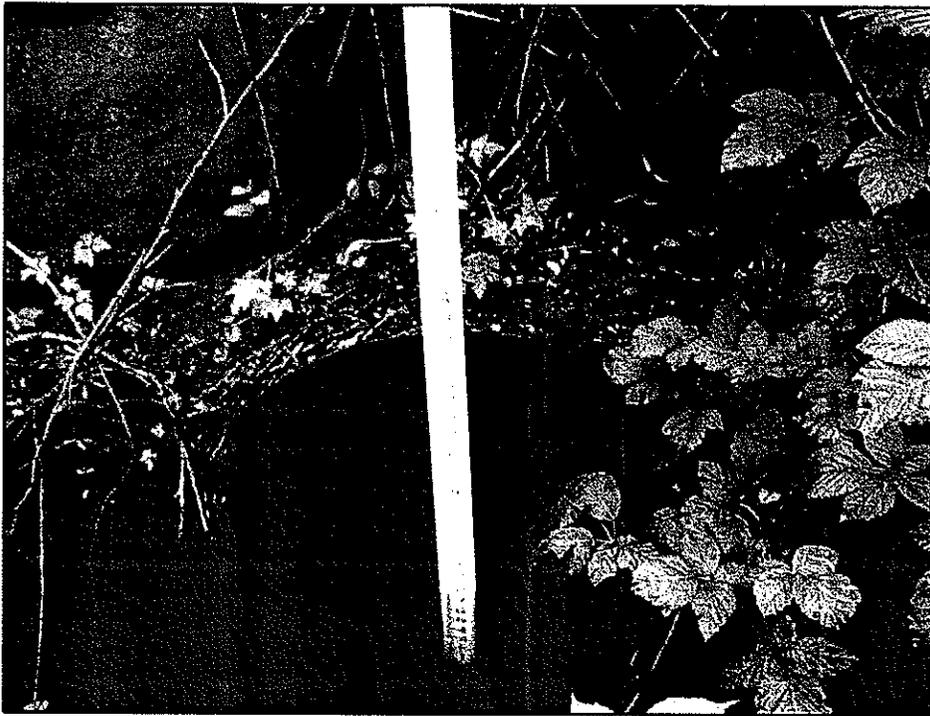
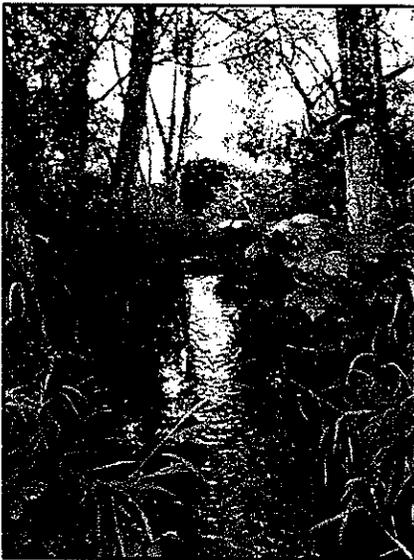


Figure 2. Reconnaissance Map from June 24, 2011 field visit.



**Photo 1.** View of the 171<sup>st</sup> Avenue NE culvert outlet.



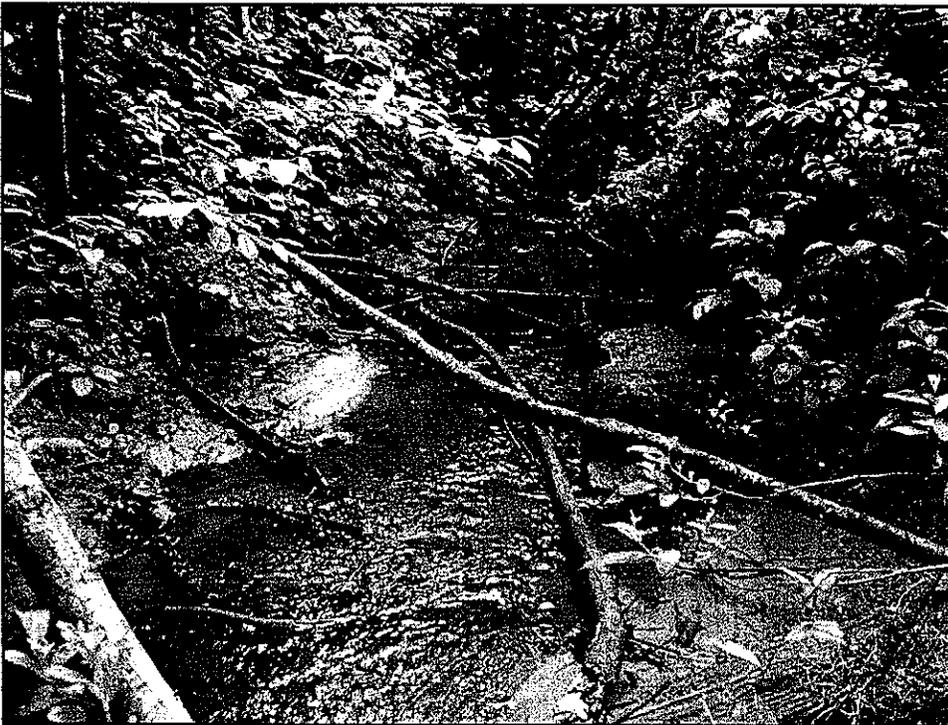
**Photo 2.** View of the looking downstream in the aggrading channel segment just downstream from the 131<sup>st</sup> Avenue NE culvert outfall.



**Photo 3.** View looking upstream of small (<1') forced head cut upstream from stormwater pond outlet.



**Photo 4.** View from the left bank looking obliquely downstream of the large channel-spanning bed log that constitutes a fish-passage barrier.



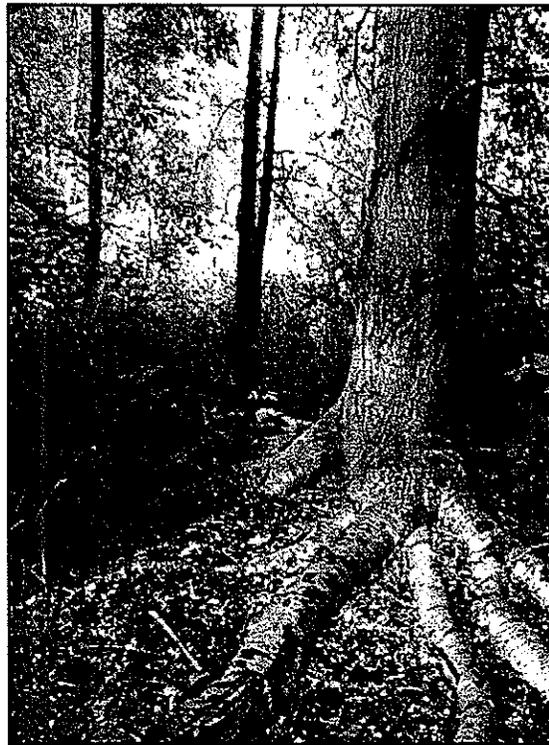
**Photo 5.** View looking downstream of the enlarged channel segment downstream from the stormwater pond outlet and channel-spanning bed log.



**Photo 6.** Roughened bed section below the Sammamish River Trail upstream from the Sammamish River confluence.



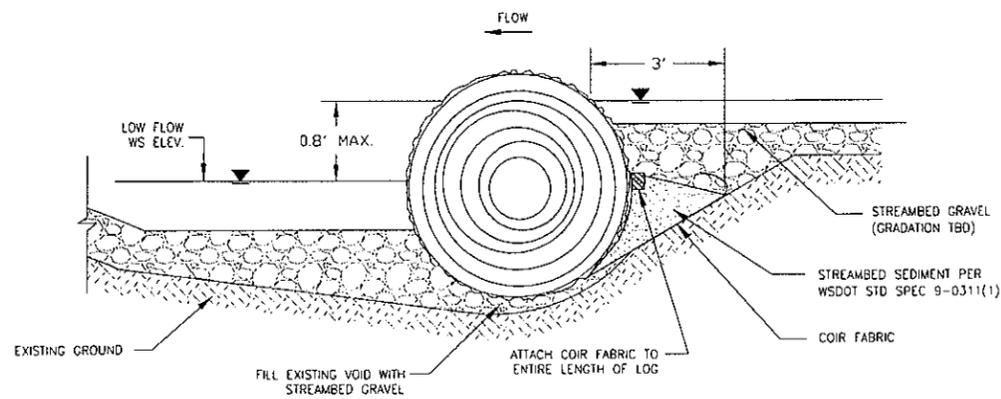
**Photo 7.** View of the stormwater pond from the parking lot at Waterford Place Apartments.



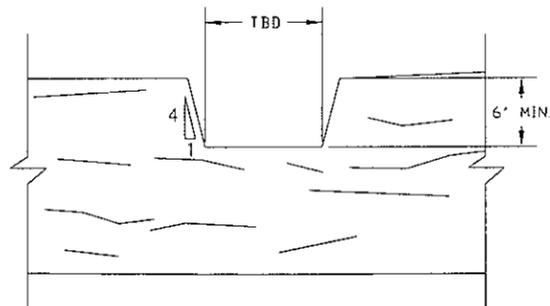
**Photo 8.** Potential evidence of intermittent sheet wash resulting from overland flow. Tree roots are exposed south of the stormwater pond on Woodin Creek left bank.



**Photo 9.** Potential mitigation site at Woodin Creek Park: looking east at Woodin Creek in an area where Himalayan blackberries were previously cleared.

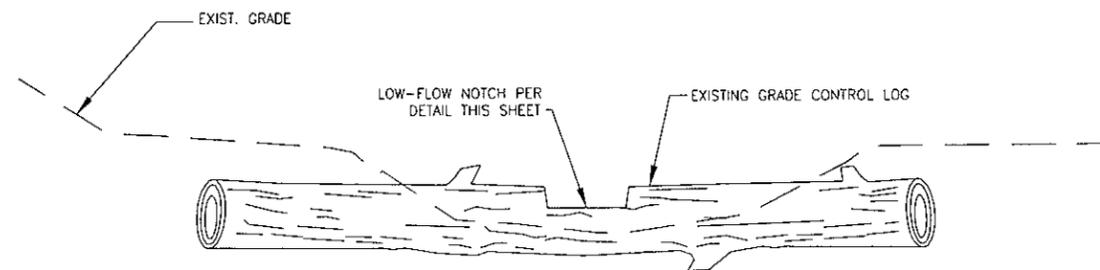


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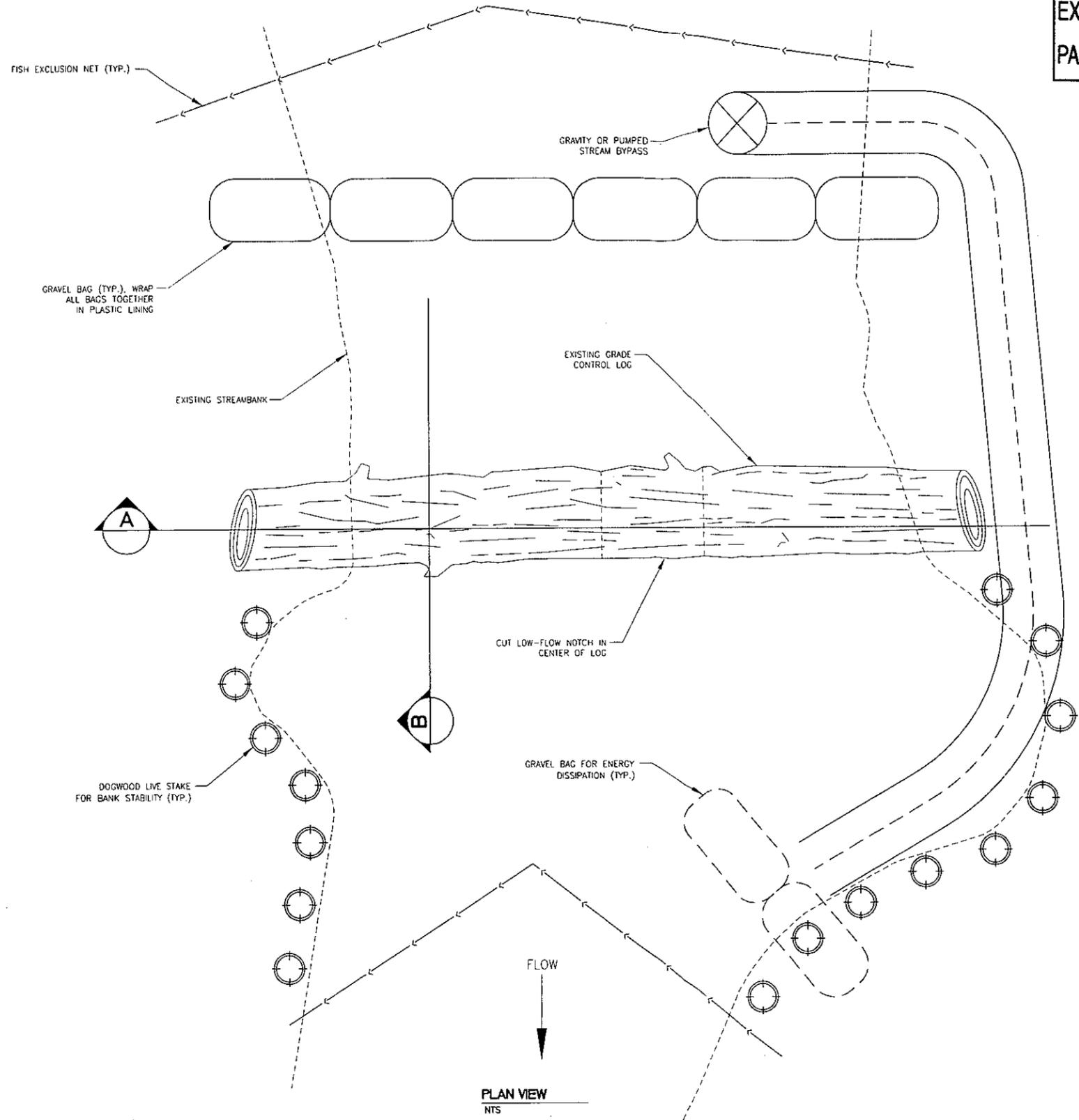


**LOW FLOW NOTCH DETAIL**  
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NOTE: FINAL LOW-FLOW NOTCH DIMENSIONS TO BE DETERMINED BASED ON HYDROLOGIC MODELING RESULTS.



**A CROSS SECTION**  
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**PLAN VIEW**  
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Preliminary - Not For Construction

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NO.	REVISION	DATE	BY	CK
1				
2				
3				
4				
5				



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PROJECT INFORMATION

**WOODINVILLE-DUWALL  
ROAD WIDENING**

SHEET TITLE:

**WOODIN CREEK  
MITIGATION CONCEPTS**

DATE: 07/12/2011	CHECKED BY: KOB
DESIGNED BY: RH	PROJECT NO.: 31423
DRAWN BY: RH	SCALE: NTS
SHEET 1 OF 1	
DRAWING NO.:	